




PUBLIC SAFETY COMPLEX
575 SMITHFIELD RD #1
NORTH SMITHFIELD, RI 02896

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

PROJECT NUMBER:
2415

LOCUS MAP N


A0.0 COVER SHEET

LANDSCAPING
C1.1 DEMO AND EROSION CONTROL
C1.2 SITE PLAN
C1.3 DETAILS

STRUCTURAL
S0.1 GENERAL NOTES
S0.2 SCHEDULES
S1.0 FOUNDATION PLAN
S1.1 FIRST FLOOR FRAMING PLAN
S1.2 ROOF FRAMING PLAN
S2.0 FOUNDATION DETAILS
S2.1 FOUNDATION DETIALS
S2.2 FRAMING DETAILS
S2.3 FRAMING DETAILS

ARCHITECTURAL
A0.1 ABBREVIATIONS, SYMBOLS, & MATERIALS
A0.2 CODE INFORMATION & GENERAL NOTES
A0.3 CODE REVIEW PLANS

AD1.0 SITE DEMOLITION PLAN
AD1.1 LOWER LEVEL DEMOLITION PLAN
AD1.2 UPPER LEVEL DEMOLITION PLAN
AD1.3 ROOF PLAN

A1.0 NEW WORK SITE PLAN
A1.1 LOWER LEVEL NEW WORK PLAN
A1.2 UPPER LEVEL NEW WORK PLAN
A1.3 NEW WORK ROOF PLAN
A1.4 LOWER LEVEL FINISHES PLAN
A1.5 UPPER LEVEL FINISHES PLAN
A1.6 LOWER LEVEL REFLECTED CEILING PLAN
A1.7 UPPER LEVEL REFLECTED CEILING PLAN

A2.1 PROPOSED ELEVATIONS
A2.2 PROPOSED ELEVATIONS
A2.3 NEW GARAGE PLAN AND ELEVATIONS

A3.1 ELEVATOR SECTIONS
A3.2 NEW SALLY PORT SECTIONS
A3.3 NEW GARAGE SECTIONS

A4.0 INTERIOR ELEVATION DETAILS
A4.1 MEN'S LOCKER ROOM INTERIOR ELEVATION
A4.2 INTERIOR BATHROOM ELEVATIONS
A4.3 INTERIOR BATHROOM ELEVATIONS
A4.4 KITCHEN INTERIOR ELEVATIONS
A4.5 PRISONER PROCESSING INTERIOR ELEVATIONS
A4.6 EMERGENCY EXIT EXTERIOR ELEVATIONS

A5.1 ADDITION DETAILS
A5.2 MILLWORK DETAILS

A6.1 DOOR SCHEDULE
A6.2 WINDOW LEGEND AND SCHEDULE
A6.3 FINISH SCHEDULE AND WALL TYPES

PLUMBING
P0.1 PLUMBING LEGEND, NOTES, & ABBREVIATIONS
PD1.1 PLUMBING DEMOLITION LOWER LEVEL PLAN - DOMESTIC WATER & GAS
PD1.2 PLUMBING DEMOLITION UPPER LEVEL PLAN - DOMESTIC WATER & GAS
PD1.3 PLUMBING DEMOLITION ROOF PLAN
P1.1 PLUMBING PROPOSED LOWER LEVEL PLAN - DOMESTIC WATER & GAS
P1.2 PLUMBING PROPOSED UPPER LEVEL PLAN - DOMESTIC WATER & GAS
P1.3 PLUMBING PROPOSED ROOF PLAN
P2.1 PLUMBING DETAILS
P2.2 PLUMBING DETAILS

FIRE PROTECTION
FP0.1 FIRE PROTECTION LEGEND, NOTES, & ABBREVIATIONS
FP1.1 FIRE PROTECTION PROPOSED LOWER LEVEL PLAN
FP1.2 FIRE PROTECTION PROPOSED UPPER LEVEL PLAN
FP2.1 FIRE PROTECTION DETAILS
FP2.2 FIRE PROTECTION DETAILS

MECHANICAL
M0.1 MECHANICAL LEGEND, NOTES, & ABBREVIATIONS
M0.2 MECHANICALSCHEDULES
M0.3 MECHANICALSCHEDULES
MD1.1 MECHANICAL DEMOLITION LOWER LEVEL PLAN - DUCTWORK
MD1.2 MECHANICAL DEMOLITION UPPER LEVEL PLAN - DUCTWORK
MD1.3 MECHANICAL DEMOLITION ROOF PLAN
M1.1 MECHANICAL PROPOSED LOWER LEVEL PLAN - DUCTWORK
M1.2 MECHANICAL PROPOSED UPPER LEVEL PLAN - DUCTWORK
M1.3 PROPOSED ATTIC DUCTWORK PLAN
M1.4 MECHANICAL PROPOSED ROOF PLAN
M2.1 MECHANICAL PROPOSED LOWER LEVEL PLAN - PIPING
M2.2 MECHANICAL PROPOSED UPPER LEVEL PLAN - PIPING
M3.1 MECHANICAL DETAILS
M3.2 MECHANICAL DETAILS

ELECTRICAL
E0.1 ELECTRICAL LEGEND, NOTES, & ABBREVIATIONS
ES1.1 ELECTRICAL SITE PLAN
ED1.1 ELECTRICAL LOWER LEVEL DEMOLITION PLAN
ED1.2 ELECTRICAL UPPER LEVEL DEMOLITION PLAN
E1.1 ELECTRICAL LOWER LEVEL LIGHTING PLAN
E1.2 ELECTRICAL UPPER LEVEL LIGHTING PLAN
E2.1 ELECTRICAL LOWER LEVEL POWER AND SYSTEMS PLAN
E2.2 ELECTRICAL UPPER LEVEL POWER AND SYSTEMS PLAN
E2.3 ELECTRICAL ROOF LIGHTING AND POWER PLAN
E3.1 ELECTRICAL POWER DISTRIBUTION DETAIL
E4.1 ELECTRICAL SCHEDULES AND DETAILS

FIRE ALARM
FA0.1 FIRE ALARM LEGEND & RISER DIGRAM
FA1.1 ELECTRICAL LOWER LEVEL FIRE ALARM PLAN
FA1.2 ELECTRICAL UPPER LEVEL FIRE ALARM PLAN

COMMUNICATIONS
LV0.1 LEGENDS AND NOTES
LV0.2 LEGENDS AND NOTES
LVD1.1 LOWER LEVEL DEMOLITION PLAN
LVD1.2 UPPER LEVEL DEMOLITION PLAN
LV1.1 LOWER LEVEL TELECOM PLAN
LV1.2 UPPER LEVEL TELECOM PLAN
LV1.3 ENLARGED AUDIOVISUAL PLAN
LV2.1 LOWER LEVEL SECURITY PLAN
LV2.2 UPPER LEVEL SECURITY PLAN
LV6.1 SCHEDULES AND DETAILS
LV6.2 SCHEDULES AND DETAILS
LV6.3 SCHEDULES AND DETAILS
LV6.4 SCHEDULES AND DETAILS
LV6.5 AUDIOVISUAL ONE-LINE
LV6.6 AUDIOVISUAL ONE-LINE


ISSUED FOR:
BIDDING
06/30/2025
STAMP:


ARCHITECT

Signal Works

ERIC ARMY, AIA

SIGNAL WORKS
11 ALEPPO STREET
PROVIDENCE, RI 02909
P: (508) 230.0260

CIVIL/LANDSCAPE ENGINEER

HORSLEY WITTEN GROUP, INC.
1 TURKS HEAD PLACE, SUITE 300
PROVIDENCE, RI 02903

P: (401) 272.1717

MEP+FP ENGINEERS

BUILDING ENGINEERING RESOURCES
66 MAIN STREET
NORTH EASTON, MA 02356
P: (508) 230.0260

LOW-VOLTAGE / AV ENGINEER

COMMUNICATION DESIGN SERVICES

STRUCTURAL ENGINEER

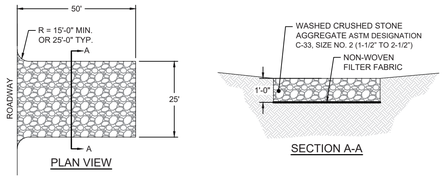
STRUCTURES ENGINEERING & DESIGN LLC
2 CHARLES STREET
SUITE C32
PROVIDENCE, RI 02904

OWNER

PAUL ZWOLENSKI
TOWN ADMINISTRATOR

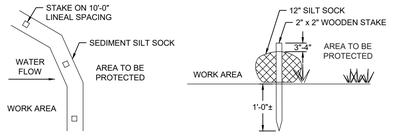
TOWN OF NORTH SMITHFIELD
83 GREENE STREET
NORTH SMITHFIELD, RI 02896





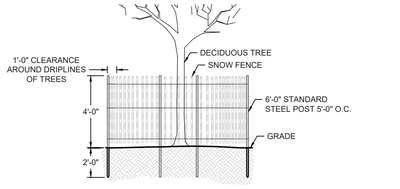

NOTES:
1. STONE CONSTRUCTION ENTRANCE(S) WILL REMAIN UNTIL INSTALLATION OF PAVEMENT SUB-BASE IS SET TO BEGIN.
2. SEE SITE PLAN FOR LOCATION & ACTUAL DIMENSIONS

## CONSTRUCTION ENTRANCE
NOT TO SCALE




NOTES:
1. SILT SOCK: SILTSOXX ORIGINAL, WITH ALL NATURAL BIODEGRADEABLE COTTON FIBER OR MULTI-FILAMENT POLYPROPYLENE (MFPP) MANUFACTURED BY FILTREXX (WWW.FILTREX.COM) OR APPROVED EQUIVALENT.
2. ALL MATERIAL TO MEET MANUFACTURER'S SPECIFICATIONS.
3. SEDIMENT SILT SOCK TO BE FILLED WITH LOCALLY SOURCED FILTER MEDIA (LEAF COMPOST AND/OR WOODY MULCH) PER MANUFACTURER'S REQUIREMENTS.
4. FOLLOWING CONSTRUCTION AND SITE STABILIZATION, COMPOST MATERIAL TO BE REMOVED OR DISPERSED ON SITE, AS APPROVED BY THE OWNER AND/OR ENGINEER.

## SEDIMENT SILT SOCK
NOT TO SCALE

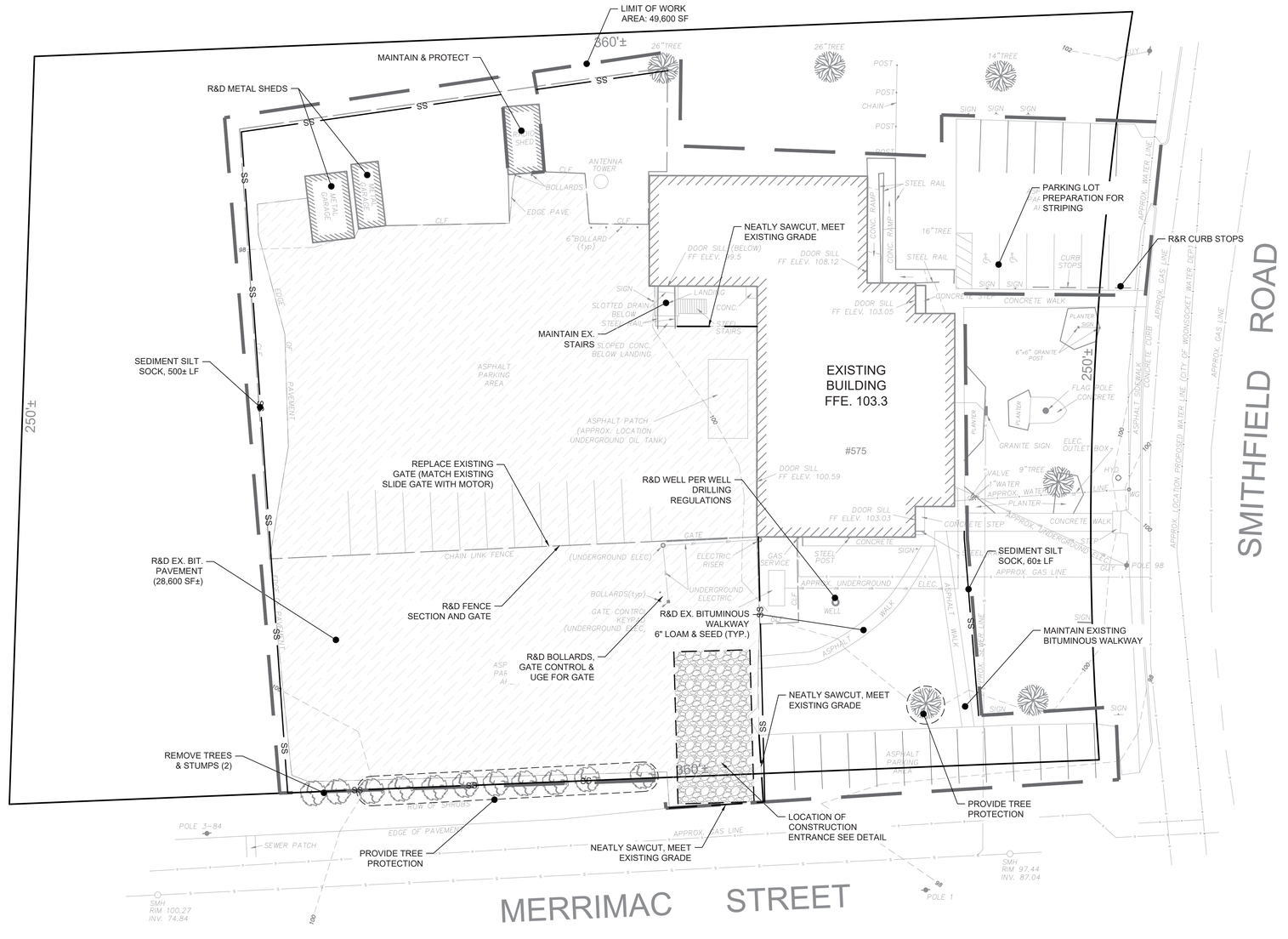



NOTES:
1. FENCING WILL BE ORANGE RESINET SM60 BARRIER FENCE "SNOW FENCE" OR APPROVED EQUIVALENT.
2. POST WILL BE HOT ROLLED RAIL STEEL & FORMED INTO A "T". DIMENSIONS OF "T" POST SECTION WILL BE APPROXIMATELY 1 7/16" X 1 5/16" X 1/8" X 6' (SIX FEET) LONG. THE POST WILL BE PAINTED GREEN OR GALVANIZED.
3. THE FENCING WILL REMAIN IN PLACE UNTIL ALL EXCAVATION HAS BEEN COMPLETED & THE SURFACE HAS BEEN RE-ESTABLISHED

## TREE PROTECTION
NOT TO SCALE

## EROSION & SEDIMENT CONTROL NOTES

1. DESIGNATE THE SITE CONSTRUCTION FOREMAN AS THE ON-SITE PERSONNEL RESPONSIBLE FOR THE DAILY INSPECTION AND MAINTENANCE OF ALL SEDIMENT AND EROSION CONTROLS AND IMPLEMENTATION OF ALL NECESSARY MEASURES TO CONTROL EROSION AND PREVENT SEDIMENT FROM LEAVING THE SITE.
2. INSTALL ALL EROSION AND SEDIMENT CONTROL (ESC) MEASURES AS INDICATED ON DRAWINGS IN CONSULTATION WITH THE ENGINEER BEFORE ANY CONSTRUCTION ACTIVITIES BEGIN. INSPECT, MAINTAIN REPAIR AND REPLACE EROSION CONTROL MEASURES, AS NECESSARY, DURING THE ENTIRE CONSTRUCTION PERIOD OF THE PROJECT. THE SITE PERIMETER EROSION CONTROLS ARE THE DESIGNATED LIMIT OF WORK. INFORM ALL PERSONNEL WORKING ON THE PROJECT SITE THAT NO CONSTRUCTION ACTIVITY IS TO OCCUR BEYOND THE LIMIT OF WORK AT ANY TIME THROUGHOUT THE CONSTRUCTION PERIOD.
3. MAINTAIN A MINIMUM SURPLUS OF 100 FEET OF EROSION CONTROL BARRIER (SILT FENCE, STRAWBALE, &/OR SILT SOCK) ONSITE AT ALL TIMES.
4. PROVIDE CONSTRUCTION EXITS AS INDICATED ON DRAWINGS TO SHED DIRT FROM CONSTRUCTION VEHICLE TIRES. CLEAN AND/OR REPLACE THE CRUSHED STONE PAD, AS NECESSARY, TO MAINTAIN ITS EFFECTIVENESS.
5. KEEP THE LIMIT OF CLEARING, GRADING AND DISTURBANCES TO A MINIMUM WITHIN THE PROPOSED AREA OF CONSTRUCTION. PHASE THE SITE WORK IN A MANNER TO MINIMIZE AREAS OF EXPOSED SOIL.
6. MONITOR LOCAL WEATHER REPORTS DURING CONSTRUCTION AND PRIOR TO SCHEDULING EARTHMOVING OR OTHER CONSTRUCTION ACTIVITIES WHICH LEAVE LARGE DISTURBED AREAS UNSTABILIZED. IF INCLEMENT WEATHER IS PREDICTED, USE BEST PROFESSIONAL JUDGEMENT AND GOOD CONSTRUCTION PRACTICES WHEN SCHEDULING CONSTRUCTION ACTIVITIES AND ENSURE THE NECESSARY EROSION CONTROL DEVICES ARE INSTALLED AND FUNCTIONING PROPERLY TO MINIMIZE EROSION FROM ANY IMPENDING WEATHER EVENTS.
7. INSPECT EROSION AND SEDIMENT CONTROL DEVICES AND STABILIZED SLOPES ON A WEEKLY BASIS AND AFTER EACH RAINFALL EVENT OF .25 INCH OR GREATER. REPAIR IDENTIFIED PROBLEMS WITHIN 24 HOURS TO ENSURE EROSION AND SEDIMENT CONTROLS ARE IN GOOD WORKING ORDER. RESET OR REPLACE MATERIALS AS REQUIRED.
8. SURROUND THE PERIMETER OF SOIL STOCKPILES WITH SILT SOCK, SILT FENCE, STRAWBALES, OR A COMBINATION OF SILT FENCE WITH STRAWBALE, AS DETERMINED NECESSARY.
9. DISTURBED AREAS AND SLOPES MUST NOT BE LEFT UNATTENDED OR EXPOSED FOR EXCESSIVE PERIODS OF TIME SUCH AS THE INACTIVE WINTER SEASON. PROVIDE APPROPRIATE STABILIZATION PRACTICES ON ALL DISTURBED AREAS AS SOON AS POSSIBLE BUT NOT MORE THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT AREA HAS TEMPORARILY OR PERMANENTLY CEASED. REINFORCE TEMPORARY AREAS HAVING A SLOPE GREATER THAN 4:1 WITH EROSION BLANKETS OR APPROVED EQUAL UNTIL THE SITE IS PROPERLY STABILIZED. TEMPORARY SWALES MAY ALSO BE REQUIRED IF DETERMINED NECESSARY IN THE FIELD BY THE ENGINEER.
10. CONTAIN ALL SEDIMENT ONSITE. SWEEP ALL EXITS FROM THE SITE AS NECESSARY INCLUDING ANY SEDIMENT TRACKING. SWEEP PAVED AREAS AS NEEDED TO REMOVE SEDIMENT AND POTENTIAL POLLUTANTS ACCUMULATED DURING SITE CONSTRUCTION.




GRAPHIC SCALE
20 0 10 20 40 80
(in feet)
1 INCH = 20 FEET


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

**Horsley Witten Group, Inc.**
*Sustainable Environmental Solutions*
*www.horsleywitten.com*
*1 Turks Head Place, Suite 300*
*Providence, RI 02903*
*401-272-1717 voice*
*401-437-8368 fax*


PROJECT TITLE:
PUBLIC SAFETY COMPLEX
575 SMITHFIELD ROAD,
NORTH SMITHFIELD,RI

ISSUED FOR:
BIDDING
6/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
DEMO & EROSION CONTROL

PROJECT NORTH:
N

PROJECT ARCHITECT:
DRAWN:
PROJECT NUMBER:
#2415

SHEET NUMBER: C1.1
REV:


last modified: 02/14/25 printed: 06/30/25 by jk H:\Projects\2016\16026 No.Smithfield Municipal Bldg Site Design\Drawings\16036-BUSH-DEMO-ESC.dwg

## GENERAL CONSTRUCTION NOTES

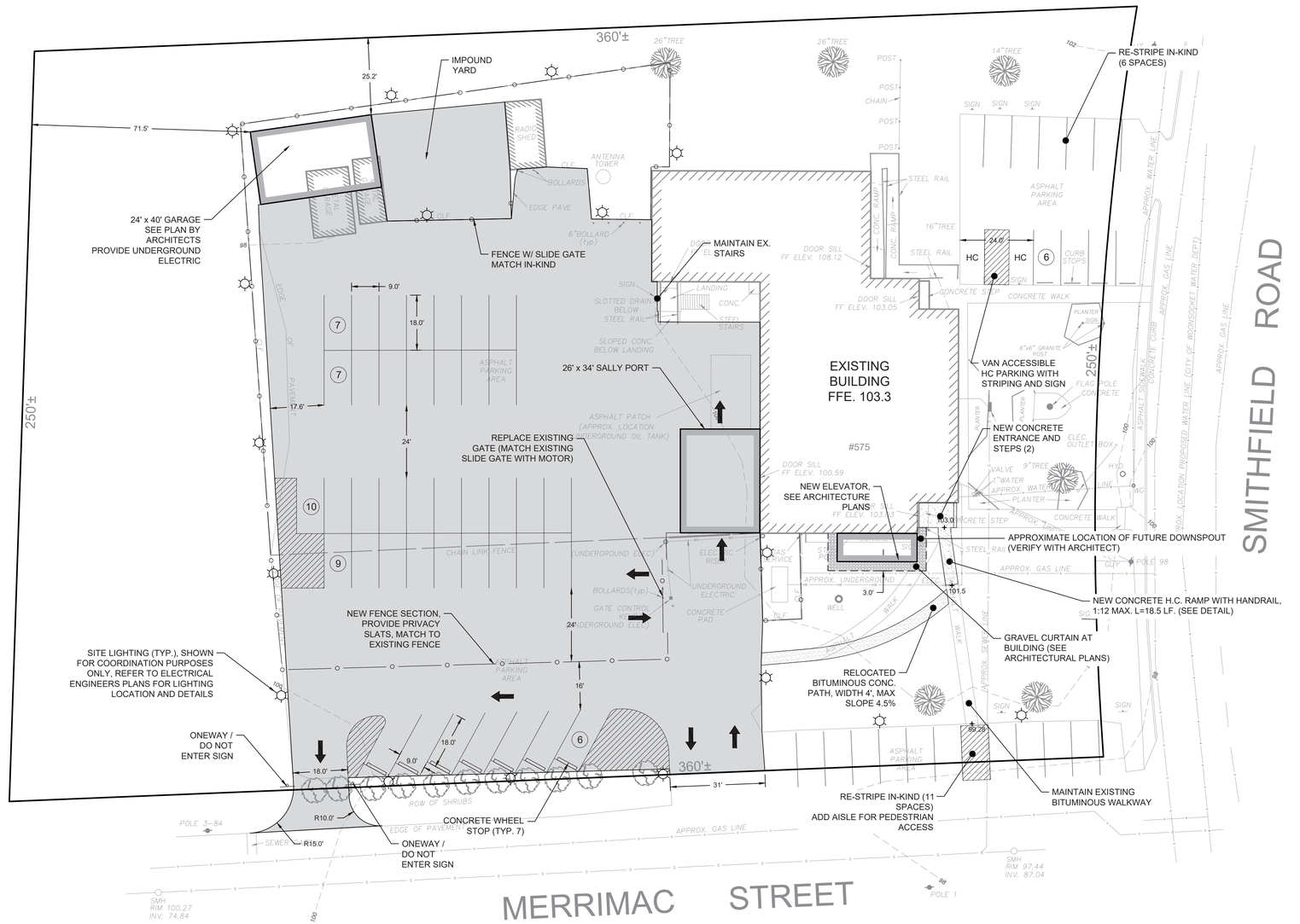
1. ALL SITE WORK TO COMPLETE THIS PROJECT AS INDICATED ON THE DRAWINGS AND IN THE SPECIFICATIONS IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
2. UTILIZE ALL PRECAUTIONS AND MEASURES TO ENSURE THE SAFETY OF THE PUBLIC, ALL PERSONNEL AND PROPERTY DURING CONSTRUCTION IN ACCORDANCE WITH OSHA STANDARDS, INCLUDING THE INSTALLATION OF TEMPORARY FENCING BARRICADES, SAFETY LIGHTING, CONES, POLICE DETAIL AND/OR FLAGMEN AS DETERMINED NECESSARY BY THE TOWN. THE CONTRACTOR IS RESPONSIBLE FOR THE COST OF POLICE DETAIL AND FOR COORDINATING WITH THE LOCAL OR STATE POLICE DEPARTMENT FOR ALL REQUIRED POLICE DETAIL.
3. MAKE ALL NECESSARY CONSTRUCTION NOTIFICATIONS AND APPLY FOR AND OBTAIN ALL NECESSARY CONSTRUCTION PERMITS, PAY ALL FEES INCLUDING POLICE DETAILS AND POST ALL BONDS, IF NECESSARY, ASSOCIATED WITH THE SAME, AND COORDINATE WITH THE OWNER AND THE ENGINEER.
4. ALL EXISTING CONDITIONS SHOWN ARE APPROXIMATE AND ARE BASED ON THE BEST INFORMATION AVAILABLE. PRIOR TO THE START CONSTRUCTION VERIFY THAT THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS DO NOT CONFLICT WITH ANY KNOWN EXISTING OR OTHER PROPOSED IMPROVEMENTS. IF ANY CONFLICTS ARE DISCOVERED, NOTIFY THE OWNER AND THE ENGINEER PRIOR TO INSTALLING ANY PORTION OF THE SITE WORK WHICH WOULD BE AFFECTED.
5. THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AND STRUCTURES AS INDICATED ON THE DRAWINGS ARE BASED ON RECORDS OF VARIOUS UTILITY COMPANIES, AND WHEREVER POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THIS INFORMATION IS NOT TO BE RELIED UPON AS BEING EXACT OR COMPLETE. VERIFY THE LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES IN THE FIELD PRIOR TO THE START OF CONSTRUCTION. CONTACT THE APPROPRIATE UTILITY COMPANY, ANY GOVERNING PERMITTING AUTHORITY IN THE TOWN, AND "DIGSAFE" (1-888-344-7233) AT LEAST THREE BUSINESS DAYS PRIOR TO ANY EXCAVATION WORK IN PREVIOUSLY UNALTERED AREAS TO REQUEST EXACT FIELD LOCATION OF UTILITIES. THE CONTRACTOR MUST RESOLVE CONFLICTS BETWEEN THE PROPOSED UTILITIES AND FIELD-LOCATED UTILITIES AND REPORT ANY DISCREPANCIES TO THE ENGINEER IMMEDIATELY. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR DAMAGES INCURRED AS A RESULT OF UTILITIES OMITTED, INCOMPLETELY OR INACCURATELY SHOWN. THE CONTRACTOR MUST MAINTAIN ACCURATE RECORDS OF THE LOCATION AND ELEVATION OF ALL WORK INSTALLED AND EXISTING UTILITIES FOUND DURING CONSTRUCTION FOR THE PREPARATION OF THE AS-BUILT PLAN.
6. COORDINATE AND MAKE ALL CONNECTION ARRANGEMENTS WITH UTILITY COMPANIES, AS REQUIRED.
7. THE CONTRACTOR MUST MAINTAIN ALL EXISTING UTILITIES IN WORKING ORDER AND FREE FROM DAMAGE DURING THE ENTIRE DURATION OF THE PROJECT. REPAIR ANY DAMAGE TO EXISTING UTILITY LINES OR STRUCTURES INCURRED DURING CONSTRUCTION OPERATIONS AT NO COST TO THE OWNER. THE CONTRACTOR IS RESPONSIBLE FOR ALL COST RELATED TO THE REPAIR OF UTILITIES. EXCAVATION REQUIRED WITHIN THE PROXIMITY OF EXISTING UTILITY LINES MUST BE DONE BY HAND.
8. COORDINATE ALL TRENCHING WORK WITHIN ROADWAYS WITH THE PROPER LOCAL & STATE AGENCY. THE CONTRACTOR IS RESPONSIBLE FOR ALL TRENCH SAFETY INCLUDING ANY LOCAL AND/OR STATE PERMITS REQUIRED FOR THE TRENCH WORK. IF THIS WORK IS REQUIRED TO OCCUR OUTSIDE THE AGREED UPON HOURS OF OPERATION FOR THE FACILITY, THE CONTRACTOR MUST PLAN ACCORDINGLY.
9. SAWCUT ALL TRENCH WORK WITHIN EXISTING PAVEMENT AS INDICATED ON THE DRAWINGS. BACKFILL AND COMPACT TRENCH WORK AS INDICATED ON THE DRAWING AND IN THE SPECIFICATIONS. IF SETTLEMENT OCCURS DUE TO INADEQUATE COMPACTION, AS DETERMINED BY THE ENGINEER, WITHIN THE WARRANTY PERIOD, CONTRACTOR IS REQUIRED TO REMOVE, PATCH AND REPAVE AFTER ONE COMPLETE 12-MONTH CYCLE.
10. IMPORT ONLY CLEAN MATERIAL. MATERIAL FROM AN EXISTING OR FORMER 21E SITE WILL NOT BE ACCEPTED.
11. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ESTABLISH AND MAINTAIN ALL CONTROL POINTS AND BENCHMARKS DURING CONSTRUCTION INCLUDING BENCHMARK LOCATIONS AND ELEVATIONS AT CRITICAL AREAS. COORDINATE WITH THE ENGINEER THE LOCATION OF ALL CONTROL POINTS AND BENCHMARKS.
12. SITE LAYOUT SURVEY REQUIRED FOR CONSTRUCTION MUST BE PROVIDED BY THE CONTRACTOR AND PERFORMED BY A REGISTERED PROFESSIONAL LAND SURVEYOR. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH THE SURVEYOR FOR ALL SITE SURVEY WORK.
13. UNLESS OTHERWISE INDICATED ON THE DRAWINGS AND/OR IN THE SPECIFICATIONS, ALL SITE CONSTRUCTION MATERIALS AND METHODOLOGIES ARE TO CONFORM TO THE MOST RECENT VERSION OF THE RHODE ISLAND DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.
14. PROVIDE ALL CONSTRUCTION SERVICE IN ACCORDANCE WITH APPLICABLE LAWS AND REGULATIONS REGARDING NOISE, VIBRATION, DUST, SEDIMENTATION CONTAINMENT, AND TRENCH WORK.
15. COLLECT SOLID WASTES AND STORE IN A SECURED DUMPSTER. THE DUMPSTER MUST MEET ALL LOCAL AND STATE SOLID WASTE MANAGEMENT REGULATIONS.
16. RESTORE ALL SURFACES EQUAL TO THEIR ORIGINAL CONDITION AFTER CONSTRUCTION IS COMPLETE PER SPECIFICATIONS. LEAVE ALL AREAS NOT DISTURBED BY CONSTRUCTION IN THEIR NATURAL STATE. TAKE CARE TO PREVENT DAMAGE TO SHRUBS, TREES, OTHER LANDSCAPING AND/OR NATURAL FEATURES. WHEREAS THE PLANS DO NOT SHOW ALL LANDSCAPE FEATURES, EXISTING CONDITIONS MUST BE VERIFIED BY THE CONTRACTOR IN ADVANCE OF THE WORK.
17. LEDGE OR BOULDER EXCAVATION IS NOT ANTICIPATED FOR THIS SITE. HOWEVER, PROVIDE A UNIT PRICE COST IN CUBIC YARD MEASURE FOR LEDGE AND/OR BOULDER REMOVAL. LEDGE AND/OR BOULDERS LESS THAN 1 CUBIC YARD IN SIZE BASED ON THE AVERAGE DIMENSIONS WILL NOT BE CONSIDERED PAYABLE ROCK. PROVIDE UNIT PRICES FOR BOTH ON AND OFF SITE DISPOSAL. IF ADDITIONAL FILL MATERIAL IS REQUIRED INCLUDE THE COST OF ALL FILL MATERIAL.
18. REGULARLY INSPECT THE PERIMETER OF THE PROPERTY TO CLEAN UP AND REMOVE LOOSE CONSTRUCTION DEBRIS BEFORE IT LEAVES THE SITE. PROMPTLY REMOVE ALL DEMOLITION DEBRIS FROM THE SITE TO AN APPROVED DUMP SITE.
19. ALL TRUCKS LEAVING THE SITE MUST BE COVERED.
20. DO NOT WASH ANY CONCRETE TRUCKS ONSITE. REMOVE BY HAND ANY CEMENT OR CONCRETE DEBRIS LEFT IN THE DISTURBED AREA.
21. BURIAL OF ANY STUMPS, SOLID DEBRIS, AND/OR STONES/BOULDERS ONSITE IS PROHIBITED. DO NOT USE ROAD SALT OR OTHER DE-ICING CHEMICALS ON THE ACCESS ROADWAY.
22. IMMEDIATELY CONTACT AND COORDINATE WITH THE ENGINEER AND OWNER IF ANY DEVIATION OR ALTERATION OF THE WORK PROPOSED ON THESE DRAWINGS IS REQUIRED.
23. AT THE END OF CONSTRUCTION, REMOVE ALL CONSTRUCTION DEBRIS AND SURPLUS MATERIALS FROM THE SITE. PERFORM A THOROUGH INSPECTION OF THE WORK PERIMETER. COLLECT AND REMOVE ALL MATERIALS AND BLOWN OR WATER CARRIED DEBRIS FROM THE SITE.

## GENERAL DEMOLITION NOTES

THIS PLAN SET DOES NOT INCLUDE DETAILS & SPECIFICATIONS FOR ALL DEMOLITION WORK REQUIRED WITHIN THE PROPOSED CONSTRUCTION LIMITS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH THE OWNER, PROJECT ARCHITECT, MECHANICAL ENGINEERS AND OTHER PROJECT ENGINEERS INVOLVED WITH THE PROPOSED NEW CONSTRUCTION TO DEVELOP A SUITABLE DEMOLITION PLAN, WHICH WILL ALLOW THE FACILITIES TO REMAIN IN OPERATION DURING THE ENTIRETY OF CONSTRUCTION.

1. UNLESS OTHERWISE NOTED, THE CONTRACTOR IS RESPONSIBLE FOR THE RELOCATION, DEMOLITION, REMOVAL AND DISPOSAL, IN A LOCATION APPROVED BY ALL GOVERNING AUTHORITIES, OF ALL EXISTING SITE ELEMENTS AND STRUCTURES INCLUDING, BUT NOT LIMITED TO, BUILDINGS, ROADWAYS, PARKING AREAS, PARKING ISLANDS, BITUMINOUS CONCRETE, CEMENT CONCRETE, GRAVEL, CURBS, WALKWAYS, SIDEWALKS, BERMS, FENCES, BOLLARDS, POSTS, PLANTING BEDS, TREES, SHRUBS, UTILITIES, DRAINAGE STRUCTURES AND ALL OTHER STRUCTURES SHOWN AND NOT SHOWN WITHIN CONSTRUCTION LIMITS, AND WHERE NEEDED, TO ALLOW FOR NEW CONSTRUCTION. ALL FACILITIES TO BE REMOVED ARE TO BE UNDERCUT TO SUITABLE MATERIAL AND BROUGHT TO GRADE WITH SUITABLE COMPACTED FILL MATERIAL PER SPECIFICATIONS.
2. REMOVE ALL DEBRIS FROM THE SITE AND DISPOSE OF THE DEBRIS IN A PROPER AND LEGAL MANNER.
3. OBTAIN ALL PERMITS REQUIRED FOR DEMOLITION AND DISPOSAL.
4. COORDINATE WITH RESPECTIVE UTILITY COMPANIES PRIOR TO THE REMOVAL AND/OR RELOCATION OF UTILITIES. COORDINATE WITH THE UTILITY COMPANIES CONCERNING PORTIONS OF THE WORK WHICH MAY BE PERFORMED BY THE UTILITY COMPANY AND ANY FEES WHICH ARE TO BE PAID TO THE UTILITY COMPANY FOR THEIR SERVICES. THE CONTRACTOR IS RESPONSIBLE FOR PAYING ALL FEES AND CHARGES.
5. REFER TO MECHANICAL AND UTILITY PLANS AND SPECIFICATIONS FOR ALL WORK WHICH REQUIRES UTILITIES TO BE REMOVED, RELOCATE OR ABANDONED AND LEFT IN PLACE.
6. PROVIDE NOTICE TO ALL UTILITY COMPANIES REGARDING DESTRUCTION AND REMOVAL OF ALL SERVICE LINES AND CAP ALL UTILITY LINES, AS REQUIRED, BEFORE PROCEEDING WITH THE WORK.
7. MAINTAIN CONTINUOUS ACCESS AND OPERATION FOR SURROUNDING FACILITIES, AS DEEMED BY THE OWNER, AT ALL TIMES DURING DEMOLITION OF THE EXISTING FACILITIES.
8. PRIOR TO DEMOLITION OCCURRING, ALL EROSION CONTROL DEVICES ARE TO BE INSTALLED.

NOTES:
1. MAINTAIN AND PROTECT ALL EXISTING BOLLARDS, FENCES, GATES, STAIRS, CONCRETE PADS, PLANTINGS, AND OTHER SITE FEATURES UNLESS OTHERWISE NOTED.
2. COORDINATE BUILDING DOOR LOCATIONS, GRADE TRANSITIONS AT ENTRIES, RAMPS, STAIRS, AND RAILINGS WITH ARCHITECT.
3. COORDINATE ALL WORK WITHIN R.O.W. WITH TOWN OF NORTH SMITHFIELD AS REQUIRED.
4. RESTRIPE REPAVED AREAS AS SHOWN. EPOXY RESIN WITH AASHTO M247 TYPE I GLASS BEADS OR APPROVED EQUAL
5. ALL PARKING SPACES SHALL HAVE CONC. WHEEL STOPS.




GRAPHIC SCALE
20 0 10 20 40 80
(in feet)
1 INCH = 20 FEET


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

**Horsley Witten Group, Inc.**
*Sustainable Environmental Solutions*
*www.horsleywitten.com*
*1 Turks Head Place, Suite 300*
*Providence, RI 02903*
*401-272-1717 voice*
*401-437-8368 fax*


PROJECT TITLE:
PUBLIC SAFETY COMPLEX
575 SMITHFIELD ROAD,
NORTH SMITHFIELD,RI

ISSUED FOR:
BIDDING
6/30/2025

REVISIONS:

STAMP:

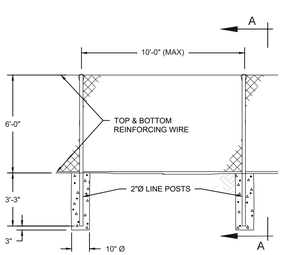
SHEET TITLE:
SITE PLAN

PROJECT NORTH:
N

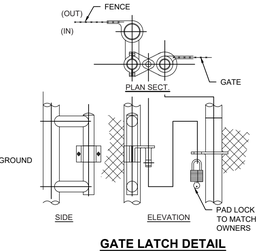
PROJECT ARCHITECT:
DRAWN:
PROJECT NUMBER:
#2415

SHEET NUMBER: C1.2
REV:

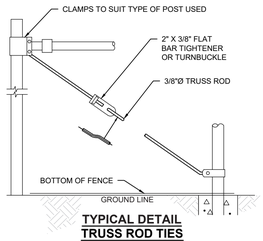

last modified: 02/14/25 printed: 06/30/25 by jk H:\Projects\2016\16026 No.Smithfield Municipal Bldg Site Design\Drawings\16036-BUSH-ST.dwg



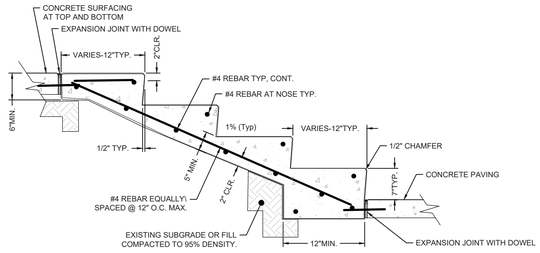

## TYPICAL LINE FENCE DETAIL
NOT TO SCALE



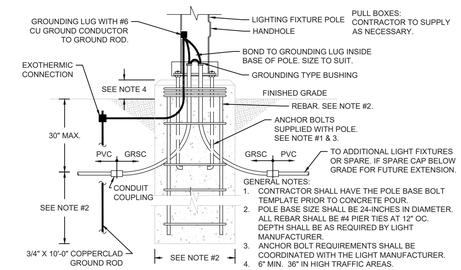

## GATE LATCH DETAIL
NOT TO SCALE




## TYPICAL DETAIL TRUSS ROD TIES
NOT TO SCALE

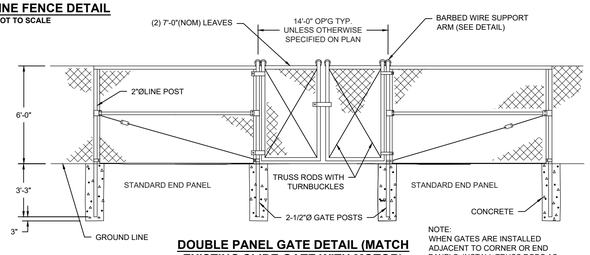



## CONCRETE STAIRS
NOT TO SCALE




GENERAL NOTES:
1. CONTRACTOR SHALL HAVE THE POLE BASE BOLT TEMPLATE PRIOR TO CONCRETE POUR.
2. POLE BASE SIZE SHALL BE 24-INCHES IN DIAMETER. ALL REBAR SHALL BE #4 PIER TIES AT 12" OC. DEPTH SHALL BE AS REQUIRED BY LIGHT MANUFACTURER.
3. ANCHOR BOLT REQUIREMENTS SHALL BE COORDINATED WITH THE LIGHT MANUFACTURER.
4. 6" MIN. 36" IN HIGH TRAFFIC AREAS.

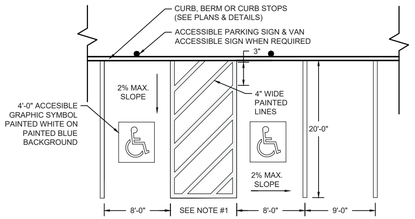
## TYPICAL SITE LIGHTING POLE BASE DETAIL
NOT TO SCALE




## DOUBLE PANEL GATE DETAIL (MATCH EXISTING SLIDE GATE WITH MOTOR)

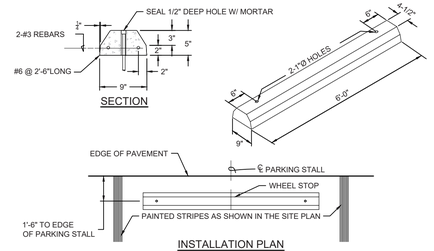
NOTE:
WHEN GATES ARE INSTALLED ADJACENT TO CORNER OR END PANELS, INSTALL TRUSS RODS AS IN PULL POST ASSEMBLIES.

## 6-FT CHAINLINK FENCE DETAIL
NOT TO SCALE




NOTES:
1. ACCESS AISLE WIDTH FOR NON VAN (CAR) ACCESSIBLE SPACES WILL BE 5'-0". VAN ACCESS AISLE WIDTH WILL BE 8'-0" (SEE PLANS).
2. ALL PAINT WILL BE NON-SKID.

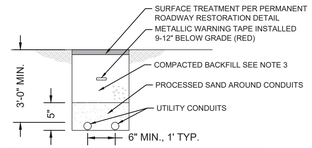
## ACCESSIBLE PARKING W/ NO SIDEWALK
NOT TO SCALE




INSTALLATION PLAN

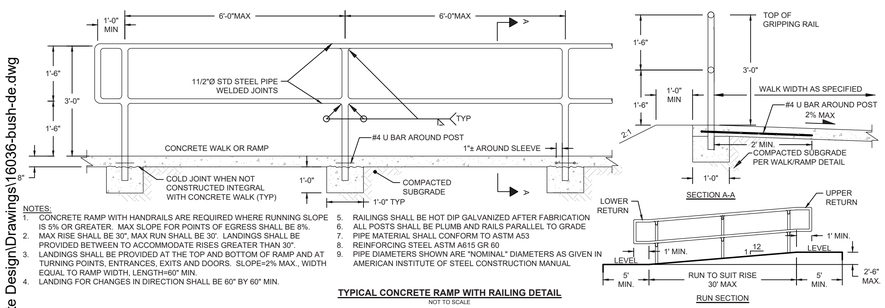
## PRECAST CONCRETE BUMPER DETAIL
NOT TO SCALE

NOTE:
DETAIL IS FOR SECONDARY ELECTRICAL SERVICE. PRIMARY SERVICE SHALL BE INSTALLED PER ELECTRICAL COMPANY STANDARDS.




NOTES:
1. SITE WORK SUBCONTRACTOR SHALL PERFORM EXCAVATION, AND BACKFILL FOR ALL CONDUIT INSTALLATIONS. ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL ALL CONDUITS, PULLWIRES, HANDHOLES, AND WARNING TAPE AS REQUIRED FOR ELECTRICAL WORK.
2. UTILITY CONDUITS SHALL INCLUDE A COMBINATION OF ONE, TWO, OR ALL OF (1) FOR TELEPHONE, (1) FOR ELECTRICAL, AND (1) FOR CABLE TELEVISION, (1) COMMUNICATION, (1) FOR OTHER AS SHOWN IN THE SITE PLAN.
3. TRENCH COMPACTED BACKFILL:
   BENEATH PAVEMENT: BACKFILL SHALL BE ROADBASE AND COMPACTED TO PAVEMENT SUBBASE REQUIREMENTS-SEE DETAIL.
   OUTSIDE PAVEMENT: GRAVEL BORROW TYPE B (3" MINUS) COMPACTED IN MAXIMUM 8 INCH LIFTS TO TO 95% COMPACTION.
4. UTILITY SHALL BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE UTILITY COMPANY STANDARDS THAT MAY BE MORE STRINGENT THAN THIS DETAIL.

## TYPICAL UTILITY TRENCH DETAIL
NOT TO SCALE

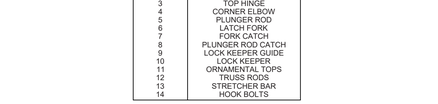



NOTES:
1. CONCRETE RAMP WITH HANDRAILS ARE REQUIRED WHERE RUNNING SLOPE IS 5% OR GREATER. MAX SLOPE FOR POINTS OF EGRESS SHALL BE 8%.
2. MAX RISE SHALL BE 30", MAX RUN SHALL BE 30'. LANDINGS SHALL BE PROVIDED BETWEEN TO ACCOMMODATE RISES GREATER THAN 30".
3. LANDINGS SHALL BE PROVIDED AT THE TOP AND BOTTOM OF RAMP AND AT TURNING POINTS, ENTRANCES, EXITS AND DOORS. SLOPE=2% MAX., WIDTH EQUAL TO RAMP WIDTH, LENGTH=60" MIN.
4. LANDING FOR CHANGES IN DIRECTION SHALL BE 60" BY 60" MIN.
5. RAILINGS SHALL BE HOT DIP GALVANIZED AFTER FABRICATION
6. ALL POSTS SHALL BE PLUMB AND RAILS PARALLEL TO GRADE
7. PIPE MATERIAL SHALL CONFORM TO ASTM A53
8. REINFORCING STEEL ASTM A615 GR 60
9. PIPE DIAMETERS SHOWN ARE "NOMINAL" DIAMETERS AS GIVEN IN AMERICAN INSTITUTE OF STEEL CONSTRUCTION MANUAL

## TYPICAL CONCRETE RAMP WITH RAILING DETAIL
NOT TO SCALE

LEGEND

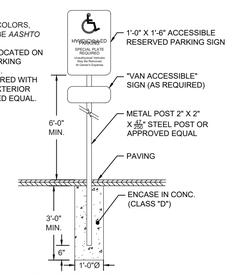
| PART NO. | DESCRIPTION |
|---|---|
| 1 | STRAIGHT PLUG |
| 2 | BOTTOM HINGE |
| 3 | TOP HINGE |
| 4 | CORNER ELBOW |
| 5 | PLUNGER ROD |
| 6 | LATCH FORK |
| 7 | FORK CATCH |
| 8 | PLUNGER ROD CATCH |
| 9 | LOCK KEEPER GUIDE |
| 10 | LOCK KEEPER |
| 11 | ORNAMENTAL TOPS |
| 12 | TRUSS RODS |
| 13 | STRETCHER BAR |
| 14 | HOOK BOLTS |



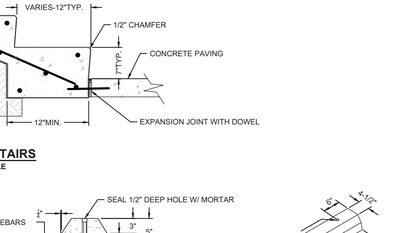

NOTES:
1. FENCING FABRIC WILL BE #9 GAUGE, STANDARD 2" DIAMOND MESH.
2. FENCE FABRIC COVERING WILL BE BLACK VINYL PER SPECIFICATIONS.

## CHAINLINK FENCE VEHICLE GATE
NOT TO SCALE

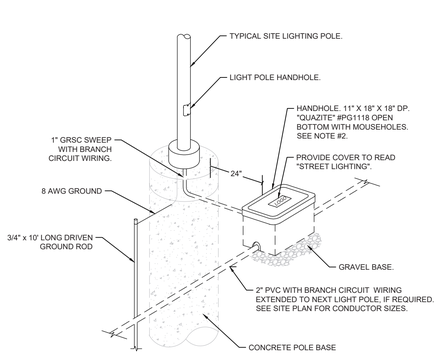
NOTES:
1. ACCESSIBLE SIGN LAYOUT, COLORS, SYMBOL & LETTERING WILL BE *AASHTO* STANDARD.
2. ACCESSIBLE SIGN WILL BE LOCATED ON SITE AT ALL ACCESSIBLE PARKING SPACES AS SHOWN ON PLAN.
3. METAL POST WILL BE DELIVERED WITH MANUFACTURER PAINTED EXTERIOR BLACK ENAMEL OR APPROVED EQUAL.




## ACCESSIBLE PARKING SIGN
NOT TO SCALE

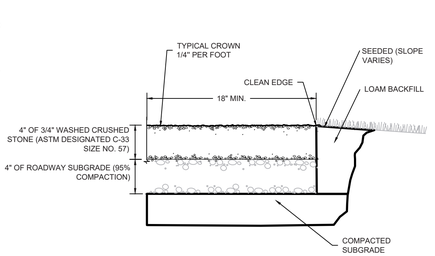



## WIRE METAL FENCE
NOT TO SCALE

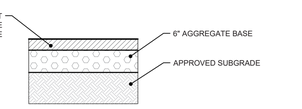



NOTES:
1. INSTALLATION TYPICAL FOR LANDSCAPED OR PAVED SIDEWALK AREAS. HANDHOLE SHALL NOT BE LOCATED IN TRAFFIC AREAS.
2. COORDINATE COVER AND FRAME COLOR OF HANDHOLE WITH ENGINEER.
3. PROVIDE IN-LINE, WATERPROOF FUSE HOLDER-BUSS "TRON", TYPE HEB OR HEX, AS REQUIRED.
4. REFER TO TYPICAL LIGHT POLE BASE DETAIL.

## SITE LIGHTING HANDHOLE DETAIL
NOT TO SCALE

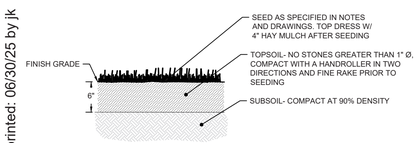



## GRAVEL SKIRT
NOT TO SCALE

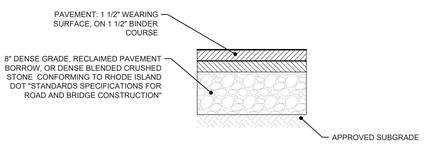



GENERAL NOTES:
1. THIS DETAIL IS RATED FOR LIGHT DUTY APPLCATIONS DUE TO ITS SINGLE ASPHALT COURSE AND BASE THICKNESS. IT IS TYPICALLY ASSOCIATED WITH PEDESTRIAN WALKS AND LIGHT SERVICE ACCESS IN RESIDENTIAL PARK SETTINGS.
2. SANDY-LOAM AND/OR LOAMY-SAND TOPSOIL MATERIAL SHALL BE EXCAVATED FROM ALL PAVED AREAS PRIOR TO SUB-BASE INSTALLATION.
3. SUB-GRADE (EXISTING MATERIAL) SHALL CONSIST OF INERT MATERIAL THAT IS HARD, DURABLE STONE AND/OR COURSE SAND, FREE FROM LOAM AND CLAY TO A DEPTH NOT LESS THAN 4-FT BELOW THE FINISH PAVEMENT SURFACE.
4. THE AGGREGATE BASE SHOULD EXTEND BEYOND THE PAVMENT EDGE SO THE EDGE WILL BE STRUCTURALLY REINFORCED.
5. SUBGRADE FILL SHALL BE COMPACTED TO 95% COMPACTION.
6. SEE SITE LAYOUT PLAN FOR PAVEMENT WIDTH AND LOCATION.
7. SEE GRADING PLANS FOR PAVMENT SLOPE AND CROSS SLOPE

## TYPICAL BITUMINOUS WALKWAY
NOT TO SCALE

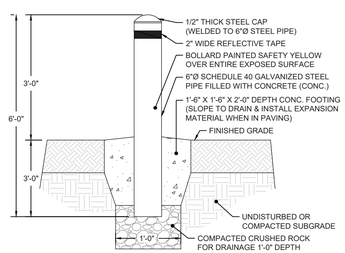



## LOAM AND SEED DETAIL
NOT TO SCALE




GENERAL NOTES:
1. SUB-GRADE (EXISTING MATERIAL) SHALL CONSIST OF INERT MATERIAL THAT IS HARD, DURABLE STONE AND/OR COARSE SAND, FREE FROM LOAM AND CLAY TO A DEPTH NOT LESS THAN 4-FT BELOW THE FINISH PAVEMENT SURFACE. EXCAVATE SANDY-LOAM AND/OR LOAMY-SAND TOPSOIL MATERIAL FROM ALL PAVED AREAS PRIOR TO SUB-BASE INSTALLATION.
2. PLACE SUB-BASE IN MAXIMUM 8" LIFTS (COMPACTED TO 95%).
3. COMPACT SUB-GRADE FILL TO 95% COMPACTION.
4. SEE SITE LAYOUT PLAN FOR PAVEMENT WIDTH AND LOCATION.
5. SEE GRADING PLANS FOR PAVEMENT SLOPE AND CROSS SLOPE.
6. SWEEP CLEAN THE EXISTING BINDER COURSE SURFACE PRIOR TO INSTALLING THE WEARING COURSE BY A STREET SWEEPING MACHINE . APPLY A TACK COAT PER SPECIFICATIONS.

## TYPICAL BITUMINOUS PAVEMENT
NOT TO SCALE




NOTE:
ALL PIPE SECTIONS WILL BE CONSTRUCTED OF SCHEDULE 40 GALVANIZED STEEL PIPE.

## CONCRETE FIXED STEEL BOLLARD
NOT TO SCALE


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

**Horsley Witten Group, Inc.**
***Sustainable Environmental Solutions***
***www.horsleywitten.com***
***1 Turks Head Place, Suite 300***
***Providence, RI 02903***
***401-272-1717 voice***
***401-437-8368 fax***


PROJECT TITLE:

# PUBLIC SAFETY COMPLEX
575 SMITHFIELD ROAD,
NORTH SMITHFIELD,RI

ISSUED FOR:
BIDDING
6/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
DETAILS

PROJECT NORTH:
N

PROJECT ARCHITECT:
DRAWN:
PROJECT NUMBER:
#2415

SHEET NUMBER: C1.3
REV:

last modified: 06/30/25 printed: 06/30/25 by jk H:\Projects\2016\16026 No.Smithfield Municipal Bldg Site Design\Drawings\16036-bush-de.dwg

## FOOTING SCHEDULE

| MARK | SIZE | REINFORCING | COMMENTS |
|---|---|---|---|
| F-1 | 20" WIDE x 10" THICK, CONT. | (3) #5 BARS CONTINUOUS BOTTOM | INTERIOR MASONRY PARTITION FOOTING |
| F-2 | 2'-6" WIDE x 12" THICK, CONT. | (3) #5 BARS CONTINUOUS BOTTOM | |
| F-3 | 3'-3" WIDE x 12" THICK, CONT. | TRANSVERSE: #5s AT 16" OC TOP<br>LONGITUDINAL: (4) TOP, (2) BOTTOM | #5 DOWELS AT 16" OC INTO WALL |
| F-4 | 2'-0" x 4'-6" x 12" THICK | TRANSVERSE: (5) #6s BOTTOM<br>LONGITUDINAL: (3) #6s BOTTOM | |
| F-5 | 1'-6" WIDE x 12" THICK SLAB HAUNCH | (2) #5 BARS CONTINUOUS MIDDLE<br>#5 EPOXY DOWELS AT 24" OC | THICKENED SLAB FOR EPOXY DOWELS AT SLAB EDGE |

## PIER SCHEDULE

| MARK | SIZE | VERTICAL REINFORCING AND CAST FOOTING DOWELS | TIES | COMMENTS |
|---|---|---|---|---|
| P-1 | 1'-4" x 1'-2" | (4) #6's AT CORNERS | #3's AT 10" OC | |
| P-2 | 1'-4" x 1'-0" | (4) #6's AT CORNERS | #3's AT 10" OC | |
| | | | | |

1. TIES TO HAVE 2" COVER ON EACH SIDE. VERTICAL BARS TO BE PLACED WITHIN TIES.

2. VERTICAL DOWELS TO HAVE 6" HOOK AND CAST INTO FOOTING. TIE TO FOOTING REINFORCING MAT.

## FOUNDATION NOTES

APPLICABLE THROUGHOUT PROJECT

1. FROST PROTECTION DEPTH: 4'-6" MINIMUM.

2. DESIGN ALLOWABLE BEARING PRESSURE: 3000 psf.

3. SATISFACTORY SOILS: ASTM D2487 SOIL CLASSIFICATION GROUPS GW, GP, GM, SW, AND SP OR A COMBINATION OF THESE GROUPS. FREE OF ROCK OR GRAVEL LARGER THAN 3 INCHES IN ANY DIMENSION, DEBRIS, WASTE, FROZEN MATERIALS, VEGETATION, AND OTHER ORGANIC MATTER.

4. COMPACTION
   A. STRUCTURAL FILL UNDER FOOTINGS = 96%
   B. STRUCTURAL FILL UNDER SLABS = 95%
   C. BACKFILL AGAINST OUTSIDE OF FOUNDATION WALLS = 90%

5. VERIFY ALL FOUNDATIONS WILL BE AT OR BELOW FROST PROTECTION ELEVATION BELOW GRADE AND IN ACCORDANCE WITH STATE AND LOCAL BUILDING CODES. COORDINATE BETWEEN ARCHITECTURAL, CIVIL, AND STRUCTURAL DRAWINGS PRIOR TO STARTING FORMWORK AND EXCAVATION.

6. ALL UNSUITABLE AND ORGANIC SOIL UNDER FOOTINGS, WALLS, AND SLABS TO BE REMOVED AND REPLACED WITH COMPACTED STRUCTURAL FILL UNDER FOOTINGS AND SLAB.

7. SEE DETAILS 1 AND 2 ON S2.2 FOR TYPICAL SLAB AND FOUNDATION WALL DETAILS.

NOTED AS <S1.xx> ON PLANS

S1.1 DRILL #5 x 18" LONG DOWELS INTO EXISTING WALL. SET DOWELS INTO CHEMICAL ADHESIVE WITH 6" EMBEDMENT AND CAST INTO NEW CONCRETE WALL. SPACE DOWELS AT 12" OC VERTICALLY IN WALL AND PROVIDE DOWEL FOR EACH FOOTING REINFORCING BAR.

S1.2 PROVIDE UNDERPINNING AND TEMPRORARY SHORING OF EXISTING FOUNDATION AS REQUIRED TO COMPLTE NEW WORK. UNDERMINE EXISITNG FOUNDATION WITH EXTREME CARE AND TAKE ALL NECESSARY MEASURES TO SHORE EXISTING STRUCTURE.

## ABBREVIATIONS

| | |
|---|---|
| ACI | AMERICAN CONCRETE INSTITUTE |
| AISC | AMERICAN INSTITUTE OF STEEL CONSTRUCTION |
| ASCE | AMERICAN SOCIETY OF CIVIL ENGINEERS |
| AFF | ABOVE FINISHED FLOOR |
| B.O.F | BOTTOM OF FOOTING |
| CMU | CONCRETE MASONRY UNIT |
| DIA | DIAMETER |
| E.O. | EDGE OF |
| E.O.D. | EDGE OF DECK |
| E.O.J. | EDGE OF JOIST |
| EQ | EQUAL |
| E.W. | EACH WAY |
| F.O. | FACE OF |
| FT | FOOT |
| GA | GAUGE |
| GALV | GALVANIZE |
| IBC | INTERNATIONAL BUILDING CODE |
| IRC | INTERNATIONAL RESIDENTIAL CODE |
| I.F. | INSIDE FACE |
| IN | INCHES |
| LLH | LONG LEG HORIZONTAL |
| LLV | LONG LEG VERTICAL |
| NTS | NOT TO SCALE |
| O.F. | OUTSIDE FACE |
| OC | ON-CENTER |
| PSF | POUNDS PER SQUARE FOOT |
| PLF | POUNDS PER LINEAR FOOT |
| PSI | POUNDS PER SQUARE INCH |
| P.T. | PRESSURE TREATED |
| S.J.I. | STEEL JOIST INSTITUTE |
| T&B | TOP AND BOTTOM |
| T&G | TONGUE AND GROOVE |
| T.O.P. | TOP OF PIER |
| T.O.S. | TOP OF STEEL |
| T.O.S. | TOP OF SLAB |
| T.O.SHF | TOP OF SHELF |
| T.O.W. | TOP OF WALL |
| UNO | UNLESS NOTED OTHERWISE |
| V.I.F. | VERIFY IN FIELD |
| WWF | WELDED WIRE FABRIC |

## CODE REVIEW

ALL WORK IS TO BE DONE AND LOADS TO BE DETERMINED IN ACCORDANCE WITH THE FOLLOWING CODES AND STANDARDS:

- RHODE ISLAND STATE BUILDING CODE, SBC-1-2021
- IBC 2018
- ASCE 7-16

GRAVITY LOADS

ROOF:
GROUND SNOW LOAD = 35 psf
ROOF SNOW LOAD = 30 psf
ROOF DL = 20 psf
SNOW DRIFTING AND SNOW SLIDING TO BE IN ACCORDANCE WITH R.I. STATE BUILDING CODE

FLOOR:
ELEVATOR LOBBY LIVE LOAD = 100 psf
FLOOR DL = 65 psf

DEFLECTION CRITERIA:

FLOOR
LIVE LOAD: L/480
TOTAL LOAD: L/360

ROOF
LIVE LOAD: L/360
TOTAL LOAD: L/240

ANY MEMBER SUPPORTING MASONRY: L/600

WIND PRESSURES

EXPOSURE B
DESIGN WIND SPEED = 130 mph
IMPORTANCE FACTOR = 1.00
BUILDING CATEGORY: II

COMPONENTS AND CLADDING
(-/+ REPRESENTS NEGATIVE AND POSITIVE PRESSURES)

WALLS MIDDLE
10 sqft: 30.4 psf, -33.0 psf
50 sqft: 27.3 psf, -29.8 psf
100 sqft: 25.9 psf, -28.4 psf

WALLS CORNER
10 sqft: 30.4 psf, -40.7 psf
50 sqft: 27.3 psf, -37.3 psf
100 sqft: 25.9 psf, -31.6 psf

ROOF MIDDLE
10 sqft: 12.4 psf, -30.4 psf
50 sqft: 10.6 psf, -28.6 psf
100 sqft: 9.8 psf, -27.8 psf

ROOF CORNER
10 sqft: 12.4 psf, -16.8 psf
50 sqft: 10.6 psf, -16.2 psf
100 sqft: 9.8 psf, -33.0 psf

MAIN WIND FORCE RESISTING SYSTEM
(-/+ REPRESENTS NEGATIVE AND POSITIVE PRESSURES)

HORIZONTAL PRESSURE, WALLS MIDDLE = 17.8 psf

HORIZONTAL PRESSURE, WALLS CORNER = 24.8 psf

HORIZONTAL PRESSURE, ROOF MIDDLE = -8.2 psf

HORIZONTAL PRESSURE, ROOF CORNER = -13.9 psf

VERTICAL PRESSURE, ROOF WINDWARD = -22.4 psf

VERTICAL PRESSURE, ROOF LEEWARD = -14.2 psf

VERTICAL PRESSURE, ROOF EDGE WINDWARD = -32.2 psf

VERTICAL PRESSURE, ROOF EDGE LEEWARD = -18.3 psf

## RHODE ISLAND GENERAL LAWS

23-27.3-128.3. CONSTRUCTION CONTRACTOR RESPONSIBILITIES:

THE ACTUAL CONSTRUCTION OF THE WORK SHALL BE THE RESPONSIBILITY OF THE OWNER OR THE CONTRACTOR DESIGNATED AS HIS OR HER AGENT AND WHO SHALL:

(1) PERFORM ALL WORK IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS ON FILE WITH THE BUILDING OFFICIAL.

(2) PERFORM SPECIFIED WORK IN A SAFE AND SATISFACTORY MANNER AND IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL STATUTES AND REGULATIONS.

(3) UPON COMPLETION OF THE CONSTRUCTION, SHALL CERTIFY TO THE BEST OF HIS OR HER KNOWLEDGE AND BELIEF THAT THE WORK HAS BEEN DONE IN SUBSTANTIAL ACCORD WITH SUBDIVISIONS (1) AND (2) ABOVE AND WITH ALL PERTINENT DEVIATIONS.

## NEW GARAGE

SUPERPSTRUCTURE STRUCTURAL SYSTEMS NARRATIVE

- 2x8 STUDS AT 16" OC WALL FRAMING
- 3/4" T&G PLYWOOD ROOF SHEATHING. PLYWOOD WEB ROOF JOISTS.
- PLYWOOD SHEAR WALLS AT PERIMETER INCLUDING HOLDOWNS, ANCHORS, BLOCKED SHEATHING.
- STRUCTURAL STEEL MOMENT FRAMES AROUND OVERHEAD DOORS. CAST IN PLACE ANCHORS ON CONCRETE FOUNDATION PILASTERS.

## STRUCTURAL NOTES

1. REGULAR AND PERIODIC FIELD OBSERVATIONS FROM THIS OFFICE REQUIRED PER THE RHODE ISLAND CODE ARE NOT INTENDED OR REQUIRED TO ASSURE COMPLETE COMPLIANCE WITH THE CONSTRUCTION DOCUMENTS. ANY ISSUES OBSERVED TO BE NON COMPLIANT WILL BE NOTED IN A FIELD REPORT. THE ABSENCE OF COMMENT DOES NOT EXPLICITLY OR IMPLICITLY CONVEY PROPER COMPLIANCE WITH DESIGN INTENT. IT REMAINS THE CONTRACTORS RESPONSIBILITY TO DELIVER THE PROJECT IN COMPLETE COMPLIANCE WITH STATE BUILDING CODE, LOCAL CODES AND ORDNANCES, AND CONSTRUCTION DOCUMENTS.

2. WALL FRAMING NOTE: THE CONTRACTOR IS TO SUBMIT SHOP DRAWINGS AND DESIGN CALCULATIONS IN ACCORDANCE WITH PROJECT SPECIFICATIONS FOR ALL EXTERIOR LIGHT GAGE STEEL FRAMING CONDITIONS ENCOUNTERED. SHOP DRAWINGS ARE TO INCLUDE, BUT NOT LIMITED TO, LAYOUT PLAN, MEMBER INFORMATION, CLIPS, FASTENERS, PLATES, AND MANUFACTURER. ALL CONNECTIONS ARE TO ALLOW FOR THE VERTICAL DEFLECTION OF THE FLOOR/ROOF FRAMING, INDEPENDENT OF THE FOUNDATION. DIFFERENTIAL DEFLECTION IS TO BE ACOMODATED BY CONNECTIONS. MEMBERS AND CONNECTIONS ARE TO BE CAPABLE OF RESISTING WINDPRESSURES, AND MEETING DEFLECTION CRITERA SHOWN ON THESE DOCUMENTS. SHOP DRAWINGS AND CALCULATIONS ARE TO BE STAMPED AND SIGNED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF RHODE ISLAND.

3. ENGINEERING CALCULATIONS FOR ALL STRUCTURAL STEEL CONNECTIONS ARE TO BE SUBMITTED FOR REVIEW. CALCULATIONS ARE TO SHOW DESIGN FOR SHOP DRAWING DETAILED CONNECTIONS. CALCULATIONS ARE TO BE STAMPED AND SIGNED BY A PROFESSIONAL ENGINEER LICENSED IN THE JURISDICTION OF THE PROJECT.

4. CONTRACTOR TO SUBMIT SHOP DRAWINGS / PRODUCT SUBMITTALS TO THE ARCHITECT AND ENGINEER FOR REVIEW INCLUDING THE FOLLOWING SCOPES:
- CHEMICAL ADHESIVES
- CONCRETE REINFORCING SHOP DRAWINGS
- CONCRETE MIX DESIGNS
- MASONRY REINFORCING
- MASONRY PRODUCTS
- STRUCTURAL STEEL
- STRUCTURAL STEEL CONNECTION DESIGN

## GENERAL NOTES

1. CONTRACTOR TO FIELD ESTABLISH ALL DIMENSIONS AND ELEVATIONS TO EXISTING STRUCTURE AND BUILDING COMPONENTS.

2. COORDINATE DIMENSIONS AND LOCATIONS OF NEW WORK WITH OTHER TRADES AND ARCHITECTURAL DRAWINGS.

3. REMOVE BUILDING COMPONENTS AND MATERIALS IN FRONT OF EXISTING BASE STRUCTURE AS REQUIRED TO INSTALL NEW WORK.

4. REMOVE, RELOCATE, AND/OR REPLACE ALL EXISTING UTILITIES OR OTHER BUILDING COMPONENTS WITHIN CEILING CAVITY AND OTHER AREAS AS REQUIRED TO INSTALL NEW WORK. COORDINATE SYSTEMS AND SEQUENCING WITH BUILDING OPERATIONS. REPLACE TO ORIGINAL WORKING ORDER.

5. REFER TO ARCHITECTURAL, ELECTRICAL, AND OTHER TRADES FOR ADDITIONAL DEMOLITION NOTES AND INFORMATION.

6. CONFIRM AND VERIFY ELEVATOR PIT AND SHAFT WALL DIMENSIONS WITH MANUFACTURER PRIOR TO ORDERING MATERIALS AND FORMING CONCRETE.

7. (E) REPRESENTS EXISTING STRUCTURAL COMPONENT

8. PROVIDE TEMPORARY SHORING OF EXISTING STRUCTURE AS REQUIRED TO COMPLETE NEW WORK.

9. THE STRUCTURAL SCOPE OF THIS PROJECT IS SPECIFICALLY LIMITED TO PROVIDING STRUCTURAL WORK SHOWN. OVERALL STRUCTURE IS OUT OF SCOPE.

## SPECIAL INSPECTIONS

CODE REFERENCE
IBC 2018, CHAPTER 17
RHODE ISLAND STATE BUILDING CODE, SBC-1-2021, 13TH EDITION

ADMINISTRATION / EXECUTION
THE OWNER SHALL HIRE A SPECIAL INSPECTION COORDINATOR AND SPECIAL INSPECTION TESTING AGENCY. THIS WORK IS TO BE COORDINATED BY THE GENERAL CONTRACTOR.

THE SPECIAL INSPECTION COORDINATOR SHALL KEEP RECORDS OF ALL INSPECTIONS AND SHALL FURNISH INSPECTION REPORTS TO THE BUILDING OFFICIAL AND THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE. DISCOVERED DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION. IF SUCH DISCREPANCIES ARE NOT CORRECTED, THE DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE BUILDING OFFICIAL AND THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE. THE SPECIAL INSPECTION PROGRAM DOES NOT RELIEVE THE CONTRACTOR OF HIS OR HER RESPONSIBILITIES

INTERIM REPORTS SHALL BE SUBMITTED TO THE BUILDING OFFICIAL AND THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE.

A FINAL REPORT OF SPECIAL INSPECTIONS DOCUMENTING COMPLETION OF ALL REQUIRED SPECIAL INSPECTIONS, TESTING AND CORRECTION OF ANY DISCREPANCIES NOTED IN THE INSPECTIONS SHALL BE SUBMITTED PRIOR TO ISSUANCE OF A CERTIFICATE OF USE AND OCCUPANCY.

SCHEDULE OF SPECIAL INSPECTIONS OVERVIEW
SECTIONS INCLUDED IN SPECIAL INSPECTIONS
- SOILS AND FOUNDATIONS
- CAST IN PLACE CONCRETE
- REINFORCED MASONRY
- STRUCTURAL STEEL

SECTIONS EXCLUDED FROM STRUCTURAL INSPECTIONS
- PRECAST CONCRETE ( NOT APPLICABLE, NONE STRUCTURAL )
- COLD FORMED LIGHT FRAME STEEL CONSTRUCTION ( EXCLUDED PER SECTION 1705.2.5 )
- WOOD CONSTRUCTION ( EXCLUDED PER SECTION 1705.5 )

SEE STATEMENT / SCHEDULE OF SPECIAL INSPECTIONS FOR ADDITIONAL INFORMATION


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

STRUCTURES ENGINEERING AND DESIGN LLC
23 BURRILL RD
HARRISVILLE, RI 02830
401-258-6784
EMAIL@STRUCTURES-LLC.COM
WWW.STRUCTURES-LLC.COM


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
6-30-2025

REVISIONS:

STAMP:

SHEET TITLE:
GENERAL NOTES

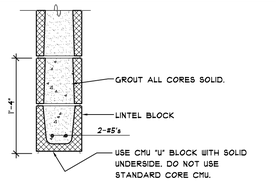
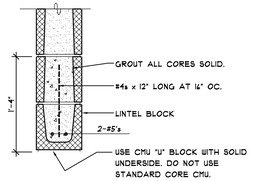
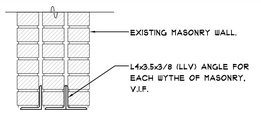
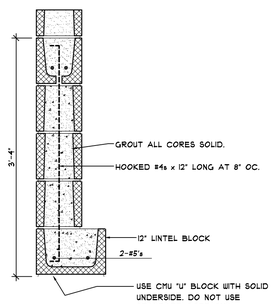
PROJECT NORTH:

PROJECT ENGINEER: JJP
DRAWN: AC / JJP

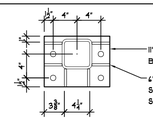
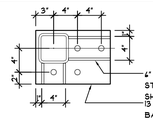
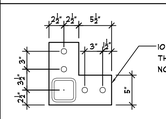
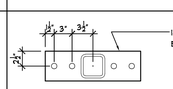
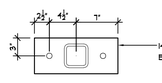
PROJECT NUMBER:
25025

SHEET NUMBER: S0.1
REV: ~

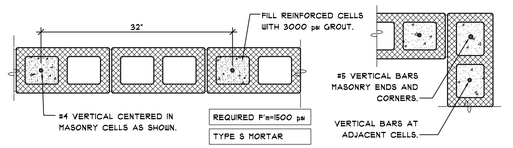
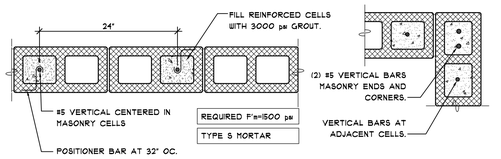
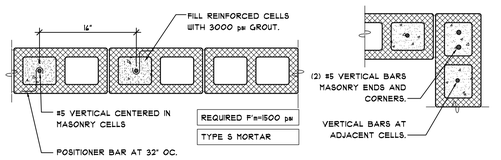
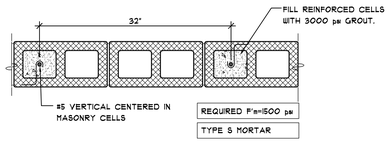
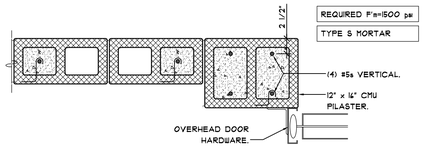
# LINTEL SCHEDULE

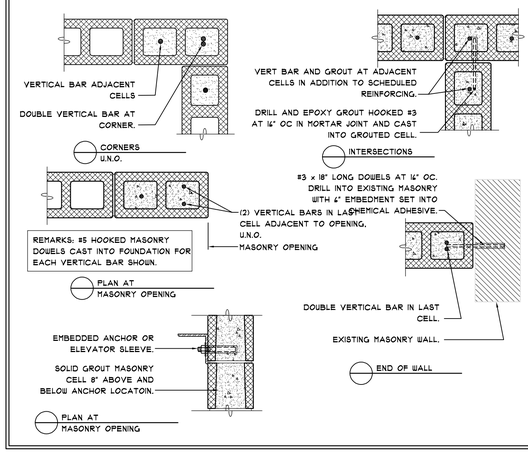
| TYPE | DETAIL | REMARKS |
|---|---|---|
| L-1 |  | PROVIDE 8" BEARING AT EACH END OF LINTEL. |
| L-2 |  | PROVIDE 8" BEARING AT EACH END OF LINTEL. |
| L-3 |  | PROVIDE 8" BEARING AT EACH END OF LINTEL.<br><br>H.D. GALVANIZE AT EXTERIOR WALL. PRIME FINISH AT INTERIOR WALL. |
| L-4 |  | PROVIDE 16" BEARING AT EACH END OF LINTEL. |

# BASEPLATE SCHEDULE

| MARK | PLAN DETAIL | PLAN DETAIL |
|---|---|---|
| BP-1 |  | 7/8" DIA A36 ANCHORS WITH THREADED ENDS AS SHOWN WITH 12" CONCRETE EMBEDMENT. 4"x4"x1/2" PLATE WASHERS AND NUTS CAST INTO CONCRETE.<br><br>PROVIDE 1/4" LEVELING PLATE SET ON 3/4" FIVE-STAR GROUT BED. |
| BP-2 |  | 7/8" DIA A36 ANCHORS WITH THREADED ENDS AS SHOWN WITH 12" CONCRETE EMBEDMENT. 4"x4"x1/2" PLATE WASHERS AND NUTS CAST INTO CONCRETE.<br><br>PROVIDE 1/4" LEVELING PLATE SET ON 3/4" FIVE-STAR GROUT BED. |
| BP-3 |  | 3/4" DIA A36 ANCHORS WITH HOOKED ENDS CAST INTO CONCRETE WITH 10" EMBEDMENT.<br><br>PROVIDE 1/4" LEVELING PLATE SET ON 3/4" FIVE-STAR GROUT BED. |
| BP-4 |  | 3/4" DIA A36 ANCHORS WITH HOOKED ENDS CAST INTO CONCRETE WITH 10" EMBEDMENT.<br><br>PROVIDE 1/4" LEVELING PLATE SET ON 3/4" FIVE-STAR GROUT BED. |
| BP-5 |  | 3/4" DIA A36 ANCHORS WITH HOOKED ENDS CAST INTO FULLY GROUTED MASONRY CELLS. PROVIDE 12" EMBEDMENT. |

# MASONRY REINFORCING SCHEDULE

| MARK | PLAN DETAIL | REMARKS |
|---|---|---|
| M-1 |  | AT FOUNDATION, PROVIDE #4 x 20" LONG DOWEL DRILLED INTO FOOTING OR WALL FOR EACH VERTICAL BAR SHOWN. SET INTO CHEMICAL ADHESIVE WITH 4" CONCRETE EMBEDMENT.<br><br>9 GAGE HORIZONTAL H.D. GALV LADDER TIES AT 16" OC. BOND BEAM AT TOP OF WALL WITH (2) #4's CONTINUOUS. SEE TYPICAL DETAILS BELOW FOR ADDITIONAL BAR AND GROUT LOCATIONS. |
| M-2 |  | AT FOUNDATION, PROVIDE #5 x 24" LONG HOOKED DOWEL CAST INTO CONCRETE FOR EACH VERTICAL BAR SHOWN. PROVIDE 8" CONCRETE EMBEDMENT.<br><br>9 GAGE HORIZONTAL H.D. GALV LADDER TIES AT 16" OC. BOND BEAM AT TOP OF WALL AND EACH ELEVATOR DOOR SILL ELEVATION WITH (2) #5's CONTINUOUS. SEE TYPICAL DETAILS BELOW FOR ADDITIONAL BAR AND GROUT LOCATIONS. |
| M-3 |  | AT FOUNDATION, PROVIDE #5 x 24" LONG HOOKED DOWEL CAST INTO CONCRETE FOR EACH VERTICAL BAR SHOWN. PROVIDE 8" CONCRETE EMBEDMENT.<br><br>9 GAGE HORIZONTAL H.D. GALV LADDER TIES AT 16" OC. BOND BEAM AT TOP OF WALL AND EACH ELEVATOR DOOR SILL ELEVATION WITH (2) #5's CONTINUOUS. SEE TYPICAL DETAILS BELOW FOR ADDITIONAL BAR AND GROUT LOCATIONS. |
| M-4<br>LIGHTWEIGHT CMU BLOCK |  | #3 PINS DRILLED AND EPOXY GROUTED INTO SURROUNDING EXISTING MASONRY ALL SIDES, SEE TYPICAL DETAILS. BOND BEAM AT TOP WITH (2) #5s. 9 GAGE HORIZONTAL WIRE REINFORCING. |
| M-5 |  | AT FOUNDATION, PROVIDE #5 x 24" LONG HOOKED DOWEL CAST INTO CONCRETE FOR EACH VERTICAL BAR SHOWN. PROVIDE 8" CONCRETE EMBEDMENT.<br><br>9 GAGE HORIZONTAL H.D. GALV LADDER TIES AT 16" OC. BOND BEAM AT TOP OF WALL AND EACH ELEVATOR DOOR SILL ELEVATION WITH (2) #5's CONTINUOUS. SEE TYPICAL DETAILS BELOW FOR ADDITIONAL BAR AND GROUT LOCATIONS. |




GENERAL MASONRY NOTES.

1. USE TYPE S MORTAR

2. GROUT MIX DESIGN TO BE 3000 psi AT 28 DAYS.

3. HIGH LIFT GROUTING IS NOT PERMITTED UNLESS PROCEDURES ARE SUBMITTED AND APPROVED BY ARCHITECT/ENGINEER. SUBMITTALS TO BE IN ACCORDANCE WITH PROJECT SPECIFICATIONS. PROCEDURES TO BE IN ACCORDANCE WITH ACI 530-05/ASCE 5-05/TMS 402-05 AND ACI 530.1/ASCE 6-05/TMS 602-05. MAXIMUM LOW LIFT GOUTING HEIGHT TO BE 24".

4. PLACING REINFORCING DURING HIGH LIFT GROUT POUR IS UNACCEPTABLE. REINFORCING IS TO BE SECURELY ATTACHED TO MASONRY TO ENSURE PROPER PLACEMENT DURING LOW OR HIGH LIFT GROUT OPERATIONS.

5. FOR HOT AND COLD WEATHER PLACEMENT FOLLOW PROVISIONS SPECIFIED IN ACI 530-05/ASCE 5-05/TMS 402-05 AND ACI 530.1/ASCE 6-05/TMS 602-05. CONTRACTOR TO SUBMIT CONSTRUCTION PROCEEDURES TO ARCHITECT AND ENGINEER PRIOR TO COMENCING WORK DURING THESE CONDITIONS.


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

STRUCTURES ENGINEERING AND DESIGN LLC
23 BURRILL RD
HARRISVILLE, RI 02830
401-258-6784
EMAIL@STRUCTURES-LLC.COM
WWW.STRUCTURES-LLC.COM


PROJECT TITLE:
PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
6-30-2025
REVISIONS:

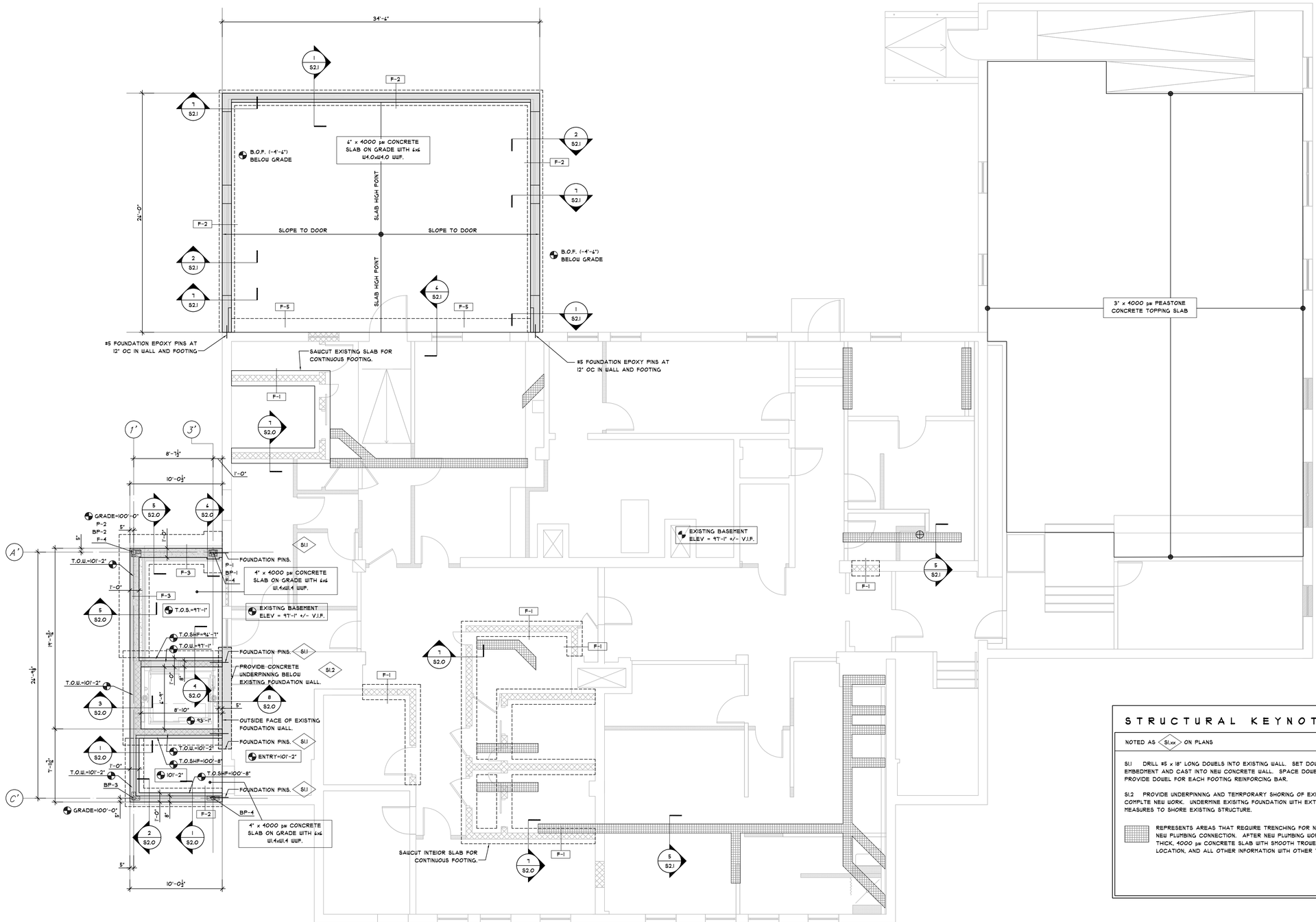
STAMP:

SHEET TITLE:
SCHEDULES

PROJECT NORTH:
N

PROJECT ENGINEER: JJP
DRAWN: AC / JJP
PROJECT NUMBER:
25025

SHEET NUMBER: S0.2
REV: ~




CALLED NORTH

FOUNDATION PLAN — 3/4" = 1'-0"

## STRUCTURAL KEYNOTES

NOTED AS ◇S1.xx◇ ON PLANS

S1.1 DRILL #5 x 18" LONG DOWELS INTO EXISTING WALL. SET DOWELS INTO CHEMICAL ADHESIVE WITH 4" EMBEDMENT AND CAST INTO NEW CONCRETE WALL. SPACE DOWELS AT 12" OC VERTICALLY IN WALL AND PROVIDE DOWEL FOR EACH FOOTING REINFORCING BAR.

S1.2 PROVIDE UNDERPINNING AND TEMPRORARY SHORING OF EXISTING FOUNDATION AS REQUIRED TO COMPLTE NEW WORK. UNDERMINE EXISITNG FOUNDATION WITH EXTREME CARE AND TAKE ALL NECESSARY MEASURES TO SHORE EXISTING STRUCTURE.

REPRESENTS AREAS THAT REQUIRE TRENCHING FOR NEW DRAIN OR SLAB ALTERATION FOR NEW PLUMBING CONNECTION. AFTER NEW PLUMBING WORK IS COMPLETED, POUR NEW 4" THICK, 4000 psi CONCRETE SLAB WITH SMOOTH TROWEL FINISH. COORDINATE SCOPE, LOCATION, AND ALL OTHER INFORMATION WITH OTHER TRADES.

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

STRUCTURES ENGINEERING AND DESIGN LLC
23 BURRILL RD
HARRISVILLE, RI 02830
401-258-6784
EMAIL@STRUCTURES-LLC.COM
WWW.STRUCTURES-LLC.COM

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
6-30-2025
REVISIONS:

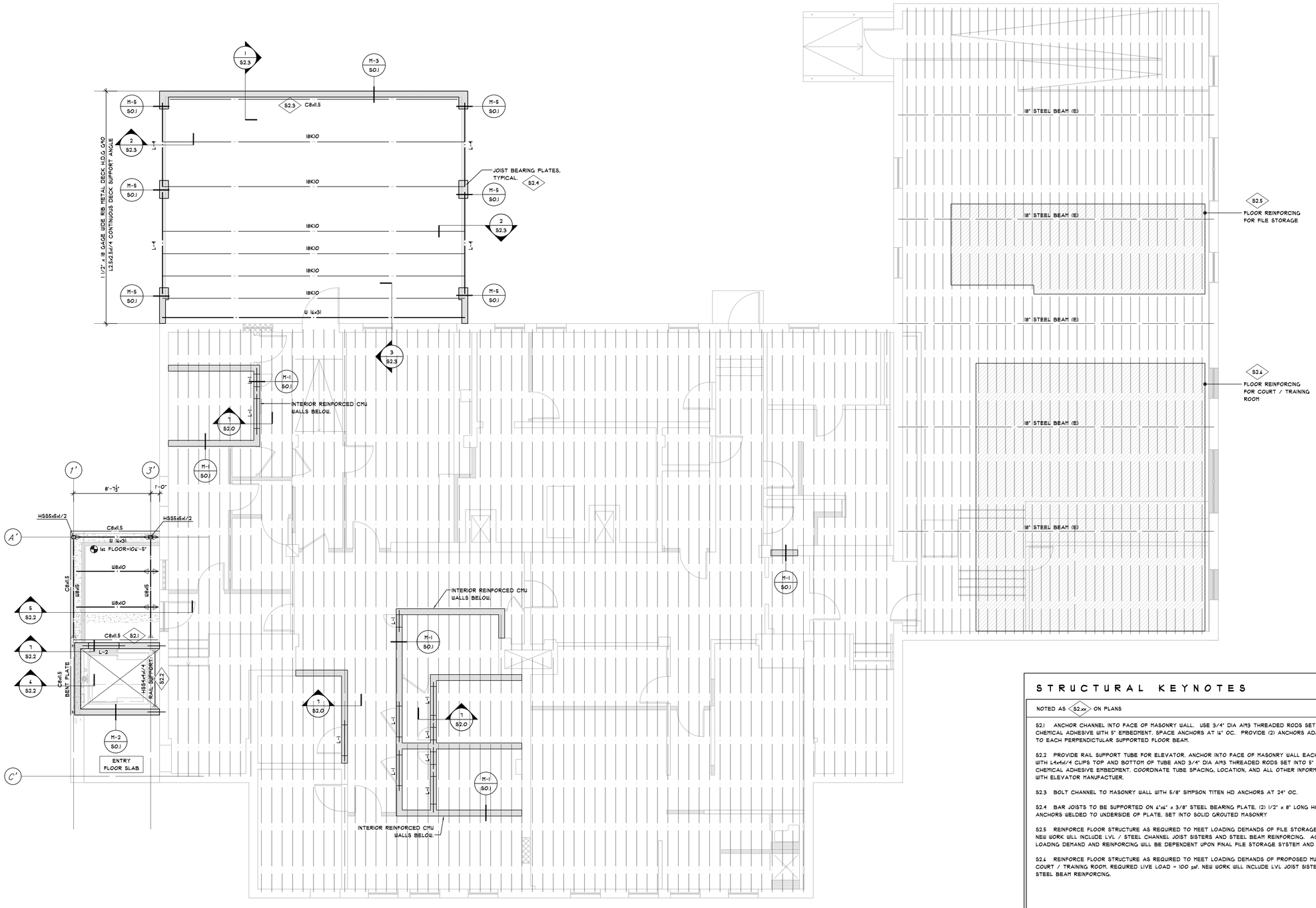
STAMP:

SHEET TITLE:
FOUNDATION PLAN

PROJECT NORTH:

PROJECT ENGINEER: JJP
DRAWN: AC / JJP
PROJECT NUMBER:
25025

SHEET NUMBER: S1.0
REV: ~




CALLED NORTH

1 S1.1 FIRST FLOOR / LOW ROOF FRAMING PLAN
3/16" = 1'-0"

## STRUCTURAL KEYNOTES

NOTED AS S2.xx ON PLANS

S2.1 ANCHOR CHANNEL INTO FACE OF MASONRY WALL. USE 3/4" DIA A193 THREADED RODS SET INTO CHEMICAL ADHESIVE WITH 5" EMBEDMENT. SPACE ANCHORS AT 16" OC. PROVIDE (2) ANCHORS ADJACENT TO EACH PERPENDICTULAR SUPPORTED FLOOR BEAM.

S2.2 PROVIDE RAIL SUPPORT TUBE FOR ELEVATOR. ANCHOR INTO FACE OF MASONRY WALL EACH END WITH L4x4x1/4 CLIPS TOP AND BOTTOM OF TUBE AND 3/4" DIA A193 THREADED RODS SET INTO 5" OF CHEMICAL ADHESIVE EMBEDMENT. COORDINATE TUBE SPACING, LOCATION, AND ALL OTHER INFORMATION WITH ELEVATOR MANUFACTUER.

S2.3 BOLT CHANNEL TO MASONRY WALL WITH 5/8" SIMPSON TITEN HD ANCHORS AT 24" OC.

S2.4 BAR JOISTS TO BE SUPPORTED ON 6"x6" x 3/8" STEEL BEARING PLATE. (2) 1/2" x 8" LONG HOOKED ANCHORS WELDED TO UNDERSIDE OF PLATE. SET INTO SOLID GROUTED MASONRY

S2.5 REINFORCE FLOOR STRUCTURE AS REQUIRED TO MEET LOADING DEMANDS OF FILE STORAGE ROOM. NEW WORK WILL INCLUDE LVL / STEEL CHANNEL JOIST SISTERS AND STEEL BEAM REINFORCING. ACTUAL LOADING DEMAND AND REINFORCING WILL BE DEPENDENT UPON FINAL FILE STORAGE SYSTEM AND DENSITY.

S2.6 REINFORCE FLOOR STRUCTURE AS REQUIRED TO MEET LOADING DEMANDS OF PROPOSED MUNICIPAL COURT / TRAINING ROOM. REQUIRED LIVE LOAD = 100 psf. NEW WORK WILL INCLUDE LVL JOIST SISTERS AND STEEL BEAM REINFORCING.

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

STRUCTURES ENGINEERING AND DESIGN LLC
23 BURRILL RD
HARRISVILLE, RI 02830
401-258-6784
EMAIL@STRUCTURES-LLC.COM
WWW.STRUCTURES-LLC.COM

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
6-30-2025
REVISIONS:

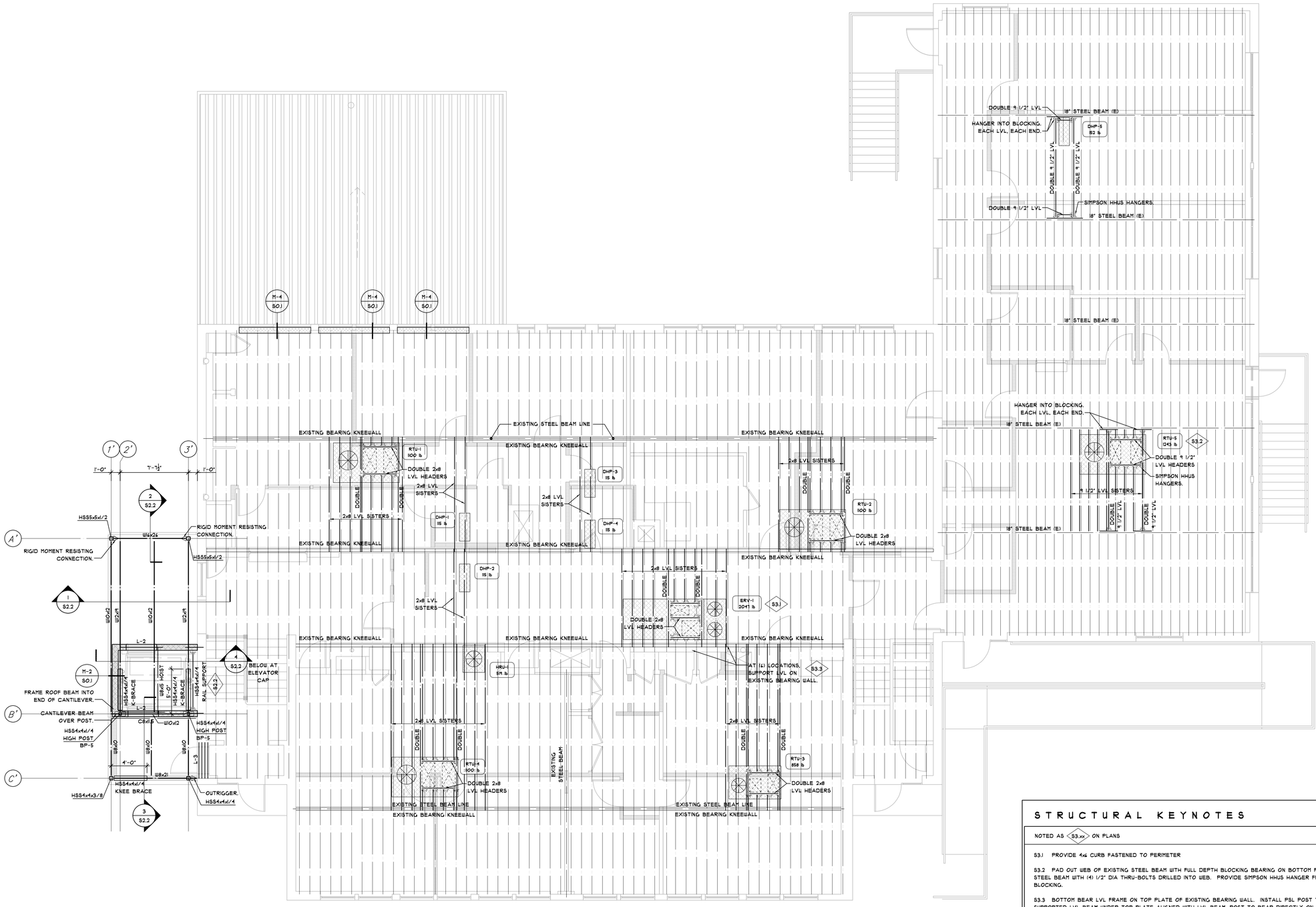
STAMP:

SHEET TITLE:
FIRST FLOOR FRAMING PLAN

PROJECT NORTH:
N

PROJECT ENGINEER: JJP
DRAWN: AC / JJP
PROJECT NUMBER:
25025

SHEET NUMBER:
S1.1
REV:
~




## STRUCTURAL KEYNOTES

NOTED AS ◇S3.xx◇ ON PLANS

S3.1 PROVIDE 4x4 CURB FASTENED TO PERIMETER

S3.2 PAD OUT WEB OF EXISTING STEEL BEAM WITH FULL DEPTH BLOCKING BEARING ON BOTTOM FLANGE. ANCHOR TO STEEL BEAM WITH (4) 1/2" DIA THRU-BOLTS DRILLED INTO WEB. PROVIDE SIMPSON HHJS HANGER FROM LVL BEAM INTO BLOCKING.

S3.3 BOTTOM BEAR LVL FRAME ON TOP PLATE OF EXISTING BEARING WALL. INSTALL PSL POST TO MATCH WIDTH OF SUPPORTED LVL BEAM UNDER TOP PLATE ALIGNED WITH LVL BEAM. POST TO BEAR DIRECTLY ON TOP OF EXISTING MASONRY WALL. LEVEL SURFACE WITH FIVE STAR GROUT AS REQUIRED.
- SIMPSON HTS20 STRAP FROM SIDE OF EACH LVL TO FACE OF EACH POST.
- SIMPSON HGA10 CLIP AND 1/4" SDS SCREWS FROM FACE OF EACH LVL TO TOP OF EXISTING WALL PLATE.
- SIMPSON HDU-2 HOLDDOWN FASTNED TO SIDE OF EACH PSL POST. ANCHOR INTO TOP OF EXISTING MASONRY WALL WITH 5/8" DIA A193 EPOXY ANCHOR WITH 8" EMBEDMENT.


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

STRUCTURES
ENGINEERING AND DESIGN LLC
23 BURRILL RD
HARRISVILLE, RI 02830
401-258-6784
EMAIL@STRUCTURES-LLC.COM
WWW.STRUCTURES-LLC.COM


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
6-30-2025
REVISIONS:

STAMP:

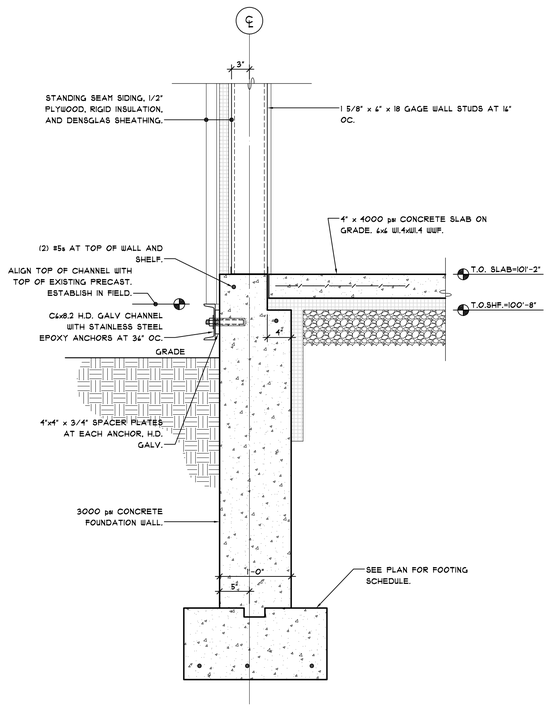
SHEET TITLE:
ROOF FRAMING PLAN

PROJECT NORTH:
N

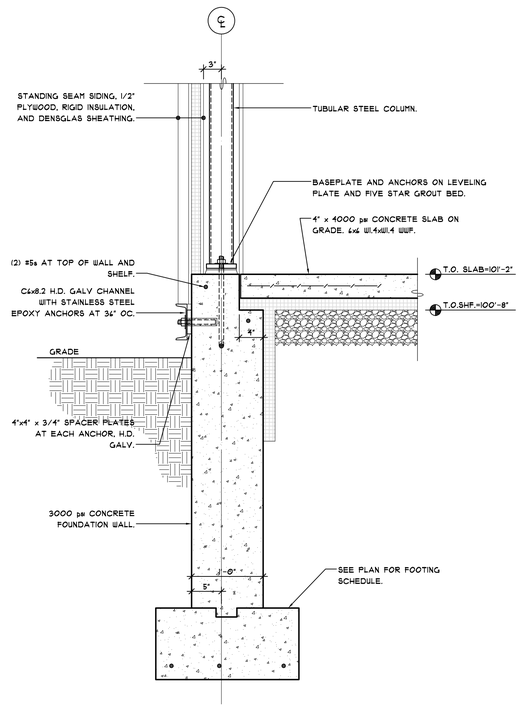
PROJECT ENGINEER: JJP
DRAWN: AC / JJP

PROJECT NUMBER:
25025

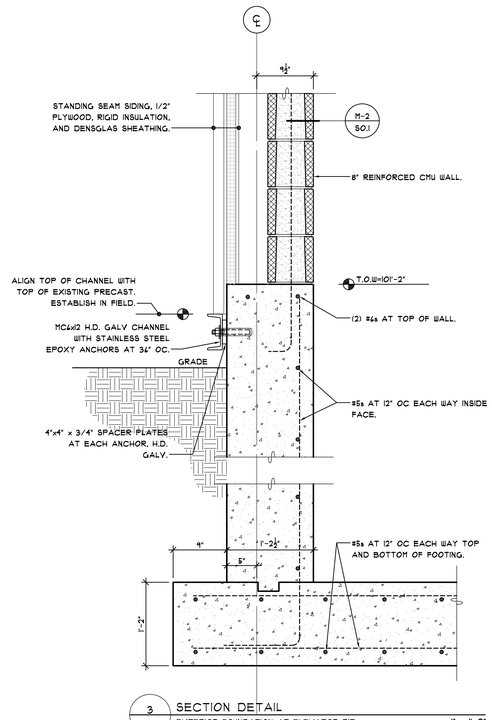
SHEET NUMBER: S1.2
REV: ~



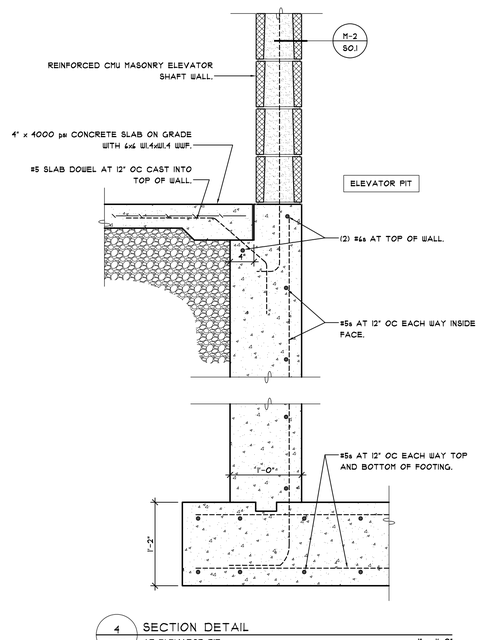

1 S2.0 SECTION DETAIL
FOUNDATION AT WALL FRAMING
1" = 1'-0"



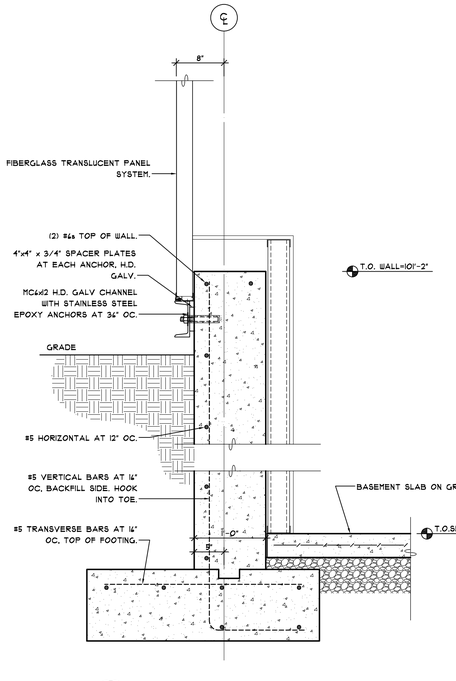

2 S2.0 SECTION DETAIL
FOUNDATION AT COLUMN
1" = 1'-0"



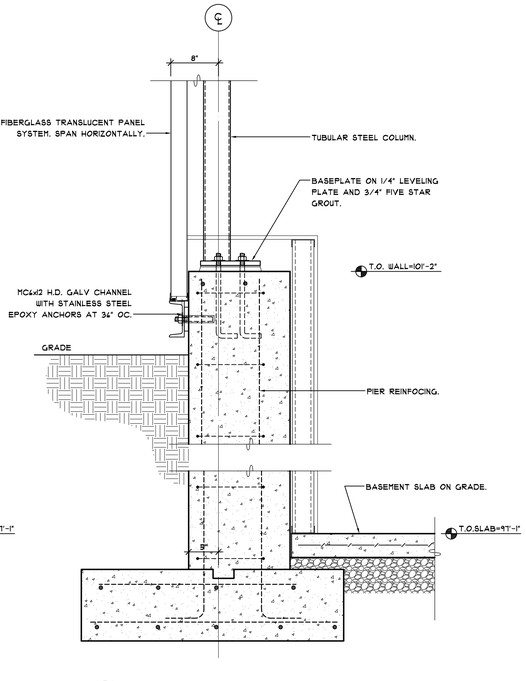

3 S2.0 SECTION DETAIL
EXTERIOR FOUNDATION AT ELEVATOR PIT
1" = 1'-0"



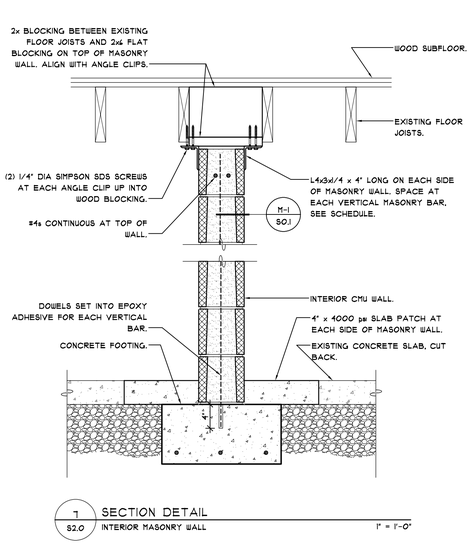

4 S2.0 SECTION DETAIL
AT ELEVATOR PIT
1" = 1'-0"



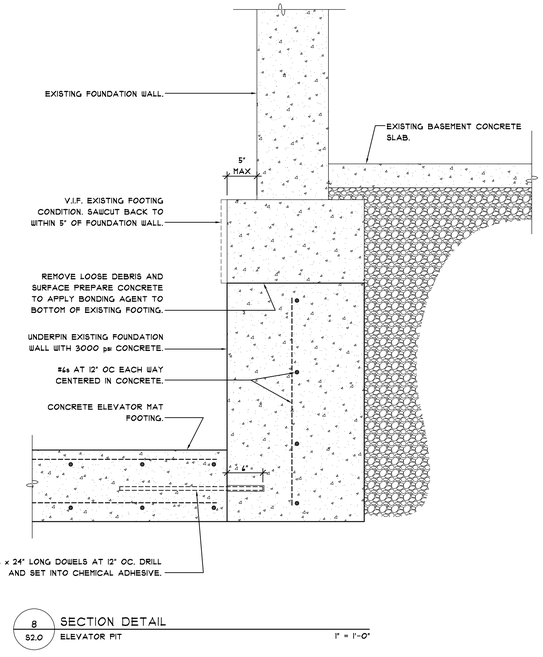

5 S2.0 SECTION DETAIL
FOUNDATION AT PANEL
1" = 1'-0"




6 S2.0 SECTION DETAIL
FOUNDATION AT PANEL
1" = 1'-0"




7 S2.0 SECTION DETAIL
INTERIOR MASONRY WALL
1" = 1'-0"




8 S2.0 SECTION DETAIL
ELEVATOR PIT
1" = 1'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

STRUCTURES
ENGINEERING AND DESIGN LLC
23 BURRILL RD
HARRISVILLE, RI 02830
401-258-6784
EMAIL@STRUCTURES-LLC.COM
WWW.STRUCTURES-LLC.COM


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
6-30-2025
REVISIONS:

STAMP:

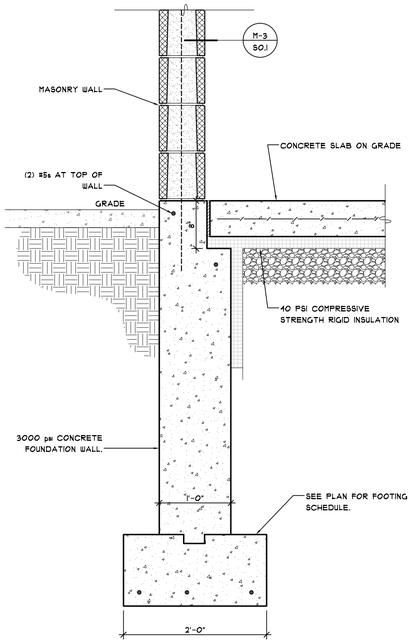
SHEET TITLE:
FOUNDATION DETAILS

PROJECT NORTH:
N

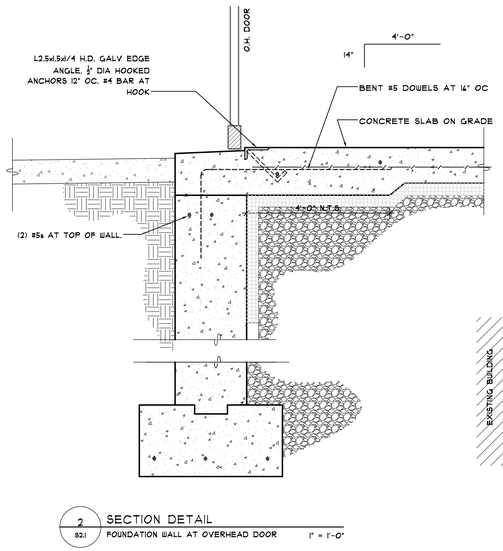
PROJECT ENGINEER: JJP
DRAWN: AC / JJP

PROJECT NUMBER:
25025

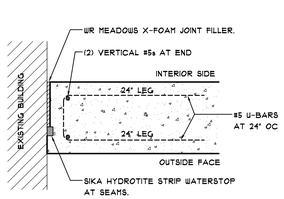
SHEET NUMBER: S2.0
REV: ~



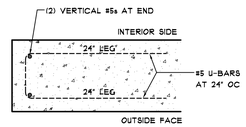

1 S2.1 SECTION DETAIL
FOUNDATION AT GARAGE WALL
1" = 1'-0"



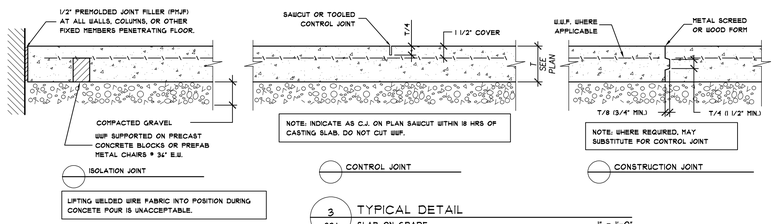

2 S2.1 SECTION DETAIL
FOUNDATION WALL AT OVERHEAD DOOR
1" = 1'-0"



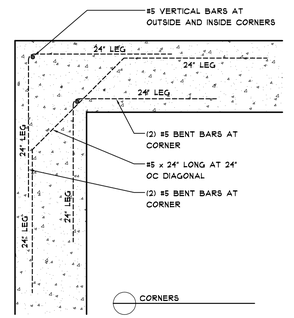

ENDS
AT EXISTING CONDITION



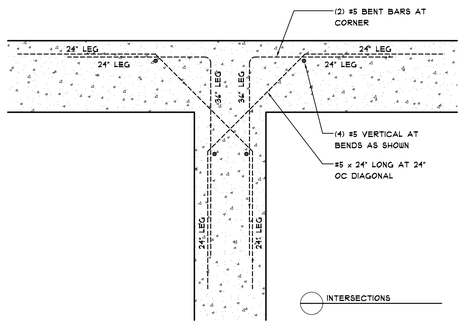

ENDS



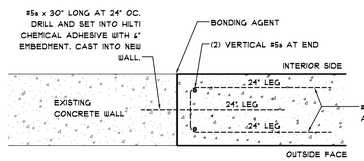

3 S2.1 TYPICAL DETAIL
SLAB ON GRADE
1" = 1'-0"

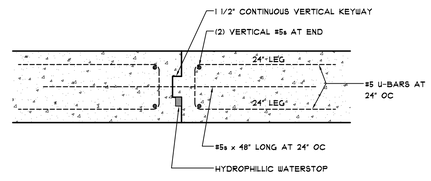



CORNERS




INTERSECTIONS



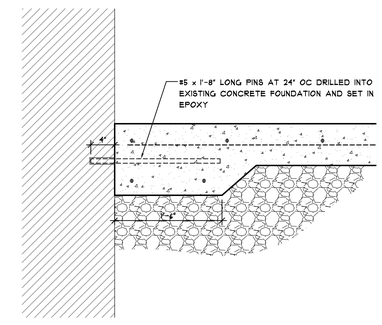




CONSTRUCTION JOINTS

TYPICAL AT ALL OCCURRENCES IN PROJECT

PROJECT SPECIFIC REINFORCING NOT SHOWN, SEE DETAILS FOR INFORMATION

4 S2.1 TYPICAL PLAN DETAILS
CONCRETE WALLS
1" = 1'-0"

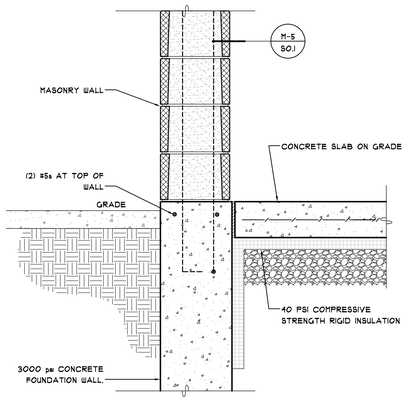



THIS DETAIL IS APPLICABLE AS NEEDED AT FLOOR TRENCHES IN SHOWROOM BUILDING

5 S2.1 SECTION DETAIL
1" = 1'-0"




4 S2.1 SECTION DETAIL
HAUNCH AT EXISTING WALL
1" = 1'-0"




7 S2.1 SECTION DETAIL
FOUNDATION AT GARAGE WALL
1" = 1'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

STRUCTURES ENGINEERING AND DESIGN LLC
23 BURRILL RD
HARRISVILLE, RI 02830
401-258-6784
EMAIL@STRUCTURES-LLC.COM
WWW.STRUCTURES-LLC.COM


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
6-30-2025
REVISIONS:

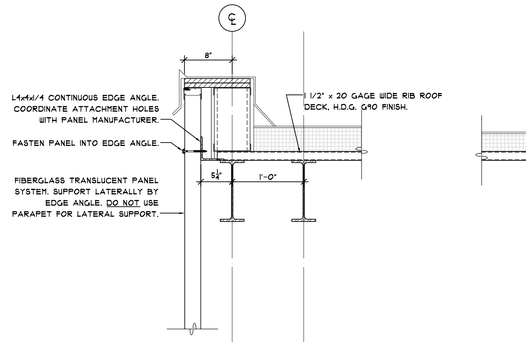
STAMP:

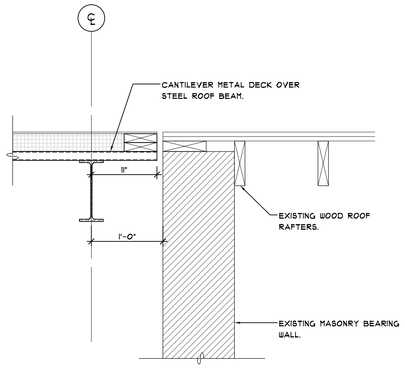
SHEET TITLE:
FOUNDATION DETAILS

PROJECT NORTH:
N

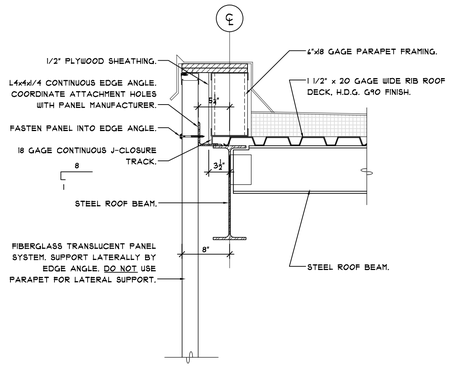
PROJECT ENGINEER: JJP
DRAWN: AC / JJP
PROJECT NUMBER:
25025

SHEET NUMBER: S2.1
REV: ~

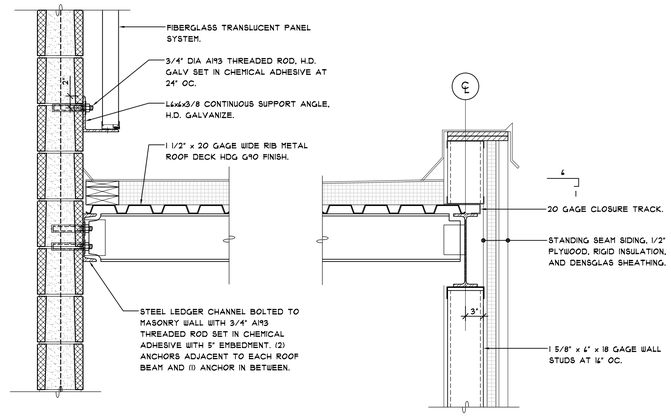


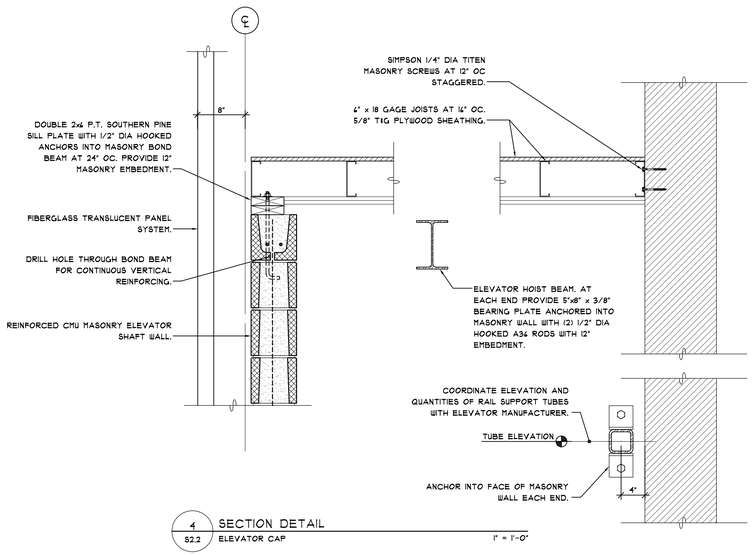

1 / S2.2 SECTION DETAIL AT ROOF 1" = 1'-0"



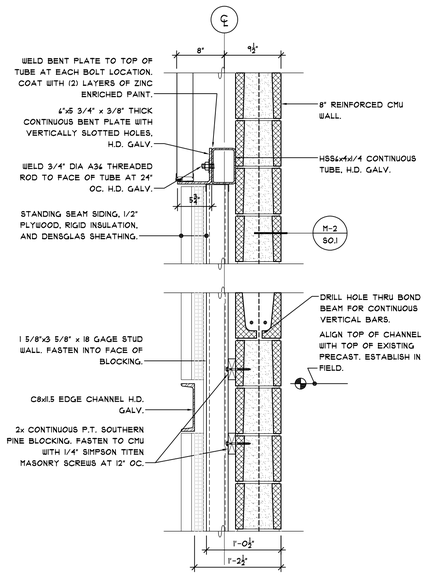

2 / S2.2 SECTION DETAIL AT ROOF 1" = 1'-0"



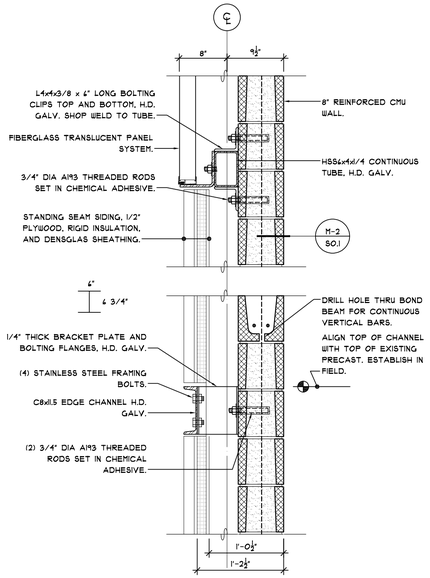

3 / S2.2 SECTION DETAIL AT LOW ROOF 1" = 1'-0"



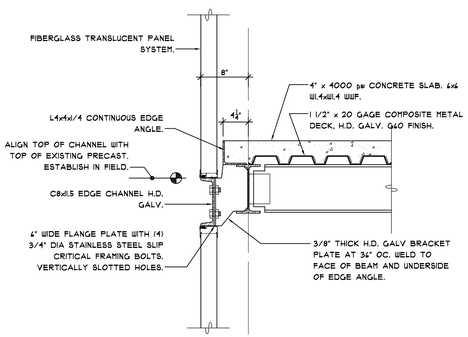

4 / S2.2 SECTION DETAIL ELEVATOR CAP 1" = 1'-0"

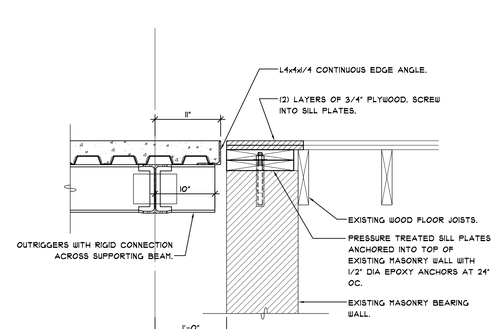



6 / S2.2 SECTION DETAIL AT ELEVATOR SHAFT 1" = 1'-0"




7 / S2.2 SECTION DETAIL ELEVATOR SHAFT AT BRACKETS 1" = 1'-0"




5 / S2.2 SECTION DETAIL AT FLOOR 1" = 1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

STRUCTURES ENGINEERING AND DESIGN LLC
23 BURRILL RD
HARRISVILLE, RI 02830
401-258-6784
EMAIL@STRUCTURES-LLC.COM
WWW.STRUCTURES-LLC.COM

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
6-30-2025
REVISIONS:

STAMP:

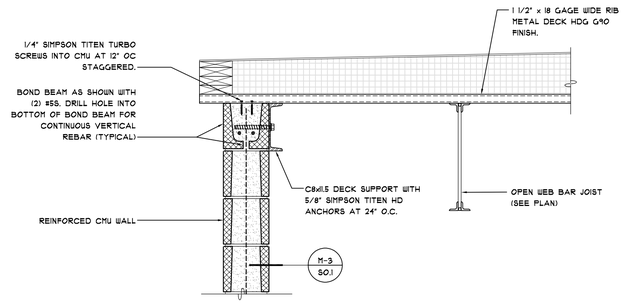
SHEET TITLE:
FRAMING DETAILS

PROJECT NORTH:
N

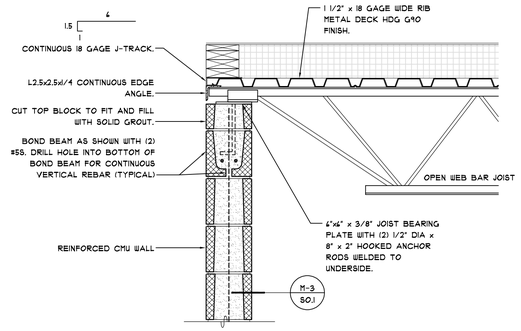
PROJECT ENGINEER: JJP
DRAWN: AC / JJP

PROJECT NUMBER:
25025

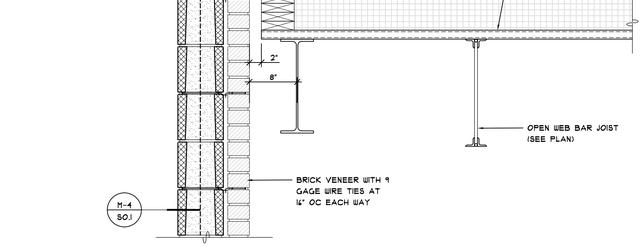
SHEET NUMBER: S2.2
REV: ~




1 S2.3 SECTION DETAIL AT SALLY PORT 1" = 1'-0"




2 S2.3 SECTION DETAIL AT SALLY PORT 1" = 1'-0"




3 S2.3 SECTION DETAIL AT SALLY PORT 1" = 1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

STRUCTURES ENGINEERING AND DESIGN LLC
23 BURRILL RD
HARRISVILLE, RI 02830
401-258-6784
EMAIL@STRUCTURES-LLC.COM
WWW.STRUCTURES-LLC.COM

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
6-30-2025
REVISIONS:

STAMP:

SHEET TITLE:
FRAMING DETAILS

PROJECT NORTH:
N

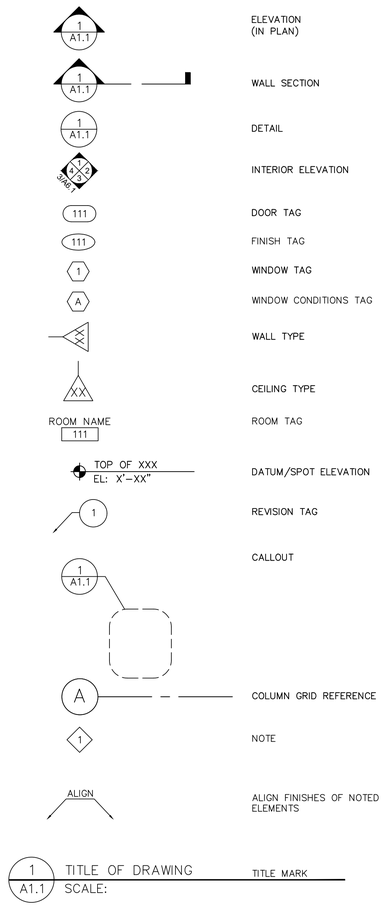
PROJECT ENGINEER: JJP
DRAWN: AC / JJP
PROJECT NUMBER:
25025

SHEET NUMBER: S2.3
REV: ~

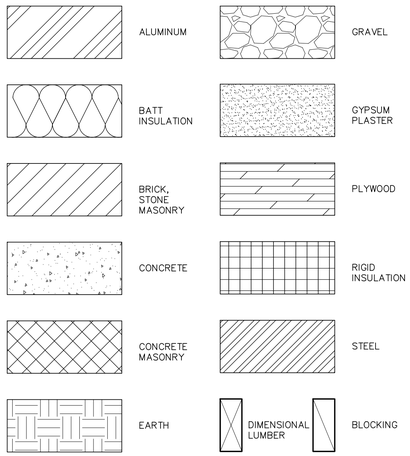
## ABBREVIATIONS

| | |
|---|---|
| & | AND |
| L | ANGLE |
| @ | AT |
| CL | CENTERLINE |
| Ø | DIAMETER |
| # | NUMBER |
| ACOUS | ACOUSTICAL |
| ACT | ACOUSTICAL CEILING TILE |
| ADDEN | ADDENDUM |
| ADD'L | ADDITIONAL |
| ADJ | ADJUSTMENTS |
| AFF | ABOVE FINISHED FLOOR |
| AGGR | AGGREGATE |
| AHU | AIR HANDLER UNIT |
| AL | ALUMINUM |
| APPX | APPENDIX |
| APPROX | APPROXIMATE |
| ARCH | ARCHITECTURAL |
| ASPH | ASPHALT |
| AWT | ACOUSTICAL WALL TREATMENT |
| BITUM | BITUMINOUS |
| BLDG | BUILDING |
| BLK | BLOCK |
| BM | BEAM |
| B.O. | BOTTOM OF |
| BOD | BOTTOM OF ROOF DECK |
| BOT | BOTTOM |
| BRD | BOARD |
| BYND | BEYOND |
| CAB | CABINET |
| CB | CATCH BASIN |
| CEM | CEMENT |
| CER | CERAMIC |
| CJ | CONTROL JOING |
| CLAD | CLADDING |
| CLG | CEILING |
| CLO | CLOSET |
| CLP | CLAP BOARD |
| CLR | CLEAR |
| CNTR | COUNTER |
| CO | CASED OPENING |
| COL | COLUMN |
| COMP | COMPRESSIBLE |
| CONC | CONCRETE |
| CONN | CONNECTION |
| CONSTR | CONSTRUCTION |
| CONT | CONTINUOUS |
| CORR | CORRIDOR |
| CPT | CARPET |
| CT | CERAMIC TILE |
| CTR | CENTER |
| CTSK | COUNTERSUNK |
| DBL | DOUBLE |
| DEPT | DEPARTMENT |
| DF | DRINKING FOUNTAIN |
| DET | DETAIL |
| DIA | DIAMETER |
| DIM | DIMENSION |
| DISP | DISPENSER |
| DN | DOWN |
| DO | DOOR OPENING |
| DR | DOOR |
| DWR | DRAWER |
| DS | DOWNSPOUT |
| DSP | DRY STANDPIPE |
| DWG | DRAWING |
| E | EAST |
| EA | EACH |
| EJ | EXPANSION JOIN |
| ELEC | ELECTRICAL |
| ELEV | ELEVATION |
| EMER | EMERGENCY |
| ENCL | ENCLOSURE |
| EP | ELECTRICAL PANELBOARD |
| EPS | EXTRUDED POLYSTYRENE |
| EQ | EQUAL |
| EQPT | EQUIPMENT |
| EVTR | ELEVATOR |
| EWC | ELECTRIC WATER COOLER |
| EXIST | EXISTING |
| ETR | EXISTING TO REMAIN |
| EXPO | EXPOSED |
| EXP | EXPANSION |
| EXT | EXTERIOR |
| FA | FIRE ALARM |
| FAP | FIRE ALARM PANEL |
| FBO/IBC | FURNISHED BY OWNER/ INSTALLED BY CONTRACTOR |
| FBO/IBO | FURNISHED BY OWNER/ INSTALLED BY OWNER |
| FC | FLOOR CLEAN OUT |
| FD | FLOOR DRAIN |
| FDC | FIRE DEPARTMENT CONNECT |
| FDN | FOUNDATION |
| FE | FIRE EXTINGUISHER |
| FEC | FIRE EXTINGUISHER CABINET |
| FHC | FIRE HOSE CABINET |
| FF | FINISH FLOOR |
| FIN | FINISH |
| FL | FLOOR |
| FLASH | FLASHING |
| FLUOR | FLUORESCENT |
| FM | FLOOR MAT |
| FOC | FACE OF CONCRETE |
| FOF | FACE OF FINISH |
| FOS | FACE OF STUD |
| FOW | FACE OF WALL |
| FP | FIRE PROTECTION |
| FRPF | FIREPROOF |
| FR | FIRE RATED |
| FRP | FIBERGLASS REINFORCED PLASTIC |
| FRT | FIRE RETARDANT TREATED |
| FS | FULL SIZE |
| FT | FOOT OF FEET |
| FTG | FOOTING |
| FURR | FURRING |
| FUT | FUTURE |
| GC | GENERAL CONTRACTOR |
| GA | GAUGE |
| GALV | GALVANIZED |
| GB | GRAB BAR |
| GL | GLASS |
| GL BLK | GLASS BLOCK |
| GND | GROUND |
| GR | GRADE |
| GWB | GYPSUM WALL BOARD |
| GYP | GYPSUM |
| HDCP | HANDICAP |
| HB | HOSE BIB |
| HC | HOLLOW CORE |
| HDWD | HARDWOOD |
| HDWE | HARDWARE |
| HM | HOLLOW METAL |
| HORIZ | HORIZONTAL |
| HP | HIGH POINT |
| HR | HOUR |
| HGT | HEIGHT |
| ID | INSIDE DIMENSION |
| INSUL | INSULATION |
| INT | INTERIOR |
| INTERM | INTERMEDIATE |
| JA | JANITOR |
| JT | JOINT |
| KIT | KITCHEN |
| LAB | LABORATORY |
| LAM | LAMINATE |
| LAV | LAVATORY |
| LCC | LEAD COATED COPPER |
| LH | LEFT HAND |
| LKR | LOCKER |
| LP | LOW POINT |
| LT | LIGHT |
| MATL | MATERIAL |
| MAX | MAXIMUM |
| M.O.E. | MEANS OF EGRESS |
| MECH | MECHANICAL |
| MEMB | MEMBRANE |
| MEP | MECHANICAL, ELECTRICAL, PLUMBING |
| MTL | METAL |
| MFR | MANUFACTURER |
| MIN | MINIMUM |
| MISC | MISCELLANEOUS |
| MO | MASONRY OPENING |
| MR | MOISTURE RESISTANT |
| MTD | MOUNTED |
| MUL | MULLION |
| N | NORTH |
| NIC | NOT IN CONTRACT |
| NO | NUMBER |
| NOM | NOMINAL |
| NTS | NOT TO SCALE |
| OC | ON CENTER |
| OD | OUTSIDE DIAMETER |
| OFF | OFFICE |
| OFOI | OWNER FURNISHED OWNER INSTALLED |
| OPNG | OPENING |
| OVHD | OVERHEAD |
| PART | PARTITION |
| PC | PRECAST |
| PCT | PORCELAIN CERAMIC TILE |
| PERF | PERFORATED |
| PL | PLASTIC |
| PLAM | PLASTIC LAMINATE |
| PLAS | PLASTER |
| PLUMB | PLUMBING |
| PLYWD | PLYWOOD |
| PNL | PANEL |
| POL | POLISHED |
| POLY | POLYETHYLENE |
| PR | PAIR |
| PS | PULL STATION |
| PT | PAINT |
| R | RISER |
| RAD | RADIUS |
| RB | RESILIENT BASE |
| RCP | REFLECTED CEILING PLAN |
| RD | ROOF DRAIN |
| REF | REFERENCE |
| REINF | REINFORCED |
| REM | REMOVE |
| REQ'D | REQUIRED |
| REQ'MTS | REQUIREMENTS |
| RESI | RESISTANT |
| REV | REVISION |
| RM | ROOM |
| RO | ROUGH OPENING |
| ROW | RIGHT OF WAY |
| S | SOUTH |
| SC | SOLID CORE |
| SCHED | SCHEDULE |
| SECT | SECTION |
| SF | SEAMLESS FLOORING |
| SH | SHELF |
| SHWR | SHOWER |
| SHT | SHEET |
| SIM | SIMILAR |
| SPEC | SPECIFICATION |
| SQ | SQUARE |
| SS | STAINLESS STEEL |
| STD | STAINED |
| STL | STEEL |
| STOR | STORAGE |
| STRUCT | STRUCTURE |
| SUSP | SUSPENDED |
| SYM | SYMMETRICAL |
| SYS | SYSTEM |
| T&G | TONGUE AND GROOVE |
| TBD | TO BE DETERMINED |
| THK | THICK |
| TOC | TOP OF CURB |
| TOP | TOP OF PARAPET |
| TOS | TOP OF SLAB |
| TOW | TOP OF WALL |
| TYP | TYPICAL |
| UNF | UNFINISHED |
| UNO | UNLESS NOTED OTHERWISE |
| UON | UNLESS OTHERWISE NOTED |
| VEN | VENEER |
| VB | VAPOR BARRIER |
| VERT | VERTICAL |
| VEST | VESTIBULE |
| VIF | VERIFY IN FIELD |
| W | WEST |
| W/ | WITH |
| WB | WOOD BASE |
| WC | WATER CLOSET |
| WD | WOOD |
| W/O | WITHOUT |
| WP | WATERPROOF |
| WT | WEIGHT |
| WWF | WELDED WIRE FABRIC |

## SYMBOLS




## MATERIALS





Signal Works

11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
ABBREVIATIONS, SYMBOLS, & MATERIALS

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS

PROJECT NUMBER:
#2415

SHEET NUMBER:
A0.1

REV:
~

# GENERAL CONDITIONS NOTES:

1. THE CONTRACTOR SHALL VISIT THE SITE AND BE FULLY COGNIZANT OF ALL EXISTING CONDITIONS PRIOR TO SUBMITTING ANY PROPOSITIONS OR BIDS. IF ANY ASBESTOS, KNOWN MATERIALS CONTAINING ASBESTOS OR ANY MATERIALS CLASSIFIED BY THE EPA AS HAZARDOUS MATERIALS ARE DISCOVERED, THEN THE CONTRACTOR SHALL BE RESPONSIBLE TO COORDINATE WITH THE OWNER, AS REQUIRED, FOR THE REMOVAL OF THESE CONDITIONS, PRIOR TO THE BEGINNING OF THIS PROJECT. IF THE CONTRACTOR PARTICIPATES IN ANY PORTION OF THE REMOVAL PROCESS IN HIS COORDINATION WITH THE OWNER, THEN THE CONTRACTOR SHALL PROVIDE THE OWNER WITH A WRITTEN STATEMENT RELEASING THE OWNER OF ANY FUTURE LIABILITY FROM THE CONTRACTOR, HIS EMPLOYEES AND ANY SUBCONTRACTORS HIRED BY THE CONTRACTOR RELATED TO THIS WORK. THESE DRAWINGS AND SPECIFICATIONS DO NOT REPRESENT AN ASSESSMENT OF THE PRESENCE OR AN ASSESSMENT OF THE ABSENCE OF ANY TOXIC OR HAZARDOUS MATERIALS ON THIS PROJECT SITE. THE OWNERS ARE SOLELY RESPONSIBLE FOR SUCH AN ASSESSMENT AND SHOULD BE CONSULTED FOR ANY QUESTIONS THEREIN. IF THE CONTRACTOR DISCOVERS ANY TOXIC OR HAZARDOUS MATERIALS, AS DEFINED BY THE APPROPRIATE GOVERNING AUTHORITIES, IN THE COURSE OF HIS WORK, HE MUST NOTIFY THE OWNERS IN WRITING, AS PER THE GUIDELINES BY ALL GOVERNING AUTHORITIES. THE CONTRACTOR SHALL RESOLVE THE APPLICABLE REGULATIONS AND PROCEDURES WITH THE OWNER AT THE TIME OF DISCOVERY.

2. ALL WORK IS TO BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE CODES, LAWS, ORDINANCES AND LOCAL MUNICIPAL REGULATIONS AND AMENDMENTS RELATED TO THIS PROJECT. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE OWNER AT ONCE UPON DISCOVERY OF ANY CONFLICTS OR DISCREPANCIES BETWEEN THE AFOREMENTIONED AND THE WORK CONTRACTED FOR THIS PROJECT OR A CHANGE OF AN APPLICABLE CODE OR STATUE BY LOCAL AUTHORITIES.

3. THE CONTRACTOR SHALL COORDINATE AND BE RESPONSIBLE FOR ALL WORK BY HIS SUBCONTRACTORS AND THEIR COMPLIANCE WITH ALL THESE GENERAL NOTES. THE CONTRACTOR SHALL IDENTIFY ANY CONFLICTS BETWEEN THE WORKS OF THE SUBCONTRACTORS, AS DIRECTED BY THESE DRAWINGS, DURING THE LAYOUT OF THE AFFECTED TRADES. THE CONTRACTOR SHALL REVIEW THESE CONDITIONS WITH THE ARCHITECTURAL DESIGNER FOR DESIGN CONFORMANCE BEFORE BEGINNING ANY INSTALLATION.

4. THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING AND PROPOSED DIMENSIONS AND CONDITIONS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE OWNER AT ONCE UPON THE DISCOVERY OF ANY CONFLICTS OR DISCREPANCIES BETWEEN THE AFOREMENTIONED AND THE DRAWINGS AND SPECIFICATIONS OF THIS PROJECT. THE CONTRACTOR SHOULD FOLLOW DIMENSIONS AND SHOULD NOT SCALE THESE DRAWINGS. IF DIMENSIONS ARE REQUIRED BUT NOT SHOWN, THEN THE CONTRACTOR SHALL REQUEST THE DIMENSIONS FROM THE OWNER BEFORE BUILDING ANY PART OF THE PROJECT, WHICH REQUIRES THE MISSING DIMENSIONS.

5. ANY CHANGES, ALTERNATIVES OR MODIFICATIONS TO THESE DRAWINGS AND SPECIFICATIONS MUST BE APPROVED IN WRITING BY THE OWNER, AND ONLY WHEN SUCH WRITTEN APPROVAL CLEARLY STATES THE AGREED COST OR CREDIT OF THE CHANGE, ALTERNATIVE OR MODIFICATION TO THIS PROJECT. FOR INFORMATION, DRAWINGS OR OTHER DOCUMENTS, NOT SHOWN OR INCLUDED IN THE PERMIT OR CONSTRUCTION DRAWINGS OR SPECIFICATIONS, THE CONTRACTOR SHALL REQUEST THE MISSING INFORMATION, DRAWINGS OR DOCUMENTS FROM THE OWNER BEFORE STARTING OR PROCEEDING WITH THE CONSTRUCTION AFFECTED BY THE MISSING INFORMATION, DRAWINGS OR DOCUMENTS.

6. THE INTENT OF THESE DRAWINGS AND SPECIFICATIONS IS TO PROVIDE THE DESIGN GUIDANCE FOR THE CONTRACTOR TO REASONABLY PLAN FOR ALL ITEMS NECESSARY FOR A COMPLETE JOB. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE ALL MATERIALS, LABOR AND EXPERTISE NECESSARY TO ACHIEVE A COMPLETE JOB AS INTENDED IN THESE DRAWINGS AND SPECIFICATIONS. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, FINAL DIMENSIONS AND PROCEDURES FOR THE WORK SHOWN ON THESE DRAWINGS AND SPECIFICATIONS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENACT THE AFOREMENTIONED IN COMPLIANCE WITH GENERALLY ACCEPTED STANDARDS OF PRACTICE FOR THE CONSTRUCTION INDUSTRY FOR THE TYPE OF WORK SHOWN ON THESE DRAWINGS AND SPECIFICATIONS. THE OWNER RESERVES THE RIGHT OF REVIEW FOR ALL MATERIALS AND PRODUCTS FOR WHICH NO SPECIFIC BRAND NAME OR MANUFACTURER IS IDENTIFIED IN THESE DRAWINGS AND SPECIFICATIONS. (7) THE CONTRACTOR SHALL VERIFY WITH THE OWNER THE NEED FOR SHOP DRAWINGS OR SAMPLES OF MATERIALS OR PRODUCTS, WHICH WERE NOT IDENTIFIED IN THESE DRAWINGS OR SPECIFICATIONS, AS WELL AS ANY MATERIAL, PRODUCT OR EQUIPMENT SUBSTITUTIONS PROPOSED IN PLACE OF THOSE ITEMS IDENTIFIED IN THESE DRAWINGS AND SPECIFICATIONS.

7. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY AND COORDINATE ALL UTILITY CONNECTIONS, UTILITY COMPANIES' REQUIREMENTS AND INCLUDE ANY RELATED COSTS ASSOCIATED WITH THIS RESPONSIBILITY IN THE PROPOSAL OR BID. THE CONTRACTOR IS ALSO RESPONSIBLE FOR WRITING LETTERS OF CONFORMATION REGARDING OPERATIVE AGREEMENTS FOR THIS PROJECT BETWEEN THE CONTRACTOR AND THE LOCAL FIRE DEPARTMENT; THE LOCAL WATER AGENCY; THE LOCAL NATURAL OR PROPANE GAS PROVIDER; THE LOCAL ELECTRICITY PROVIDER; THE LOCAL TELEPHONE SERVICE PROVIDERS; THE LOCAL CABLE TV PROVIDER; THE OWNER'S SECURITY SERVICE PROVIDER AND ANY UNNAMED UTILITY TYPE SERVICE PROVIDER. THE CONTRACTOR SHALL PROVIDE COPIES OF ANY SUCH AGREEMENTS TO THE OWNER, IF REQUIRED OR REQUESTED.

8. THE CONTRACTOR IS FULLY RESPONSIBLE TO ENACT THE APPROPRIATE SAFETY PRECAUTIONS REQUIRED TO MAINTAIN A SAFE WORKING ENVIRONMENT. THE CONTRACTOR SHALL ALSO INDEMNIFY AND HOLD HARMLESS THE OWNER, THEIR CONSULTANTS AND EMPLOYEES FROM ANY PROBLEMS, WHICH RESULT FROM THE CONTRACTOR'S PERFORMANCE OF THE WORK RELATED TO THE SAFETY OF THE CONSTRUCTION SITE.

9. THE CONTRACTOR SHALL CARRY THE APPROPRIATE WORKMAN'S COMPENSATION AND LIABILITY INSURANCE, AS REQUIRED BY THE LOCAL GOVERNMENT AGENCY HAVING JURISDICTION FOR THIS ISSUE, AS WELL AS COMPLY WITH THE GENERALLY ACCEPTED INDUSTRY STANDARDS OF PRACTICE FOR A PROJECT OF THIS SCOPE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY WITH THE OWNER, IF HE WILL BE REQUIRED TO CARRY FIRE INSURANCE OR OTHER TYPES OF INSURANCE, AS WELL AS, MAKING THE OWNER ADDITIONALLY INSURED ON THEIR POLICIES FOR THE DURATION OF THE PROJECT. HE SHOULD ALSO ASSIST THE OWNER IN IDENTIFYING THE AMOUNT OF COVERAGE REQUIRED FOR THEIR CO-INSURANCE NEEDS.

10. THE CONTRACTOR SHALL MAINTAIN A CLEAN AND ORDERLY JOB SITE ON A DAILY BASIS. THE CONTRACTOR SHALL NOT UNREASONABLY ENCUMBER THE SITE WITH MATERIALS OR EQUIPMENT. THE CONTRACTOR SHALL NOT ENDANGER EXISTING STRUCTURES AND ANY NEWLY CONSTRUCTED STRUCTURE BY OVERLOADING THE AFOREMENTIONED WITH MATERIALS OR EQUIPMENT. THE CONTRACTOR SHALL PROTECT ALL EXISTING CONSTRUCTION TO REMAIN AND NEW CONSTRUCTION AFTER IT IS INSTALLED. THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE TEMPORARY ENCLOSURES OR PROTECTION, AS NEEDED, TO PROTECT THE EXISTING STRUCTURE AND ANY NEWLY CONSTRUCTED STRUCTURES FROM THE ILL EFFECTS OF WEATHER FOR THE DURATION OF THE ENTIRE CONSTRUCTION PROCESS.

11. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGE INCURRED BY HIM OR HIS SUBCONTRACTORS TO ANY EXISTING STRUCTURE OR WORK, ANY STRUCTURE OR WORK IN PROGRESS; UNUSED MATERIAL INTENDED FOR USE IN THE PROJECT; OR ANY EXISTING SITE CONDITION WITHIN THE SCOPE OF WORK INTENDED BY THESE DRAWINGS AND SPECIFICATIONS. THIS RESPONSIBILITY WILL INCLUDE ANY MATERIALS AND LABOR REQUIRED TO CORRECT SUCH DAMAGE TO THE OWNER'S SATISFACTION AT NO COST TO THE OWNER UNLESS AGREED TO BY THE OWNER IN WRITING.

12. THE CONTRACTOR SHALL WARRANTY ACCORDING TO STATE CONSTRUCTION LAW ALL WORK DONE BY HIM, HIS EMPLOYEES AND HIS SUBCONTRACTORS AGAINST ALL VISIBLE DEFECTS OR ERRORS THAT BECOME APPARENT WITHIN THE FIRST YEAR AFTER THE COMPLETION OF THE PROJECT, AS ACCEPTED BY THE OWNER. THE CONTRACTOR SHALL, ADDITIONALLY, WARRANTY ALL DEFECTS AND ERRORS NOT VISIBLE, BUT CONTAINED WITHIN CONSTRUCTED WORK, FOR A PERIOD OF TEN YEARS FROM THE COMPLETION OF THE PROJECT, ALSO ACCORDING TO STATE CONSTRUCTION LAW. ANY AND ALL DEFECTS AND ERRORS THAT DO BECOME APPARENT SHALL BE PROMPTLY REPAIRED BY THE CONTRACTOR TO THE OWNER'S SATISFACTION AT NO COST TO THE OWNER FOR MATERIALS OR LABOR. ALTERATIONS OR CHANGES TO THIS WARRANTY MUST BE MUTUALLY AGREED TO IN WRITING BY BOTH THE CONTRACTOR AND THE OWNER.

13. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE APPROPRIATENESS OF THE APPLICATION OF ALL THE PRODUCT SELECTIONS SHOWN OR INTENDED IN THESE DRAWINGS AND SPECIFICATIONS. THE INTENDED MEANING OF 'APPROPRIATENESS' IS THE PROPER SYSTEM, MODEL AND SPECIFIC SELECTION REQUIRED FOR THE INTENDED USE AS SHOWN ON THESE DRAWINGS AND SPECIFICATIONS. THE CONTRACTOR IS RESPONSIBLE TO VERIFY THE MOST CURRENT MODEL NAME OR NUMBER FROM THE SELECTED MANUFACTURER. THE CONTRACTOR IS RESPONSIBLE TO VERIFY THAT ANY INSTALLERS, WHICH HE SELECTS FOR THE VARIOUS PRODUCTS WILL FOLLOW ALL THAT PRODUCT MANUFACTURER'S REQUIRED AND RECOMMENDED METHODS AND PROCEDURES TO ACHIEVE THE DESIRED RESULTS CLAIMED BY SUCH MANUFACTURERS FOR THEIR PRODUCTS. IN ADDITION, THESE DRAWINGS AND SPECIFICATIONS IDENTIFY SOME REQUIRED SYSTEMS AND PRODUCTS IN GENERIC TERMS. THE CONTRACTOR IS RESPONSIBLE TO MAKE SPECIFIC SELECTIONS FOR THESE SYSTEMS AND PRODUCTS THAT SATISFY THE SAME CONDITIONS OUTLINED ABOUT THE IDENTIFIED MANUFACTURED ITEMS.

14. IT IS THE INTENT OF THESE DRAWINGS AND SPECIFICATIONS TO IDENTIFY THE SCOPE OF WORK FOR A DESIGN AND BUILD TYPE OF MECHANICAL AND PLUMBING INSTALLATION. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE: THE NECESSARY LABOR FAMILIAR WITH THIS TYPE OF INSTALLATION; ALL NECESSARY MATERIALS, TOOLS, EQUIPMENT, TRANSPORTATION, TEMPORARY CONSTRUCTION; AND ANY SPECIAL OR OCCASIONAL SERVICES REQUIRED TO INSTALL COMPLETE WORKING MECHANICAL AND PLUMBING SYSTEMS, AS DIAGRAMMATICALLY DESCRIBED AND SHOWN IN THESE DRAWINGS AND SPECIFICATIONS. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE TO VERIFY ANY INFORMATION THAT IS NOT INDICATED IN THESE DRAWINGS AND SPECIFICATIONS BUT IS REQUIRED FOR THE PERFORMANCE OF THE INSTALLATION.

15. IT IS THE INTENT OF THESE DRAWINGS AND SPECIFICATIONS TO IDENTIFY THE SCOPE OF WORK FOR A DESIGN AND BUILD TYPE OF FIRE SPRINKLER INSTALLATION THROUGHOUT THE ENTIRE STRUCTURE. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE: THE NECESSARY LABOR FAMILIAR WITH THIS TYPE OF INSTALLATION; ALL NECESSARY MATERIALS, TOOLS, EQUIPMENT, TRANSPORTATION, TEMPORARY CONSTRUCTION; AND ANY SPECIAL OR OCCASIONAL SERVICES, INCLUDING THE PROCUREMENT OF ALL PERMITS REQUIRED TO INSTALL A COMPLETE WORKING SYSTEM. THE CONTRACTOR WILL ALSO BE RESPONSIBLE TO VERIFY ANY INFORMATION THAT IS NOT INDICATED IN THESE DRAWINGS AND SPECIFICATIONS BUT IS REQUIRED FOR THE PERFORMANCE OF THE INSTALLATION.

16. IF THE CONTRACTOR FINDS FAULT WITH, DISAGREES WITH, OBJECTS TO, OR WOULD LIKE TO CHANGE THE SCOPE OF THESE GENERAL NOTES OR HIS STATED RESPONSIBILITIES, AS OUTLINED IN THESE GENERAL NOTES, THEN THE CONTRACTOR MUST RESOLVE SUCH CHANGES WITH THE OWNER IN WRITING BEFORE SIGNING A CONTRACT. FAILURE TO DO SO SHALL CONSTITUTE AN UNDERSTANDING OF THESE GENERAL NOTES AND THEIR ACCEPTANCE BY THE CONTRACTOR.

17. THE CONTRACTOR SHALL IDENTIFY IN HIS PROPOSAL OR BID, WHICH PERMITS HE EXPECTS TO OBTAIN AND WHICH PERMITS AND APPLICATION FEES HE EXPECTS THE OWNER TO PROVIDE.

18. THE CONTRACTOR IS RESPONSIBLE TO IDENTIFY ANY CONFLICTS BETWEEN HIS CONTRACT WITH THE OWNER AND THESE DRAWINGS. THE ARCHITECTURAL DESIGNER, THE CONTRACTOR AND THE OWNER SHALL REVIEW THESE CONFLICTS IN ORDER TO AMEND ONE OF THESE DOCUMENTS BEFORE THE START OF THE CONSTRUCTION. IF A CONFLICT IS DISCOVERED WITHOUT THIS PRIOR RESOLUTION, THEN THESE DRAWINGS SHALL TAKE PRECEDENCE OVER ANY OTHER DOCUMENTS IN RESOLVING A CONFLICT.

19. THE CONTRACTOR SHALL ASSUME THAT SITE MEETINGS WITH THE OWNER, THE ARCHITECTURAL DESIGNER AND THE CONTRACTOR PRESENT SHALL BE HELD ONCE EVERY WEEK, UNLESS THEY ARE MUTUALLY CHANGED OR CANCELED. THE CONTRACTOR SHALL KEEP WRITTEN NOTES OF ALL RELEVANT INFORMATION DISCUSSED AT THESE MEETINGS AND PROVIDE COPIES TO THE OWNER AND THE ARCHITECTURAL DESIGNER, UNLESS DIFFERING ARRANGEMENTS ARE RESOLVED WITH THE ARCHITECTURAL DESIGNER AND THE OWNER. THE ARCHITECTURAL DESIGNER SHALL PROVIDE ANY REQUESTED SKETCHES OR ANY REQUESTED INFORMATION THAT IS REQUIRED AND REQUESTED DURING THESE MEETINGS. THE OWNER AND THE CONTRACTOR SHALL ALSO PROVIDE ANY REQUESTED INFORMATION THAT IS REQUIRED DURING THESE MEETINGS.

20. THE ARCHITECTURAL DESIGNER OR THE OWNER CAN WRITE AND ISSUE FIELD ORDERS FOR CHANGES TO THE DRAWINGS AND SPECIFICATIONS, AS REQUESTED BY OWNER OR THE CONTRACTOR. IF ADDITIONAL (OR DELETION OF) COST TO THE PROJECT IS REQUIRED, THEN THESE FIELD ORDERS SHALL BECOME THE BASIS OF A CHANGE ORDER.

21. THE CONTRACTOR SHALL WRITE AND ISSUE ALL CHANGE ORDERS, WHICH SHALL INCLUDE A COST BREAKDOWN FOR ALL THE WORK DESCRIBED IN SUCH A CHANGE ORDER. ANY CHANGE ORDER WILL NOT BE BINDING TO THE OWNER UNTIL BOTH THE CONTRACTOR AND THE OWNER HAVE SIGNED IT.

22. UPON SUBSTANTIAL COMPLETION THE CONTRACTOR SHALL NOTIFY THE ARCHITECTURAL DESIGNER, WHO SHALL COORDINATE A WALK-THROUGH OF THE PROJECT WITH THE OWNER AND THE CONTRACTOR AND THEN PROVIDE A PUNCH LIST OF ITEMS TO COMPLETE. ARRANGEMENTS FOR FINAL PAYMENT WILL BE MADE AT THAT TIME.

# CODE REFERENCES

RISBC-1 RHODE ISLAND BUILDING CODE (510-RICR-00-00-1) INCORPORATES THE INTERNATIONAL BUILDING CODE, 2018 EDITION, BY REFERENCE.

RI FIRE CODE (450-RICR-00-00-7) INCORPORATES THE FIRE CODE OF THE NATIONAL FIRE PROTECTION ASSOCIATION, INC., (NFPA 1), 2018 EDITION, BY REFERENCE. RI LIFE SAFETY CODE (450-RICR-00-00-8) INCORPORATES THE LIFE SAFETY CODE OF THE NATIONAL FIRE PROTECTION ASSOCIATION, INC., (NFPA 101), 2018 EDITION, BY REFERENCE.

RISBC-3 RHODE ISLAND PLUMBING CODE (510-RICR-00-00-3) INCORPORATES THE INTERNATIONAL PLUMBING CODE, 2018 EDITION, BY REFERENCE.

RISBC-4 RHODE ISLAND MECHANICAL CODE (510-RICR-00-00-4) INCORPORATES THE INTERNATIONAL MECHANICAL CODE, 2018 EDITION, BY REFERENCE.

RISBC-5 RHODE ISLAND ELECTRICAL CODE (510-RICR-00-00-5) INCORPORATES THE NATIONAL ELECTRICAL CODE, 2020 EDITION, BY REFERENCE.

IECC 2024 INTERNATIONAL ENERGY CONSERVATION CODE, UNAMMENDED.

# SITE INFORMATION NOTES:

PLAT 9 LOT 591

EXISTING ZONE: RS
EXISTING ZONING USE: RESIDENTIAL SUBURBAN

EXISTING USE: B (BUSINESS)

EXISTING BUILDING TYPE: IIIB UNSPRINKLERED

MAXIMUM HEIGHT: 25'-5"
MAXIMUM STORIES: 2 STORY
LOT AREA: 92,310 SF
TOTAL BLDG AREA: 7,868 SF

| | |
|---|---|
| LOWER LEVEL | 7,860 SF |
| UPPER LEVEL | 7,860 SF |
| TOTAL | 15,720 SF |

# DEMOLITION GENERAL NOTES:

1. THE DEMOLITION WORK SHOWN ON THESE DRAWINGS MAY NOT BE THE COMPLETE DEMOLITION REQUIRED TO ACCOMMODATE THE NEW WORK, WHICH IS SHOWN ELSEWHERE. THE INTENT OF THESE DRAWINGS IS TO GENERALLY SHOW THE DEMOLITION SCOPE OF WORK EXPECTED OF THE CONTRACTOR. THE CONTRACTOR WILL BE RESPONSIBLE TO COORDINATE ANY ADDITIONAL DEMOLITION WORK AND VERIFY THE EXTENT OF DEMOLITION REQUIRED IN ORDER TO ACCOMMODATE ANY NEW WORK.

2. ALL THE DIMENSIONS SHOWN, OR NOT SHOWN BUT REQUIRED, MUST BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION. THE INFORMATION SHOWN ON THESE DRAWINGS WAS DERIVED BY THE ARCHITECTURAL DESIGNER WITHOUT ANY SURVEYING OR ENGINEERING EQUIPMENT AND IS INTENDED TO BE HELPFUL, BUT NOT NECESSARILY ACCURATE.

3. ALL BIDS OR PROPOSALS MUST CLEARLY IDENTIFY WHAT WORK WILL BE PERFORMED AND WHAT WORK WILL NOT BE PERFORMED. THE CONTRACTOR WILL ALSO IDENTIFY ANY ALLOWANCES FOR WORK TOO UNCERTAIN TO BID FROM THE INFORMATION SHOWN ON THESE DRAWINGS.

4. THE CONTRACTOR WILL COORDINATE THE CAPPING AND PATCHING OF ALL EXISTING PLUMBING FIXTURES, SPRINKLER SYSTEMS AND RELATED EQUIPMENT SHOWN TO BE REMOVED WITH THE EXISTING ROUGH-IN SYSTEM TO REMAIN. THE CONTRACTOR WILL VERIFY THE WORK REQUIRED FOR INSTALLING AND CONNECTING NEW PLUMBING FIXTURES AND RELATED EQUIPMENT, AS SHOWN ON THE NEW WORK PLANS, TO THE REMAINING EXISTING SYSTEM. THE CONTRACTOR WILL REVIEW WITH THE ARCHITECTURAL DESIGNER IN THE FIELD ANY CONDITIONS THAT WILL CONFLICT WITH THIS INTENT.

5. THE CONTRACTOR WILL COORDINATE THE CAPPING AND PATCHING OF THE MECHANICAL SYSTEM AND RELATED DEVICES SHOWN TO BE REMOVED WITH THE EXISTING SYSTEM TO REMAIN. THE CONTRACTOR WILL VERIFY THE WORK REQUIRED FOR INSTALLING ANY NEW MECHANICAL SYSTEM AND RELATED EQUIPMENT, AS SHOWN ON THE NEW WORK PLANS, TO THE REMAINING EXISTING SYSTEM OR EQUIPMENT. THE CONTRACTOR WILL REVIEW WITH THE ARCHITECTURAL DESIGNER IN THE FIELD ANY CONDITIONS THAT WILL CONFLICT WITH THIS INTENT.

6. THE CONTRACTOR WILL COORDINATE THE CAPPING AND PATCHING OF ALL EXISTING ELECTRICAL FIXTURES AND RELATED EQUIPMENT SHOWN TO BE REMOVED WITH THE EXISTING SYSTEM TO REMAIN. THE CONTRACTOR WILL VERIFY THE WORK REQUIRED FOR INSTALLING AND CONNECTING NEW ELECTRICAL FIXTURES AND RELATED EQUIPMENT, AS SHOWN ON THE NEW WORK PLANS, TO THE REMAINING EXISTING SYSTEM. THE CONTRACTOR WILL REVIEW WITH THE ARCHITECTURAL DESIGNER IN THE FIELD ANY CONDITIONS THAT WILL CONFLICT WITH THIS INTENT.

7. THE CONTRACTOR WILL PROTECT EXISTING MATERIALS TO REMAIN, AS REQUIRED. DAMAGE TO EXISTING MATERIALS TO REMAIN, BECAUSE OF INADEQUATE PROTECTION SHALL BE FIXED, REPAIRED OR REPLACED, AS REQUIRED BY THE ARCHITECTURAL DESIGNER, AT THE SOLE EXPENSE OF THE CONTRACTOR INCLUDING BUT NOT NECESSARILY LIMITED TO LABOR AND MATERIALS.

8. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR OBTAINING ANY ADDITIONAL PERMITS, ENGINEERING, SHORING AND ANY CONSTRUCTION DOCUMENTS BY OTHERS RELATED TO THIS WORK, WHETHER OR NOT THEY ARE REQUIRED, FROM THE LOCAL AUTHORITIES.

9. THE CONTRACTOR IS RESPONSIBLE TO PROPERLY STORE AND PROTECT ANY MATERIAL DESIGNATED ON THE DRAWINGS TO BE SALVAGED AND RE-INSTALLED AS PART OF THE NEW WORK INTENT.

# CONSTRUCTION GENERAL NOTES:

1. THE CONTRACTOR WILL BE RESPONSIBLE TO MAINTAIN THE SECURITY OF THE JOB SITE DURING THE CONSTRUCTION PROCESS UNTIL FINAL ACCEPTANCE BY THE OWNER OR UNTIL AN ALTERNATE DATE, AS MUTUALLY AGREED BETWEEN THE OWNER AND THE CONTRACTOR.

2. THE CONTRACTOR WILL VERIFY THE ROUGH-IN DIMENSIONS AND REQUIREMENTS FROM THE APPROPRIATE MANUFACTURER OR FABRICATOR FOR DOORS, WINDOWS, EQUIPMENT, CABINETRY, PLUMBING FIXTURES, ELECTRICAL FIXTURES, APPLIANCES AND ANY OTHER DEVICES BEFORE PROCEEDING TO LAY OUT AREAS WHERE SUCH ITEMS ARE LOCATED.

3. ALL CONNECTIONS AND FASTENERS ARE INTENDED TO BE CONCEALED, UNLESS OTHERWISE NOTED. WHERE SUCH DEVICES CAN NOT BE CONCEALED AS INTENDED NOTIFY THE ARCHITECTURAL DESIGNER FOR REVIEW OF DESIGN CONFORMANCE.

4. FIREBLOCKING SHALL BE PROVIDED IN ALL LOCATIONS IDENTIFIED BY LOCAL / STATE BUILDING CODE AND IN ANY ADDITIONAL LOCATIONS IDENTIFIED BY THE LOCAL AUTHORITIES OR LOCAL ORDINANCES

5. THE CONTRACTOR WILL VERIFY ALL ROOF AND FRAMING SPACES REQUIRED TO BE VENTILATED WITH THE LOCAL FIELD INSPECTOR OR LOCAL CODE AND PROVIDE THE APPROPRIATE NET FREE VENTILATION AREA, BUT IN NO CASE SHALL IT BE LESS THAN 1/50TH OF THE AREA OF THE SPACE TO BE VENTILATED. WHEN THE MEANS OF THE VENTILATION IS VISIBLE FROM A COMMONLY USED SPACE, PASSAGEWAY, YARD OR PUBLIC RIGHT OF WAY, THE CONTRACTOR SHALL REVIEW THIS SITUATION WITH THE ARCHITECTURAL DESIGNER FOR DESIGN CONFORMANCE BEFORE INSTALLING SUCH DEVICES, EQUIPMENT OR MATERIALS.

6. THE CONTRACTOR WILL VERIFY AND PROVIDE THE REQUIRED BLOCKING AND BACKING FOR ALL CABINETRY, WALL-MOUNTED ACCESSORIES, BUILT-IN EQUIPMENT, LIGHT FIXTURES OR OTHER DEVICES REQUIRING BLOCKING OR BACKING.

7. THE CONTRACTOR WILL VERIFY AND PROVIDE ALL CODE REQUIRED FIREPROOFING AT ALL PENETRATIONS INTO AND THROUGH A FIRE RATED FLOOR, WALL, CEILING OR ROOF ASSEMBLY.

8. ALL CHANGES OR OFFSETS IN FLOOR FINISH MATERIAL WILL OCCUR UNDER A THRESHOLD, WHEN PROVIDED, OR AT THE CENTERLINE OF A DOOR TRANSITION UNLESS OTHERWISE INDICATED ON THE DRAWINGS. OTHER LOCATIONS OF THESE CONDITIONS SHALL BE VERIFIED WITH THE ARCHITECTURAL DESIGNER IN THE FIELD FOR DESIGN CONFORMANCE BEFORE INSTALLING ANY MATERIAL.

9. THE SEALANT, CAULKING AND FLASHING LOCATIONS SHOWN ON THESE DRAWINGS ARE NOT INTENDED TO COVER ALL CONDITIONS REQUIRING THESE PRODUCTS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO IDENTIFY ALL CONDITIONS REQUIRING THESE PRODUCTS, SIMILAR PRODUCTS AND REVIEW THESE CONDITIONS NOT IDENTIFIED IN THE DRAWINGS WITH THE ARCHITECTURAL DESIGNER FOR DESIGN CONFORMANCE.

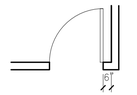
10. COMPLETE ALL WORK REQUIRED TO MEET LOCAL / STATE ENERGY CONSERVATION REQUIREMENTS INCLUDING BUT NOT LIMITED TO ALL MANDATORY AND SPECIAL FEATURES, AS WELL AS ANY LOCAL ORDINANCES AND ANY NEW REQUIREMENTS IDENTIFIED BY THE LOCAL BUILDING FIELD INSPECTOR.

11. THE CONTRACTOR SHALL IDENTIFY IN HIS PROPOSAL WHICH UTILITY TYPE (WATER, ELECTRICITY, TELEPHONE, INTERNET, ETC.) CONNECTIONS, USE AND RELATED COSTS WILL BE INCLUDED IN HIS OVERHEAD AND WHICH COSTS HE EXPECTS THE OWNER TO PROVIDE. ANY UTILITY TYPE COST WHICH IS NOT IDENTIFIED, AS AN OWNER PROVIDED ITEM, WILL BE ASSUMED TO BE INCLUDED IN THE CONTRACTOR'S OVERHEAD COST.

12. THE CONTRACTOR SHALL IDENTIFY AND PROVIDE THE REQUIRED SIDEWALK AND PUBLIC PASSAGE ENCLOSURE PROTECTION AT ANY AFFECTED RIGHT-OF-WAY AREAS OR PUBLIC ACCESS LOCATIONS. THE CONTRACTOR WILL REVIEW ALL INTENDED SIGNAGE WITH THE ARCHITECTURAL DESIGNER FOR DESIGN CONFORMANCE.

13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MEANS AND METHODS OF CONSTRUCTION AND ANY DIRECTION FROM THE OWNER OR THE ARCHITECTURAL DESIGNER SHALL NOT BE CONSTRUED TO OVERRIDE THIS RESPONSIBILITY UNLESS MUTUALLY AGREED TO IN A WRITTEN DOCUMENT IDENTIFYING A SPECIFIC AREA OF WORK FOR WHICH THE CONTRACTOR WILL NOT BE RESPONSIBLE

# ARCHITECTURAL GENERAL NOTES:




DOORS TO BE PLACED 6" FROM FACE OF WALL, U.N.O.

2. ALL THE DIMENSIONS OF EXISTING CONDITIONS SHOWN, OR NOT SHOWN BUT REQUIRED, MUST BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION. LABELED DIMENSIONS CONTROL THE DESIGN INTENT, DO NOT SCALE DRAWINGS. DIMENSIONS FOR PROPOSED WORK ARE NOT ADJUSTABLE WITHOUT APPROVAL FROM THE ARCHITECT.

3. PROVIDE ALL TEMPORARY FRAMING AND SHORING REQ'D TO SUPPORT EXISTING STRUCTURE DURING DEMOLITION AND ALTERATION OF ANY LOAD BEARING BUILDING COMPONENTS.

4. PROVIDE TEMPORARY, SECURE / WEATHER-PROOF ENCLOSURE @ ALL NEW AND ALTERED OPENINGS TO EXTERIOR DURING DEMOLITION AND CONSTRUCTION.

5. PROVIDE TEMPORARY DUST-PROOF BARRIERS BETWEEN AREA OF WORK AND EXISTING INTERIOR SPACES TO REMAIN.

6. PRIOR TO BEGINNING DEMOLITION, IDENTIFY WITH OWNER ANY APPLIANCES, CABINETS, FIXTURES OR OTHER ITEMS TO BE SELECTIVELY REMOVED AND STORED ONSITE FOR FUTURE REUSE.

7. DEMOLISH FIXTURES AND EQUIPMENT AS SHOWN, REMOVE ALL ASSOCIATED PLUMBING & WIRING NOT TO BE REUSED IN NEW WORK.

8. OWNER TO DETERMINE IN FIELD WITH CONTRACTOR EXTENT TO WHICH EXISTING FLOORING DISTURBED BY CONSTRUCTION WILL BE REMOVED AND REPLACED. CONTRACTOR SHALL SUGGEST APPROPRIATE STEPS TO ADEQUATELY REFINISH FLOORING AS NEEDED.

9. IN NO CASE SHALL DIMENSIONS BE SCALED FROM DRAWINGS. THE CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS IN THE FIELD BEFORE PROCEEDING WITH SUBSEQUENT WORK.

10. ALL DIMENSIONS ARE TO CENTER LINE ($\mathbb{C}_L$) OF NEW WALLS AND FACE OF FINISH TO EXISTING WALLS UNLESS OTHERWISE NOTED.

11. DIMENSIONS MARKED "MIN." INDICATE A MINIMUM CLEARANCE THAT MUST BE MAINTAINED.

12. REFER TO SHEET A0.0 FOR SYMBOLS AND ABBREVIATIONS. REFER TO SHEETS A0.1, ET. AL. FOR GENERAL NOTES AND SPECIFICATIONS

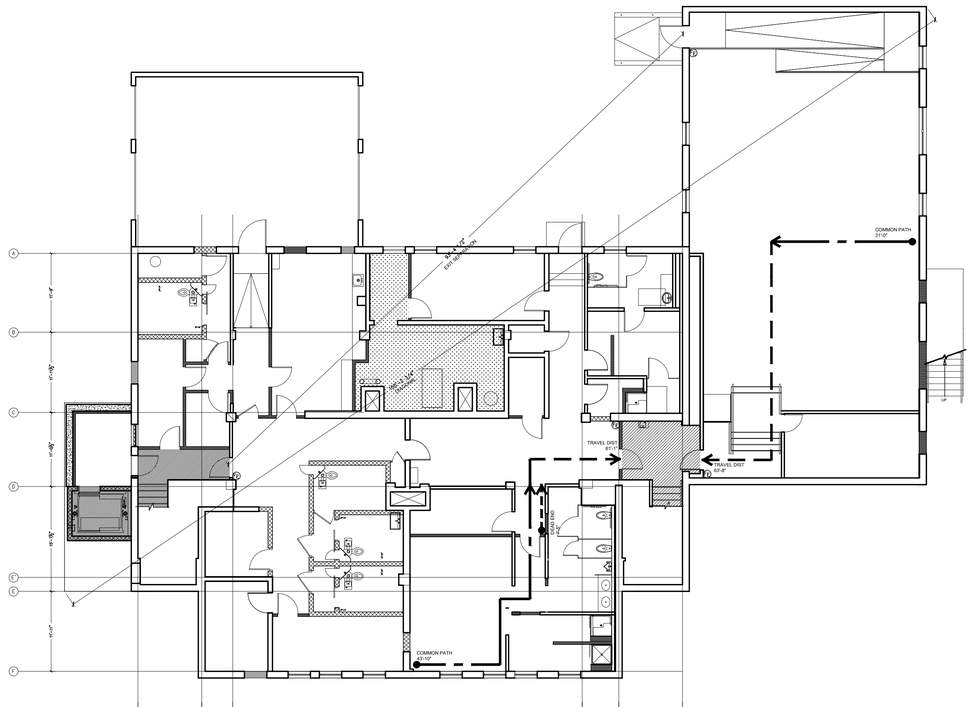
13. ALL FINISH WALL SURFACES TO BE FLUSH UNLESS NOTED OTHERWISE. PROVIDE FURRING AS REQUIRED.

14. ALL GYP. BD. WALLS TO BE TAPED, SANDED AND PRIMED TO LEVEL 5 FINISH ("IMPERIAL" PLASTER SKIMCOAT, PRIMED AND PAINTED) UNLESS NOTED OTHERWISE.

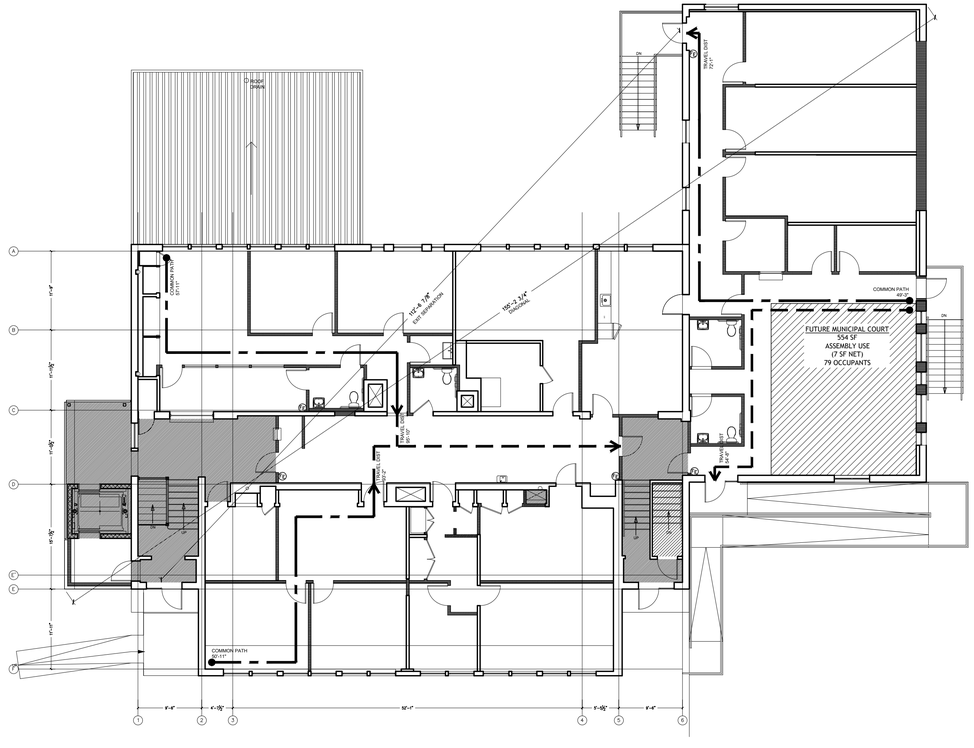
15. ALL WORK SHALL COMPLY WITH CURRENTLY ADOPTED STATE BUILDING CODE AND ASSOCIATED CODES ADOPTED VIA INCORPORATION.

16. IF THE ARCHITECT HAS NOT BEEN RETAINED FOR CONSTRUCTION ADMINISTRATION, THEN THE ARCHITECT IS NOT RESPONSIBLE FOR SEEING THAT THE CONTRACTOR ADHERES TO THE CONSTRUCTION DRAWINGS.

# MECHANIC




1 / A0.3 Code Review Plan - Lower Level
3/32" = 1'-0"




1 / A0.3 Code Review Plan - Upper Level
3/32"=1'-0"

KEY

- COMMON PATH
- TRAVEL DISTANCE TO NEAREST EXIT
- DEAD-END
- 2A (10 B/C) FIRE EXTINGUISHER

FIRE EXTINGUISHER PROVISION

75FT MAX TRAVEL DISTANCE
REQUIREMENT:
1A PER 15005F
11A REQUIRED FOR TOTAL AREA 15,768SF
9(2A) PROVIDED

- NET ASSEMBLY AREA
- PROPOSED 1 HR INCIDENTAL
- EXISTING 1 HR SHAFT
- PROPOSED 1 HR SHAFT

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

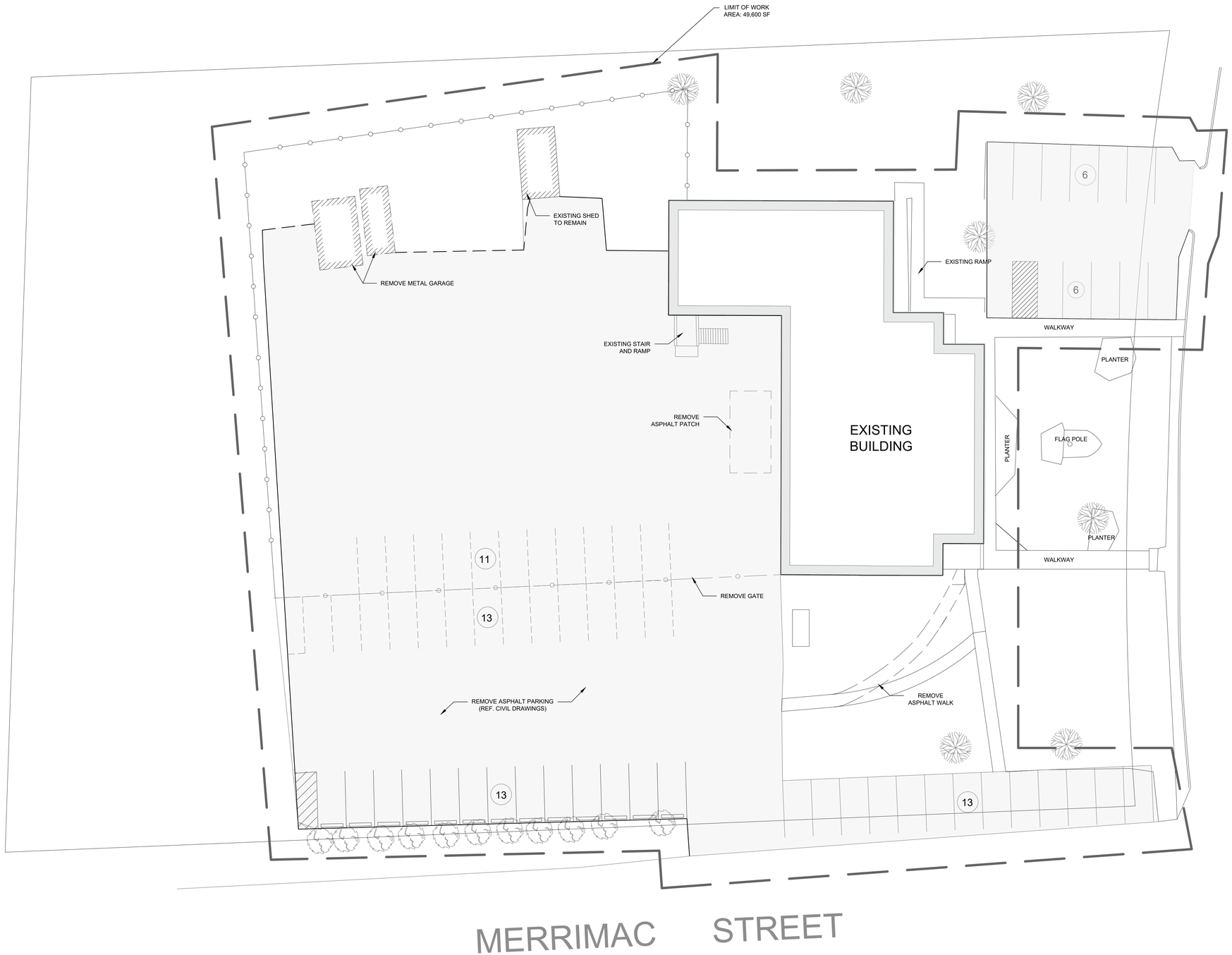
SHEET TITLE:
CODE REVIEW PLANS

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS

PROJECT NUMBER:
#2415

SHEET NUMBER: A0.3
REV: ~




1 AD1.0 SITE DEMOLITION PLAN
1/16"=1'-0"

## DEMO NOTES

1. MAINTAIN AND PROTECT ALL EXISTING BOLLARDS, FENCES, GATES, STAIRS, CONCRETE PADS, PLANTINGS, AND OTHER SITE FEATURES UNLESS OTHERWISE NOTED.

2. ENGINEER TO INSPECT ASPHALT BASE. REPAIR BASE AS REQUIRED BEFORE PAVEMENT OVERLAY.

3. COORDINATE BUILDING DOOR LOCATIONS, GRADE TRANSITIONS AT ENTRIES, RAMPS, STAIRS, AND RAILINGS WITH ARCHITECT.

4. COORDINATE ALL WORK WITHIN R.O.W. WITH TOWN OF NORTH SMITHFIELD AS REQUIRED. (REF. CIVIL DRAWINGS)

5. RESTRIPE REPAVED AREAS AS SHOWN. EPOXY RESIN WITH AASHTO M247 TYPE I GLASS BEADS OR APPROVED EQUAL. (REF. CIVIL DRAWINGS)

6. ALL PARKING SPACES SHALL HAVE CONC. WHEEL STOPS. (REF. CIVIL DRAWINGS)

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

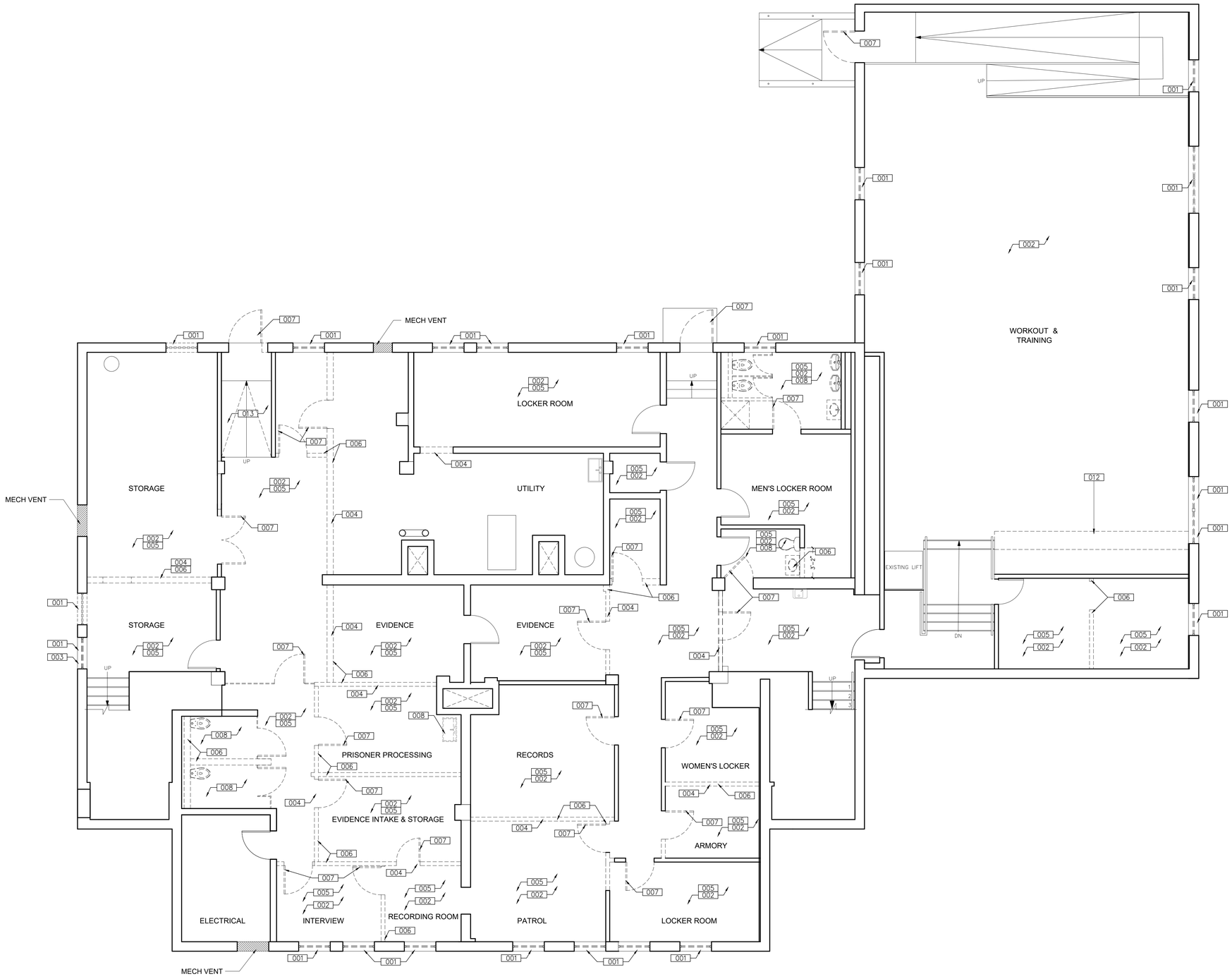
SHEET TITLE:
SITE DEMOLITION PLAN

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS

PROJECT NUMBER:
#2415

SHEET NUMBER: AD1.0
REV: ~




1 AD1.1 LOWER LEVEL DEMOLITION PLAN
3/16"=1'-0"

## KEYNOTES

001 REMOVE AND DISPOSE OF EXISTING WINDOW

002 REMOVE AND DISPOSE OF CEILING GRID IN ITS ENTIRETY

003 CREATE OPENING IN MASONRY WALL, REF A2.1E & A2.1

004 PROVIDE STRUCTURAL SHORING & BRACING AT DEMO WALLS, TYP.

005 REMOVE & DISPOSE OF EXISTING FLOOR FINISH & BASE. PREP FOR NEW FLOOR FINISH/BASE. LEVEL AND REPAIR EXISTING SLAB AS REQUIRED.

006 REMOVE & DISPOSE OF EXISTING WALL, INCLUDING ALL TRIM, BASEBOARD AND ASSOCIATED ELEMENTS. REMOVE/RELOCATE ANY EXISTING ELECTRICAL/WALL HUNG DEVICES AS REQUIRED.

007 REMOVE AND DISPOSE OF EXISTING DOOR/FRAME/HARDWARE/SIDELIGHT.

008 REMOVE AND DISPOSE OF EXISTING PLUMBING FIXTURES AND ACCESSORIES

008 REMOVE AND DISPOSE OF EXISTING PLUMBING FIXTURES AND ACCESSORIES

009 REMOVE WAINSCOTING

010 REMOVE FRONT STEP AND SURROUNDING SIDEWALK. REF. TO CIVIL PROPOSED DRAWINGS

011 REMOVE & STORE SECURITY GLASS TO BE REINSTALLED IN THE NEW LOCATION

012 REMOVE AND DISPOSE OF EXISTING STAIR

013 REMOVE EXISTING HAND/GUARDRAIL IN IT'S ENTIRETY. COORDINATE NEW WORK SCOPE ON DRAWING 2/A2.1

014 REMOVE, SALVAGE, AND STORE DOOR FOR FUTURE INSTALLATION

## GENERAL DEMOLITION NOTES

1. DEMO GWB CEILING AS NECESSARY FOR HVAC, PLUMBING, & LIGHTING
2. PREPARE PREVIOUSLY PAINTED SURFACES FOR REPAINTING
3. DEMO PLANS ARE TO BE COORDINATED WITH NEW WORK PLANS.
4. REVIEW ANY UNFORESEEN CONDITIONS IN FIELD W/ ARCHITECT.
5. PROVIDE TEMPORARY SHORING AT BEARING WALLS THAT ARE TO BE REMOVED.
6. EXISTING WALL TO REMAIN WILL HAVE SURFACE PREPPED FOR NEW PAINT.

## LEGENDS

DEMO WALL/ITEM TO BE REMOVED

EXISTING WALL TO REMAIN

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

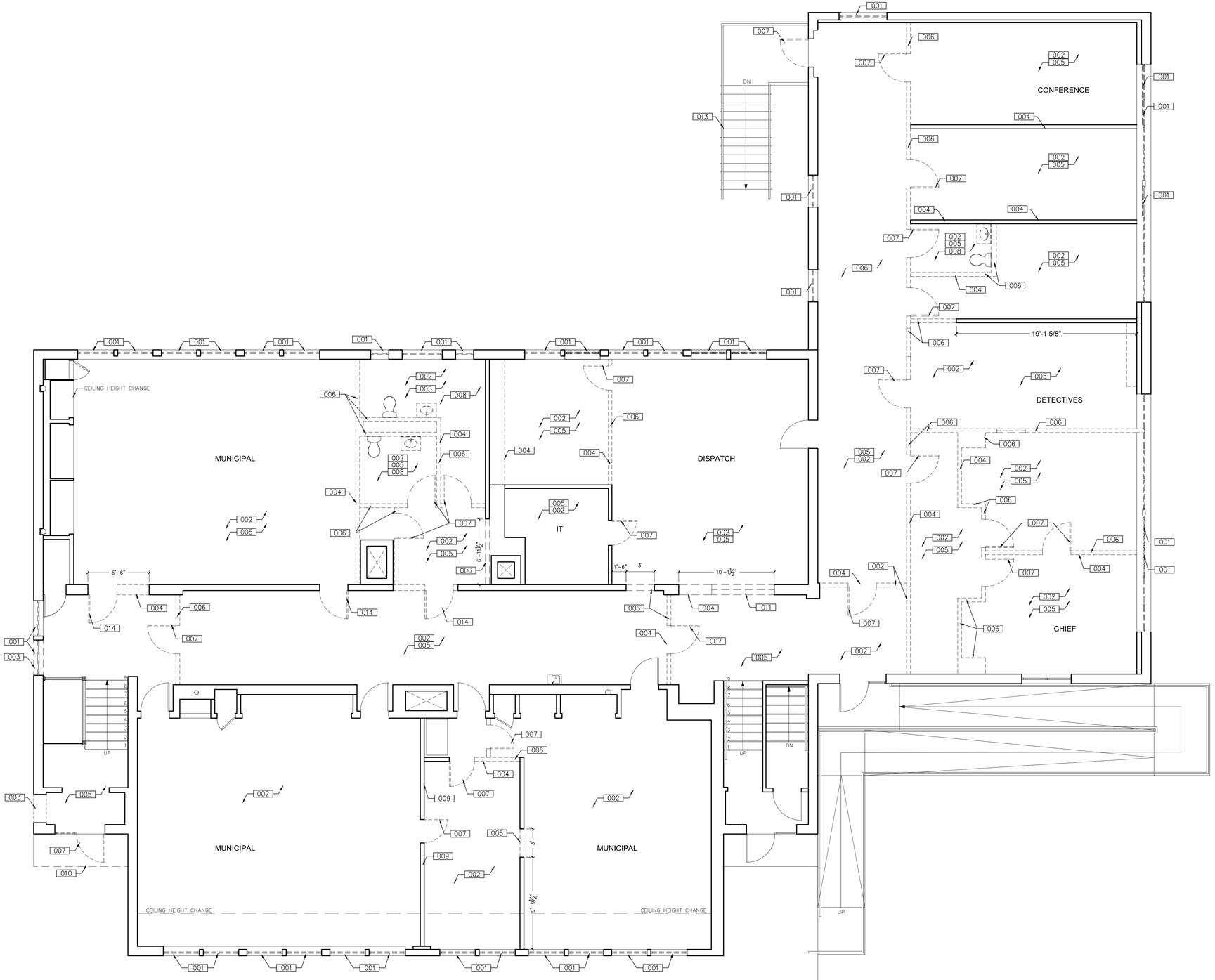
STAMP:

SHEET TITLE:
LOWER LEVEL DEMOLITION PLAN

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS
PROJECT NUMBER:
#2415

SHEET NUMBER: AD1.1
REV: ~




1 AD1.2 UPPER LEVEL DEMOLITION PLAN
3/16"=1'-0"

## KEYNOTES

001 REMOVE AND DISPOSE OF EXISTING WINDOW

002 REMOVE AND DISPOSE OF CEILING GRID IN ITS ENTIRETY

003 CREATE OPENING IN MASONRY WALL, REF A2.1E & A2.1

004 PROVIDE STRUCTURAL SHORING & BRACING AT DEMO WALLS, TYP.

005 REMOVE & DISPOSE OF EXISTING FLOOR FINISH & BASE. PREP FOR NEW FLOOR FINISH/BASE. LEVEL AND REPAIR EXISTING SLAB AS REQUIRED.

006 REMOVE & DISPOSE OF EXISTING WALL, INCLUDING ALL TRIM, BASEBOARD AND ASSOCIATED ELEMENTS. REMOVE/RELOCATE ANY EXISTING ELECTRICAL/WALL HUNG DEVICES AS REQUIRED.

007 REMOVE AND DISPOSE OF EXISTING DOOR/FRAME/HARDWARE/SIDELIGHT.

008 REMOVE AND DISPOSE OF EXISTING PLUMBING FIXTURES AND ACCESSORIES

008 REMOVE AND DISPOSE OF EXISTING PLUMBING FIXTURES AND ACCESSORIES

009 REMOVE WAINSCOTING

010 REMOVE FRONT STEP AND SURROUNDING SIDEWALK. REF. TO CIVIL PROPOSED DRAWINGS

011 REMOVE & STORE SECURITY GLASS TO BE REINSTALLED IN THE NEW LOCATION

012 REMOVE AND DISPOSE OF EXISTING STAIR

013 REMOVE EXISTING HAND/GUARDRAIL IN IT'S ENTIRETY. COORDINATE NEW WORK SCOPE ON DRAWING 2/A2.1

014 REMOVE, SALVAGE, AND STORE DOOR FOR FUTURE INSTALLATION

## GENERAL DEMOLITION NOTES

1. DEMO GWB CEILING AS NECESSARY FOR HVAC, PLUMBING, & LIGHTING
2. PREPARE PREVIOUSLY PAINTED SURFACES FOR REPAINTING
3. DEMO PLANS ARE TO BE COORDINATED WITH NEW WORK PLANS.
4. REVIEW ANY UNFORESEEN CONDITIONS IN FIELD W/ ARCHITECT.
5. PROVIDE TEMPORARY SHORING AT BEARING WALLS THAT ARE TO BE REMOVED.
6. EXISTING WALL TO REMAIN WILL HAVE SURFACE PREPPED FOR NEW PAINT.

## LEGENDS

DEMO WALL/ITEM TO BE REMOVED

EXISTING WALL TO REMAIN

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

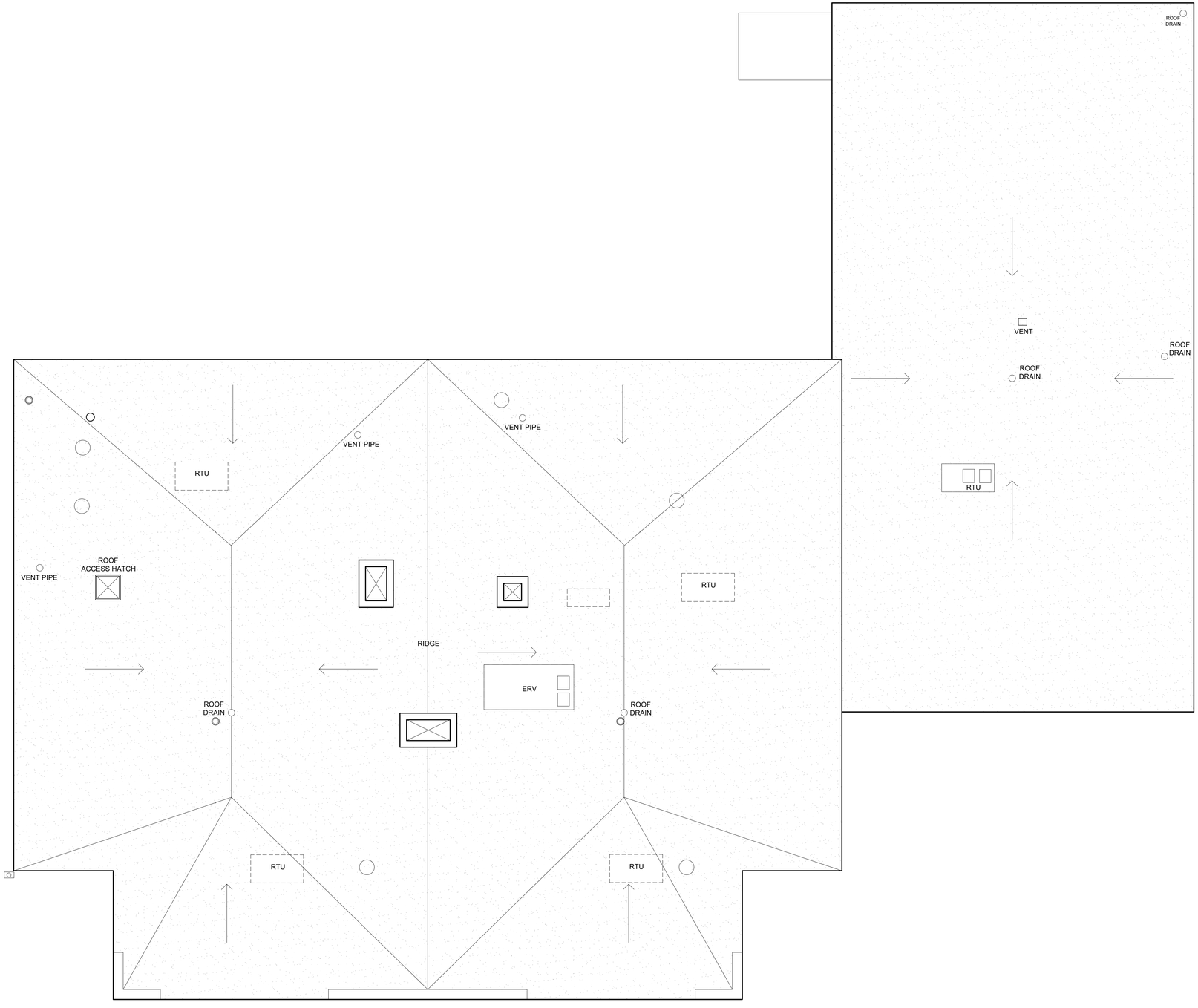
STAMP:

SHEET TITLE:
UPPER LEVEL DEMOLITION PLAN

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS
PROJECT NUMBER:
#2415

SHEET NUMBER: AD1.2
REV: ~




1 AD1.3 ROOF DEMOLITION PLAN
3/16"=1'-0"

## GENERAL DEMOLITION NOTES

1. DEMO GWB CEILING AS NECESSARY FOR HVAC, PLUMBING, & LIGHTING
2. PREPARE PREVIOUSLY PAINTED SURFACES FOR REPAINTING
3. DEMO PLANS ARE TO BE COORDINATED WITH NEW WORK PLANS.
4. REVIEW ANY UNFORESEEN CONDITIONS IN FIELD W/ ARCHITECT.
5. PROVIDE TEMPORARY SHORING AT BEARING WALLS THAT ARE TO BE REMOVED.
6. EXISTING WALL TO REMAIN WILL HAVE SURFACE PREPPED FOR NEW PAINT.

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
ROOF PLAN

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS
PROJECT NUMBER:
#2415

SHEET NUMBER: AD1.3
REV: ~

## NOTES

1. MAINTAIN AND PROTECT ALL EXISTING BOLLARDS, FENCES, GATES, STAIRS, CONCRETE PADS, PLANTINGS, AND OTHER SITE FEATURES UNLESS OTHERWISE NOTED.

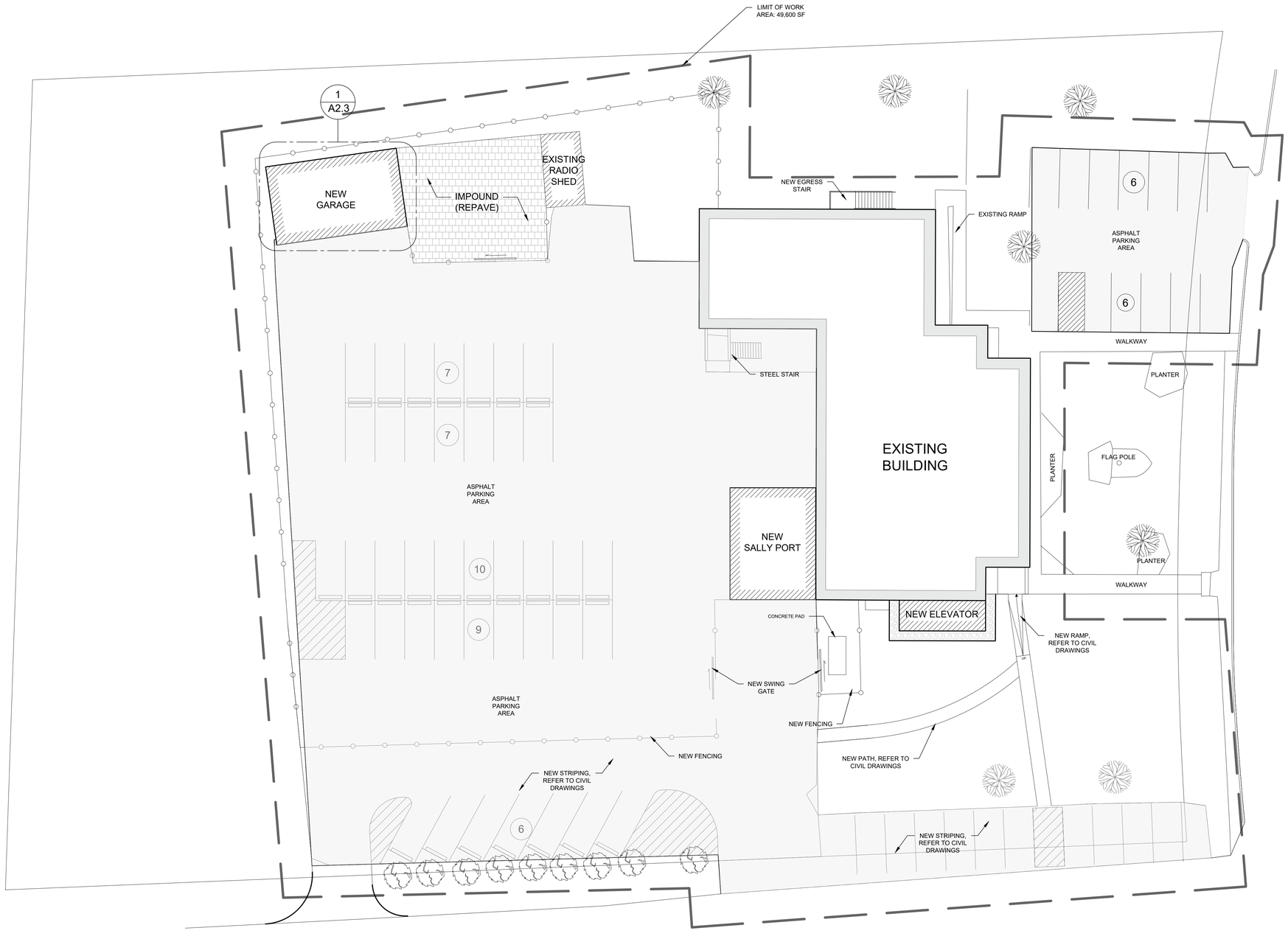
2. ENGINEER TO INSPECT ASPHALT BASE. REPAIR BASE AS REQUIRED BEFORE PAVEMENT OVERLAY.

3. COORDINATE BUILDING DOOR LOCATIONS, GRADE TRANSITIONS AT ENTRIES, RAMPS, STAIRS, AND RAILINGS WITH ARCHITECT.

4. COORDINATE ALL WORK WITHIN R.O.W. WITH TOWN OF NORTH SMITHFIELD AS REQUIRED. REFERENCE CIVIL DRAWINGS.

5. RESTRIPE REPAVED AREAS AS SHOWN. EPOXY RESIN WITH AASHTO M247 TYPE I GLASS BEADS OR APPROVED EQUAL. REFERENCE CIVIL DRAWINGS.

6. ALL PARKING SPACES SHALL HAVE CONC. WHEEL STOPS. REFERENCE CIVIL DRAWINGS.




1 / A1.0 NEW WORK SITE PLAN
1/16"=1'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com


CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

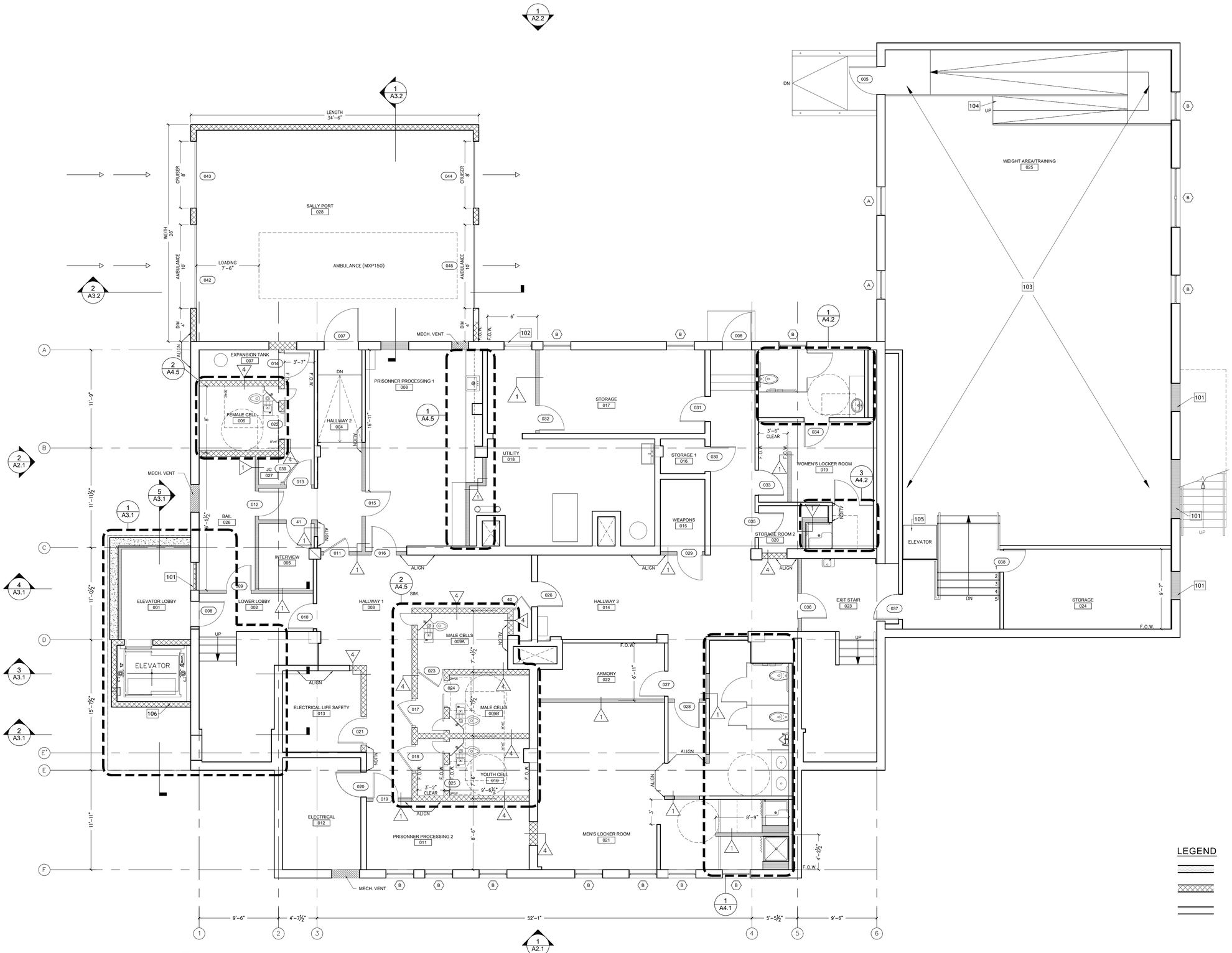
SHEET TITLE:
NEW WORK SITE PLAN

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS

PROJECT NUMBER:
#2415

SHEET NUMBER: A1.0
REV: ~




1 A2.2 — 1 A3.2 — 2 A3.2 — 2 A2.1 — 1 A3.1 — 5 A3.1 — 4 A3.1 — 3 A3.1 — 2 A3.1 — 2 A4.5 — 1 A4.5 — 1 A4.2 — 3 A4.2 — 2 A2.2 — 1 A4.1 — 1 A2.1

## NOTES

101 FILL WINDOW OPENING WITH BRICK TO MATCH ADJACENT

102 NEW INTAKE LOUVER. REFER TO MECHANICAL ENGINEERS DRAWINGS

103 NEW CONCRETE TOPPING SLAB TO LOWER BASEMENT. LEVEL TO SUIT CONSISTENT RISER HEIGHT OF STEPS TO REMAIN. REFER TO STRUCTURAL ENGINEERS DRAWINGS.

104 ALLOW TO ALTER BOTTOM OF RAMP, GUARD AND HANDRAIL TO SUIT NEW FLOOR HEIGHT

105 ALLOW TO ADJUST EXISTING WHEELCHAIR LIFT TO SUIT NEW FLOOR LEVEL

106 CONSTRUCT CMU SHAFT ELEVATOR MFG REQUIREMENTS. REFER TO STRUCTURAL ENG. DETAILS. REF TO A3.1 FOR DIMENSION SETOUTS.

107 COORDINATE OPENING AND POWER REQUIREMENTS WITH FFE DESIGN

108 REINSTALL SECURITY GLASS TO NEW LOCATION

109 ARMORCORE BULLET RESISTANT FIBERGLASS PANEL CONCEALLED BEHIND NEW DRYWALL LINING (PAINTED FINSH). LEVEL: 7

110 NEW ENTRY RAMP AND HANDRAILS. REFER TO CIVIL ENGINEER DETAIL

111 NEW CHASE REQUIRED TO BE 1HR SHAFT SEALED AT FLOOR PENETRATIONS

## GENERAL NOTES

1. REVIEW ANY UNFORESEEN CONDITIONS IN FIELD W/ ARCHITECT.
2. SEE MEP/FP/LV DRAWINGS FOR MRE INFORMATION.
3. PAINT ALL NEW WALLS AND PREVIOUSLY PAINTED SURFACES.

## LEGEND

=NEW WALL

=NEW MASONRY WALL

=EXISTING WALL

1 A1.1 LOWER LEVEL NEW WORK PLAN
3/16"=1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
LOWER LEVEL NEW WORK PLAN

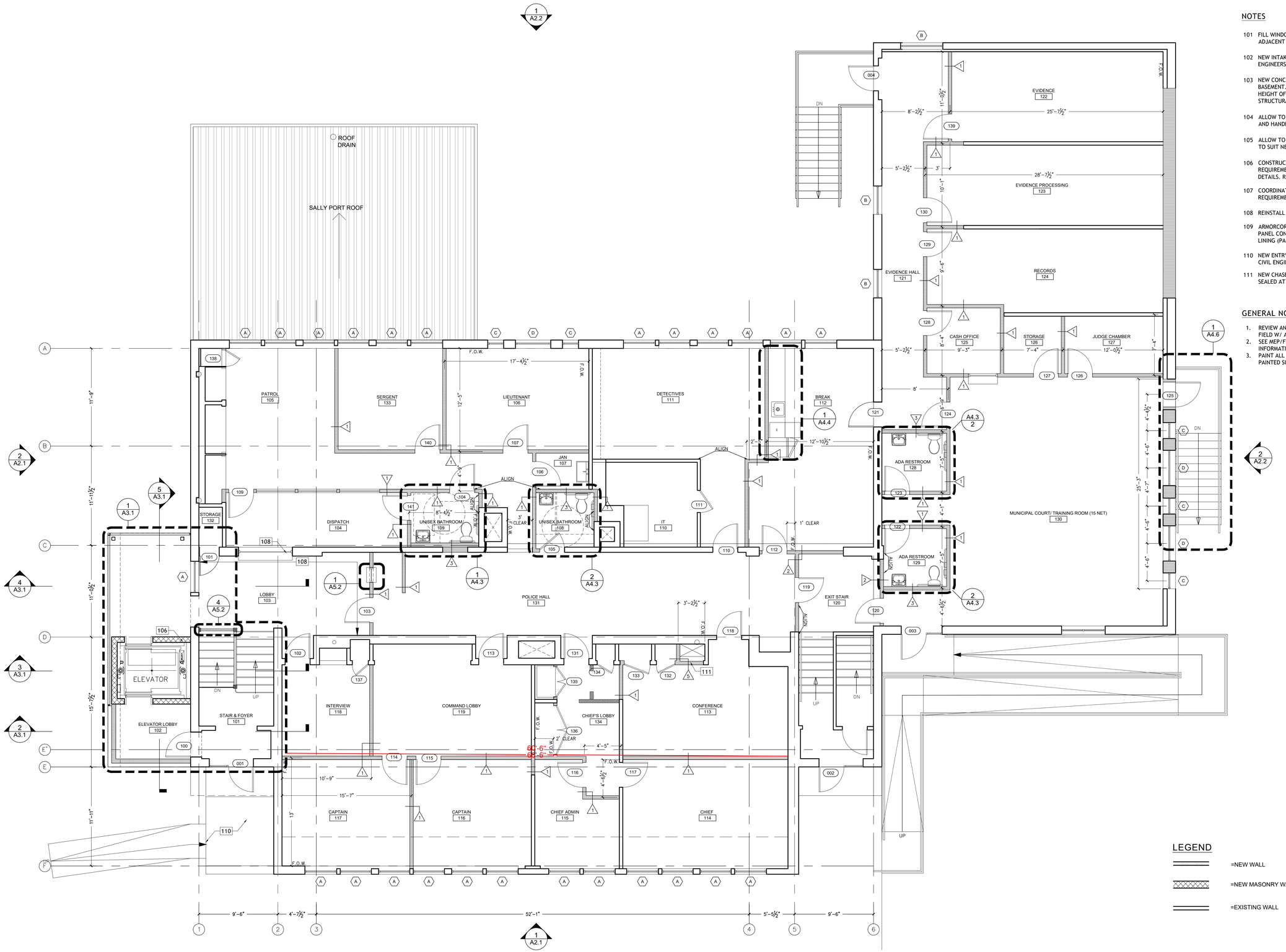
PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS

PROJECT NUMBER:
#2415

SHEET NUMBER:
A1.1

REV:
~




1 UPPER LEVEL NEW WORK PLAN
A1.2 3/16"=1'-0"

## NOTES

101 FILL WINDOW OPENING WITH BRICK TO MATCH ADJACENT

102 NEW INTAKE LOUVER. REFER TO MECHANICAL ENGINEERS DRAWINGS

103 NEW CONCRETE TOPPING SLAB TO LOWER BASEMENT. LEVEL TO SUIT CONSISTENT RISER HEIGHT OF STEPS TO REMAIN. REFER TO STRUCTURAL ENGINEERS DRAWINGS.

104 ALLOW TO ALTER BOTTOM OF RAMP, GUARD AND HANDRAIL TO SUIT NEW FLOOR HEIGHT

105 ALLOW TO ADJUST EXISTING WHEELCHAIR LIFT TO SUIT NEW FLOOR LEVEL

106 CONSTRUCT CMU SHAFT ELEVATOR MFG REQUIREMENTS. REFER TO STRUCTURAL ENG. DETAILS. REF TO A3.1 FOR DIMENSION SETOUTS.

107 COORDINATE OPENING AND POWER REQUIREMENTS WITH FFE DESIGN

108 REINSTALL SECURITY GLASS TO NEW LOCATION

109 ARMORCORE BULLET RESISTANT FIBERGLASS PANEL CONCEALLED BEHIND NEW DRYWALL LINING (PAINTED FINSH). LEVEL: 7

110 NEW ENTRY RAMP AND HANDRAILS. REFER TO CIVIL ENGINEER DETAIL

111 NEW CHASE REQUIRED TO BE 1HR SHAFT SEALED AT FLOOR PENETRATIONS

## GENERAL NOTES

1. REVIEW ANY UNFORESEEN CONDITIONS IN FIELD W/ ARCHITECT.
2. SEE MEP/FP/LV DRAWINGS FOR MORE INFORMATION.
3. PAINT ALL NEW WALLS AND PREVIOUSLY PAINTED SURFACES.

## LEGEND

=NEW WALL

=NEW MASONRY WALL

=EXISTING WALL

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
UPPER LEVEL NEW WORK PLAN

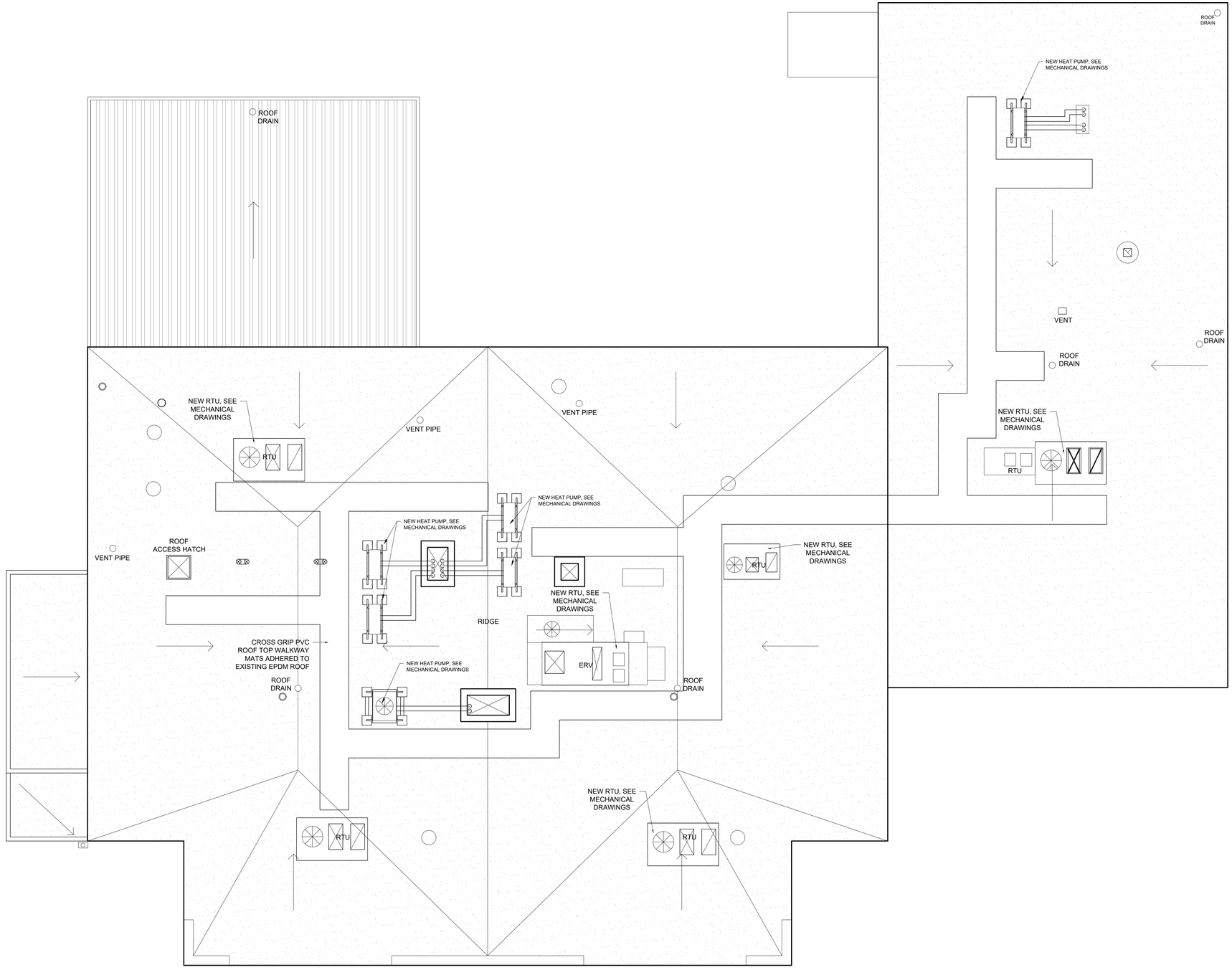
PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS

PROJECT NUMBER:
#2415

SHEET NUMBER:
A1.2

REV:
~




1 A1.3 NEW WORK ROOF PLAN
3/16"=1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

GENERAL NOTES

1. REVIEW ANY UNFORESEEN CONDITIONS IN FIELD W/ ARCHITECT.
2. SEE MEP/FP/LV DRAWINGS FOR MRE INFORMATION.
3. PAINT ALL NEW WALLS AND PREVIOUSLY PAINTED SURFACES.

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

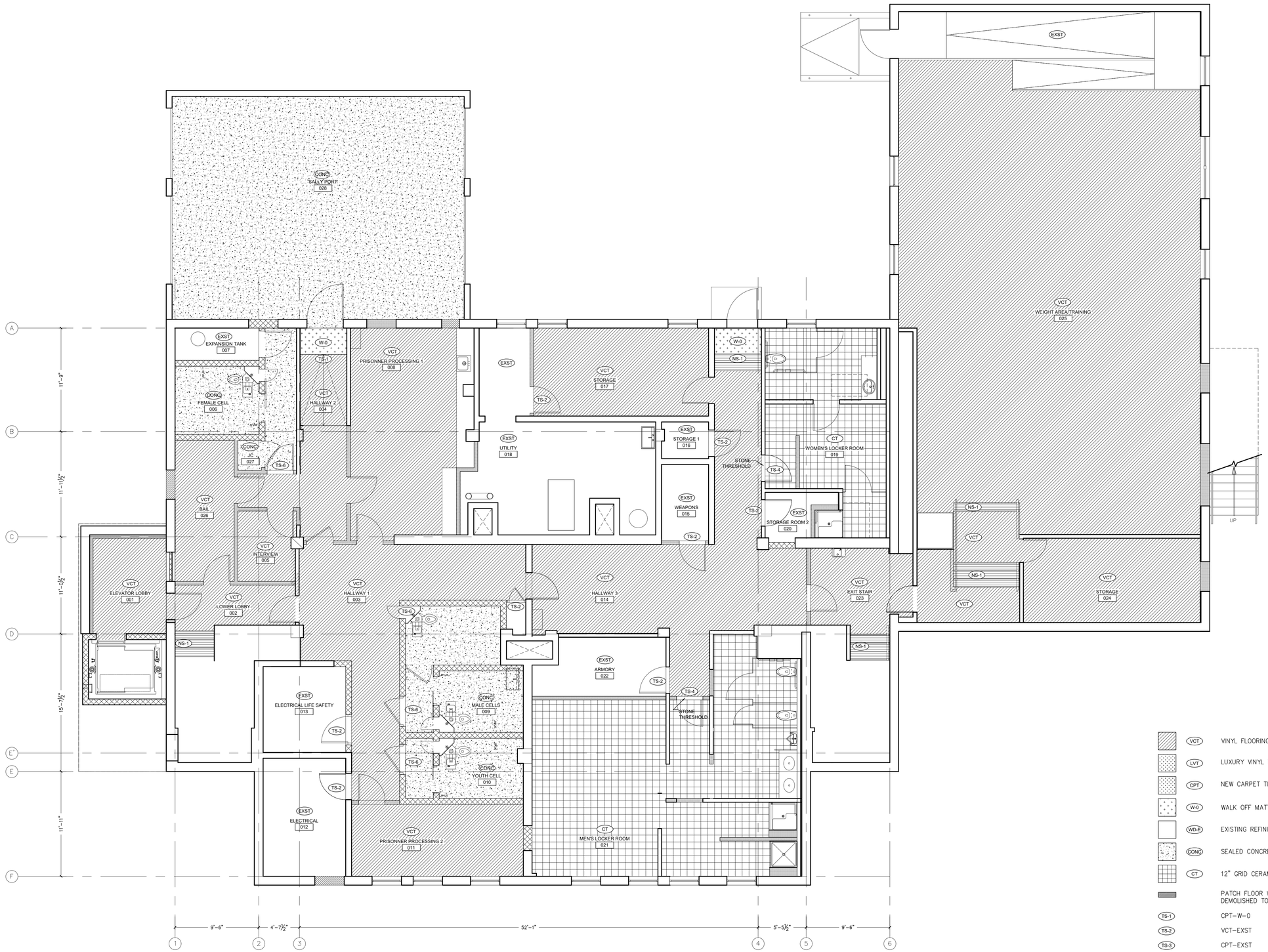
STAMP:

SHEET TITLE:
NEW WORK ROOF PLAN

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS
PROJECT NUMBER:
#2415

SHEET NUMBER: A1.3
REV: ~




1 / A1.1 LOWER LEVEL FINISHES PLAN
3/16"=1'-0"

| | | |
|---|---|---|
| VCT | VINYL FLOORING TILE |
| LVT | LUXURY VINYL TILE |
| CPT | NEW CARPET TILE |
| W-0 | WALK OFF MATT 24" TILE |
| WD-E | EXISTING REFINISHED WOOD FLOOR |
| CONC | SEALED CONCRETE WITH CAULKED JOINTS |
| CT | 12" GRID CERAMIC TILE |
| | PATCH FLOOR WHERE WALL HAS BEEN DEMOLISHED TO MATCH EXISTING |
| TS-1 | CPT-W-0 |
| TS-2 | VCT-EXST |
| TS-3 | CPT-EXST |
| TS-4 | VCT-CT |
| TS-5 | VCT-WD |
| TS-6 | VCT-CONC |
| TS-7 | CPT-VCT |
| NS-1 | STAIR TREADS |
| | SEE FINISH SCHEDULE A6.3 |

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

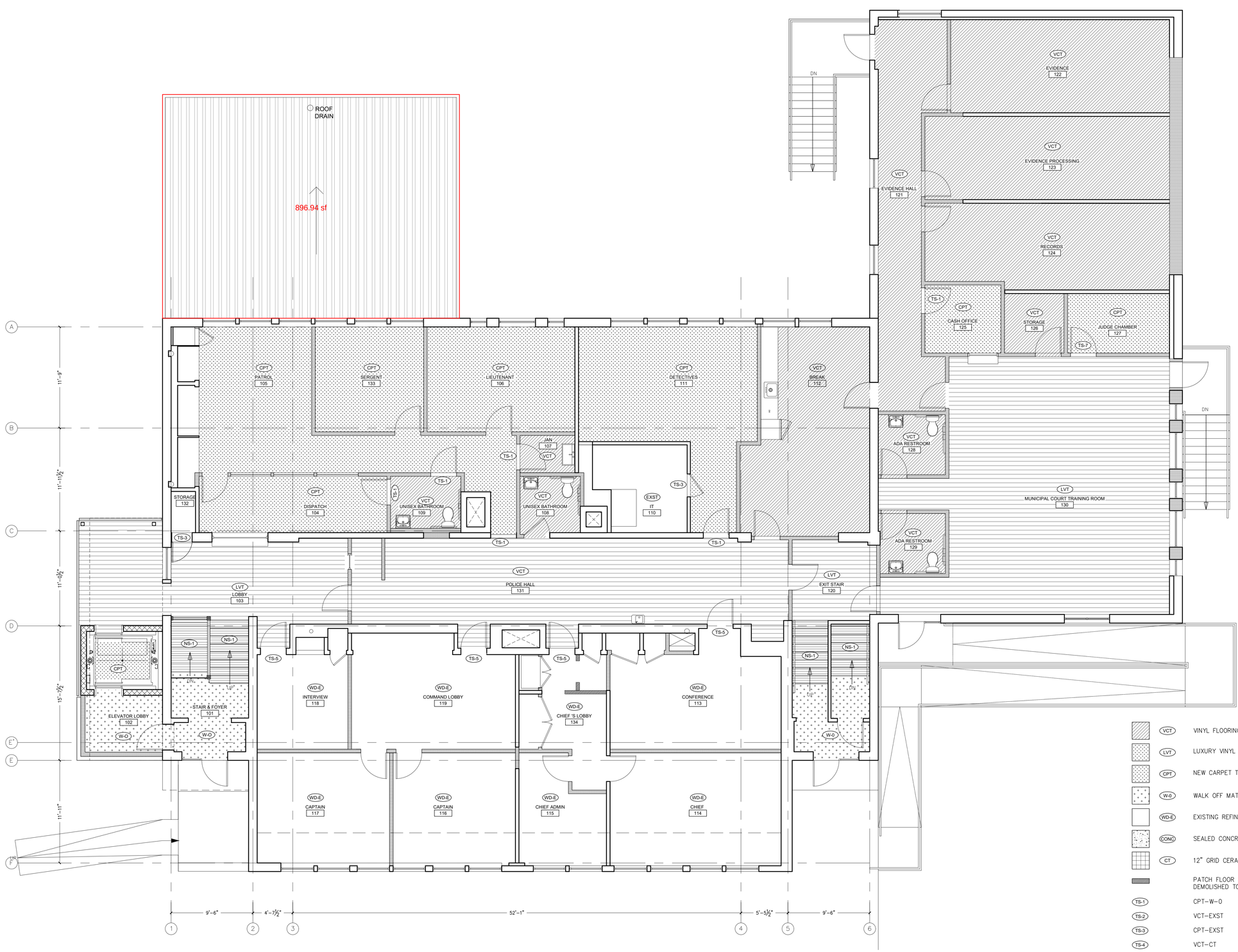
SHEET TITLE:
LOWER LEVEL FINISHES PLAN

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS

PROJECT NUMBER:
#2415

SHEET NUMBER: A1.4
REV: ~




1 A1.2 UPPER LEVEL FINISHES PLAN
3/16"=1'-0"

| | | |
|---|---|---|
| VCT | VINYL FLOORING TILE | |
| LVT | LUXURY VINYL TILE | |
| CPT | NEW CARPET TILE | |
| W-O | WALK OFF MATT 24" TILE | |
| WD-E | EXISTING REFINISHED WOOD FLOOR | |
| CONC | SEALED CONCRETE WITH CAULKED JOINTS | |
| CT | 12" GRID CERAMIC TILE | |
| | PATCH FLOOR WHERE WALL HAS BEEN DEMOLISHED TO MATCH EXISTING | |
| TS-1 | CPT–W–O | |
| TS-2 | VCT–EXST | |
| TS-3 | CPT–EXST | |
| TS-4 | VCT–CT | |
| TS-5 | VCT–WD | |
| TS-6 | VCT–CONC | |
| TS-7 | CPT–VCT | |
| NS-1 | STAIR TREADS | |
| | SEE FINISH SCHEDULE A6.3 | |

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
UPPER LEVEL FINISHES PLAN

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS

PROJECT NUMBER:
#2415

SHEET NUMBER: A1.5
REV: ~




1 / A1.6 LOWER LEVEL REFLECTED CEILING PLAN
3/16"=1'-0"

CEILING LEGEND

=GYP. BOARD CEILING

=2'X4' ACOUSTICAL CEILING TILE & GRID

=2'X2' ACOUSTICAL CEILING TILE & GRID

=REINFORCED GYP. CEILING

=BALLISTIC PROOF CEILING

A - DIRECT / INDIRECT PENDANT MOUNT LINEAR LED

B - 2X2 DIRECT / INDIRECT RECESSED LED BASKET FIXTURE

C - 1X4 SURFACE MOUNTED LED WRAPAROUND WITH INTEGRAL OCCUPANCY SENSOR

D - 2X4 DIRECT / INDIRECT RECESSED LED BASKET FIXTURE

E & E1 - 4' & 2' WALL MOUNTED LED VANITY LIGHT

F - 1X4 ;EF SURFACE MOUNTED WRAPAROUND

G - 1X4 LENSED LED STRIP LIGHT

H - 1X4 CORNER MOUNT HIGH ABUSE LED FIXTURE

K - OUTLET BOX MOUNTED 6" ROUND LED SHOWER LIGHT

L - RECESSED 2X2 HIGH ABUSE LED FIXTURE

M - 1X4 DIRECT / INDIRECT ENDANT LED

RECTANGULAR/ROUND SUPPLY AIR DUCTWEORK UP

RECTANGULAR/ROUND RETURN AIR DUCTWORK UP

RECTANGULAR/RETURN EXHAUST AIR DUCTWORK UP

RECTANGULAR/ROUND SUPPLY AIR DUCTWEORK DOWN

RECTANGULAR/ROUND RETURN AIR DUCTWORK DOWN

RECTANGULAR/RETURN EXHAUST AIR DUCTWORK DOWN

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
LOWER LEVEL REFLECTED CEILING PLAN

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS

PROJECT NUMBER:
#2415

SHEET NUMBER:
A1.6

REV:
~




1 A1.7 UPPER LEVEL REFLECTED CEILING PLAN
3/16"=1'-0"

CEILING LEGEND

=GYP. BOARD CEILING

=2'X4' ACOUSTICAL CEILING TILE & GRID

=2'X2' ACOUSTICAL CEILING TILE & GRID

=REINFORCED GYP. CEILING

=BALLISTIC PROOF CEILING

A - DIRECT / INDIRECT PENDANT MOUNT LINEAR LED

B - 2X2 DIRECT / INDIRECT RECESSED LED BASKET FIXTURE

C - 1X4 SURFACE MOUNTED LED WRAPAROUND WITH INTEGRAL OCCUPANCY SENSOR

D - 2X4 DIRECT / INDIRECT RECESSED LED BASKET FIXTURE

E & E1 - 4' & 2' WALL MOUNTED LED VANITY LIGHT

F - 1X4 ,EF SURFACE MOUNTED WRAPAROUND

G - 1X4 LENSED LED STRIP LIGHT

H - 1X4 CORNER MOUNT HIGH ABUSE LED FIXTURE

K - OUTLET BOX MOUNTED 6" ROUND LED SHOWER LIGHT

L - RECESSED 2X2 HIGH ABUSE LED FIXTURE

M - 1X4 DIRECT / INDIRECT ENDANT LED

RECTANGULAR/ROUND SUPPLY AIR DUCTWORK UP

RECTANGULAR/ROUND RETURN AIR DUCTWORK UP

RECTANGULAR/RETURN EXHAUST AIR DUCTWORK UP

RECTANGULAR/ROUND SUPPLY AIR DUCTWORK DOWN

RECTANGULAR/ROUND RETURN AIR DUCTWORK DOWN

RECTANGULAR/RETURN EXHAUST AIR DUCTWORK DOWN

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
UPPER LEVEL REFLECTED CEILING PLAN

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS

PROJECT NUMBER:
#2415

SHEET NUMBER: A1.7
REV: ~

## KEYNOTES

201. REPAIR, SCRAPE, AND REFINISH DECORATIVE COPPER. CONTRACTOR TO IDENTIFY ANY AREAS IN "POOR" CONDITION UNABLE TO BE RESTORED w/ ARCHITECT. CONTRACTOR TO PROVIDE MOCK-UP OF RESTORATION WORK AT SMALL AREA (TO BE IDENTIFIED BEFORE WORK COMMENCES).

202. EXISTING MASONRY TO BE REPAIRED AND REPOINTED. CONTRACTOR TO CARRY 25% OF WALL AREA TO MATCH EXISTING.

203. PROVIDE NEW DECORATIVE COPPER BAND AS SHOWN. PROFILE TO MATCH ADJACENT EXISTING DECORATIVE COPPER BANDING.

204. BREAK METAL AT REPLACEMENT WINDOWS TO BE ANODIZED DARK BRONZE. CONTRACTOR TO SUBMIT SAMPLES FOR ARCHITECT REVIEW & APPROVAL

205. REPAIR / REPLACE AREAS OF FAILURE/CRACKING @ CONCRETE AND PREP SURFACE FOR REPAINTING. TREAT ANY RUST @ RAILINGS AND PREP SURFACES FOR REPAINTING.

206. LIMESTONE / GRANITE BANDING TO REPAIRED AS NEEDED. IF AREAS ARE REQ'D TO BE REPLACED, THE CONTRACTOR IS TO CARRY 15% OF AREA COST FOR REPLACEMENT.

207. INFILL OPENINGS w/ BRICK TO MATCH ADJACENT CONSTRUCTION.

208. FIBERGLASS TRANSLUCENT PANELING (REFER TO STRUCTURAL SHEETS FOR ADDITIONAL INFORMATION)
BASIS OF DESIGN: KALWALL
THICKNESS: 2-3/4" (KALWALL 70mm)
PANEL SIZE: 4' (W) x 16' (H)
GRID: REVERSE SHOJI
ORIENTATION / SPAN: VERTICAL
COLOR: WHITE

209. FLUSH METAL WALL PANELING
BASIS OF DESIGN: WESTERN STATE METAL ROOFING
PRODUCT: T-GROOVE 12" NR (TG12-NR)
COLOR: TO BE SELECTED FROM MFGR'S FULL RANGE OF "COPPER COLORS"
ORIENTATION / SPAN: VERTICAL
THICKNESS: 22ga
GRID: VERIFY IN-FIELD

210. NEW ADA-COMPLIANT EXTERIOR RAMP AND RECONFIGURED EXTERIOR STAIRS. REFER TO CIVIL DRAWINGS FOR ADDITIONAL INFORMATION

211. LOWER ELEVATION WINDOWS TO RECEIVE TRANSLUCENT WINDOW FILM
BASIS OF DESIGN: 3M
PRODUCT #: 7725SE-324
COLOR: FROSTED CRYSTAL
THICKNESS: 4.7mil
SIZE: VERIFY IN-FIELD

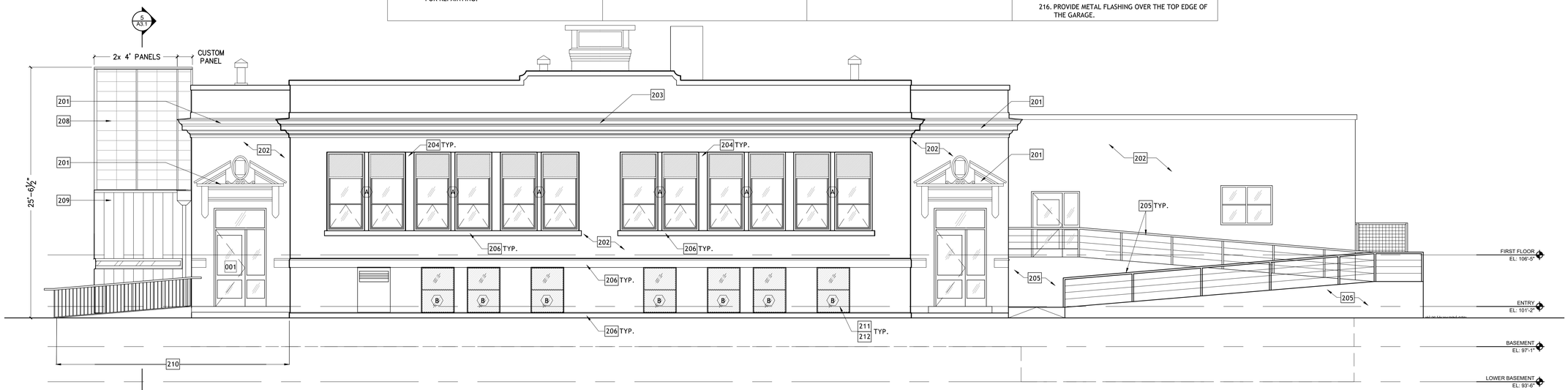
212. REMOVE EXISTING SECURITY GRILLES AND SALVAGE DURING DEMOLITION. SANDBLAST, REPAINT BLACK AND REINSTALL @ ALL LOWER WINDOW LOCATIONS ONCE NEW WINDOWS ARE INSTALLED. PREP FASTENING HOLES AS REQUIRED TO RECEIVE MOUNTING HARDWARE.

213. NEW SECURITY FENCING (REFER TO CIVIL DRAWINGS FOR ADDITIONAL INFORMATION)

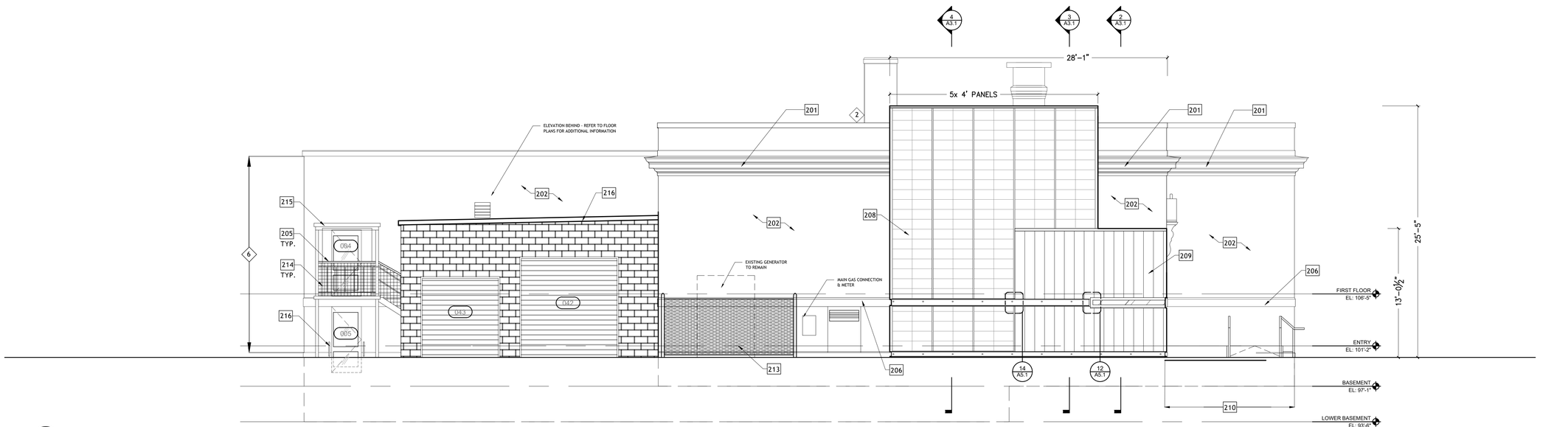
214. SANDBLAST EXISTING STAIR IN ITS ENTIRETY, TREAT RUST AREAS AND PREP SURFACE FOR REPAINTING. REPAINT BLACK. INSTALL NEW 42" GALVANIZED PIPE GUARDRAIL & HANDRAIL @ 36" ABOVE RISER. INSTALL GALVANIZED STEEL MESH SHEET RISERS w/ LESS THAN 4" GAPS/HOLES. INSTALL GALVANIZED STEEL MESH TO EXTERIOR OF GUARDRAILS w/ LESS THAN 4" GAPS/HOLES. ALL TO BE PAINTED BLACK

215. REPLACE METAL COPING/FASCIA w/ LIKE MATERIAL.

216. PROVIDE METAL FLASHING OVER THE TOP EDGE OF THE GARAGE.




1 A2.1 PROPOSED NORTH ELEVATION
3/16"=1'-0"




2 A2.1 PROPOSED EAST ELEVATION
3/16"=1'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
PROPOSED ELEVATIONS

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS

PROJECT NUMBER:
#2415

SHEET NUMBER: A2.1
REV: ~

## KEYNOTES

201. REPAIR, SCRAPE, AND REFINISH DECORATIVE COPPER. CONTRACTOR TO IDENTIFY ANY AREAS IN "POOR" CONDITION UNABLE TO BE RESTORED w/ ARCHITECT. CONTRACTOR TO PROVIDE MOCK-UP OF RESTORATION WORK AT SMALL AREA (TO BE IDENTIFIED BEFORE WORK COMMENCES).

202. EXISTING MASONRY TO BE REPAIRED AND REPOINTED. CONTRACTOR TO CARRY 25% OF WALL AREA TO MATCH EXISTING.

203. PROVIDE NEW DECORATIVE COPPER BAND AS SHOWN. PROFILE TO MATCH ADJACENT EXISTING DECORATIVE COPPER BANDING.

204. BREAK METAL AT REPLACEMENT WINDOWS TO BE ANODIZED DARK BRONZE. CONTRACTOR TO SUBMIT SAMPLES FOR ARCHITECT REVIEW & APPROVAL

205. REPAIR / REPLACE AREAS OF FAILURE/CRACKING @ CONCRETE AND PREP SURFACE FOR REPAINTING. TREAT ANY RUST @ RAILINGS AND PREP SURFACES FOR REPAINTING.

206. LIMESTONE / GRANITE BANDING TO REPAIRED AS NEEDED. IF AREAS ARE REQ'D TO BE REPLACED, THE CONTRACTOR IS TO CARRY 15% OF AREA COST FOR REPLACEMENT.

207. INFILL OPENINGS w/ BRICK TO MATCH ADJACENT CONSTRUCTION.

208. FIBERGLASS TRANSLUCENT PANELING (REFER TO STRUCTURAL SHEETS FOR ADDITIONAL INFORMATION)
BASIS OF DESIGN: KALWALL
THICKNESS: 2-3/4" (KALWALL 70mm)
PANEL SIZE: 4' (W) x 16' (H)
GRID: REVERSE SHOJI
ORIENTATION / SPAN: VERTICAL
COLOR: WHITE

209. FLUSH METAL WALL PANELING
BASIS OF DESIGN: WESTERN STATE METAL ROOFING
PRODUCT: T-GROOVE 12" NR (TG12-NR)
COLOR: TO BE SELECTED FROM MFGR'S FULL RANGE OF "COPPER COLORS"
ORIENTATION / SPAN: VERTICAL
THICKNESS: 22ga
GRID: VERIFY IN-FIELD

210. NEW ADA-COMPLIANT EXTERIOR RAMP AND RECONFIGURED EXTERIOR STAIRS. REFER TO CIVIL DRAWINGS FOR ADDITIONAL INFORMATION

211. LOWER ELEVATION WINDOWS TO RECEIVE TRANSLUCENT WINDOW FILM
BASIS OF DESIGN: 3M
PRODUCT #: 7725SE-324
COLOR: FROSTED CRYSTAL
THICKNESS: 4.7mil
SIZE: VERIFY IN-FIELD

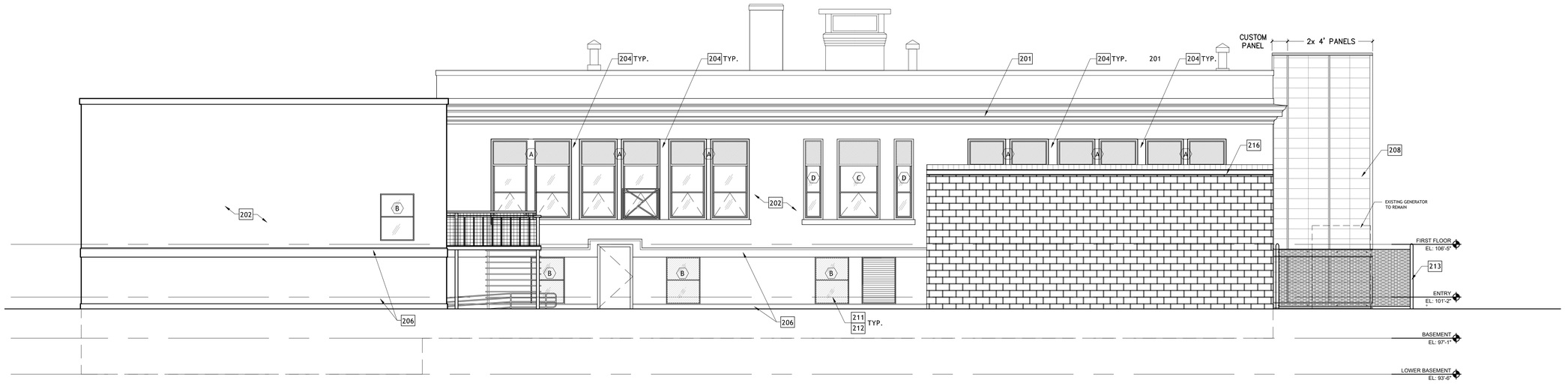
212. REMOVE EXISTING SECURITY GRILLES AND SALVAGE DURING DEMOLITION. SANDBLAST, REPAINT BLACK AND REINSTALL @ ALL LOWER WINDOW LOCATIONS ONCE NEW WINDOWS ARE INSTALLED. PREP FASTENING HOLES AS REQUIRED TO RECEIVE MOUNTING HARDWARE.

213. NEW SECURITY FENCING (REFER TO CIVIL DRAWINGS FOR ADDITIONAL INFORMATION)

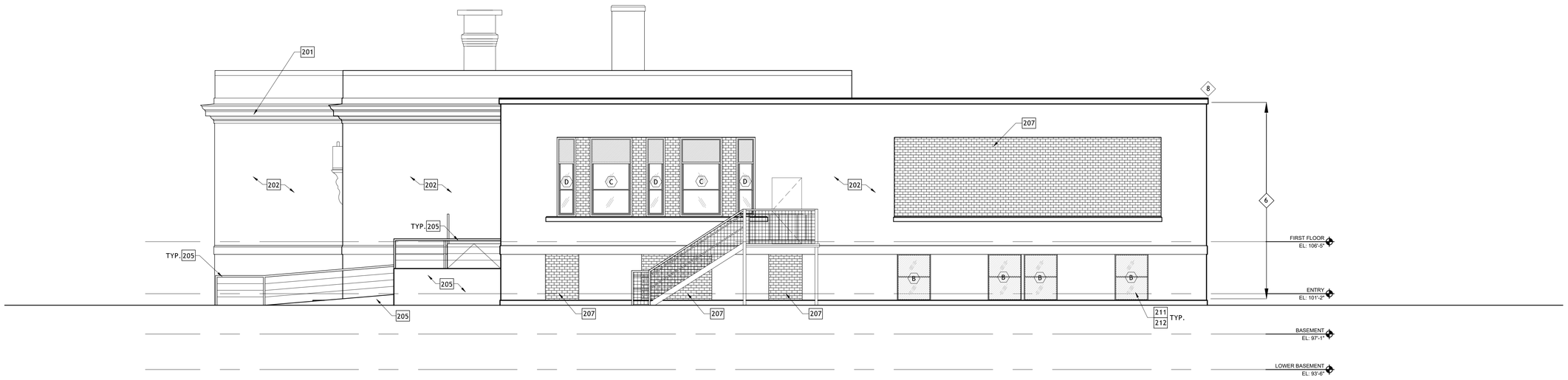
214. SANDBLAST EXISTING STAIR IN ITS ENTIRETY, TREAT RUST AREAS AND PREP SURFACE FOR REPAINTING. REPAINT BLACK. INSTALL NEW 42" GALVANIZED PIPE GUARDRAIL & HANDRAIL @ 36" ABOVE RISER. INSTALL GALVANIZED STEEL MESH SHEET RISERS w/ LESS THAN 4" GAPS/HOLES. INSTALL GALVANIZED STEEL MESH TO EXTERIOR OF GUARDRAILS w/ LESS THAN 4" GAPS/HOLES. ALL TO BE PAINTED BLACK

215. REPLACE METAL COPING/FASCIA w/ LIKE MATERIAL.

216. PROVIDE METAL FLASHING OVER THE TOP EDGE OF THE GARAGE.




1 A2.2 PROPOSED SOUTH ELEVATION
3/16"=1'-0"




2 A2.2 PROPOSED WEST ELEVATION
3/16"=1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

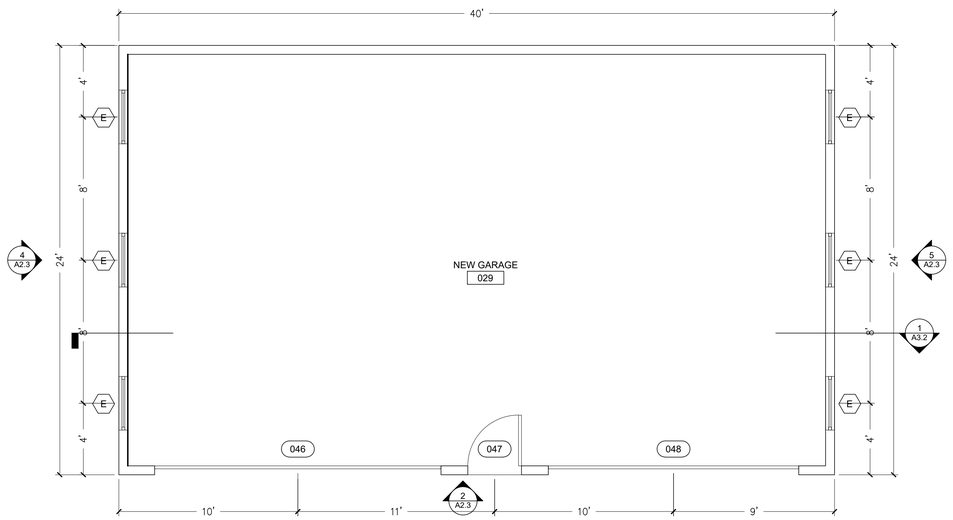
STAMP:

SHEET TITLE:
PROPOSED ELEVATIONS

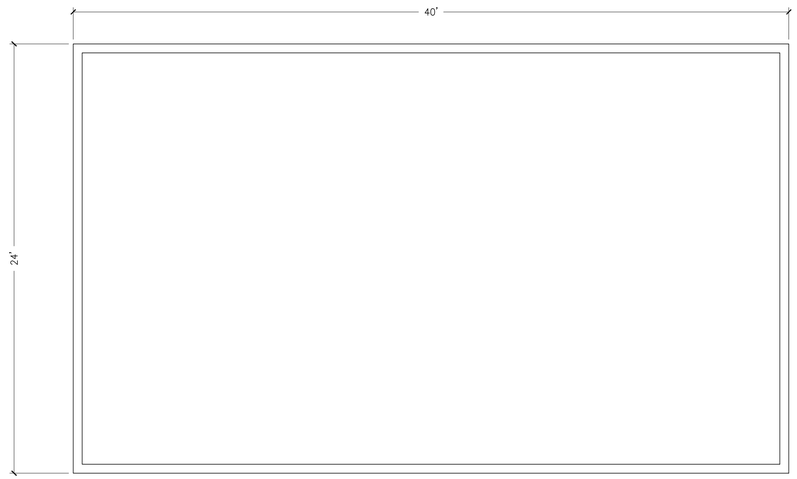
PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS
PROJECT NUMBER:
#2415

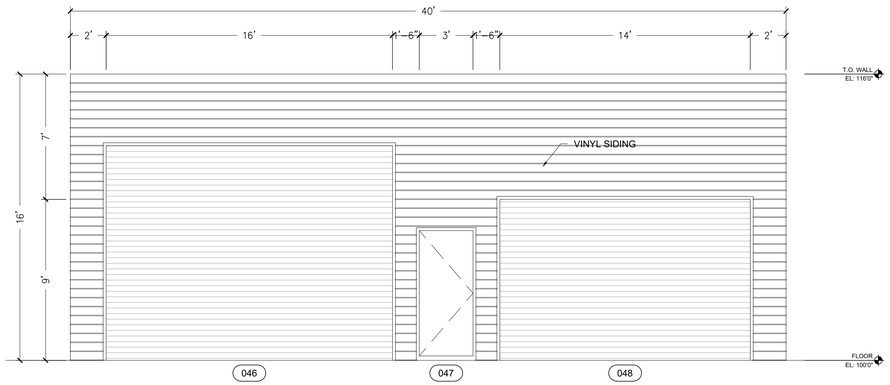
SHEET NUMBER: A2.2
REV: ~



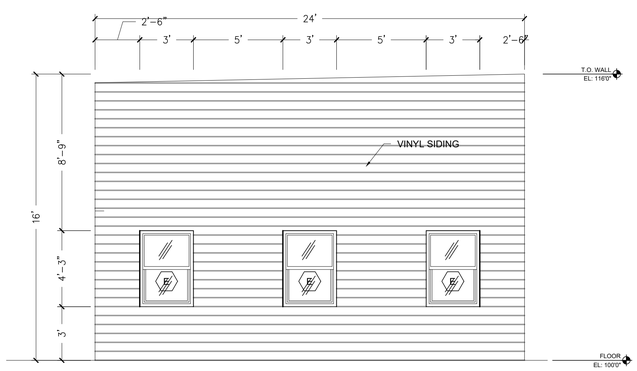

1 A2.3 NEW GARAGE PLAN
1/4"=1'-0"



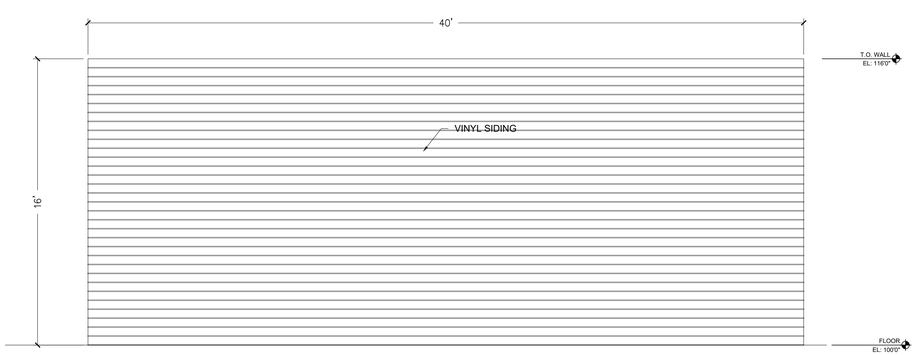

1 A2.3 NEW GARAGE ROOF PLAN
1/4"=1'-0"



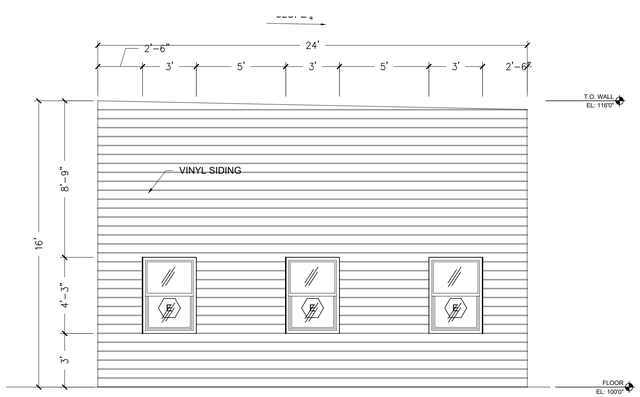

2 A2.3 NEW GARAGE FRONT ELEVATION
1/4"=1'-0"




4 A2.3 NEW GARAGE LEFT SIDE ELEVATION
1/4"=1'-0"




3 A2.3 NEW GARAGE REAR ELEVATION
1/4"=1'-0"




5 A2.3 NEW GARAGE RIGHT SIDE ELEVATION
1/4"=1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

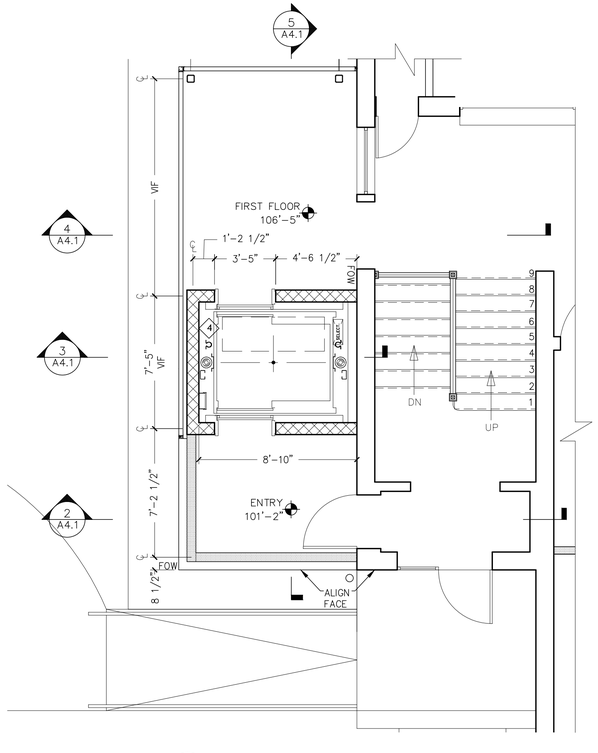
SHEET TITLE:
NEW GARAGE PLAN
AND ELEVATIONS

PROJECT NORTH:
N

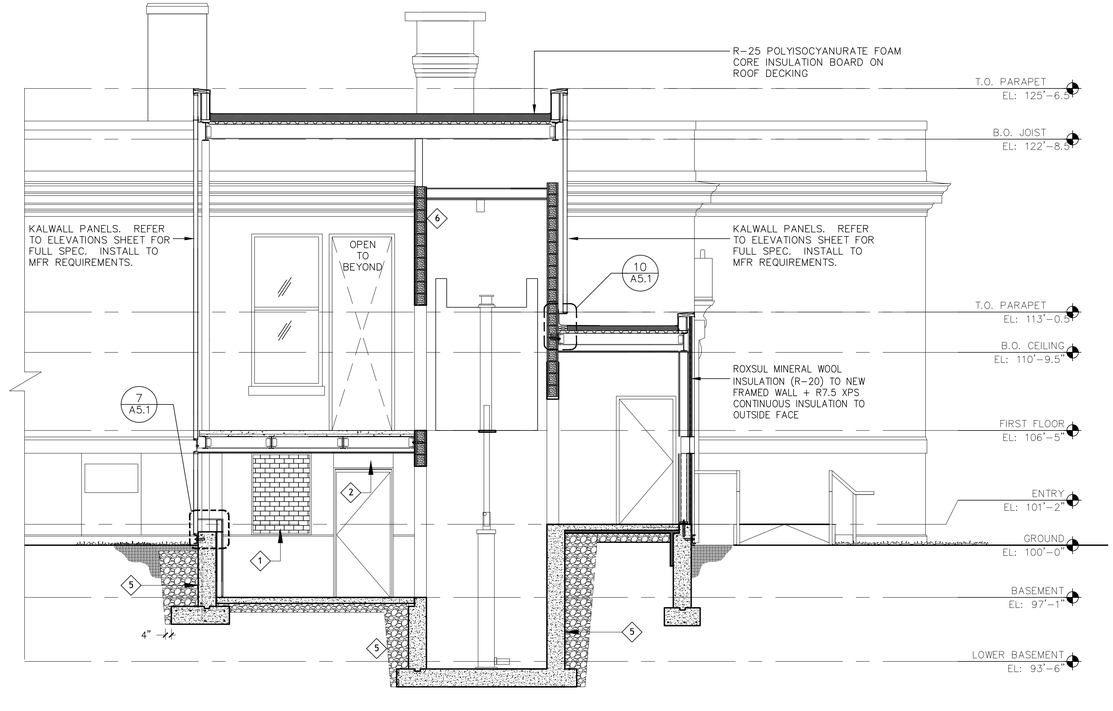
PROJECT ARCHITECT: BTB
DRAWN: MM / SS

PROJECT NUMBER:
#2415

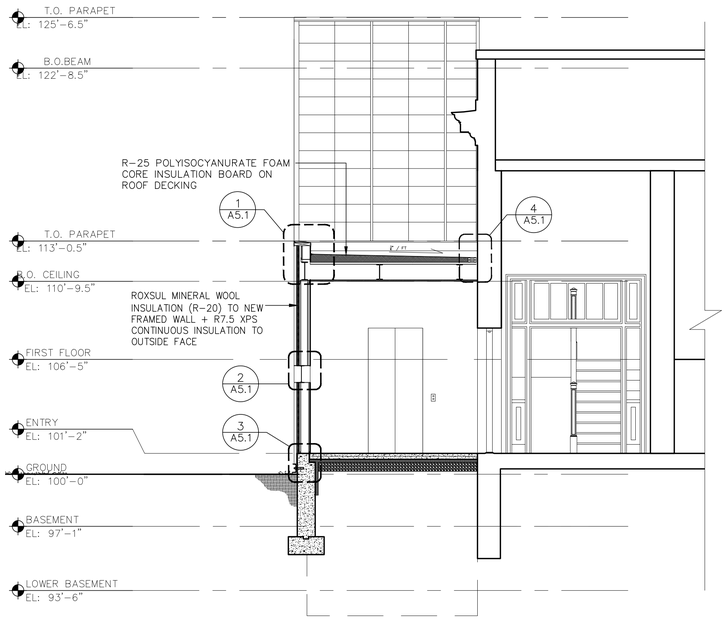
SHEET NUMBER: A2.3
REV: ~



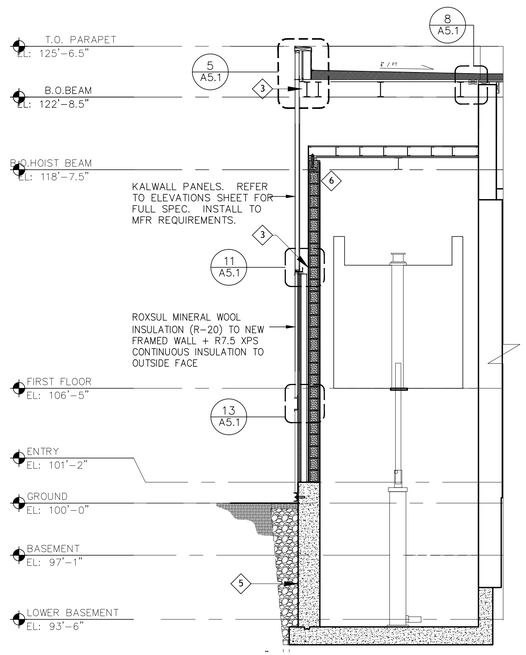

1 A3.1 Proposed Addition Floor
1/4"=1'-0"



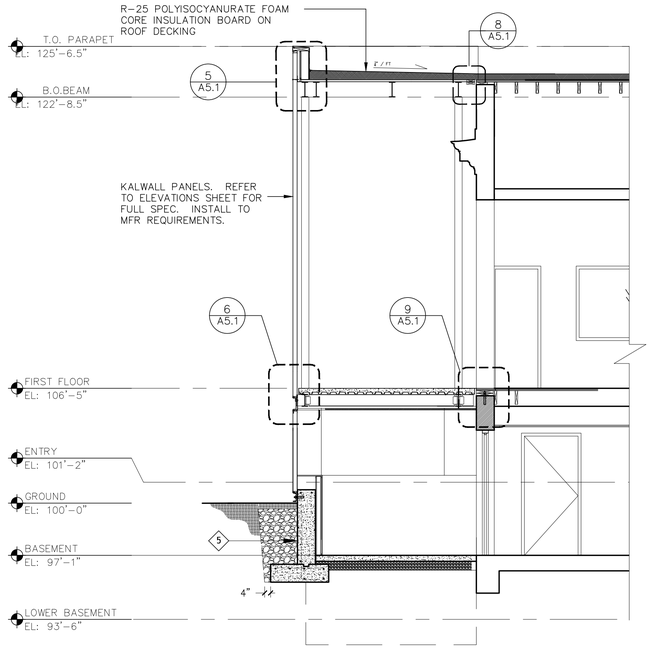

5 A3.1 Proposed Addition Section
1/4"=1'-0"




2 A3.1 Addition Section at Entry Level
1/4"=1'-0"




3 A3.1 Proposed Addition Section through Elevator Shaft
1/4"=1'-0"




4 A3.1 Proposed Addition Section at Upper Level
1/4"=1'-0"

NOTES

1. FILL IN DEMOLISHED WINDOW WITH SALVAGED BRICK
2. LT WT. INFILL ABOVE NEW DOOR. GWB TO BOTH SIDES, PAINTED FINISH.
3. INSTALL LED STRIP LITGHTS TO TOP AND BOTTOM OF CAVITY BETWEEN KALWALL AND CMU SHAFT. REFER TO ELECTRICAL ENGINEERS DRAWINGS.
4. CONFIRM MINIMUM INTERNAL DIMENSIONS OF CMU SHAFT WITH ELEVATOR MFG REQUIREMENTS AND REFER TO STRUCTURAL ENGINEER DETAIL
5. BITUMINOUS DAMPROOFING TO OUTSIDE FACE OF FOUNDATION. REFER TO SPEC
6. CONSTRUCT CMU SHAFT ELEVATOR MFG REQUIREMENTS. REFER TO STRUCTURAL ENG. DETAILS

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

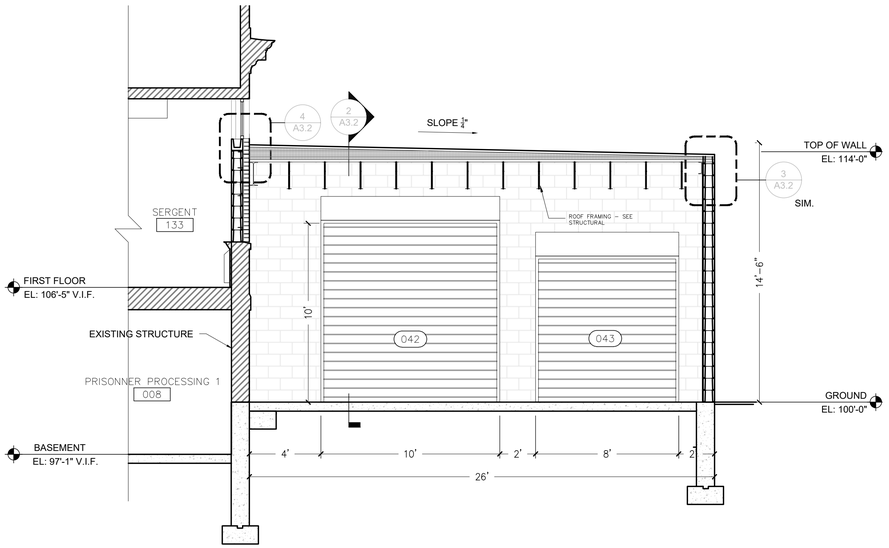
STAMP:

SHEET TITLE:
ELEVATOR SECTIONS

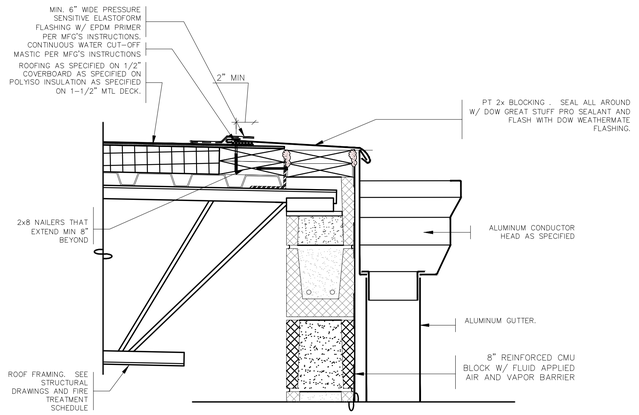
PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS
PROJECT NUMBER:
#2415

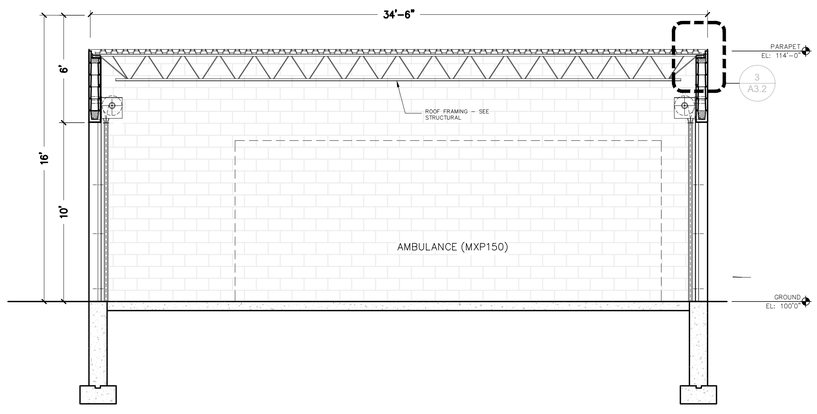
SHEET NUMBER: A3.1
REV: ~



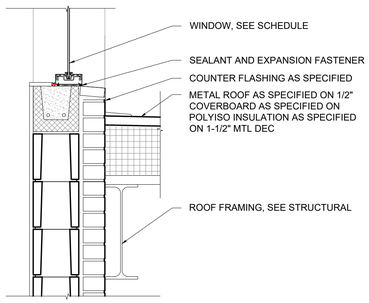

1 / A3.2 SECTION - SALLY PORT
1/4"=1'-0"




3 / A3.2 DETAIL - SALLY PORT
1"=1'-0"




2 / A3.2 SECTION - SALLY PORT
1/4"=1'-0"




4 / A3.2 DETAIL - SALLY PORT
1"=1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

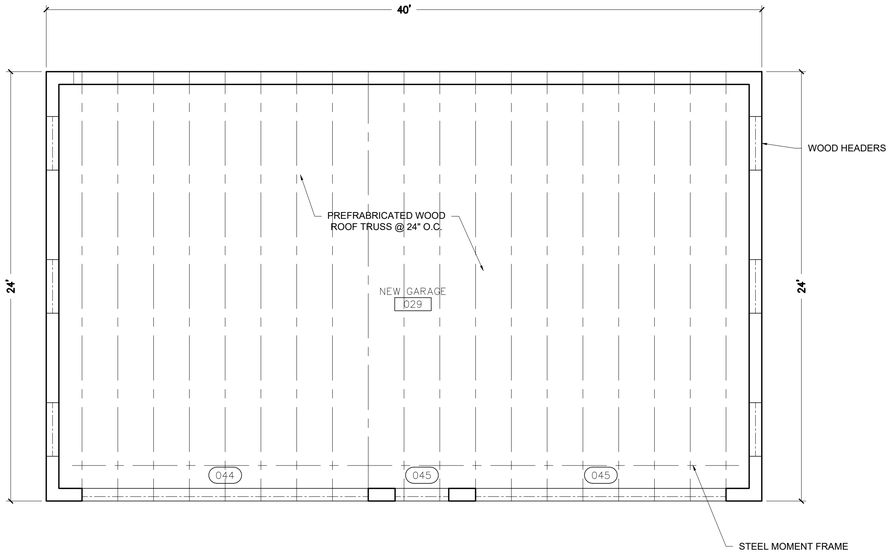
STAMP:

SHEET TITLE:
NEW SALLY PORT SECTIONS

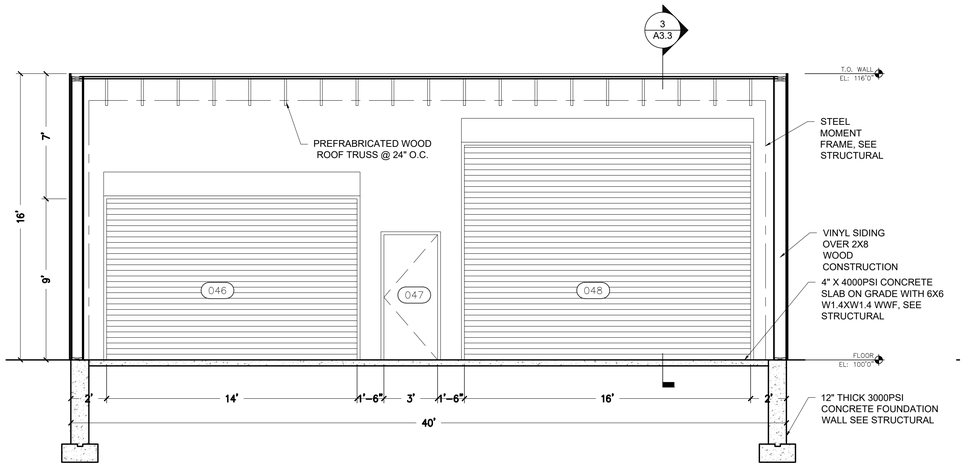
PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS
PROJECT NUMBER:
#2415

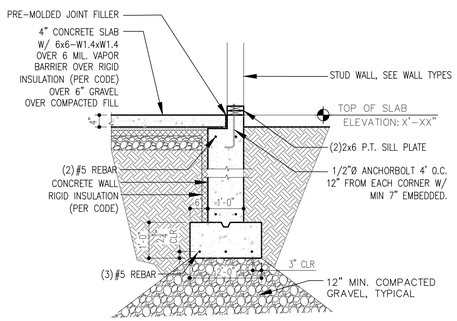
SHEET NUMBER:
A3.2
REV:
~



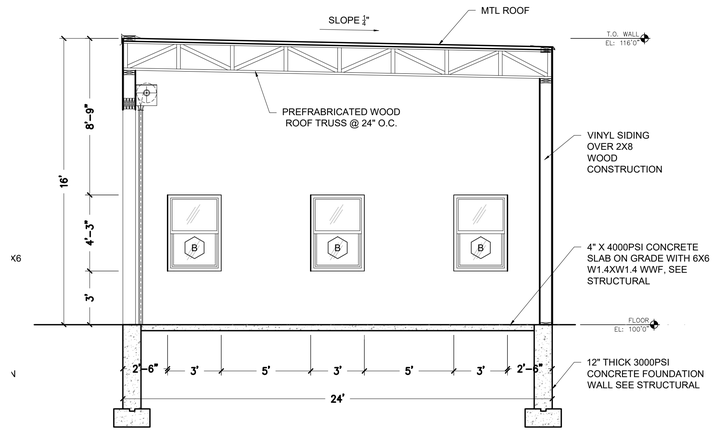

1 A3.3 NEW GARAGE FRAMING PLAN
1/4"=1'-0"




2 A3.3 NEW GARAGE SECTION
1/4"=1'-0"




4 A3.3 DETAIL - GARAGE FOUNDATION
1/2"=1'-0"




3 A3.3 NEW GARAGE SECTION 2
1/4"=1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

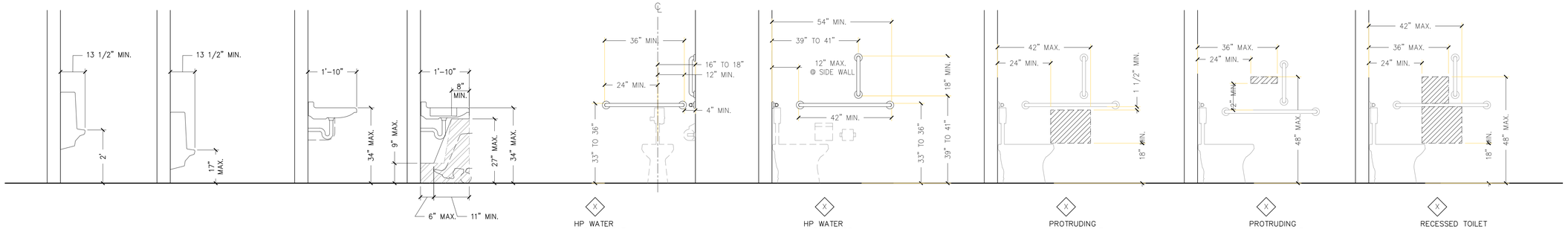
SHEET TITLE:
NEW GARAGE SECTIONS

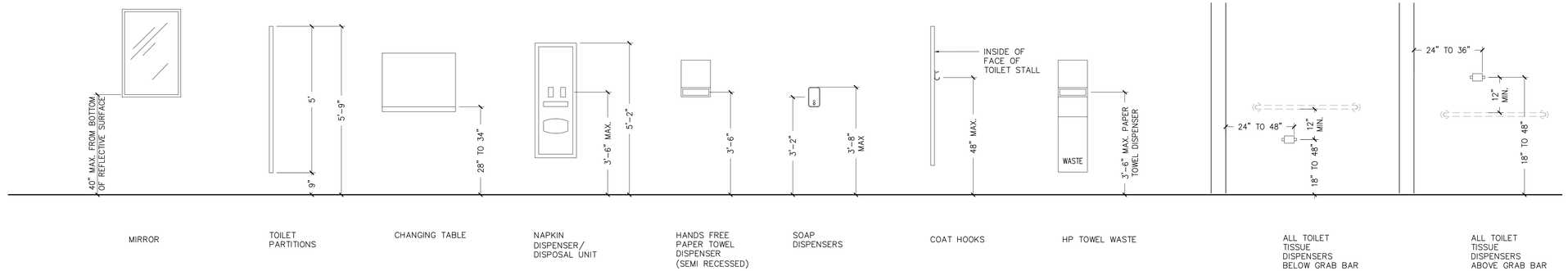
PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS
PROJECT NUMBER:
#2415

SHEET NUMBER:
A3.3

REV:
~




2010 ADA STANDARDS FOR ACCESSIBLE DESIGN
N.T.S.

BATHROOM ACCESSORIES LEGEND

| CODE | NAME | MANUFACTURER/PRODUCT | DESCRIPTION |
|---|---|---|---|
| A | MIRROR | BRADLEY, #780 SERIES | SATIN FINISH STAINLESS STEEL |
| B | SOAP DISPENSER | BY OWNER OR OWNERS VENDOR | |
| C | TOWEL DISPENSER | BY OWNER OR OWNERS VENDOR | |
| D | WASTE RECEPTACLE | BY OWNER OR OWNERS VENDOR | |
| E | NAPKIN DISPOSAL | BY OWNER OR OWNERS VENDOR | |
| F | TOILET PAPER DISPENSER | BY OWNER OR OWNERS VENDOR | |
| G | WATER CLOSET | SEE PLUMBING PLANS | |
| H | LAVATORY | SEE PLUMBING PLANS | |
| I | FLUSH VALVE | SEE PLUMBING PLANS | |
| J | FAUCET | SEE PLUMBING PLANS | |
| K | GRAB BARS | BRADLEY #8327, SEE PLANS FOR SIZE | #4 SATIN W/ SAFETY GRIP FINISH |
| L | SHOWER ROSE/MIXER | SEE PLUMBING PLANS | |
| M | URINAL | SEE PLUMBING PLANS | |
| N | TOILET PARTITIONS | SEE SPECIFICATION SECTION 10.210 | |
| O | BRACKET | RAKKS BRACKET EH-1212 @ 32" MAX OC | |

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

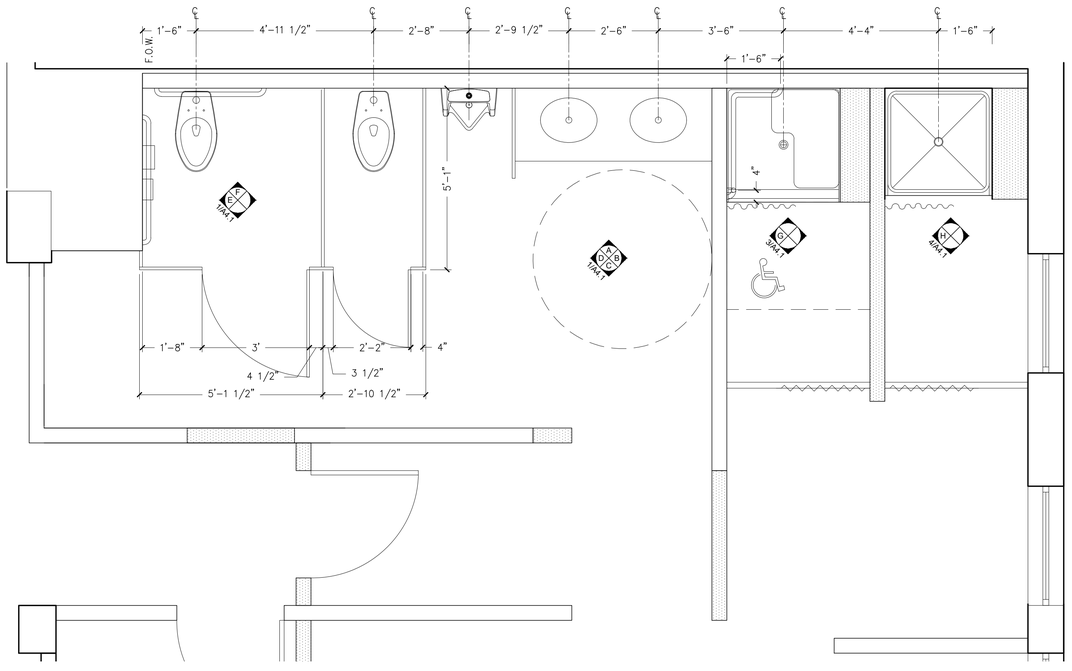
STAMP:

SHEET TITLE:
INTERIOR ELEVATIONS

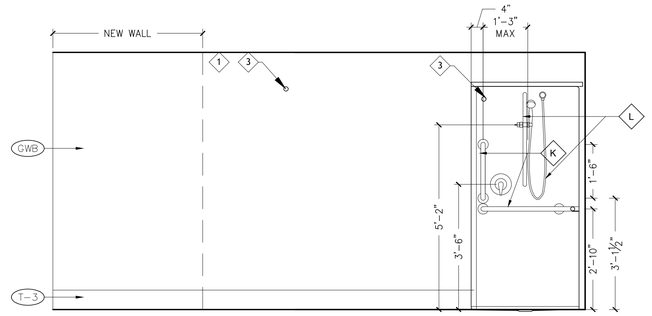
PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN:
PROJECT NUMBER:
#2415

SHEET NUMBER:
A4.0
REV:
~

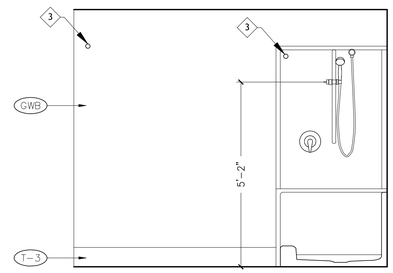



1 A4.1 MEN'S LOCKER ROOM FLOOR PLAN
1/2"=1'-0"



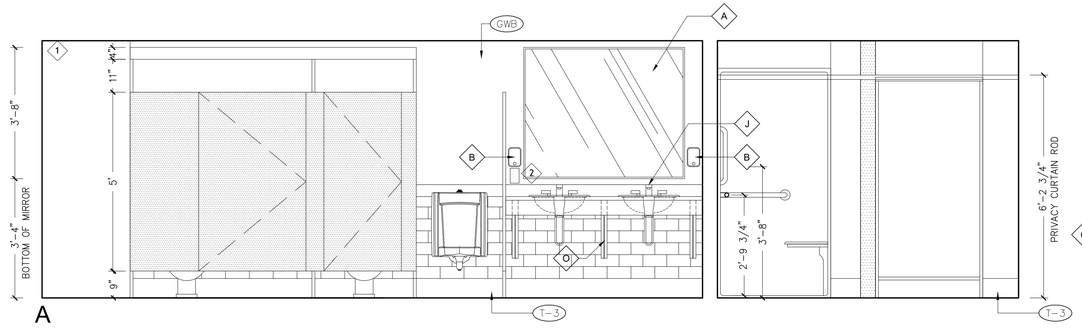

G

3 A4.1 MEN'S ADA SHOWER ROOM INTERIOR ELEVATION
1/2"=1'-0"

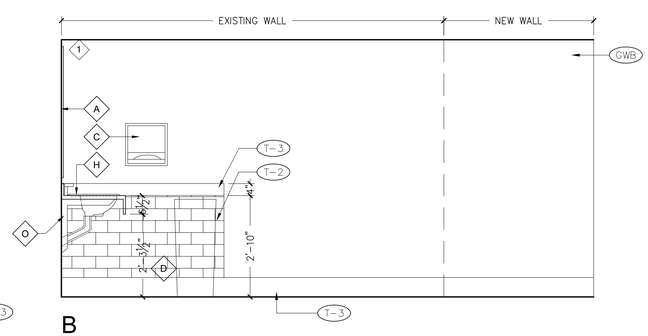



H

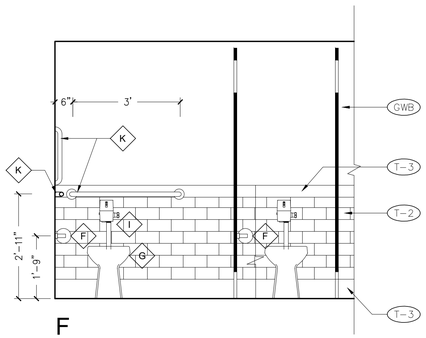
4 A4.1 MEN'S SHOWER ROOM INTERIOR ELEVATION
1/2"=1'-0"



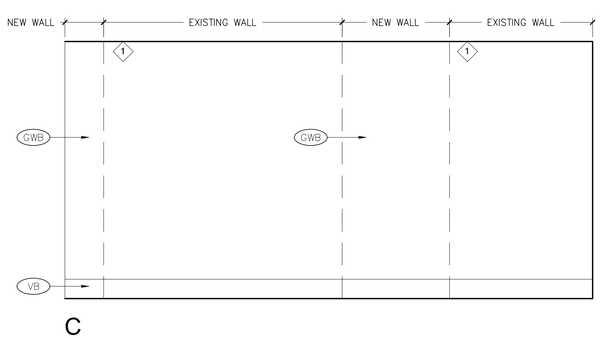

A



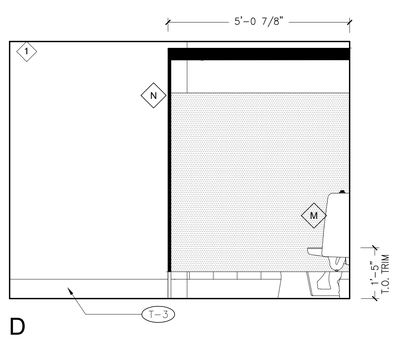

B



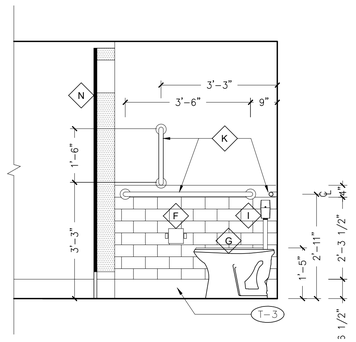

F




C




D




E

2 A4.1 MEN'S LOCKER ROOM INTERIOR ELEVATIONS
1/2"=1'-0"

NOTES

1. PREPARE AND PAINT EXISTING WALL MATERIAL AND TRIM. STAIN/CLEAR FINISH TRIM WHERE REQUIRED TO MATCH EXISTING ADJACENT.
2. GFI OUTLET. REFER TO ELECTRICAL ENGINEERS DRAWINGS
3. SHOWER CURTAIN ROD


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
MEN'S LOCKER ROOM INTERIOR ELEVATIONS

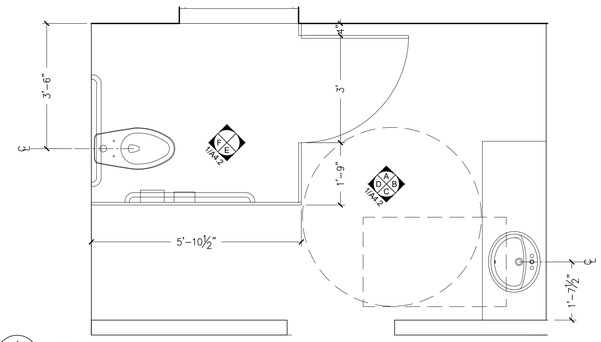
PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN:
PROJECT NUMBER:
#2415

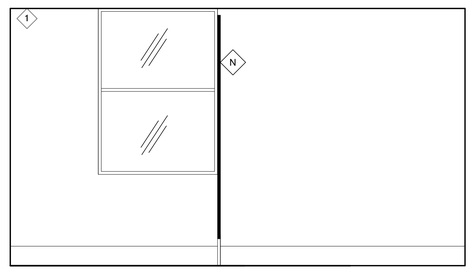
SHEET NUMBER: A4.1
REV: ~

NOTES

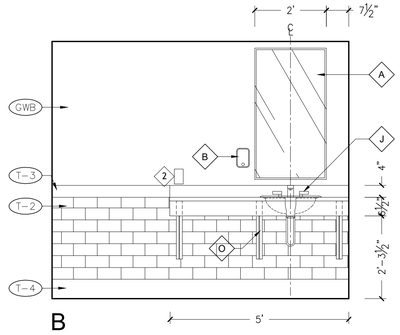
1. PREPARE AND PAINT EXISTING WALL MATERIAL AND TRIM. STAIN/CLEAR FINISH TRIM WHERE REQUIRED TO MATCH EXISTING ADJACENT.
2. GFI OUTLET. REFER TO ELECTRICAL ENGINEERS DRAWINGS



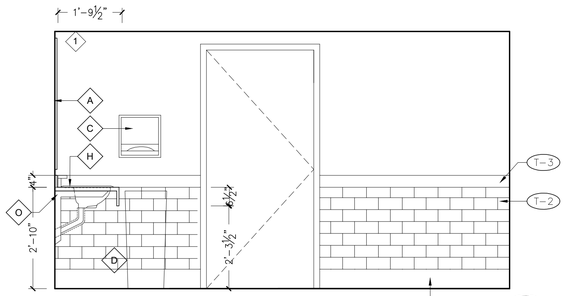

1 / A4.2 WOMEN'S LOCKER ROOM PLAN
1/2"=1'-0"



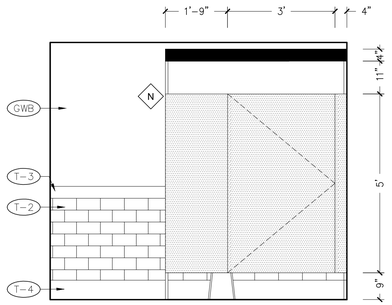

A



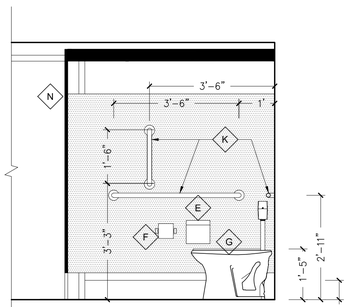

B



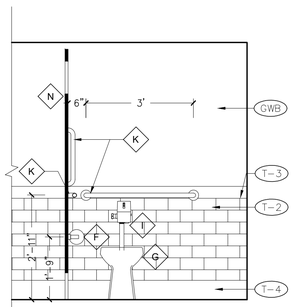

C




D

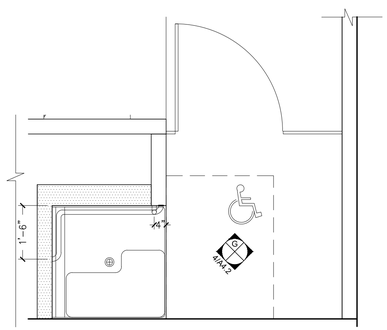



E

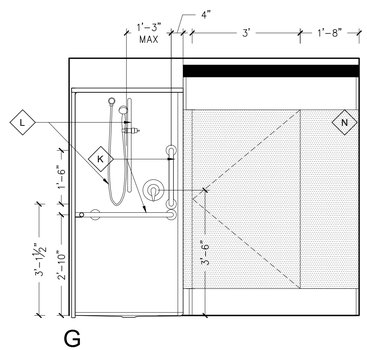



F

2 / A4.2 WOMEN'S LOCKER INTERIOR ELEVATION
1/2"=1'-0"




3 / A4.2 WOMEN'S LOCKER ROOM SHOWER PLAN
1/2"=1'-0"




G

4 / A4.2 WOMEN'S LOCKER ROOM SHOWER ELEVATION
1/2"=1'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com


CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

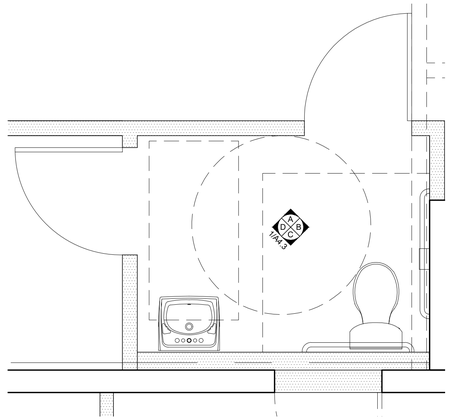
SHEET TITLE:
INTERIOR BATHROOM ELEVATIONS

PROJECT NORTH:
N

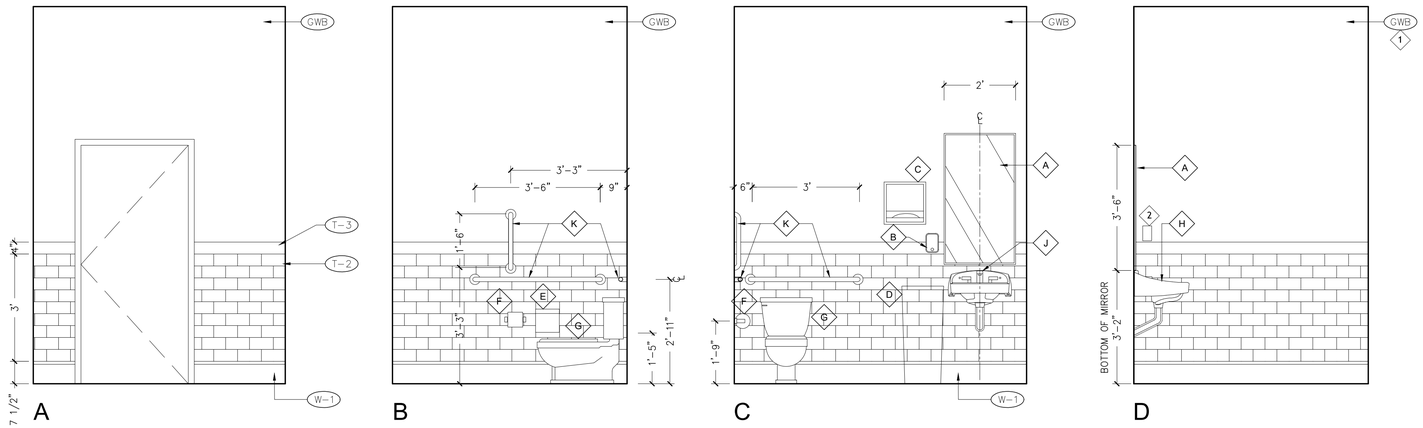
PROJECT ARCHITECT: BTB
DRAWN:

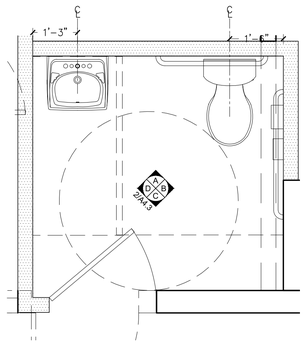
PROJECT NUMBER:
#2415

SHEET NUMBER: A4.2
REV: ~

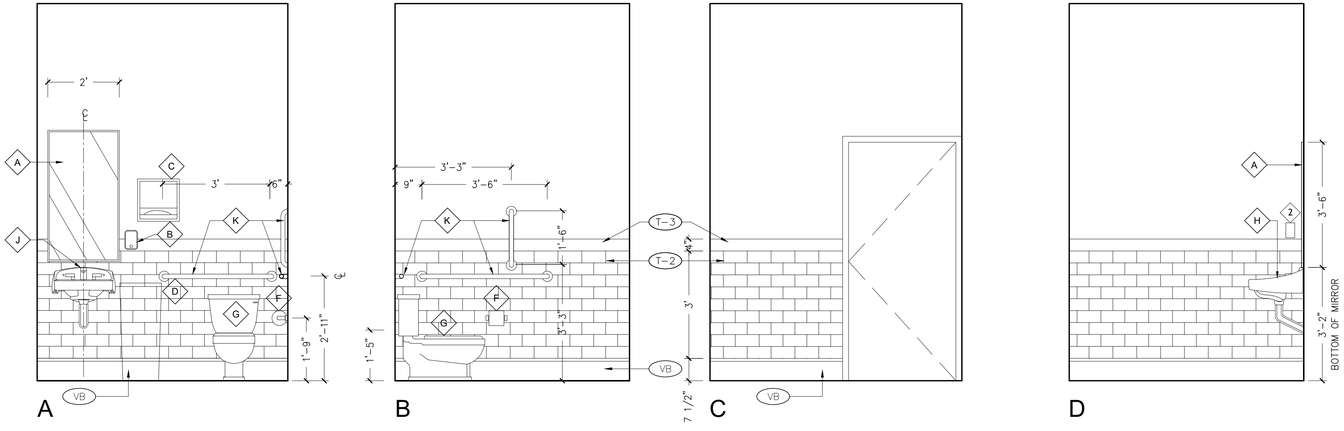



1 A4.3 POLICE WOMEN'S BATHROOM
1/2"=1'-0"




2 A4.3 POLICE MEN'S BATHROOM
1/2"=1'-0"




NOTES

1. PREPARE AND PAINT EXISTING WALL MATERIAL AND TRIM. STAIN/CLEAR FINISH TRIM WHERE REQUIRED TO MATCH EXISTING ADJACENT.
2. GFI OUTLET. REFER TO ELECTRICAL ENGINEERS DRAWINGS

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

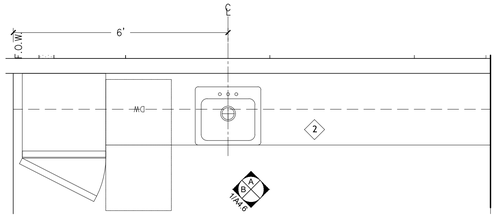
STAMP:

SHEET TITLE:
INTERIOR BATHROOM ELEVATIONS

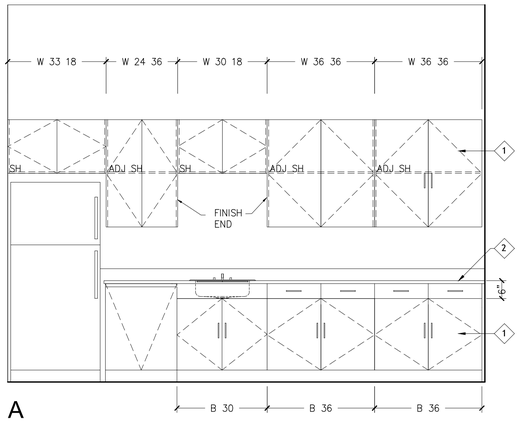
PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN:
PROJECT NUMBER:
#2415

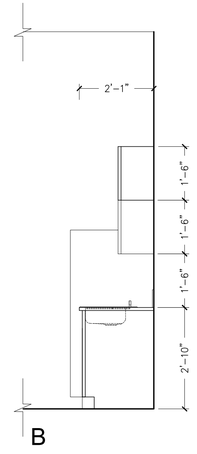
SHEET NUMBER: A4.3
REV: ~




1 A4.4 POLICE BREAK ROOM KITCHEN
1/2"=1'-0"




A




B

NOTES

1. WHITE MELANINE CABINETS
2. PLAM COUNTERTOPS WITH HARDWOOD EDGE

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

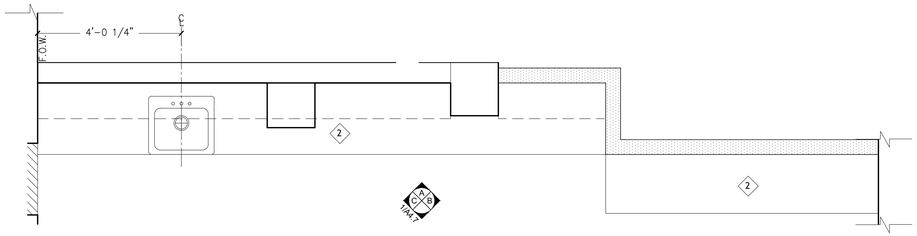
SHEET TITLE:
KITCHEN INTERIOR ELEVATIONS

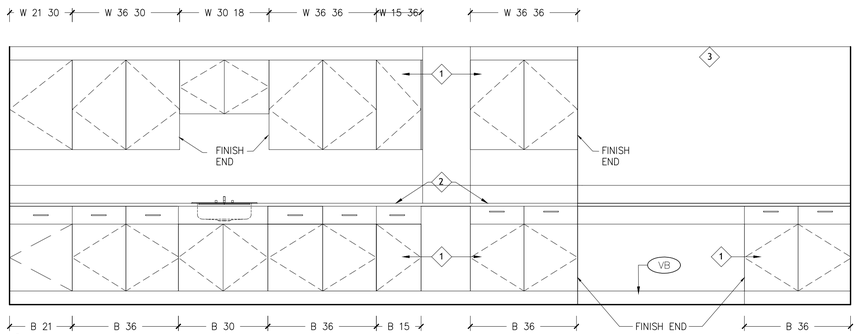
PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN:

PROJECT NUMBER:
#2415

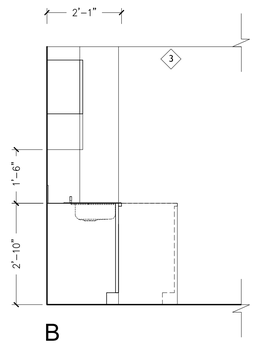
SHEET NUMBER: A4.4
REV: ~



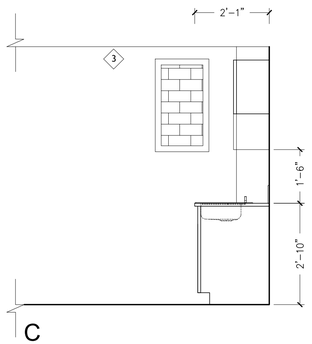




A

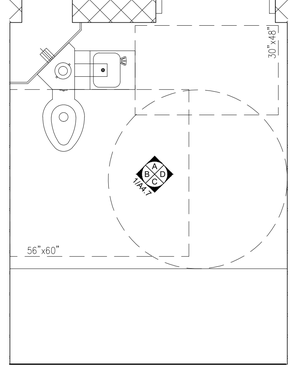
1/A4.5 PRISONER PROCESSING PLAN
1/2"=1'-0"

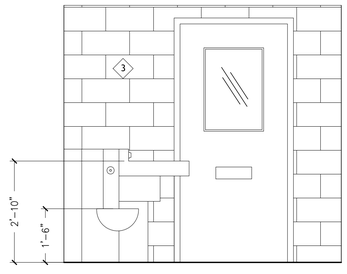



B

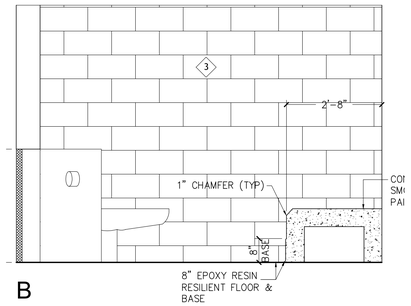



C

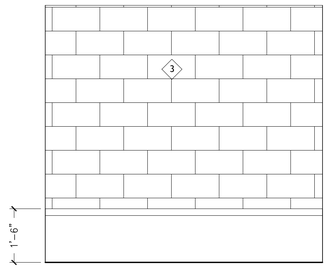


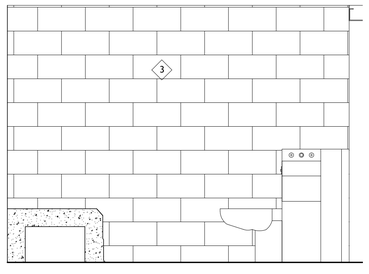

A




B




C




D

2 A4.5 CELL PLAN
1/2"=1'-0"

NOTES

1. WHITE MELANINE CABINETS
2. PLAM COUNTERTOPS WITH HARDWOOD EDGE
3. PREPARE AND PAINT EXISTING OR PROPOSED WALL. STAIN/CLEAR FINISH RIM WHERE REQUIRED TO MATCH EXISTING ADJACENT.

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

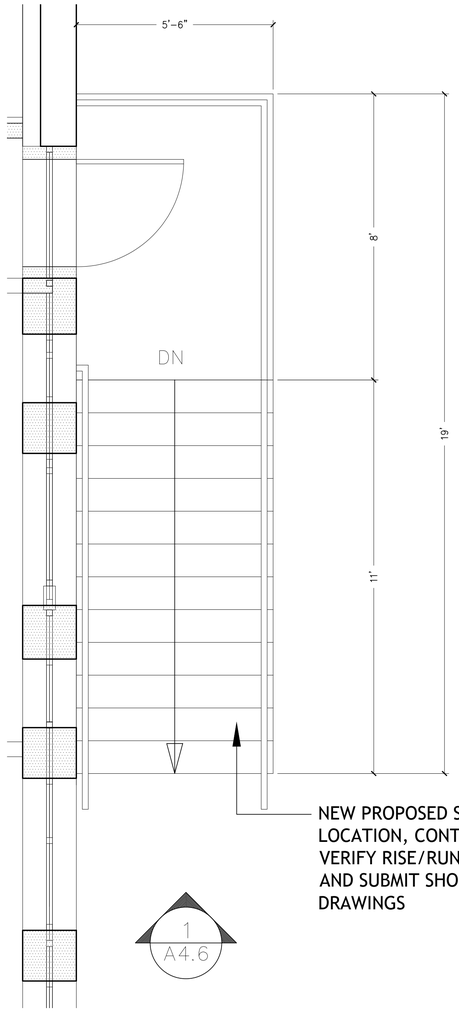
STAMP:

SHEET TITLE:
PRISONER PROCESSING
INTERIOR ELEVATIONS

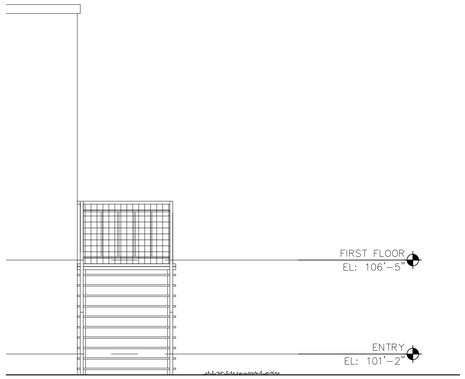
PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN:
PROJECT NUMBER:
#2415

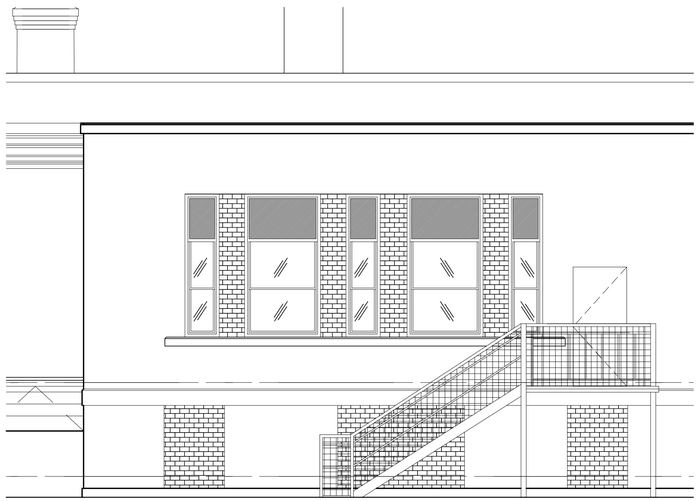
SHEET NUMBER: A4.5
REV: ~




1 A4.6 EMERGENCY EXIT STAIR PLAN
1/2"=1'-0"



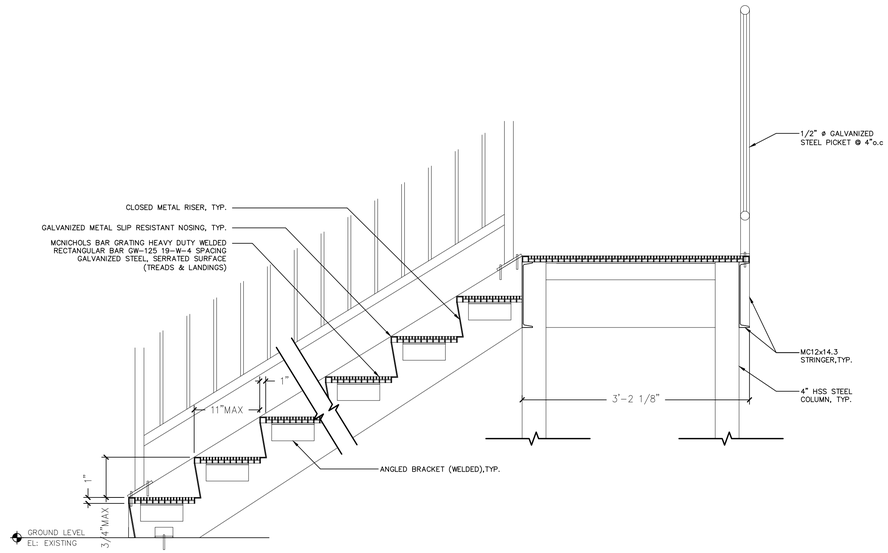

2 A4.6 EMERGENCY EXIT STAIR FRONT ELEVATION
1/4"=1'-0"



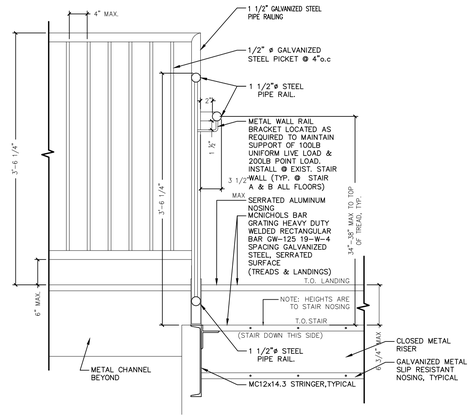
3 A4.6 EMERGENCY EXIT STAIR SIDE ELEVATION
1/4"=1'-0"

NOTES

1. WHITE MELANINE CABINETS
2. PLAM COUNTERTOPS WITH HARDWOOD EDGE
3. PREPARE AND PAINT EXISTING OR PROPOSED WALL. STAIN/CLEAR FINISH RIM WHERE REQUIRED TO MATCH EXISTING ADJACENT.




4 A4.6 TYPICAL METAL STIAR DETAIL
1"=1'-0"




5 A4.6 TYPICAL METAL STIAR DETAIL
1"=1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

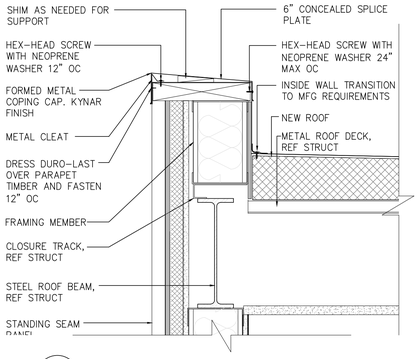
STAMP:

SHEET TITLE:
EMERGENCY EXIT EXTERIOR ELEVATIONS

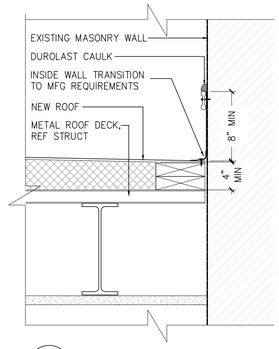
PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN:
PROJECT NUMBER:
#2415

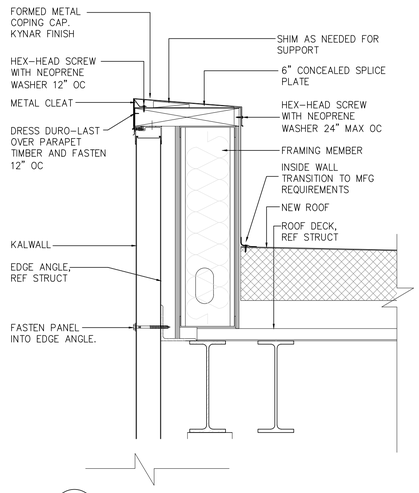
SHEET NUMBER: A4.6
REV: ~



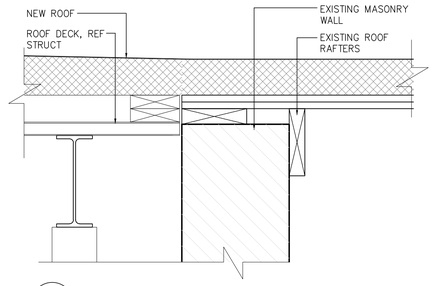

1 A5.1 Metal Sheet Clad Parapet Section
1½"=1'-0"



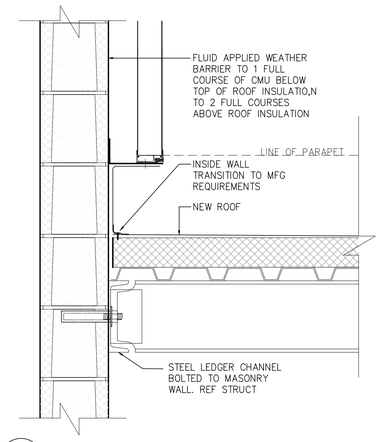

4 A5.1 Lower Roof Connection o Existing
1½"=1'-0"




5 A5.1 Kallwall Parapet Section
1½"=1'-0"




8 A5.1 Upper Roof Connection to Existing
1½"=1'-0"




10 A5.1 Kallwall Connection to Lower Roof
1½"=1'-0"




2 A5.1 Window Section
1½"=1'-0"




13 A5.1 Metal Sheet Clad to Channel Connection
1½"=1'-0"




6 A5.1 Kalwall to Channel Connection & 1st Floor Support
1½"=1'-0"




9 A5.1 First Floor Eleavtor Lobby Floor Connection to Existing
1½"=1'-0"




11 A5.1 Standing Seam to Kallwall Connection
1½"=1'-0"




3 A5.1 Metal Sheet Clad Foundation
1½"=1'-0"




7 A5.1 Kalwall to Ground Connection
1½"=1'-0"




12 A5.1 Window to Channel Connection, Plan View
1½"=1'-0"




14 A5.1 Kalwal to Standing Seam Panel Connection, Plan View
1½"=1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

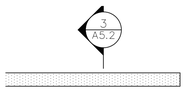
STAMP:

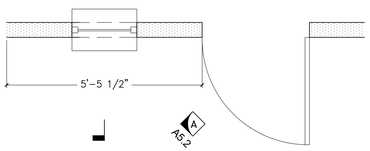
SHEET TITLE:
ADDITION DETAILS

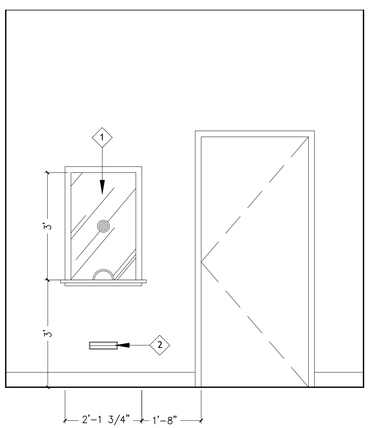
PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS
PROJECT NUMBER:
#2415

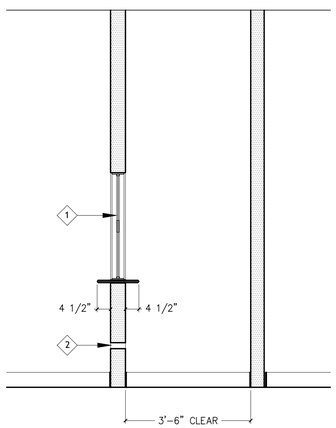
SHEET NUMBER:
A5.1
REV:
~



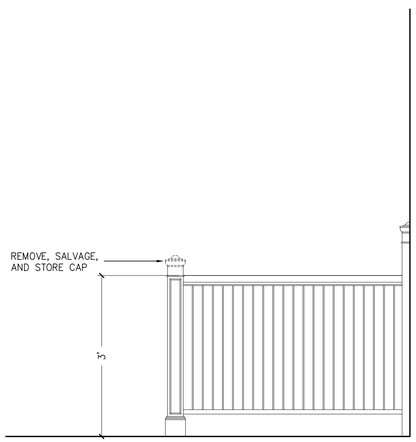



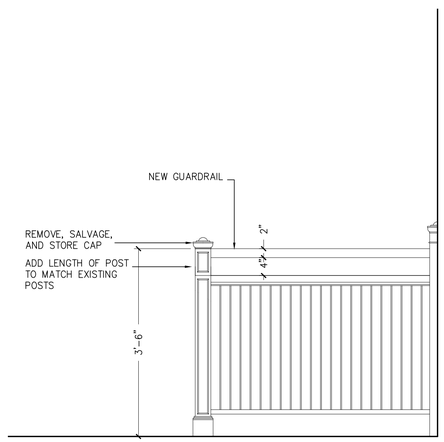

2 A5.2 Fine Collection Counter
1/2"=1'-0"




3 A5.2 Fine Collection Counter
1/2"=1'-0"




4 A5.2 Existing Handrail at East Stair
1/2"=1'-0"




5 A5.2 Proposed Guardrail at East Stair
1/2"=1'-0"

NOTES

1. BULLET RESISTANT GLASS
2. AFTER-HOURS DROP-FF MAIL SLOT

Signal Works

11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

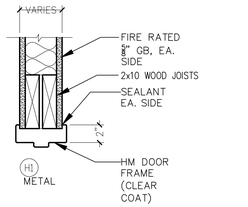
SHEET TITLE:
MILLWORK DETAILS

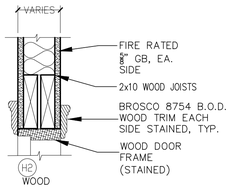
PROJECT NORTH:
N

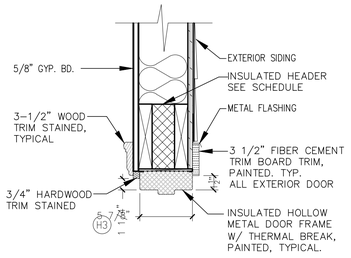
PROJECT ARCHITECT: BTB
DRAWN: MM / SS

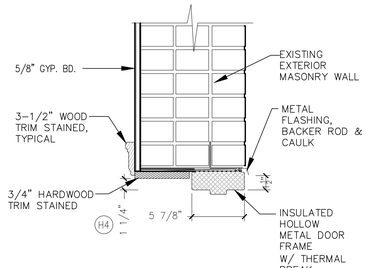
PROJECT NUMBER:
#2415

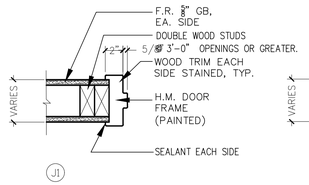
SHEET NUMBER: A5.2
REV: ~

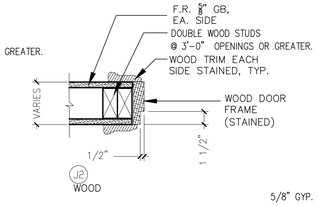


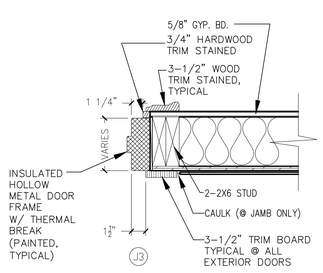



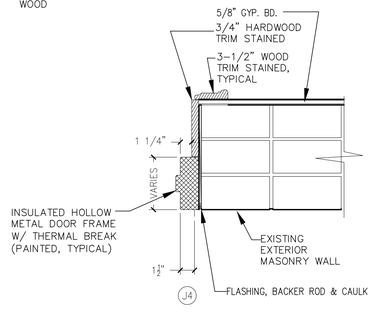



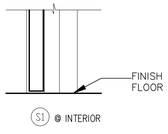



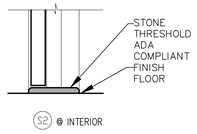



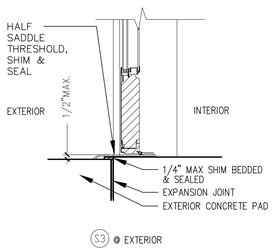




## DOOR SCHEDULE @ LOWER LEVEL

| NO | TYPE | WIDTH | HEIGHT | FTYPE | LABEL | DOOR HARDWARE | REMARKS | |
|---|---|---|---|---|---|---|---|---|
| 001 | G | 3'-0" | 7'-0" | EXST | | SET 2.2 | EXTERIOR | 1, |
| 002 | EXST | 3'-0" | 6'-8" | EXST | | SET 2.2 | EXTERIOR | 1, |
| 003 | EXST | 3'-0" | 6'-8" | EXST | | SET 2.2 | EXTERIOR | 1, |
| 004 | H | 3'-0" | 7'-0" | EXST | | SET 2.2 | EXTERIOR | 1 |
| 005 | G | 3'-0" | 7'-0" | EXST | | SET 2.1 | EXTERIOR | 1, 5 |
| 006 | H | 3'-0" | 7'-0" | EXST | | SET 2.1 | EXTERIOR | 1, 5 |
| 007 | H | 4'-0" | 7'-0" | EXST | | SET 2.1 | EXTERIOR | 1, 5 |
| 008 | C2 | 3'-0" | 6'-8" | 1 | 60 MIN | SET 10.1 | BASEMENT LOBBY | 1, |
| 009 | A2 | 3'-0" | 6'-8" | 1 | 60 MIN | SET 3.2 | BAIL | 1, 5 |
| 010 | C2 | 3'-0" | 6'-8" | 1 | 60 MIN | SET 3.2 | HALLWAY 1 | 1, 3, 5 |
| 011 | C2 | 3'-0" | 6'-8" | 1 | | SET 10.2 | HALLWAY 2 | 1, |
| 012 | C2 | 3'-0" | 6'-8" | 1 | | SET 3.2 | BAIL | 1, 5 |
| 013 | D1 | 3'-0" | 6'-8" | 1b | | DETENTION | HALLWAY 2 | 8 |
| 014 | A2 | 3'-0" | 6'-8" | 1 | | SET 5.1 | EXPANSION TANK | 1, 3 |
| 015 | C2 | 3'-0" | 6'-8" | 1 | | SET 10.2 | PRIS PROCESSING 1 | 1, |
| 016 | C2 | 3'-0" | 6'-8" | 1 | | SET 10.2 | PRIS PROCESSING 1 | 1, |
| 017 | D1 | 3'-0" | 6'-8" | 1b | | DETENTION | HALLWAY 1 | 8 |
| 018 | D1 | 3'-0" | 6'-8" | 1b | | DETENTION | HALLWAY 1 | 8 |
| 019 | C2 | 3'-0" | 6'-8" | 1 | | SET 10.2 | PRIS PROCESSING 2 | 1, |
| 020 | EXST | 3'-0" | 7'-0" | EXST | | SET 5.0 | ELECTRICAL | 1, 5 |
| 021 | A2 | 3'-0" | 7'-0" | 1 | 90 MIN | SET 5.2 | ELECTRICAL LIFE SAFETY | 1, 5 |
| 022 | D2 | 3'-0" | 7'-0" | 1b | | DETENTION | FEMALE ADA CELL | 8 |
| 023 | D2 | 3'-0" | 7'-0" | 1b | | DETENTION | MALE CELL | 8 |
| 024 | D2 | 3'-0" | 7'-0" | 1b | | DETENTION | MALE ADA CELL | 8 |
| 025 | D2 | 3'-0" | 7'-0" | 1b | | DETENTION | YOUTH CELL | 8 |
| 026 | EXST | 3'-0" | 6'-8" | EXST | | SET 3.3 | HALLWAY | 1, 5 |
| 027 | A2 | 3'-0" | 6'-8" | 1 | | SET 3.3 | ARMORY | 1, 5, 9 |
| 028 | A2 | 3'-0" | 6'-8" | 1 | | SET 12.0 | MALE LOCKER ROOM | 1, |
| 029 | A2 | 3'-0" | 6'-8" | 1 | | SET 3.3 | WEAPONS | 1, 5 |
| 030 | EXST | 3'-0" | 6'-8" | EXST | | SET 10.0 | STORAGE 1 | 1, |
| 031 | EXST | 3'-0" | 6'-8" | EXST | | SET 10.0 | STORAGE | 1, |
| 032 | A2 | 3'-0" | 6'-8" | 1 | 90 MIN | SET 5.1 | UTILITY | 1, 3 |
| 033 | EXST | 3'-0" | 7'-0" | EXST | | SET 12.0 | FEMALE LOCKER ROOM | 1, |
| 034 | A2 | 3'-0" | 6'-8" | EXST | | SET 9.1 | FEMALE BATHROOM | 1, 2, 7 |
| 035 | EXST | 3'-0" | 6'-8" | EXST | | SET 5.0 | STORAGE 2 | 1, 3 |
| 036 | C2 | 3'-0" | 6'-8" | EXST | 60 MIN | SET 10.1 | EXIT STAIR | 1, 5 |
| 037 | EXST | 3'-0" | 6'-8" | EXST | 60 MIN | SET 10.1 | EXIT STAIR | 1, |
| 038 | A2 | 3'-0" | 6'-8" | 1 | 90 MIN | SET 3.1 | RECORD STORAGE | 1, 5 |
| 039 | A2 | 3'-0" | 6'-8" | 1 | | SET 10.0 | JANITORS CLOSET | 1, |
| 040 | A2 | 3'-0" | 6'-8" | 1 | | SET 10.0 | STORAGE | 1, |
| 041 | A2 | 3'-0" | 6'-8" | 1 | | SET 10.2 | INTERVIEW | 1, |
| 042 | I | 10'-0" | 10'-0" | 2 | | OVERHEAD | SALLY PORT | 2 |
| 043 | I | 8'-0" | 8'-0" | 2 | | OVERHEAD | SALLY PORT | 2 |
| 044 | I | 8'-0" | 8'-0" | 2 | | OVERHEAD | SALLY PORT | 2 |
| 045 | I | 10'-0" | 10'-0" | 2 | | OVERHEAD | SALLY PORT | 2 |
| 046 | I | 16'-0" | 14'-0" | 2 | | OVERHEAD | GARAGE | |
| 047 | A1 | 3'-0" | 7'-0" | 2 | | SET 2.1 | GARAGE | |
| 048 | I | 14'-0" | 8'-0" | 2 | | OVERHEAD | GARAGE | |

## DOOR SCHEDULE @ UPPER FLOOR

| NO | TYPE | WIDTH | HEIGHT | FTYPE | LABEL | DOOR HARDWARE | REMARKS | |
|---|---|---|---|---|---|---|---|---|
| 100 | C3 | 3'-0" | 7'-0" | 1 | 60 MIN | SET 10.1 | ELEVATOR LOBBY | 1, |
| 101 | EXST | 3'-0" | 7'-0" | EXST | | SET 5.0 | STORAGE | 1, 3 |
| 102 | EXST | 3'-0" | 7'-0" | EXST | | SET 5.0 | INTERIVEW | 1, 3 |
| 103 | C2 | 3'-0" | 7'-0" | 1 | | SET 3.3 | FOYER | 1, 5 |
| 104 | A2 | 3'-0" | 7'-0" | 1 | | SET 9.0 | BATHROOM | 1, |
| 105 | A2 | 3'-0" | 7'-0" | 1 | | SET 9.0 | BATHROOM | 1, |
| 106 | A2 | 3'-0" | 6'-8" | 1 | | SET 5.1 | JANITOR CLOSET | 1, 3 |
| 107 | B3 | 3'-0" | 7'-0" | 1 | | SET 8.1 | LIEUTENANT | 1, 3 |
| 108 | DELTED | | | | | | ~~PATROL~~ | |
| 109 | F | 3'-0" | 6'-8" | 4 | | SET 10.0 | DISPATCH | 1, |
| 110 | F | 3'-0" | 7'-0" | 1 | | SET 8.0 | DETECTIVES | 1, 2 |
| 111 | A2 | 3'-0" | 7'-0" | 1 | | SET 5.0 | IT | 1, 3 |
| 112 | F | 3'-0" | 7'-0" | 1 | | SET 10.0 | BREAK | 1 |
| 113 | EXST | 3'-0" | 7'-0" | EXST | | SET 8.1 | COMMAND LOBBY | 1, 3 |
| 114 | B3 | 3'-0" | 7'-0" | 1 | | SET 8.1 | CAPTAIN | 1, 3 |
| 115 | B3 | 3'-0" | 7'-0" | 1 | | SET 8.1 | CAPTAIN | 1, 3 |
| 116 | B3 | 3'-0" | 7'-0" | 1 | | SET 8.1 | CHIEF ADMIN | 1, 3 |
| 117 | B3 | 3'-0" | 7'-0" | 1 | | SET 8.1 | CHIEF | 1, 3 |
| 118 | EXST | 3'-0" | 7'-0" | EXST | | SET 7.0 | CONFERENCE | 1, 3 |
| 119 | C2 | 3'-0" | 7'-0" | 1 | 60 MIN | SET 10.1 | EXIT STAIR | 1, |
| 120 | C2 | 3'-0" | 7'-0" | 1 | 60 MIN | SET 10.1 | EXIT STAIR | 1, 5 |
| 121 | C2 | 3'-0" | 7'-0" | 1 | | SET 10.0 | BREAK | 1, |
| 122 | A4 | 3'-0" | 7'-0" | 1 | | SET 9.0 | BATHROOM | 1, |
| 123 | A4 | 3'-0" | 7'-0" | 1 | | SET 9.0 | BATHROOM | 1, |
| 124 | C3 | 3'-0" | 7'-0" | 1 | | SET 3.2 | EVIDENCE HALL | 1, 5 |
| 125 | G | 3'-0" | 7'-0" | 2 | | SET 2.2 | MUNICIPAL COURT | 1, 3 |
| 126 | B3 | 3'-0" | 7'-0" | 1 | | SET 8.1 | JUDGE CHAMBER | 1, 3 |
| 127 | A4 | 3'-0" | 7'-0" | 1 | | SET 10.2 | STORAGE | 1 |
| 128 | A2 | 3'-0" | 7'-0" | 1 | | SET 3.1 | CASH OFFICE | 1, 5 |
| 129 | A2 | 3'-0" | 7'-0" | 1 | | SET 3.1 | RECORDS | 1, 5 |
| 130 | A2 | 3'-0" | 7'-0" | 1 | | SET 3.1 | EVIDENCE PROCESSING | 1, 5 |
| 131 | EXST | 3'-0" | 7'-0" | EXST | | SET 7.0 | CHIEFS LOBBY | 1, 3 |
| 132 | A3 | 2'-3" | 6'-0" | 4 | | SET 5.1 | CONFERENCE STORAGE | 1, |
| 133 | A3 | 3'-0" | 6'-0" | 4 | | SET 5.1 | CONFERENCE STORAGE 2 | 1 |
| 134 | EXST | 2'-0" | 7'-0" | EXST | | SET 5.0 | CHIEF'S LOBBY | 1, 3 |
| 135 | A4 | 2(2'-7") | 7'-0" | 4 | | SET 6.0 | CHIEF'S LOBBY | 1, 3 |
| 136 | A4 | 2(2'-7") | 6'-8" | 4 | | SET 6.1 | CHIEF'S LOBBY | 1 |
| 137 | EXST | 3'-0" | 7'-0" | EXST | | SET 5.0 | INTERIVEW | 1, 3 |
| 138 | EXST | 2'-7" | 6'-8" | EXST | | SET 10.0 | PATROL | 1 |
| 139 | A2 | 3'-0" | 7'-0" | 1 | | SET 3.1 | EVIDENCE | 1, 5 |
| 140 | B3 | 3'-0" | 7'-0" | 1 | | SET 8.1 | SERGENT | 1, 3 |
| 141 | A2 | 3'-0" | 7'-0" | 1 | | SET 9.0 | UNISEX BATHROOM | 1 |

## ABBREVIATIONS

| | |
|---|---|
| FTYPE | FRAME TYPE |
| FMATL | FRAME MATERIAL |
| HM | HOLLOW METAL |
| WD | WOOD |
| SP | SINGLE PANE, SAFETY GLAZING |
| MT | INSULATED METAL |
| IGU | INSULATED GLAZING UNIT |
| EXST | EXISTING |

## TYPICAL NOTES

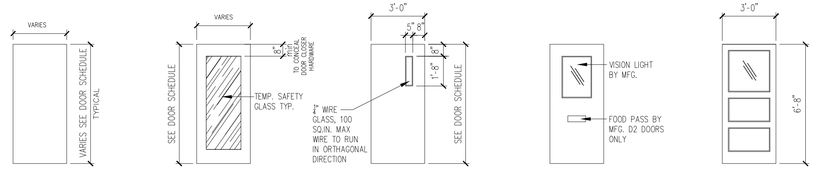
1 PROVIDE ADA DOOR HARDWARE.
2 PROVIDE AUTOMATIC CLOSER
3 KEYED LOCKSET
4 PAINT DOOR AND TRIM TO MATCH WALL BASE
5 CARD READER
6 AUTOMATED OPERATOR
7 DOOR SWING FLIPPED
8 PROVIDE DETENTION DOOR HARDWARE
9 EXISTING DOOR, HINGE FLIPPED TO OTHER SIDE

## GENERAL DOOR NOTES

1. INSULATE & PROVIDE THERMAL BREAK @ EXTERIOR DOOR & SIDELIGHT FRAMES & PROVIDE ADA LOW PROFILE THRESHOLD.
2. ALL DOORS ARE TO BE PROVIDED w/ ADA-COMPLIANT HARDWARE.
3. CONTRACTOR TO CONFIRM KEYING REQUIREMENTS w/ OWNER.
4. CONTRACTOR TO REPAINT DOORS & FRAMES THAT ARE ETR WITHIN PROJECT SCOPE IN THEIR ENTIRETY. COORDINATE w/ OWNER AT TIME OF PRICING. HARDWARE AT ETR DOORS IS TO REMAIN UNLESS OTHERWISE DIRECTED BY OWNER. ASSUME NEW CORES AT ALL DOORS IN SCOPE OF WORK.
5. ALL DOORS TO HAVE FULL-SWING AS NOTED IN PLANS
6. CONTRACTOR TO COORDINATE w/ OWNER AT THE TIME OF PRICING TO DETERMINE ANY DOORS THAT REQUIRE ELECTRIFICATION FOR ACCESS CONTROL.

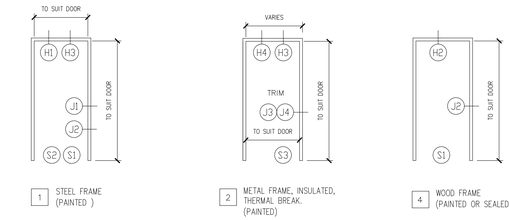
U-FACTORS:

| | |
|---|---|
| FIXED FENESTRATION | 0.34 MAX. |
| OPERABLE FENESTRATION | 0.45 MAX. |
| ENTRANCE DOORS | 0.63 MAX. |
| SHGG | 0.40 MAX. |




## DOOR TYPES

SCALE: 1/4" = 1'-0"




## FRAME TYPES

SCALE: 1/4" = 1'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
DOOR SCHEDULE

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS
PROJECT NUMBER:
#2415

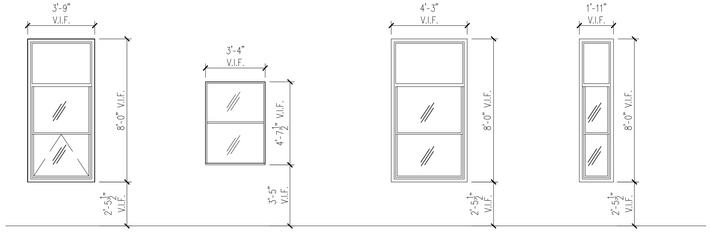
SHEET NUMBER:
A6.1
REV:
~

## WINDOW SCHEDULE @ LOWER LEVEL

| WINDOW TYPE | LOCATION | MODEL# | MIN WIDTH | MIN HEIGHT | THICKNESS | INTERIOR | EXTERIOR | MATERIAL | U-VALUE | TYPE |
|---|---|---|---|---|---|---|---|---|---|---|
| B | STORAGE<br>WOMEN'S RESTROOM<br>PRISONNER PROCESSING 2<br>WEIGHT AREA/TRAINING<br>MEN'S LOCKER ROOM | – | 3'-4" | 4'-7½" | 1 3/4" | WHITE | ANODIZED DARK BRONZE | ALUM. | 0.45 | AWNING DOUBLE HUNG |

## WINDOW SCHEDULE @ UPPER LEVEL

| WINDOW TYPE | LOCATION | MODEL# | MIN WIDTH | MIN HEIGHT | THICKNESS | INTERIOR | EXTERIOR | MATERIAL | J-FACTOR | TYPE |
|---|---|---|---|---|---|---|---|---|---|---|
| A | CHIEF ADMIN<br>CHIEF<br>CAPTAIN<br>CAPTAIN<br>PATROL<br>SERGEANT<br>DETECTIVES<br>BREAK<br>LOBBY | – | 3'-9" | 8'-0" | 1 3/4" | WHITE | ANODIZED DARK BRONZE | ALUM. | 0.45 | AWNING FIXED W/ CASEMENT |
| B | EVIDENCE HALL | – | 3'-4" | 4'-7½" | 1 3/4" | WHITE | ANODIZED DARK BRONZE | ALUM. | 0.34 | AWNING FIXED |
| C | LIEUTENANT<br>TRAINING ROOM | – | 4'-3" | 8'-0" | 1 3/4" | WHITE | ANODIZED DARK BRONZE | ALUM. | 0.34 | AWNING FIXED |
| D | LIEUTENANT<br><br>TRAINING ROOM | – | 1'-11" | 8'-0" | 1 3/4" | WHITE | ANODIZED DARK BRONZE | ALUM. | 0.34 | AWNING FIXED |




A — ALUMINUM STORE FRONT WINDOW, DOUBLE PANE, INSULATED, THERMALLY BROKEN, WITH CASEMENT.

A1 — INFILL LOWER LIGHTS AS PART OF THE SALLY PORT ADD ALT

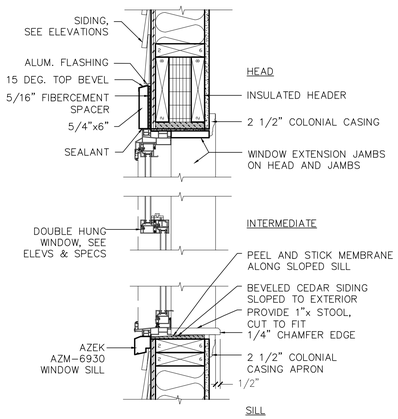
B — DOUBLE HUNG, DOUBLE PANE, INSULATED, THERMALLY BROK

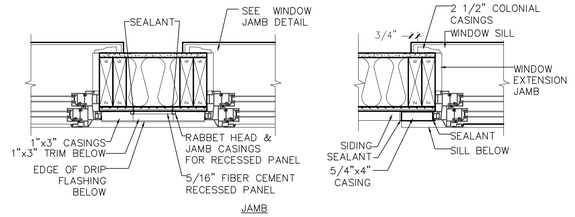
C — ALUMINUM STORE FRONT, WINDOW, DOUBLE PANE, INSULATED, THERMALLY BROKEN

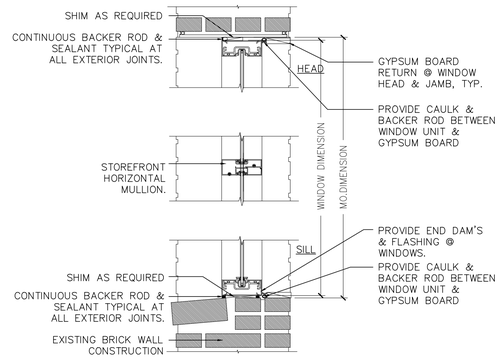
D — ALUMINUM STORE FRONT, WINDOW DOUBLE PANE, INSULATED, THERMALLY BROKEN

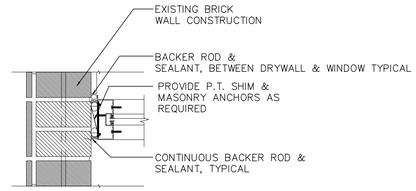
### WINDOW TYPES
SCALE: 1" = 1'-0"

NOTE: INSULATE & PROVIDE THERMAL BREAK




## ABBREVIATIONS

| | |
|---|---|
| FTYPE | FRAME TYPE |
| FMATL | FRAME MATERIAL |
| HM | HOLLOW METAL |
| WD | WOOD |
| SP | SINGLE PANE, SAFETY GLAZING |
| MT | INSULATED METAL |
| IGU | INSULATED GLAZING UNIT |
| EXST | EXISTING |

WINDOWS GENERAL NOTES:

1.) ALL NEW WINDOWS ARE SHOWN FOR DIAGRAMMATIC PURPOSES ONLY. CONTRACTOR TO COORDINATE w/ OWNER FOR THE PURCHASE OF REPLACEMENT WINDOWS AS REQ'D AND INSTALL PER MANUFACTURER'S INSTRUCTIONS. CONTRACTOR TO CONFIRM ALL DIMENSIONS IN-FIELD.

2.) CONTRACTOR TO ENSURE NEW WINDOWS ARE COMPLIANT WITH RHODE ISLAND STATE ENERGY CODE, 2025. CONTRACTOR RESPONSIBLE FOR PROVIDING A WEATHER-TIGHT INSTALLATION.

3.) NEW WINDOWS ARE TO BE MOUNTED AT THE SAME SILL HEIGHTS AS THE EXISTING.

4.) PROVIDE PAN FLASHING & BACK DAM.

5.) GLAZING TO BE ⅝" DOUBLE-GLAZED IGU. MAXIMUM U-VALUE: 0.34 FOR FIXED WINDOWS, 0.45 OPERABLE, & 0.63 FOR DOORS.

6.) INSTALL 4 ½" METAL FRAME STOREFRONT WITH THERMAL BREAK TO MATCH EXISTING,YKKAP MODEL 35 - IMPACT RESISTANT & BLAST MITIGATING MEDIUM STILE ENTRANCE.


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
WINDOW LEGEND AND SCHEDULE

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS

PROJECT NUMBER:
#2415

SHEET NUMBER:
A6.2

REV:
~

## FINISH SCHEDULE @ BASEMENT LEVEL

| ROOM NAME | FL-FIN | WL-BASE | WL-MATL | WL-FIN | CLG-HGT | CLG-TYPE | CLG-FIN | REMARKS |
|---|---|---|---|---|---|---|---|---|
| 001 ELEVATOR LOBBY | CONC | VB | CONC/BR/GWB | PT | 7'-2" | GYP | PT | 2 |
| 002 LOWER LOBBY | EXST | VB | GWB/BR/CMU | PT | VARIES | ACT | PRE | 1 |
| 003 HALLWAY 1 | EXST | VB | CMU/GWB | PT | 7'-2" | ACT | PRE | 1 |
| 004 HALLWAY 2 | EXST | VB | BR/GWB | PT | 7'-2" | ACT | PRE | 1 |
| 005 INTERVIEW | VCT | VB | BR/GWB/CMU | PT | 7'-2" | ACT | PRE | 1 |
| 006 FEMALE CELL | EXST | VB | CMU | PT | 7'-2" | R | PRE | 1 3 |
| 007 EXPANSION TANK | EXST | VB | BR/CMU | PT | 7'-2" | EXST | – | 1 |
| 008 PRISONER PROCESSING | VCT | VB | BR/GWB | PT | 7'-2" | ACT | PRE | 1 |
| 009A-B MALE CELLS | EXST | VB | CMU | PT | 7'-2" | R | PRE | 1 3 |
| 010 YOUTH CELLS | EXST | VB | CMU | PT | 7'-2" | R | PRE | 1 3 |
| 011 PRIS. PROCESSING 2 | VCT | VB | BR/GWB/CMU | PT | 7'-2" | ACT | PRE | 1 |
| 012 ELECTRICAL | EXST | VB | BR/CMU | PT | 7'-2" | EXST | – | |
| 013 ELEC. LIFE SAFETY | EXST | VB | BR/CMU | PT | 7'-2" | EXST | – | |
| 014 HALLWAY 3 | VCT | VB | BR/GWB/CMU | PT | 7'-2" | ACT | PRE | 1 3 |
| 015 WEAPONS | EXST | VB | CMU/GWB | PT | 7'-2" | BRF | – | 1 |
| 016 STORAGE | EXST | VB | BR | PT | 7'-2" | EXST | – | 1 |
| 017 STORAGE | VCT | VB | BR/GWB | PT | 7'-2" | ACT | PRE | 1 |
| 018 UTILITY | EXST | VB | BR/GWB | PT | 7'-2" | EXST | – | |
| 019 WOMEN'S LOCKER ROOM | VCT | VB | BR/GWB | PT | 7'-2" | ACT | PRE | 1 |
| 020 STORAGE ROOM 2 | EXST | VB | BR/GWB | PT | 7'-2" | EXST | – | 1 |
| 021 MEN'S LOCKER ROOM | VCT | VB | BR/GWB/CMU | PT | 7'-2" | ACT | PRE | 1 |
| 022 ARMORY | EXST | VB | BR/GWB/CMU | PT | 7'-2" | BRF | – | 1 |
| 023 EXIT STAIR | VCT | VB | BR/GWB/CMU | PT | VARIES | ACT | PRE | 1 2 |
| 024 STORAGE | VCT | VB | BR/GWB | PT | VARIES | ACT | PRE | 1 |
| 025 WEIGHT AREA/TRAINING | VCT | VB | BR/GWB | PT | 9'-6" | GYP | PT | 1 |
| 026 BAIL | VCT | VB | BR/GWB | PT | 10'-10.5" | GYP | PT | 1 |
| 027 JANITOR'S CLOSET | CONC | VB | BR/GWB | PT | 10'-10.5" | GYP | PT | 1 |
| 028 SALLY PORT | CONC | – | – | – | – | – | – | |

## FINISH SCHEDULE @ FIRST FLOOR

| ROOM NAME | FL-FIN | WL-BASE | WL-MATL | WL-FIN | CLG-HGT | CLG-TYPE | CLG-FIN | REMARKS |
|---|---|---|---|---|---|---|---|---|
| 101 STAIR & FOYER | VCT | WD | BR/GWB/WD | PT | VARIES | EXST | PT | 1 |
| 102 ELEVATOR LOBBY | CPT | VB | BR/GWB | | TO STRUCT. | GWB | PT | 2 |
| 103 LOBBY | VCT | VB | GWB | PT | 10'-6.5" | EXST | PT | |
| 104 DISPATCH | CPT | VB | GWB | PT | 10'-6.5" | EXST | PT | 1 |
| 105 PATROL | CPT | VB | GWB | PT | 10'-6.5" | EXST | PT | 1 |
| 106 LIEUTENANT | CPT | VB | GWB | PT | 10'-6.5" | EXST | PT | 1 |
| 107 JANITOR'S CLOSET | VCT | VB | GWB | PT | 10'-6.5" | EXST | PT | 1 |
| 108 MALE BATHROOM | VCT | VB | GWB | PT | 10'-6.5" | EXST | PT | 1 |
| 109 FEMALE BATHROOM | VCT | VB | GWB | PT | 10'-6.5" | EXST | PT | 1 |
| 110 IT | EXISTING | VB | GWB | PT | --- | ACT | | 1 |
| 111 BREAK | VCT | VB | GWB | PT | 10'-6.5" | EXST | PT | 1 |
| 112 DETECTIVES | CPT | VB | GWB | PT | 10'-6.5" | EXST | PT | 1 |
| 113 CONFERENCE | WD-E | WD | GWB | PT | 10'-6.5" | EXST | PT | 1 2 |
| 114 CHIEF | WD-E | WD | GWB | PT | 10'-6.5" | EXST | PT | 1 |
| 115 CHIEF ADMIN | WD-E | WD | GWB | PT | 10'-6.5" | EXST | PT | 1 |
| 116 CAPTAIN | WD-E | WD | GWB | PT | 10'-6.5" | EXST | PT | 1 |
| 117 CAPTAIN | WD-E | WD | GWB | PT | 10'-6.5" | EXST | PT | 1 |
| 118 INTERVIEW | WD-E | WD | GWB | PT | 10'-6.5" | EXST | PT | 1 |
| 119 COMMAND LOBBY | WD-E | WD | GWB | PT | 10'-6.5" | EXST | PT | 1 |
| 120 EXIT STAIR | VCT | VB | GWB | PT | VARIES | ??? | PT | 1 |
| 121 EVIDENCE HALL | VCT | VB | GWB | PT | 8' | ACT | | 1 |
| 122 EVIDENCE | VCT | VB | GWB | PT | 8' | ACT | | 1 |
| 123 EVIDENCE RPOCESSING | VCT | VB | GWB | PT | 8' | ACT | | 1 |
| 124 RECORDS | VCT | VB | GWB | PT | 8' | ACT | | 1 |
| 125 CASH OFFICE | CPT | VB | GWB | PT | 8' | ACT | | 1 |
| 126 STORAGE | VCT | VB | GWB | PT | 8' | ACT | | 1 |
| 127 JUDGE CHAMBERS | CPT | VB | GWB | PT | 8' | ACT | | 1 |
| 128 ADA RESTROOM | VCT | VB | GWB | PT | 8' | ACT | | 1 |
| 129 ADA RESTROOM | VCT | VB | GWB | PT | 8' | ACT | | 1 |
| 130 MUNICIPAL CRT/TRAINING | VCT | VB | GWB | PT | 8' | ACT | | 1 |
| 131 POLICE HALLWAY | VCT | VB | GWB | PT | 8' | EXST | PT | 1 |
| 132 STORAGE | EXST | EXST | GWB | PT | 10'-6.5" | EXST | PT | |
| 133 SERGENT | CPT | VB | GWB | PT | 10'-6.5" | EXST | PT | 1 |
| 134 CHIEF'S LOBBY | WD-E | WD | GWB | PT | 10'-6.5" | EXST | PT | 1 |

### ABBREVIATIONS:

| | |
|---|---|
| --- | "AS IS" OR NO FINISH |
| ACT | ACOUSTIC CEILING TILE |
| CMU | CONCRETE MASONRY UNIT |
| PT | PAINT |
| PRE | PREFINISHED |
| GWB | GYPSUM WALL BOARD |
| VB | VINYL BASE |
| GL | GLASS |
| MTL | METAL |
| BR | MASONRY BRICK |
| BRF | BULLET RESISTANT FIBERGLASS PANEL |

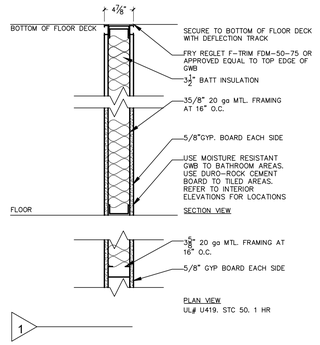
### TYPICAL NOTES

1 EXISTING: PREPARE & PAINT FINISH
2 INTERIOR EXPOSED BRICK TO REMAIN UNPAINTED
3 NEW CMU WALLS PAINTED

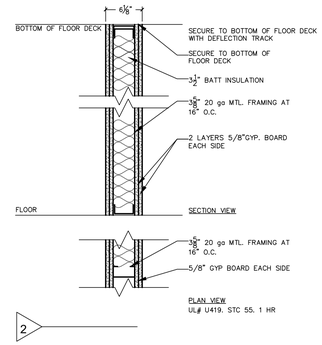
## FINISH SPECIFICATIONS

| CODE | TYPE | MANUFACTURER | PRODUCT | SIZE | FINISH | COLOR | NOTES |
|---|---|---|---|---|---|---|---|
| FLOORING FINISHES | | | | | | | |
| VCT | VINYL COMPOSITE TILE | ARMSTRONG | EXCELON FLOORING, STONETEX TILE | | – | | |
| CPT | CARPET MODULAR TILE | SHAW CONTRACT GROUP | DIRECTION TILE 5T071 | | – | | |
| WD-E | EXISTING REFINISHED WOOD FLOOR | – | | | CLEAR | | |
| LVT | LUXURY VINYL TILE | – | | | – | | |
| CONC | SEALED CONCRETE WITH CAULKED JOINTS | – | | | – | | |
| CT | CERAMIC FLOOR TILES | DAL TILES | | 12X12 | | | |
| W-0 | WALK-OFF MATT | FORBO | CORAL | 24X24 | | | |
| TRANSITION STRIPS | | | | | | | |
| TS-1 | CPT-W-0 | SCHULTER | CTA-XX-HT 1/4" TO 0.080" | | – | | |
| TS-2 | VCT-EXST | SCHULTER | RRS-XX-B 0.080" TO FLOOR | | – | | |
| TS-3 | CPT – EXST | SCHULTER | | | – | | |
| TS-4 | VCT-CT | SCHULTER | CTA-XX-HT 1/4" TO 0.080" | | – | | |
| TS-5 | VCT-WD | JOHNSONITE | RRS-XX-B 0.080" TO FLOOR | | – | | |
| TS-6 | VCT-CONC | SCHULTER | | | – | | |
| TS-7 | CPT-VCT | JOHNSONITE | | | – | | |
| N-1 | RUBBER NOSING | JOHNSONITE | SA-XXX RUBBER STAIR TREADS WITHOUT INTEGRATED RISER | | TEXTURE: SERVICE WEIGHT SAFE-T-GRIP | | |
| WALL MATERIAL | | | | | | | |
| GWB | GYPSUM WALL BOARD | – | | 1/2" THICK | PAINTED | | |
| GWF1 | GYPSUM FIRE 1HR RATED | CERTAINTEED | | | PAINTED | | |
| T-1 | CERAMIC WALL TILE | DAL TILES | SUBWAY TILE | 3"X6" | SEMI-GLOSS | 019D ARCTIC WHITE | |
| T-2 | CERAMIC WALL TILE | DAL TILES | SUBWAY TILE | 3"X6" | SEMI-GLOSS | | |
| T-3 | CERAMIC WALL TILE | DAL TILES | | | | | |
| WALL BASE | | | | | | | |
| VB | VINYL BASE | ARMSTRONG | | 1/2" THICK | – | | |
| W-1 | WOOD BASE | CUSTOM | | | PAINTED* | | |
| WALL TRIM | | | | | | | |
| W-2 | WOOD TRIM | CUSTOM | | | PAINTED* | | TO MATCH EXISTING TRIM |
| W-3 | WOOD TRIM | CUSTOM | | | PAINTED* | | TO MATCH EXISTING TRIM |
| CEILING | | | | | | | |
| CT | EXISTING | | | | | | |
| GYP | GYPSUM | | | 1/2" THICK | PAINTED | | |
| ACT | ACOUSTIC CEILING TILE | CERTAINTEED | PERFORMA 'OPEN PLAN' | 24"X24"X1" | PREFINISHED | | |
| BA | BULLET RESISTANT FIBERGLASS PANEL | ARMORCORE | LEVEL: 7 | 1-1/8" | – | | |
| TA | TAMPER RESISTANT CEILING | ARMSTRONG | METALWORKS SECURELOCK PLUS | 12" | PREFINISHED | WHITE (WH) | |

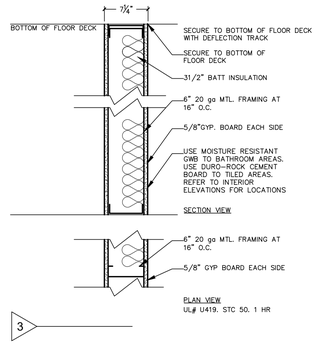
*EXCEPT WHERE NOTED AS STAINED/CLEAR COATED FINISH



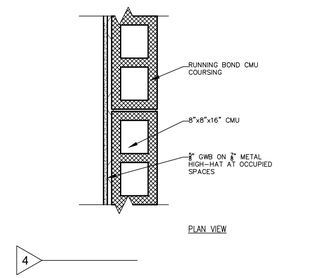

1
WALL TYPE
NON-RATED INTERIOR PARTITION



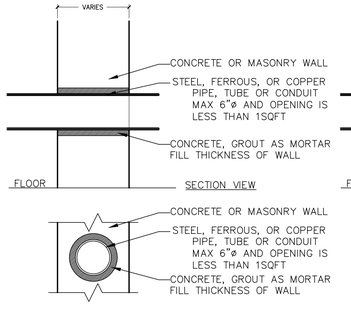

2
WALL TYPE
1 HR UNIT TO CORRIDOR DEMISING WALL



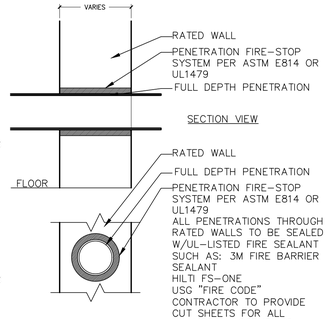

3
WALL TYPE
1 HR PLUMBING WALL



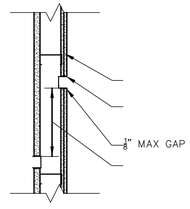

4
WALL TYPE
2 HR CMU BLOCK WALL




PENETRATION DETAIL
2 HR RATED WALL
OPTION 1




PENETRATION DETAIL
2 HR RATED WALL
OPTION 2





Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
FINISH SCHEDULE AND WALL TYPES

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MM / SS

PROJECT NUMBER:
#2415

SHEET NUMBER: A6.3
REV: ~

## EXPANSION TANK SCHEDULE

| SYMBOL | MANUFACTURER | MODEL # | CAPACITY | MAX. ACCEPT. FACTOR | CW SUPPLY | REMARKS |
|---|---|---|---|---|---|---|
| ET-1 | AMTROL | ST-5 | 2 GALLONS | .45 | 3/4" | THERM-X-TROL, IN-LINE, MAX. OPERATING TEMPERATURE – 200°F, MAX. WORKING PRESSURE – 150 PSIG, CHARGE TO CITY WATER PRESSURE. |

NOTES: INSTALL PER ALL RI CODE AND MANUFACTURER'S INSTALLATION REQUIREMENTS.

## THERMOSTATIC MIXING VALVE SCHEDULE

| SYMBOL | MANUFACTURER | MODEL # | FLOW RATE | WATER SUPPLY | | REMARKS |
|---|---|---|---|---|---|---|
| | | | | INLETS | OUTLET | |
| TMV-1 | SYMMONS | 7-200 | 7.6 GPM | 1¼" | 1¼" | SET TEMPERATURE TO 115°F, MAX DIFF. PRESSURE = 10 PSI. PROVIDE WALL MOUNTING BRACKET. |

NOTE: INSTALL PER RI CODE AND MANUFACTURER'S REQUIREMENTS.

## PUMP SCHEDULE

| SYMBOL | MANUFACTURER | MODEL # | CAPACITY | | | ELECTRICAL | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | GPM | HEAD | HP | AMPS | VOLTS | PHASE | HZ | RPM | |
| RP-1 | TACO | 005 | 19 | 9 | 1/35 | .52 | 115 | 1 | 60 | – | CAST IRON CASING, STAINLESS STEEL CARTRIDGE, 125 PSI MAX. INSTALL ON 120°F HOT WATER RETURN SYSTEM. |
| RP-2 | TACO | 005 | 19 | 9 | 1/35 | .52 | 115 | 1 | 60 | – | CAST IRON CASING, STAINLESS STEEL CARTRIDGE, 125 PSI MAX. INSTALL ON 120°F HOT WATER RETURN SYSTEM. |
| SP-1 | STANCOR | SE-50 | 55 | 15' | 1/2 | 8 | 115 | 1 | 60 | 3800 | "OIL MINDER" SUBMERSIBLE PUMP, NEMA 4X ENCLOSURES, STAINLESS STEEL SENSOR PROBE, CONTROL PANEL. |

NOTES:
INSTALL PER ALL RI CODE AND MANUFACTURER'S INSTALLATION REQUIREMENTS. COORDINATE EXACT LOCATION OF PUMP & CONTROL PANEL WITH ARCHITECT & OWNER PRIOR TO INSTALLATION.

## WATER HEATER SCHEDULE

| SYMBOL | MANUFACTURER | MODEL # | CAPACITY | RECOVERY | | WATER SUPPLY | | GAS | ELECTRICAL | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | GPH | △T | CW | HW | CFH | AMPS | WATTS | VOLTS | PHASE | HZ | |
| GWH-1 | STATE | SUF60 120NE | 60 | 138 | 100° | 1¼" | 1¼" | 120 | – | – | 120 | 1 | 60 | CONDENSING HIGH EFFICIENCY GAS FIRED TANK TYPE WATER HEATER, 1¼" GAS CONNECTION, 4" PVC INTAKE & EXHAUST FLUES, 4.4"W.C. 95% EFFICIENCY COORDINATE EXACT LOCATION WITH ARCHITECT PRIOR TO INSTALLATION. |

NOTE: PROVIDE CONDENSATE NEUTRALIZER #9007959005 FOR GWH-1. PROVIDE 4" CONCENTRIC VENT TERMINATION KIT #9006328005. INSTALL PER ALL RI CODE AND MANUFACTURER'S INSTALLATION REQUIREMENTS.

## DRAIN SCHEDULE

| SYMBOL | TYPE | MANUFACTURER | MODEL | OUTLET | STRAINER | REMARKS |
|---|---|---|---|---|---|---|
| FD-1 | FLOOR DRAIN | WATTS | FD-100-A | 2" | 6"ø NICKEL BRONZE | CAST IRON BODY, NO-HUB, ADJUSTABLE STRAINER, VANDAL PROOF, TRAP SEAL GASKET. |
| FD-2 | FLOOR DRAIN | WATTS | FD-100-B | 2" | 6"ø NICKEL BRONZE | CAST IRON BODY, NO-HUB, ADJUSTABLE STRAINER, VANDAL PROOF, SEDIMENT BUCKET, TRAP SEAL GASKET. |
| RD-1 | ROOF DRAIN | WATTS | 200C4-0FS | 4" | 14" CAST IRON DOME | CAST IRON BODY, NO-HUB, FLASHING CLAMP, STRAINER. |

NOTE: ALL FLOOR DRAINS SHALL HAVE SEAL GASKETS EQUAL TO "SURE-SEAL". INSTALL PER ALL RI CODE AND MANUFACTURER'S INSTALLATION REQUIREMENTS.

## PLUMBING FIXTURE SCHEDULE

| SYMBOL | DESCRIPTION | FIXTURE | | | | FIXTURE | | | SERVICES | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MANUFACTURER | MODEL | TYPE | SIZE | MANUFACTURER | MODEL | TYPE | S/W | V | CW | HW | TW | |
| P-1 | WATER CLOSET – ADA | AMERICAN STANDARD | 2854.128 | FLOOR MOUNTED | 1.28 GPF | AMERICAN STANDARD | 6047.121 | MANUAL FLUSH VALVE | 4" | 2" | 1" | – | – | VITREOUS CHINA, ELONGATED, LOW CONSUMPTION. AMERICAN STANDARD #5901.100 OPEN FRONT SEAT. |
| P-1A | WATER CLOSET – ADA | AMERICAN STANDARD | 215AA.104 | FLOOR MOUNTED | 1.28 GPF | AMERICAN STANDARD | – | TANK TYPE | 4" | 2" | 1" | – | – | VITREOUS CHINA, ELONGATED, LOW CONSUMPTION. AMERICAN STANDARD #5321.110 OPEN FRONT SEAT. |
| P-1B | WATER CLOSET | AMERICAN STANDARD | 2855.128 | FLOOR MOUNTED | 1.28 GPF | AMERICAN STANDARD | 6047.121 | MANUAL FLUSH VALVE | 4" | 2" | 1" | – | – | VITREOUS CHINA, ELONGATED, LOW CONSUMPTION. AMERICAN STANDARD #5321.110 OPEN FRONT SEAT. |
| P-2 | LAVATORY– ADA | AMERICAN STANDARD | 0495.221 | COUNTER MOUNTED | 17⅜"x14½" | CHICAGO | 3501–E2805ABCP | MANUAL | 1–1/2" | 1–1/2" | 1/2" | 1/2" | – | VITREOUS CHINA, UNDERCOUNTER MOUNTED, SINGLE HOLE. 0.5 GPM, METERING FAUCET W/ INTERNAL TEMPERATURE CONTROL MIXER. PROVIDE GRID DRAIN ASSEMBLY. PROVIDE CHROME PLATED HEAVY DUTY OFFSET P-TRAP, SUPPLIES & STOPS. |
| P-3 | URINAL – ADA | TOTO | UT105U | WALL HUNG | – | TOTO | TEU1UN12#CP | MANUAL | 2" | 2" | 1/2" | 1/2" | – | VITREOUS CHINA, TOP-SPUD FLUSH VALVE, LOW CONSUMPTION. PROVIDE WALL CARRIER. PROVIDE HEAVY DUTY CHROME PLATED SUPPLY & STOP. BARRIER FREE, ADA COMPLIANT |
| P-4 | SHOWER | AQUATIC | 1363CM | ENCLOSURE | 36"x36"x75" | SYMMONS | 3501–CYL–B–X–1.5 | MANUAL | 2" | 2" | 1/2" | 1/2" | – | 3–PIECE SHOWER, GELCOAT, CENTER GRID DRAIN. TEMPTROL PRESSURE–BALANCING MIXING VALVE W/ ADJUSTABLE STOP SCREW TO LIMIT HANDLE TURN. 1.5 GPM, SHOWER HEAD WITH ARM & FLANGE. |
| P-4A | SHOWER – ADA | AQUATIC | 1363BFSC | ENCLOSURE | 36"x36"x75" | SYMMONS | C–96–500–B30–V–X–1.5 | MANUAL | 2" | 2" | 1/2" | 1/2" | – | TRANSFER SHOWER, GELCOAT, CENTER GRID DRAIN, GRAB BARS, FOLD–UP SEAT. TEMPTROL PRESSURE–BALANCING MIXING VALVE W/ ADJUSTABLE STOP SCREW TO LIMIT HANDLE TURN. 1.5 GPM, SHOWER HEAD WITH ARM & FLANGE & HAND SHOWER SYSTEM. BARRIER FREE, ADA COMPLIANT. |
| P-5 | SINK | ELKAY | LRAD221960 | COUNTER MOUNTED | 22"x19½"x6" | SYMMONS | SPP–3510–1.0 | MANUAL | 2" | 1–1/2" | 1/2" | 1/2" | – | STAINLESS STEEL, DROP–IN, 6" DEEP, THREE HOLE, DECK PLATE, 1.0 GPM LEVER FAUCET. PROVIDE CHROME PLATED HEAVY DUTY P–TRAP W/ CLEANOUT & DISHWASHER CONNECTION (AS REQUIRED), SUPPLIES & STOPS. |
| P-6 | COMBINATION LAV/WC – ADA | METCRAFT | HET3155–X–HC | FLOOR MOUNTED | 1.28GPF | SLOAN | 952–1.28 | MANUAL | 4" | 2" | 1–1/4" | 1/2" | – | INSTITUTIONAL FLOOR MOUNTED, WALL OUTLET, STAINLESS STEEL CABINET AND TOILET BOWL – REFER TO PLANS FOR ORIENTATION. PROVIDE SUICIDE PREVENTIVE SKIRT, RECTANGULAR BASIN, FAST DRAIN, ELECTRONIC VALVE W/ HEMISPHERICAL PUSH BUTTON, HEMISPHERICAL SPOUT, MIRROR FINISH SEAT, SECURITY FRAME. 42" GRAB BAR W/ CLOSURE PLATE & FIXTURE GRAB BAR W/ CLOSURE PLATE. PROVIDE EXTENSIONS FOR GRAB BARS AS REQUIRED TO SECURE TO WALLS. BARRIER FREE, ADA COMPLIANT. |
| P-6A | COMBINATION LAV/WC | METCRAFT | HET3118–45 | FLOOR MOUNTED | 1.28GPF | SLOAN | 952–1.28 | MANUAL | 4" | 2" | 1–1/4" | 1/2" | – | INSTITUTIONAL FLOOR MOUNTED, WALL OUTLET, STAINLESS STEEL CABINET AND TOILET BOWL – REFER TO PLANS FOR ORIENTATION. PROVIDE SUICIDE PREVENTIVE SKIRT, RECTANGULAR BASIN, FAST DRAIN, ELECTRONIC VALVE W/ HEMISPHERICAL PUSH BUTTON, HEMISPHERICAL SPOUT, MIRROR FINISH SEAT, SECURITY FRAME. |
| P-7 | SERVICE SINK | FIAT | MSB2424 | FLOOR MOUNTED | 24"x24"x12" | CHICAGO | 540–LD897SGCCP | MANUAL | 2" | 2" | 1/2" | 1/2" | – | FLOOR MOUNTED, WALL MOUNTED CHROME PLATED LEVER FAUCET, VACUUM BREAKER. PROVIDE SPLASH GUARD, MOP & HOSE BRACKETS. |
| P-8 | DRINKING FOUNTAIN | HALSEY TAYLOR | HCRFEBP | WALL HUNG | SINGLE LEVEL | – | – | – | 1–1/2" | 1–1/2" | 1/2" | – | – | FACE MOUNTED WATER FOUNTAIN, ONE PIECE, STAINLESS STEEL, BARRIER FREE, ADA COMPLIANT. |
| HB-1 | HOSE BIBB | JR SMITH | 5670–H–CP | WALL MOUNTED | 3⅛"x2¾" | – | – | – | – | – | 1/2" | – | – | BRASS BODY, VACUUM BREAKER AND REMOVABLE WHEEL HANDLE. |

NOTES:
1. ALL ADA FIXTURES SHALL BE INSTALLED PER ADA REQUIREMENTS.
2. ALL PLUMBING FIXTURES, EQUIPMENT & ACCESSORIES SHALL BE INSTALLED PER RI CODE AND MANUFACTURER'S REQUIREMENTS.

## GENERAL NOTES

1. GENERAL NOTES, SYMBOLS LIST AND DETAILS ARE APPLICABLE TO ALL PLUMBING DRAWINGS.
2. DRAWINGS ARE DIAGRAMMATIC: DETERMINE LOCATIONS OF SYSTEMS AND COMPONENTS IN FIELD. DO NOT SCALE DRAWINGS.
3. NEITHER ACCURACY NOR COMPLETION OF UTILITY LOCATIONS SHOWN ON DRAWINGS IS GUARANTEED. DETERMINE EXACT LOCATIONS OF EXISTING UTILITIES IN FIELD, WHETHER OR NOT SHOWN ON DRAWINGS. EXERCISE CAUTION AND IDENTIFY LOCATIONS OF UNMARKED UTILITY LINES AS NECESSARY TO PERFORM WORK OF THIS SECTION.
4. ALL PLUMBING WORK SHALL BE IN ACCORDANCE WITH THE PRESIDING PLUMBING CODE AND ALL APPLICABLE LOCAL CODES.
5. IT SHALL BE THE RESPONSIBILITY OF THIS CONTRACTOR TO COORDINATE WORK WITH THAT OF ALL OTHER TRADES, INCLUDING (BUT NOT LIMITED TO), ELECTRICAL, HVAC, FIRE PROTECTION, STRUCTURAL AND GENERAL ARCHITECTURE.
6. ANY INTERFERENCE SHALL BE BROUGHT TO THE ATTENTION OF THE CONSTRUCTION MANAGER, GENERAL CONTRACTOR, AND/OR THE OWNER'S REPRESENTATIVE, AND RESOLVED PRIOR TO THE INSTALLATION OF THE WORK INVOLVED.
7. ALL PIPING PENETRATING CEILINGS AND WALLS SHALL BE INSTALLED WITH CHROME (STAINLESS WHERE NOTED) PLATED ESCUTCHEONS AT THE PENETRATION. ALL PIPING PENETRATING EXTERIOR WALLS AND ROOFS SHALL BE FLASHED AS REQUIRED AND SHALL BE SEALED WEATHERTIGHT. PIPING PENETRATING FIRE RATED PARTITIONS SHALL BE PROTECTED WITH UL LISTED SEALS OF EQUAL RATING.
8. MANUFACTURERS' MODEL NUMBERS ARE SPECIFIED SOLELY TO ESTABLISH STANDARDS OF QUALITY FOR PERFORMANCE AND MATERIALS.
9. ALL PRODUCT INSTALLATION SHALL ADHERE TO THE MANUFACTURERS' RECOMMENDATIONS.
10. PROVIDE ACCESS PANELS FOR ALL EQUIPMENT THAT REQUIRES PERIODIC SERVICE AND FOR ALL VALVES.
11. TOPS OF ALL FLOOR DRAINS AND CLEANOUTS SHALL BE SET FLUSH WITH FINISHED FLOOR. ALL PIPING ABOVE GRADE SHALL BE PROPERLY SUPPORTED BY THE BUILDING STRUCTURE AND SHALL NOT REST ON CEILING TILES OR CEILING STRUCTURE.
12. CONTRACTOR SHALL COORDINATE ELECTRICAL CHARACTERISTICS AND REQUIREMENTS OF ALL PLUMBING EQUIPMENT WITH THE ELECTRICAL DRAWINGS, AND SHALL FURNISH EQUIPMENT WIRED FOR THE VOLTAGES SHOWN HEREIN.
13. PROVIDE SHUTOFF VALVES ON ALL BRANCH PIPING AND SUPPLIES TO INDIVIDUAL FIXTURES AND EQUIPMENT. PROVIDE BALL VALVES ON ALL WATER MAIN BRANCHES IN CORRIDORS AND WHERE INDICATED ON DRAWINGS. ALL VALVES SHALL BE ACCESSIBLE.
14. ALL SLEEVES THROUGH CONCRETE FLOORS AND ALL CORE DRILLING OF CONCRETE FLOORS AND WALLS SHALL BE BY THIS CONTRACTOR. CONCRETE PADS AND PLATFORMS FOR WORK OF THIS SECTION WILL BE PROVIDED BY GENERAL CONTRACTOR. PROVIDE INFORMATION AS NECESSARY TO COORDINATE WORK.
15. RUN PIPING CONCEALED WHERE POSSIBLE, UNLESS SPECIFIED OTHERWISE.
16. STRUCTURAL WELDING SHALL BE 1/4–INCH FILLET UNLESS REQUIRED OTHERWISE.
17. PROVIDE CLAMPS, OFFSETS, EXPANSION JOINTS, ANCHORS AND GUIDES AS NECESSARY TO PREVENT STRESS ON PIPING.
18. PROVIDE BALANCING VALVES AT SYSTEM LOOP RETURNS AND AT RETURN RISERS, PROVIDE SHUTOFF VALVES AT SYSTEM LOOP SUPPLIES AND SUPPLY RISERS.
19. PROVIDE VENTS AT HIGH POINTS IN PIPING SYSTEMS AND DRAIN VALVES AT LOW POINTS.
20. PROVIDE GAUGE FITTINGS AND THERMOMETER WELLS AT HOT WATER SUPPLY AND RETURN BRANCHES AND AT PUMP INLETS AND OUTLETS.
21. VERIFY EXACT SIZES, LOCATIONS, INVERTS AND ELEVATIONS PRIOR TO RUNNING ANY PIPING. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS OF ALL FIXTURES AND EQUIPMENT.
22. PIPE SUPPORTS FOR PLUMBING IN BUILDING SHAFTS ARE BY THIS CONTRACTOR. CAREFULLY COORDINATE WITH PLACEMENT OF STEEL GRATE SUPPORT BEAMS. SHAFT PIPE SUPPORT SHALL BEAR FROM WALL AND FROM FLOOR SUPPORT BEAMS.
23. GENERAL FLOOR CONTROL VALVES OF PIPED SERVICES SHALL BE IN THE PIPE SHAFTS UNLESS OTHERWISE INDICATED.
24. OBTAIN GAS PERMITS AND DEFRAY ALL COSTS INCIDENTAL TO THE GAS PIPING SYSTEM. CONTRACTORS WORK SHALL COMMENCE ON THE HOUSE SIDE OF THE UTILITY COMPANY METER.
25. A SUITABLE DRIP OF CONDENSATE POCKET SHALL BE INSTALLED AT THE BOTTOM OF ALL GAS RISERS.
26. ALL GAS PIPING TO COMPLY WITH LOCAL AND STATE CODES.
27. GAS PIPING AND SAFETY DEVICES SHALL CONFORM TO REQUIREMENTS OF NFPA 54 AND SHALL BE SUBJECT TO THE INSPECTION AND APPROVAL OF THE AUTHORITY HAVING JURISDICTION.
28. PROVIDE A SUITABLE GAS COCK VALVE AT HOUSE SIDE OF METER AND EACH BRANCH RUNOUT FROM THE MAIN SERVING GAS OUTLETS AND INDIVIDUAL GAS FIXTURES.
29. GAS PIPING SHALL BE TESTED ACCORDING TO THE STATE FUEL GAS CODE AND NATIONAL CODE PROVISIONS OF THE LOCAL PLUMBING INSPECTOR. IF INSPECTION OF THE TEST SHOWS DEFECTS, SUCH DEFECTIVE WORK AND MATERIAL SHALL BE REPLACED AND INSPECTION AND TEST SHALL BE REDONE.
30. PLUMBING CONTRACTOR IS RESPONSIBLE FOR EXTENDING ALL REGULATOR VENTS TO ATMOSPHERE. REGULATORS ARE PART OF EQUIPMENT GAS TRAIN. PIPE ALL GAS TRAN VENTS FROM HVAC BOILERS TO ATMOSPHERE.
31. NO PIPING SHALL RUN OVER ELECTRICAL PANELS.
32. ALL EXTERIOR GAS PIPING SHALL BE PAINTED WITH TWO (2) COATS OF EPOXY BASED PAINT. COLOR TO MATCH EXISTING. REFER TO SPECIFICATION SECTION "PAINTING".
33. ALL PIPING THAT PENETRATES FLOORS OR FIRE RATED WALLS SHALL BE FIRE STOPPED W/ FIRE RATED CAULKING PER MANUFACTURERS RECOMMENDATIONS. REFER TO SPECIFICATION SECTION "PENETRATION FIRESTOPPING".
34. ELECTRICAL SUB CONTRACTOR IS RESPONSIBLE FOR PROVIDING POWER TO ALL EQUIPMENT AND CONTROLS WITHIN THE PLUMBING SYSTEMS FOR THIS PROJECT.

## PLUMBING LEGEND

| | | |
|---|---|---|
| | RE | REMOVE EXISTING PIPING & EQUIPMENT |
| | ETR | LIGHT LINE INDICATES EXISTING PIPING TO REMAIN |
| | CTE | CONNECT TO EXISTING |
| | CC | CUT & CAP |
| | V&C | VALVE & CAP |
| CW | CW | COLD WATER |
| CW | CW | COLD WATER BELOW FLOOR BURIED |
| HW | HW | HOT WATER |
| HWR | HWR | HOT WATER RECIRCULATION |
| S or W | S or W | SOIL OR WASTE |
| S/W | S or W | SOIL OR WASTE BELOW FLOOR OR BURIED |
| GW | GW OR (GW) | GARAGE WASTE |
| V | V | VENT |
| V | V | VENT BELOW FLOOR OR BURIED |
| AI | V | AIR INTAKE (WATER HEATER) |
| GV | V | GAS VENT (WATER HEATER) |
| G | G | NATURAL GAS |
| (G) | G | NATURAL GAS BELOW FLOOR OR BURIED |
| ST | ST | STORM (CONDUCTOR) DRAINAGE |
| | | CONTINUATION |
| | UP | PIPE RISE OR UP |
| | DN/DR | PIPE DOWN OR DROP/RISE |
| | | PIPE TEE |
| | | SHUT–OFF VALVE (WATER) |
| | | SHUT–OFF VALVE (GAS) |
| | | CHECK VALVE |
| | BVA | BALANCING VALVE ASSEMBLY |
| | W & T | WASTE & TRAP |
| | CO | CLEANOUT PLUG |
| | FCO | FLUSH FLOOR CLEANOUT |
| | WCO | WALL CLEANOUT |
| | | CAPPED PIPE |
| | | ARROW INDICATES DIRECTION OF FLOW |
| .01 | | ARROW INDICATES DIRECTION OF SLOPE |
| | | UNION |
| | HB | HOSE BIBB |
| | WH | WALL HYDRANT |
| | FD | FLOOR DRAIN |
| | EX | EXISTING |
| | IW | INDIRECT WASTE |
| | VTR | VENT THRU ROOF |
| | IE/INV | INVERT ELEVATION |
| | TYP | TYPICAL |
| | VIF | VERIFY EXACT LOCATION, SIZE & INVERT IN FIELD |
| | NC | NORMALLY CLOSED |
| | NTS | NOT TO SCALE |
| | AFF | ABOVE FINISHED FLOOR |
| | F.F.E. | FINSHED FLOOR ELEVATION |
| | LPC | LIMIT OF PLUMBING CONTRACT |
| | NIPC | NOT IN PLUMBING CONTRACT |
| | GC | GENERAL CONTRACTOR |
| | FPC | FIRE PROTECTION CONTRACTOR |
| | PC | PLUMBING CONTRACTOR |
| | EC | ELECTRICAL CONTRACTOR |
| | HVAC | HVAC CONTRACTOR |
| | F & I | FURNISH & INSTALL |
| | S=.01 | SLOPE = 1/8" PER FOOT |
| | S=.02 | SLOPE = 1/4" PER FOOT |


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street, N. Easton, MA 02356, T 508.230.0260, F 508.230.0265, ber@ber-engineering.com
Office Commons 95, 351 Centerville Road, Warwick, RI 02886, T 401.384.7682, www.ber-engineering.com


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
PLUMBING
LEGEND, NOTES, & SCHEDULES

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: AG

PROJECT NUMBER:
#2415

SHEET NUMBER: P0.1
REV: ~

BER # 24237

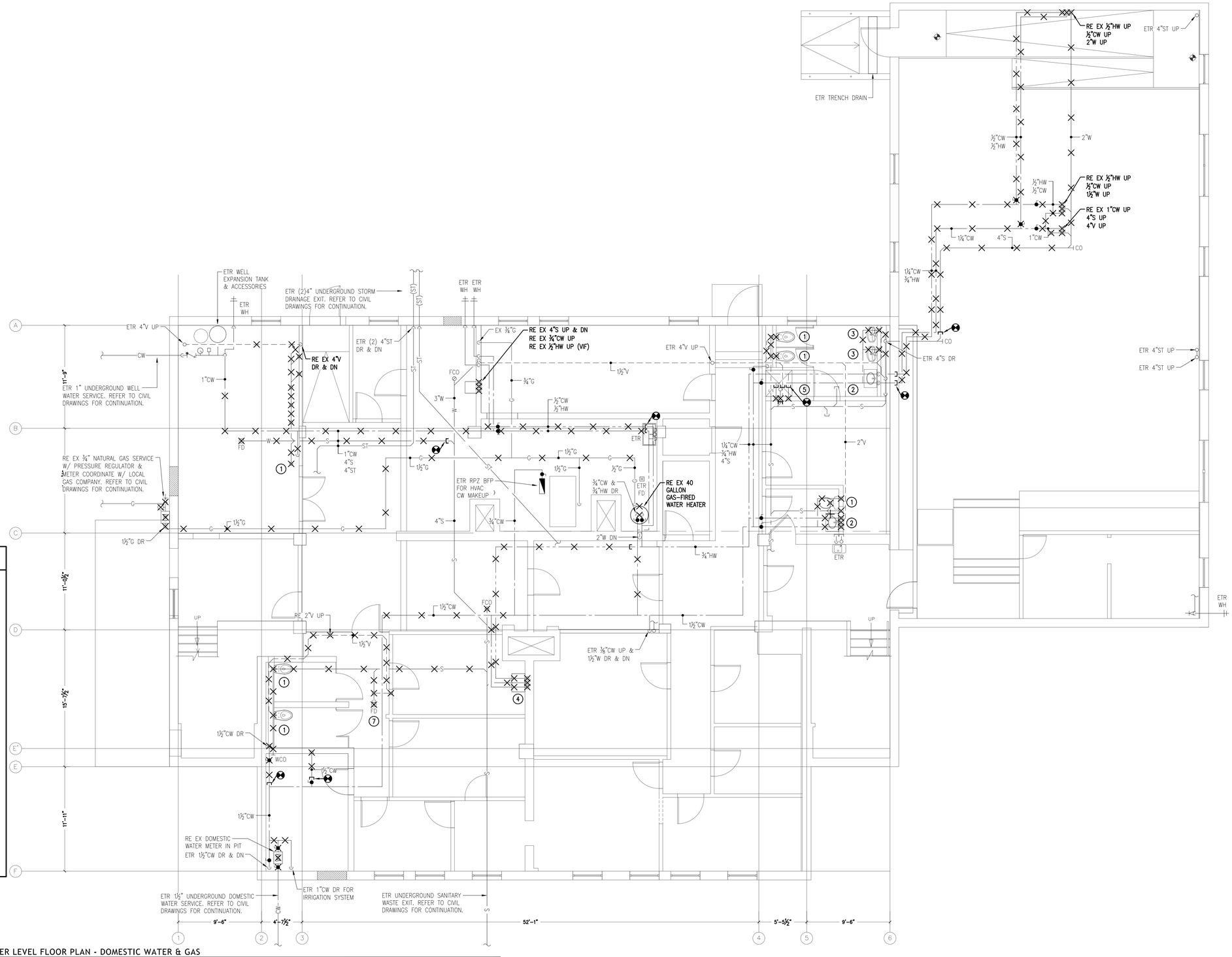
## PLUMBING DEMO KEYED NOTES

1. REMOVE AND DISCARD EXISTING FLOOR MOUNTED FLUSH VALVE WATERCLOSET. CUT AND CAP BACK EXISTING COLD WATER SUPPLY AND SANITARY WASTE AND VENT LINES BACK TO EXISTING RESPECTIVE MAIN LINES.
2. REMOVE AND DISCARD EXISTING WALL HUNG LAVATORY & FAUCET. CUT AND CAP BACK EXISTING HOT & COLD WATER SUPPLY AND SANITARY WASTE & VENT LINES BACK TO EXISTING RESPECTIVE MAIN LINES.
3. REMOVE AND DISCARD EXISTING WALL MOUNTED FLUSH VALVE URINAL AND CARRIER. CUT AND CAP BACK EXISTING COLD WATER SUPPLY AND SANITARY WASTE & VENT LINES BACK TO EXISTING RESPECTIVE MAIN LINES.
4. REMOVE AND DISCARD EXISTING COUNTER MOUNTED SINK & FAUCET. CUT AND CAP BACK EXISTING HOT & COLD WATER SUPPLY AND SANITARY WASTE & VENT LINES BACK TO EXISTING RESPECTIVE MAIN LINES.
5. REMOVE AND DISCARD EXISTING SHOWER ENCLOSURE AND VALVE SYSTEM. CUT AND CAP BACK EXISTING HOT & COLD WATER SUPPLY AND SANITARY WASTE & VENT LINES BACK TO EXISTING RESPECTIVE MAIN LINES.
6. REMOVE AND DISCARD EXISTING SERVICE SINK. CUT AND CAP BACK EXISTING HOT & COLD WATER SUPPLY AND SANITARY WASTE & VENT LINES BACK TO EXISTING RESPECTIVE MAIN LINES.
7. REMOVE AND DISCARD EXISTING FLOOR DRAIN. CUT AND CAP BACK EXISTING TP SUPPLY AND SANITARY WASTE & VENT LINES BACK TO EXISTING RESPECTIVE MAIN LINES.
8. REMOVE AND DISCARD EXISTING WALL MOUNTED DRINKING FOUNTAIN. CUT AND CAP BACK EXISTING COLD WATER SUPPLY AND SANITARY WASTE & VENT LINES BACK TO EXISTING RESPECTIVE MAIN LINE.

NOTES:
VERIFY EXACT LOCATIONS OF ALL ABOVE AND BELOW GROUND DOMESTIC WATER, SANITARY WASTE & VENT, STORM DRAINAGE AND NATURAL GAS SUPPLY & MAIN PIPING IN FIELD.

## PLUMBING DEMOLITION NOTES

1. PRIOR TO SUBMITTING BID, THE CONTRACTOR SHALL VISIT THE PROJECT SITE TO BECOME FAMILIAR WITH ALL EXISTING CONDITIONS AND TO DETERMINE THE EXTENT OF WORK TO REMOVE THE EXISTING PLUMBING SYSTEM COMPLETELY. IF DISCREPANCIES EXIST BETWEEN DRAWINGS AND/OR SITE CONDITIONS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE OWNER PRIOR TO SIGNING OF CONTRACT. REQUESTS FOR COMPENSATION FOR EXTRA WORK, WHICH WOULD HAVE BEEN EVIDENT BY COMPLIANCE WITH THE PREVIOUS STATEMENT, WILL NOT BE CONSIDERED.
2. DISCONNECT, DISMANTLE AND DEMOLISH ALL EXISTING PLUMBING SYSTEMS AND EQUIPMENT AS INDICATED IN THE CONTRACT DRAWINGS. REMOVE ALL DEBRIS AND DISCONNECTED EQUIPMENT AND CLEAN OUT EXISTING SPACES. REFER TO ARCHITECTURAL & PLUMBING DEMOLITION PLANS FOR DEMOLITION WORK.
3. REMOVE ALL EXISTING DOMESTIC, SANITARY AND GAS PLUMBING SERVICES INDICATED TO BE DEMOLISHED AND CAP BACK TO RESPECTIVE EXISTING MAIN LINES TO REMAIN. REMOVE AND DISCARD EXISTING PLUMBING STACKS, MAINS, BRANCHES AND VENTS SERVING FIXTURES TO BE DEMOLISHED. OBTAIN EXISTING RECORD DRAWINGS FROM OWNER.
4. VERIFY PIPING SERVES ONLY PLUMBING FIXTURES INDICATED FOR DEMOLITION BEFORE SHUT-DOWN FOR DISCONNECTION. IDENTIFY EXISTING PIPING WHICH SERVES FIXTURES TO REMAIN. PROMPTLY NOTIFY ARCHITECT OF ACTIVE PIPING TO BE MAINTAINED WHEN LOCATED IN PARTITIONS TO BE DEMOLISHED.
5. COORDINATE ALL SHUT-DOWNS, TIE-INS, ETC., WITH THE G.C. ELECTRICAL MAKE-SAFE OF PLUMBING EQUIPMENT REQUIRING DEMOLITION SHALL BE COMPLETED BY THE ELECTRICAL SUBCONTRACTOR.
6. DEMOLITION SUBCONTRACTOR MUST PROTECT EXISTING SLAB, WALL, FENCING AND BUILDING STRUCTURE DURING DEMOLITION PHASE. DAMAGE TO EXISTING STRUCTURE SHALL BE REPAIRED AT DEMOLITION SUBCONTRACTORS EXPENSE.
7. ALL DEMOLITION WORK PERFORMED SHALL BE DONE IN ACCORDANCE WITH THE APPLICABLE NATIONAL, STATE AND LOCAL CODES, LAWS AND ORDINANCES.




1 / PD1.1 DEMOLITION LOWER LEVEL FLOOR PLAN - DOMESTIC WATER & GAS
3/16"=1'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street
N. Easton, MA 02356
T 508.230.0260
F 508.230.0265
ber@ber-engineering.com
Office Commons 95
351 Centerville Road
Warwick, RI 02886
T 401.384.7682
www.ber-engineering.com


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
PLUMBING
DEMOLITION LOWER LEVEL
PLAN - DOMESTIC WATER & GAS

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MAJ

PROJECT NUMBER:
#2415

SHEET NUMBER: PD1.1
REV: ~

BER # 24237

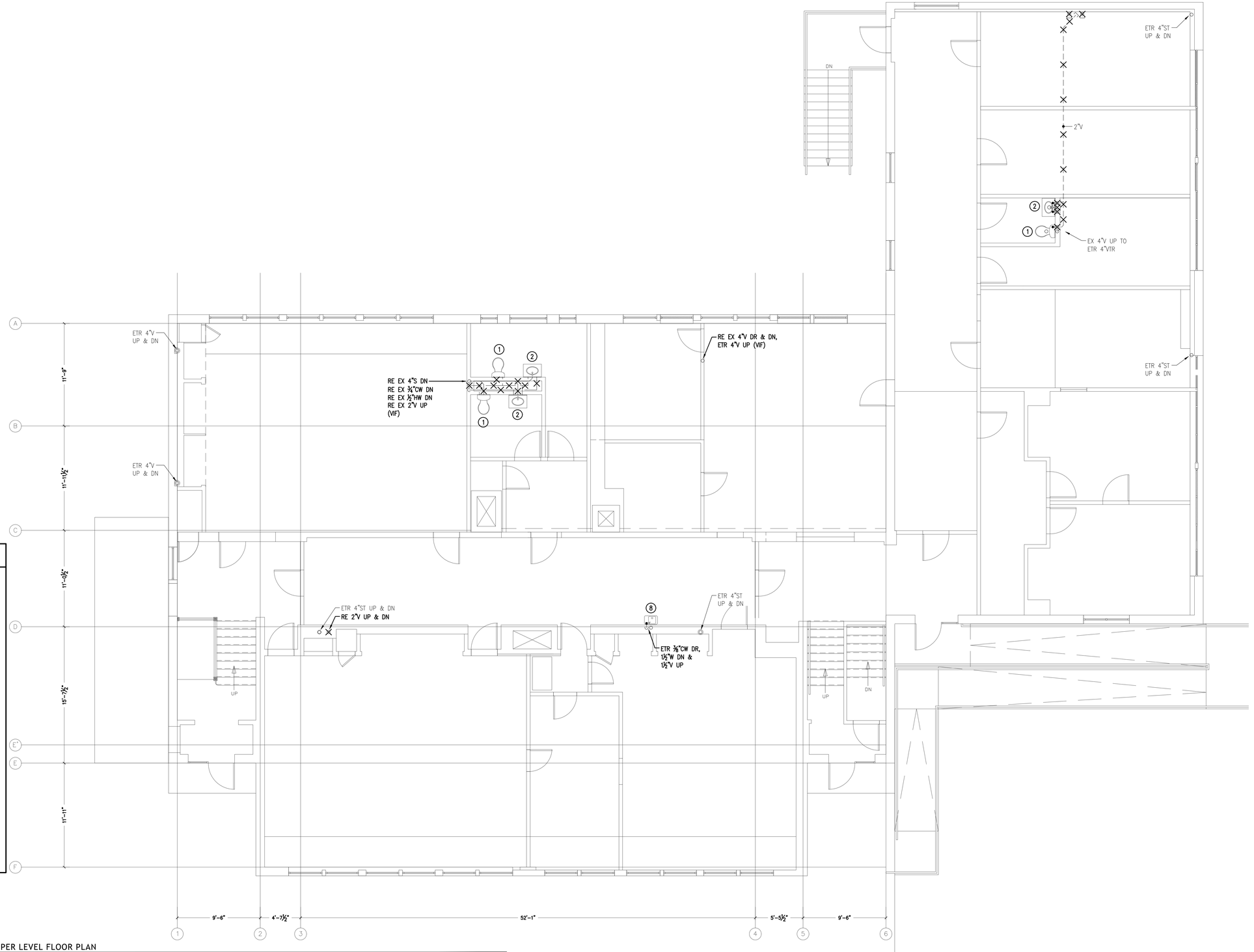
## PLUMBING DEMO KEYED NOTES

1. REMOVE AND DISCARD EXISTING FLOOR MOUNTED FLUSH VALVE WATERCLOSET. CUT AND CAP BACK EXISTING COLD WATER SUPPLY AND SANITARY WASTE AND VENT LINES BACK TO EXISTING RESPECTIVE MAIN LINES.
2. REMOVE AND DISCARD EXISTING WALL HUNG LAVATORY & FAUCET. CUT AND CAP BACK EXISTING HOT & COLD WATER SUPPLY AND SANITARY WASTE & VENT LINES BACK TO EXISTING RESPECTIVE MAIN LINES.
3. REMOVE AND DISCARD EXISTING WALL MOUNTED FLUSH VALVE URINAL AND CARRIER. CUT AND CAP BACK EXISTING COLD WATER SUPPLY AND SANITARY WASTE & VENT LINES BACK TO EXISTING RESPECTIVE MAIN LINES.
4. REMOVE AND DISCARD EXISTING COUNTER MOUNTED SINK & FAUCET. CUT AND CAP BACK EXISTING HOT & COLD WATER SUPPLY AND SANITARY WASTE & VENT LINES BACK TO EXISTING RESPECTIVE MAIN LINES.
5. REMOVE AND DISCARD EXISTING SHOWER ENCLOSURE AND VALVE SYSTEM. CUT AND CAP BACK EXISTING HOT & COLD WATER SUPPLY AND SANITARY WASTE & VENT LINES BACK TO EXISTING RESPECTIVE MAIN LINES.
6. REMOVE AND DISCARD EXISTING SERVICE SINK. CUT AND CAP BACK EXISTING HOT & COLD WATER SUPPLY AND SANITARY WASTE & VENT LINES BACK TO EXISTING RESPECTIVE MAIN LINES.
7. REMOVE AND DISCARD EXISTING FLOOR DRAIN. CUT AND CAP BACK EXISTING TP SUPPLY AND SANITARY WASTE & VENT LINES BACK TO EXISTING RESPECTIVE MAIN LINES.
8. REMOVE AND DISCARD EXISTING WALL MOUNTED DRINKING FOUNTAIN. CUT AND CAP BACK EXISTING COLD WATER SUPPLY AND SANITARY WASTE & VENT LINES BACK TO EXISTING RESPECTIVE MAIN LINE.

NOTES:
VERIFY EXACT LOCATIONS OF ALL ABOVE AND BELOW GROUND DOMESTIC WATER, SANITARY WASTE & VENT, STORM DRAINAGE AND NATURAL GAS SUPPLY & MAIN PIPING IN FIELD.

## PLUMBING DEMOLITION NOTES

1. PRIOR TO SUBMITTING BID, THE CONTRACTOR SHALL VISIT THE PROJECT SITE TO BECOME FAMILIAR WITH ALL EXISTING CONDITIONS AND TO DETERMINE THE EXTENT OF WORK TO REMOVE THE EXISTING PLUMBING SYSTEM COMPLETELY. IF DISCREPANCIES EXIST BETWEEN DRAWINGS AND/OR SITE CONDITIONS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE OWNER PRIOR TO SIGNING OF CONTRACT. REQUESTS FOR COMPENSATION FOR EXTRA WORK, WHICH WOULD HAVE BEEN EVIDENT BY COMPLIANCE WITH THE PREVIOUS STATEMENT, WILL NOT BE CONSIDERED.
2. DISCONNECT, DISMANTLE AND DEMOLISH ALL EXISTING PLUMBING SYSTEMS AND EQUIPMENT AS INDICATED IN THE CONTRACT DRAWINGS. REMOVE ALL DEBRIS AND DISCONNECTED EQUIPMENT AND CLEAN OUT EXISTING SPACES. REFER TO ARCHITECTURAL & PLUMBING DEMOLITION PLANS FOR DEMOLITION WORK.
3. REMOVE ALL EXISTING DOMESTIC, SANITARY AND GAS PLUMBING SERVICES INDICATED TO BE DEMOLISHED AND CAP BACK TO RESPECTIVE EXISTING MAIN LINES TO REMAIN. REMOVE AND DISCARD EXISTING PLUMBING STACKS, MAINS, BRANCHES AND VENTS SERVING FIXTURES TO BE DEMOLISHED. OBTAIN EXISTING RECORD DRAWINGS FROM OWNER.
4. VERIFY PIPING SERVES ONLY PLUMBING FIXTURES INDICATED FOR DEMOLITION BEFORE SHUT-DOWN FOR DISCONNECTION. IDENTIFY EXISTING PIPING WHICH SERVES FIXTURES TO REMAIN. PROMPTLY NOTIFY ARCHITECT OF ACTIVE PIPING TO BE MAINTAINED WHEN LOCATED IN PARTITIONS TO BE DEMOLISHED.
5. COORDINATE ALL SHUT-DOWNS, TIE-INS, ETC., WITH THE G.C. ELECTRICAL MAKE-SAFE OF PLUMBING EQUIPMENT REQUIRING DEMOLITION SHALL BE COMPLETED BY THE ELECTRICAL SUBCONTRACTOR.
6. DEMOLITION SUBCONTRACTOR MUST PROTECT EXISTING SLAB, WALL, FENCING AND BUILDING STRUCTURE DURING DEMOLITION PHASE. DAMAGE TO EXISTING STRUCTURE SHALL BE REPAIRED AT DEMOLITION SUBCONTRACTORS EXPENSE.
7. ALL DEMOLITION WORK PERFORMED SHALL BE DONE IN ACCORDANCE WITH THE APPLICABLE NATIONAL, STATE AND LOCAL CODES, LAWS AND ORDINANCES.




1 / PD1.2 DEMOLITION UPPER LEVEL FLOOR PLAN
3/16"=1'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street, N. Easton, MA 02356, T 508.230.0260, F 508.230.0265, ber@ber-engineering.com
Office Commons 95, 351 Centerville Road, Warwick, RI 02886, T 401.384.7682, www.ber-engineering.com


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
PLUMBING
DEMOLITION UPPER LEVEL
PLAN - DOMESTIC WATER & GAS

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: MAJ

PROJECT NUMBER:
#2415

SHEET NUMBER: PD1.2
REV: ~

BER # 24237




1 PD1.3 DEMOLITION ROOF PLAN - PLUMBING
3/16"=1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street
N. Easton, MA 02356
T 508.230.0260
F 508.230.0265
ber@ber-engineering.com
Office Commons 95
351 Centerville Road
Warwick, RI 02886
T 401.384.7682
www.ber-engineering.com

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
PLUMBING
DEMOLITION ROOF PLAN

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MAJ

PROJECT NUMBER:
#2415

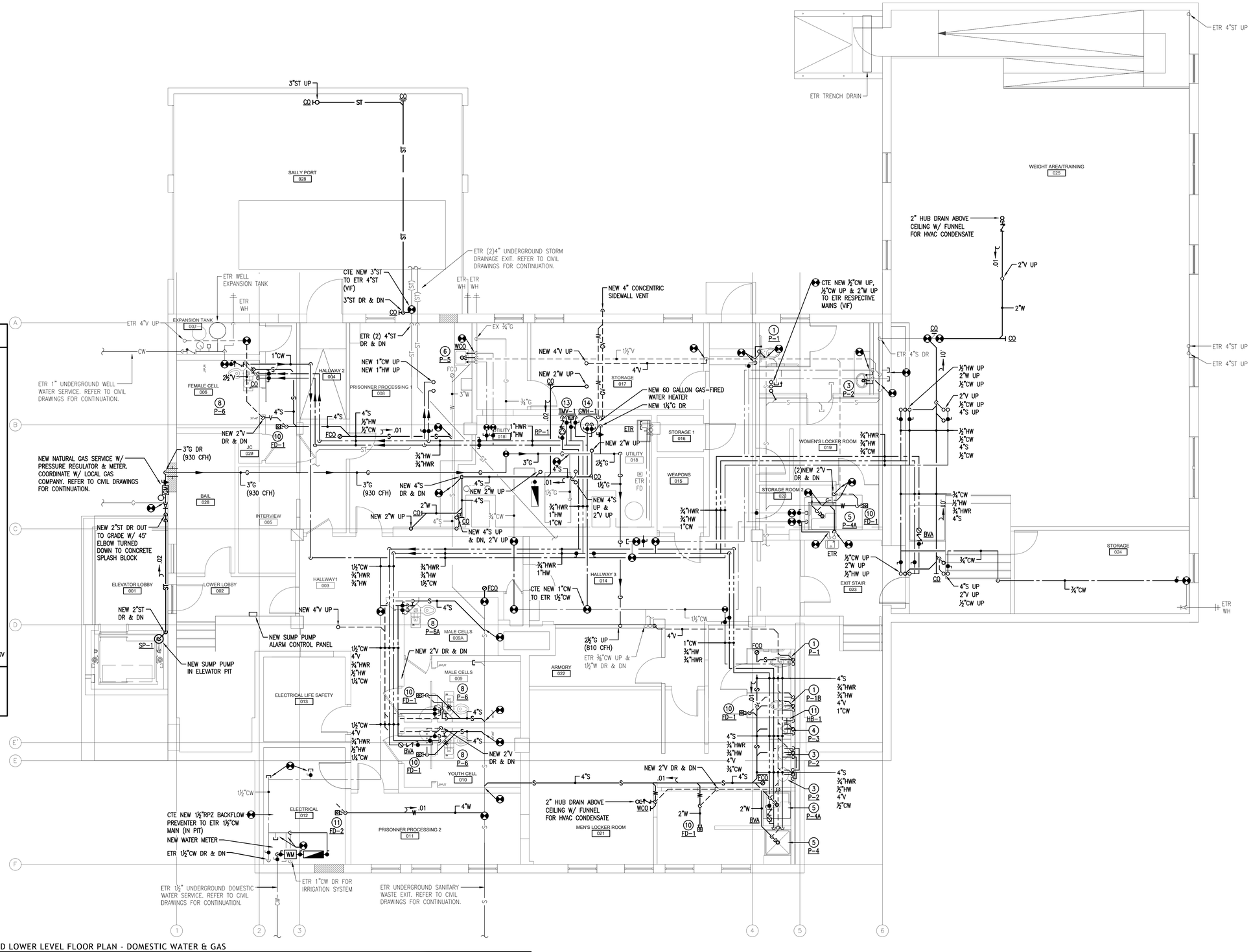
SHEET NUMBER: PD1.3
REV: ~

BER # 24237

## PLUMBING KEYED NOTES

1. NEW FLOOR MOUNTED FLUSH VALVE WATERCLOSET: 1"CW DR, 4"S DN & 2"V DR
2. NEW FLOOR MOUNTED TANK TYPE WATER CLOSET: ½"CW DR, 4"S DN, 2"V DR
3. NEW COUNTER MOUNTED LAVATORY & FAUCET: ½"CW DR, ½"HW DR, 1½"W DN, 1½"V DR
4. NEW WALL MOUNTED FLUSH VALVE URINAL: ¾"CW DR, 2"S DN, 2"V DR
5. NEW SHOWER ENCLOSURE & VALVE SYSTEM: ½"CW DR, ½"HW DR, 1½"W DN, 1½"V DR
6. NEW COUNTER MOUNTED SINK & FAUCET: ½"CW DR, ½"HW DR, 2"W DN, 1½"V DR
7. NEW INSTITUTIONAL COMBO LAV & WATERCLOSET: 1¼"CW DR, ½"HW DR, 4"S DN, 2"V DR
8. NEW FLOOR MOUNTED SERVICE SINK & FAUCET: ½"CW DR, ½"HW DR, 2"W DN, 2"V DR
9. NEW WALL HUNG DRINKING FOUNTAIN: ½"CW DR, 1½"W DN, 1½"V DR
10. NEW 2" FLOOR DRAIN: 2"W DN, 2"V DR
11. NEW 4" FLOOR DRAIN: 4"W DN, 2"V DR
12. NEW WALL MOUNTED HOSE BIBB: ½"CW DR
13. NEW WALL MOUNTED THERMOSTATIC MIXING VALVE: 1½"CW DR, 1½"HW (120°) DR, 1½"HW (140°) DR
14. NEW GAS FIRED WATER HEATER (GWH-1): 1¼"CW DR, 1¼"HW DR, ¾"HWR DR 1¼"G DR, 4"AI & 4"GV

NOTE:
CONNECT ALL NEW DOMESTIC WATER, SANITARY WASTE & VENT AND NATURAL GAS SUPPLY PIPING FROM NEW FIXTURES & EQUIPMENT TO EXISTING RESPECTIVE MAIN LINES. VERIFY EXACT LOCATIONS IN FIELD. TRENCH PIPING AS REQUIRED.




I / P1.1 PROPOSED LOWER LEVEL FLOOR PLAN - DOMESTIC WATER & GAS
3/16"=1'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com


CONSULTANT:


B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street, N. Easton, MA 02356, T 508.230.0260, F 508.230.0265, ber@ber-engineering.com
Office Commons 95, 351 Centerville Road, Warwick, RI 02886, T 401.384.7682, www.ber-engineering.com


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
PLUMBING
PROPOSED LOWER LEVEL PLAN
- DOMESTIC WATER & GAS

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: MAJ

PROJECT NUMBER:
#2415

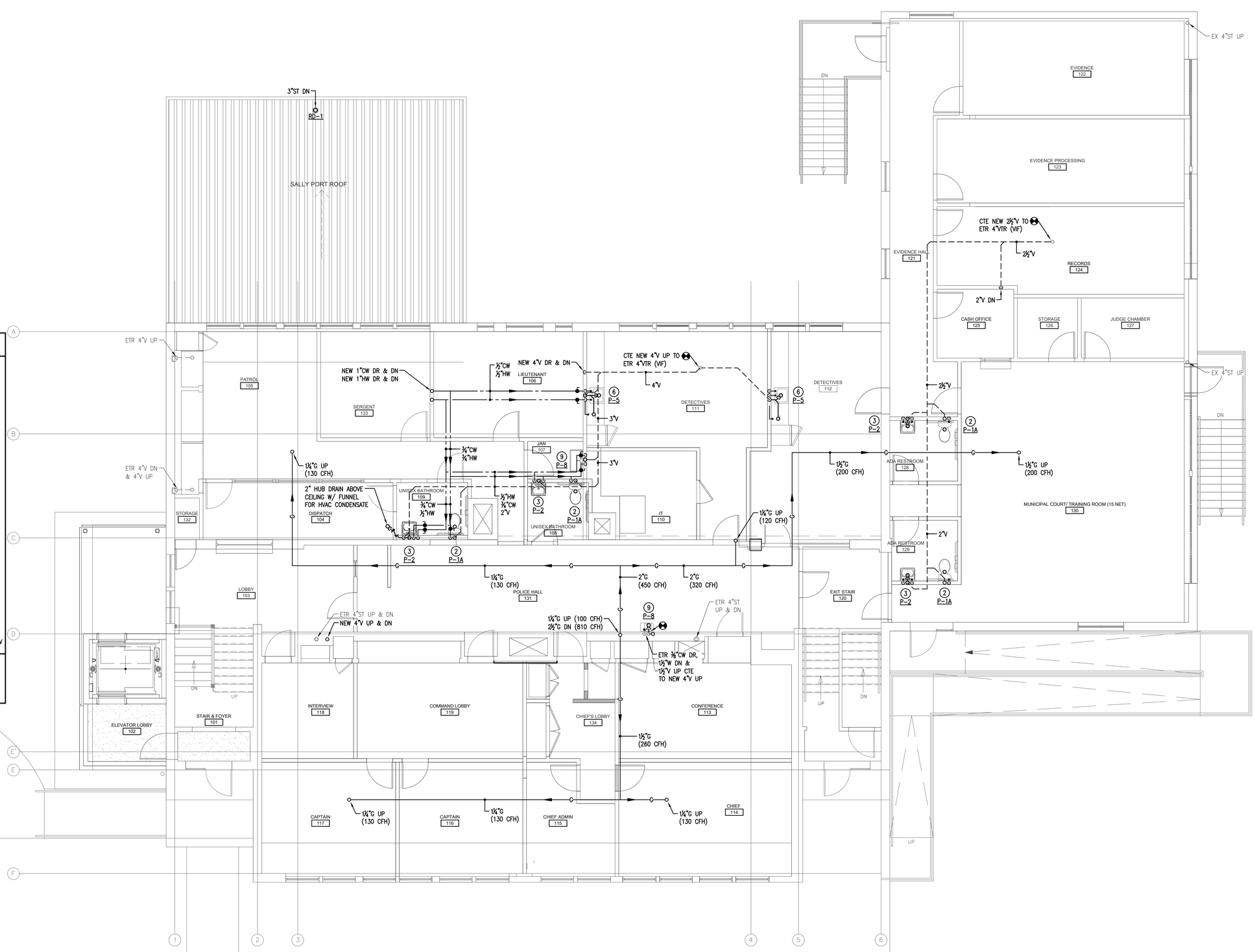
SHEET NUMBER: P1.1
REV: ~

BER # 24237

## PLUMBING KEYED NOTES

1. NEW FLOOR MOUNTED FLUSH VALVE WATERCLOSET: 1"CW DR, 4"S DN & 2"V DR
2. NEW FLOOR MOUNTED TANK TYPE WATER CLOSET: ½"CW DR, 4"S DN, 2"V DR
3. NEW COUNTER MOUNTED LAVATORY & FAUCET: ½"CW DR, ½"HW DR, 1½"W DN, 1½"V DR
4. NEW WALL MOUNTED FLUSH VALVE URINAL: ¾"CW DR, 2"S DN, 2"V DR
5. NEW SHOWER ENCLOSURE & VALVE SYSTEM: ½"CW DR, ½"HW DR, 1½"W DN, 1½"V DR
6. NEW COUNTER MOUNTED SINK & FAUCET: ½"CW DR, ½"HW DR, 2"W DN, 1½"V DR
7. NEW INSTITUTIONAL COMBO LAV & WATERCLOSET: 1¼"CW DR, ½"HW DR, 4"S DN, 2"V DR
8. NEW FLOOR MOUNTED SERVICE SINK & FAUCET: ½"CW DR, ½"HW DR, 2"W DN, 2"V DR
9. NEW WALL HUNG DRINKING FOUNTAIN: ½"CW DR, ½"W DN, 1½"V DR
10. NEW 2" FLOOR DRAIN: 2"W DN, 2"V DR
11. NEW WALL MOUNTED HOSE BIBB: ½"CW DR
12. NEW WALL MOUNTED THERMOSTATIC MIXING VALVE: 1¼"CW DR, 1¼"HW (120°) DR, 1¼"HW (140°) DR
13. NEW GAS FIRED WATER HEATER (GWH-1): 1¼"CW DR, 1¼"HW DR, ¾"HWR DR 1½"G DR, 4"AI & 4"GV

NOTE:
CONNECT ALL NEW DOMESTIC WATER, SANITARY WASTE & VENT AND NATURAL GAS SUPPLY PIPING FROM NEW FIXTURES & EQUIPMENT TO EXISTING RESPECTIVE MAIN LINES. VERIFY EXACT LOCATIONS IN FIELD. TRENCH PIPING AS REQUIRED.




PROPOSED UPPER LEVEL FLOOR PLAN
3/16"=1'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com


CONSULTANT:


B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street, N. Easton, MA 02356, T 508.230.0260, F 508.230.0265, ber@ber-engineering.com
Office Commons 95, 351 Centerville Road, Warwick, RI 02886, T 401.384.7682, www.ber-engineering.com


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
PLUMBING
PROPOSED UPPER LEVEL PLAN
- DOMESTIC WATER & GAS

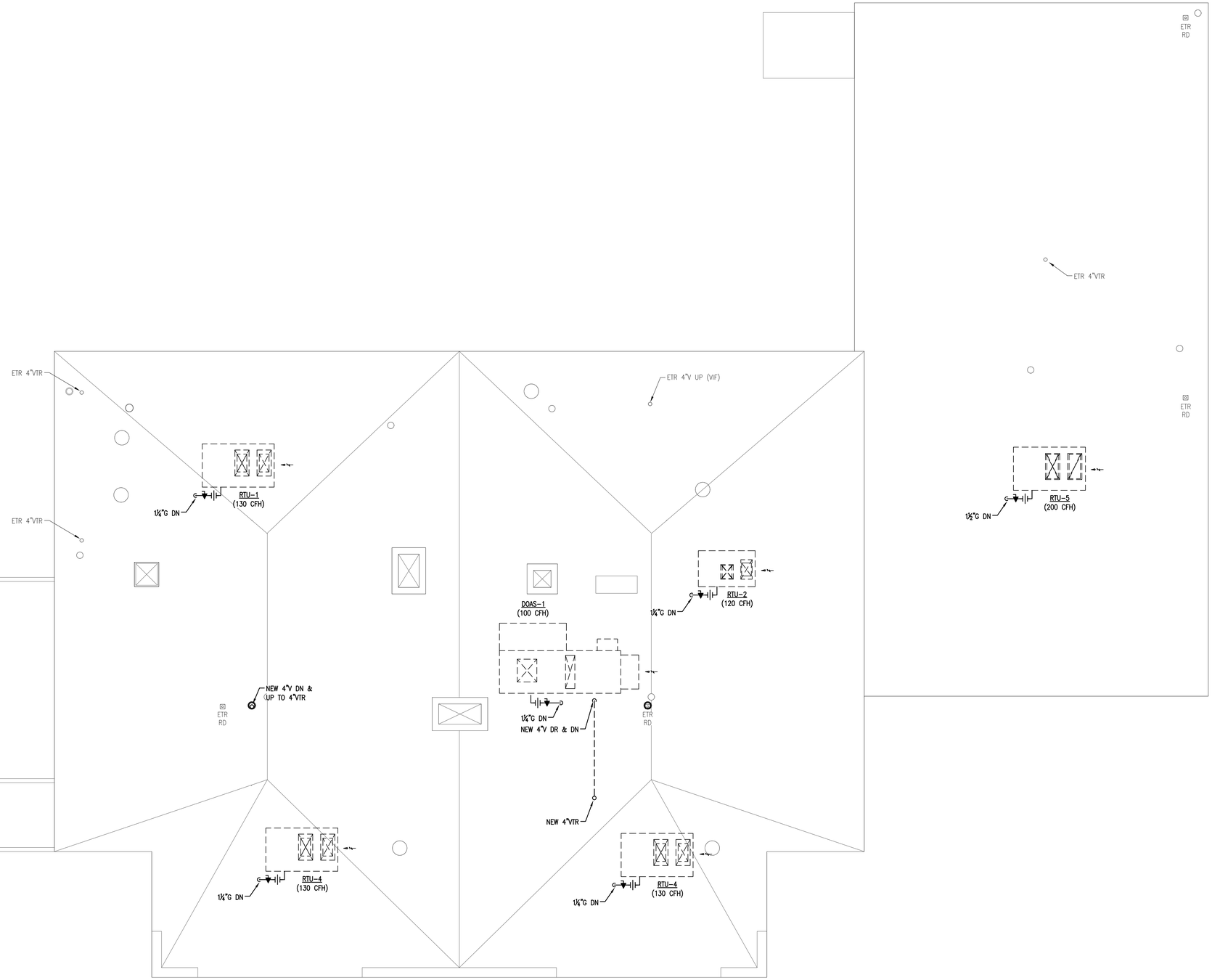
PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: MAJ

PROJECT NUMBER:
#2415

SHEET NUMBER: P1.2
REV: ~

BER # 24237




1 / P1.3 PROPOSED ROOF PLAN - PLUMBING
3/16"=1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street
N. Easton, MA 02356
T 508.230.0260
F 508.230.0265
ber@ber-engineering.com
Office Commons 95
351 Centerville Road
Warwick, RI 02886
T 401.384.7682
www.ber-engineering.com

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
PLUMBING
PROPOSED ROOF PLAN

PROJECT NORTH:
N

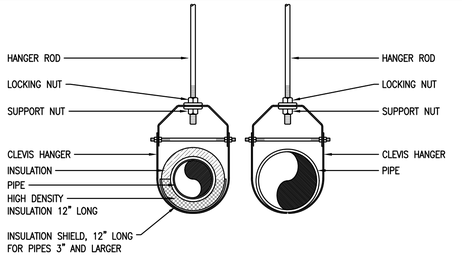
PROJECT ARCHITECT: BTB
DRAWN: MAJ

PROJECT NUMBER:
#2415

SHEET NUMBER:
P1.3

REV:
~

BER # 24237



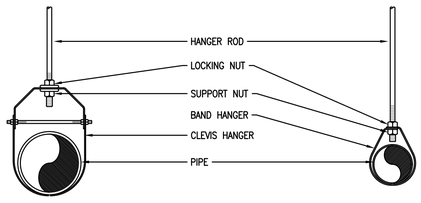

| HANGER ROD SCHEDULE | |
|---|---|
| PIPE SIZE | ROD SIZE |
| UP TO 2" | 3/8" DIA. |
| 2 1/2" THRU 3" | 1/2" DIA. |
| 4" AND 5" | 5/8" |
| 6" – 8" | 3/4" |
| 10 & 12" | 7/8" |
| | |

| HANGER ROD SPACING | |
|---|---|
| PIPE SIZE | MAX. ALLOWABLE SPACING |
| 1" | 7' |
| 1 1/4" | 8' |
| 1 1/2" | 9' |
| 2" | 10' |
| 2 1/2" | 11' |
| 3" – 12" | 12' |

INSULATED AND NON INSULATED
PLUMBING SYSTEMS

## 1 CLEVIS PIPE HANGER/ROD INSTALLATION

NTS




5–INCH AND LARGER

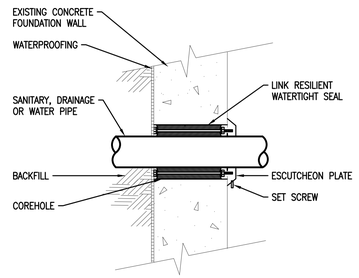
4–INCH AND SMALLER

| HANGER ROD SCHEDULE | |
|---|---|
| PIPE SIZE | ROD SIZE |
| UP TO 2" | 3/8" DIA. |
| 2 1/2" & 3" | 1/2" DIA. |
| 4" AND 5" | 5/8" |
| 6" – 8" | 3/4" |
| 10 & 12" | 7/8" |
| | |

| HANGER ROD SPACING | |
|---|---|
| PIPE SIZE | MAX. ALLOWABLE SPACING |
| 1" | 7' |
| 1 1/4" | 8' |
| 1 1/2" | 9' |
| 2" | 10' |
| 2 1/2" | 11' |
| 3" – 12" | 12' |

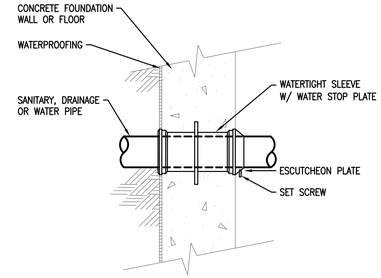
## 2 CLEVIS-BAND HANGER/ROD INSTALLATION

NTS




## 3 EXISTING CONSTRUCTION WATER TIGHT SLEEVE

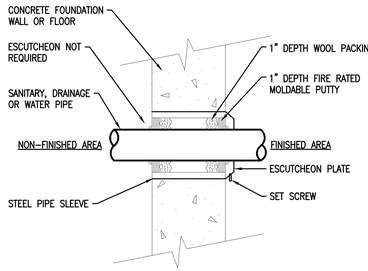
NTS




## 4 NEW CONSTRUCTION WATER TIGHT SLEEVE

NTS

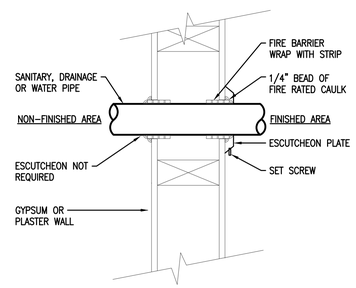
NOTE:
FIRESTOP SEALANTS AND PIPING PENETRATIONS THROUGH FIRE RATED ASSEMBLIES SHALL COMPLY WITH THE UL FIRE RESISTANCE DIRECTORY.




## 5 MASONRY WALL FIRE RATED SLEEVE

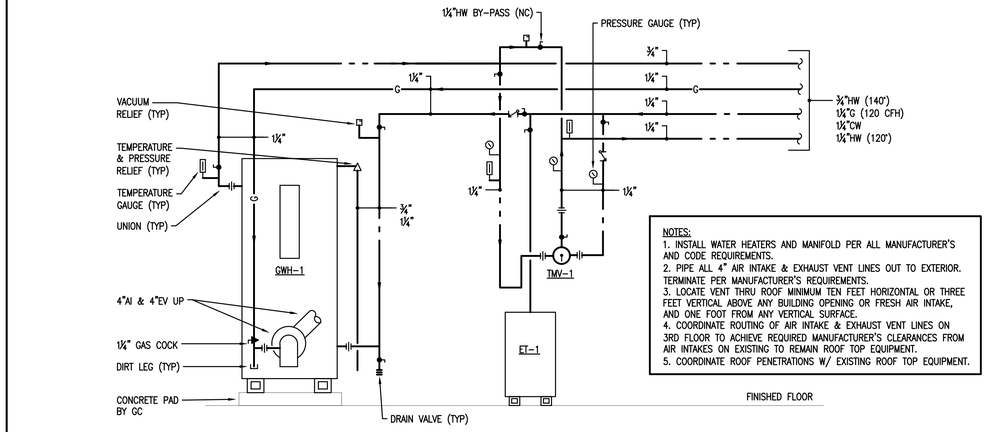
NTS

NOTE:
FIRESTOP SEALANTS AND PIPING PENETRATIONS THROUGH FIRE RATED ASSEMBLIES SHALL COMPLY WITH THE UL FIRE RESISTANCE DIRECTORY.



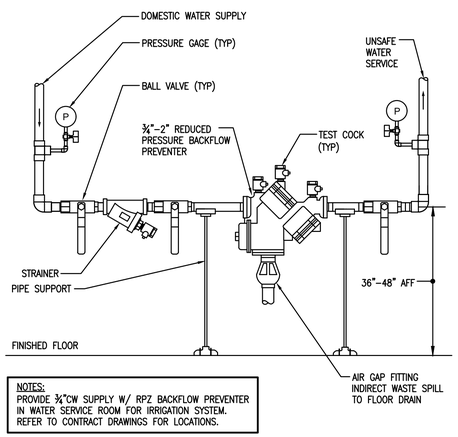

## 6 STUD WALL FIRE RATED SLEEVE

NTS



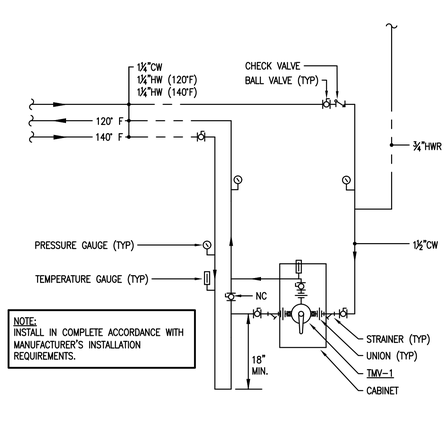

## 7 GAS FIRED WATER HEATER DIAGRAM

NTS



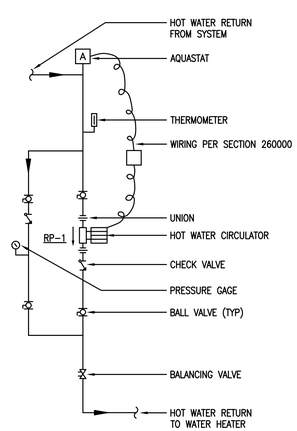

## 8 REDUCED PRESSURE BACKFLOW PREVENTER

NTS



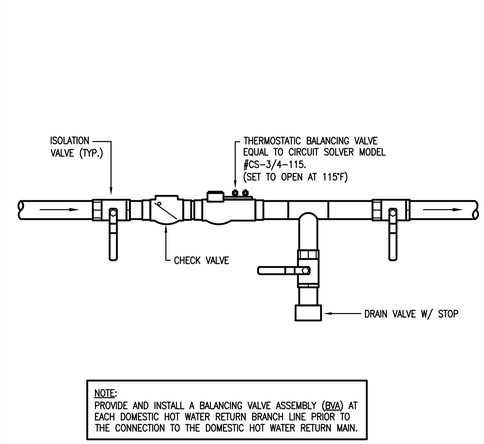

## 9 THERMOSTATIC MIXING VALVE ASSEMBLY

NTS




## 10 HOT WATER CIRCULATOR DIAGRAM

NTS




## 11 BALANCING VALVE ASSEMBLY DETAIL

NTS

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street
N. Easton, MA 02356
T 508.230.0260
F 508.230.0265
ber@ber-engineering.com
Office Commons 95
351 Centerville Road
Warwick, RI 02886
T 401.384.7682
www.ber-engineering.com

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
PLUMBING
DETAILS

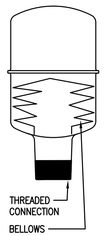
PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: AG

PROJECT NUMBER:
#2415

SHEET NUMBER: P2.1
REV: ~

BER # 24237

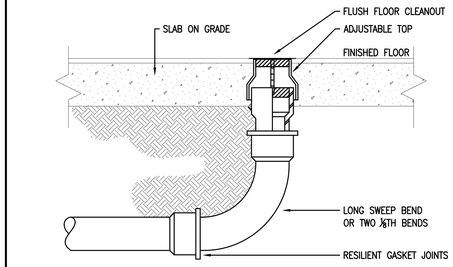



SPECIFICATIONS & NOTES

1. ALL H & CW PIPING, FIXTURES & EQUIPMENT SHALL BE PROTECTED FROM WATER HAMMER EITHER BELLOWS TYPE; HAMMER ARRESTORS OR SHOCK ARRESTORS.
2. ARRESTORS SHALL BE LOCATED IN AN ACCESSIBLE LOCATIONS. PROVIDE RATED ACCESS PANELS WHERE REQ'D.
3. ALL BRANCH PIPING SUPPLYING FLUSH VALVES SHALL BE PROTECTED BY BELLOWS TYPE SHOCK ARRESTORS MANUFACTURED BY ZURN, J.R. SMITH, AMTROL OR WADE.
4. LOCATE & SIZE BELLOWS TYPE SHOCK ARRESTORS AS PER SELECTED MANUFACTURER'S & PDI-WH201 RECOMMENDATIONS.
5. SUBMIT FOR APPROVAL; MANUFACTURERS DATA, SIZE AND LOCATIONS.

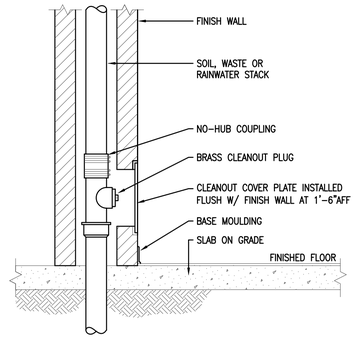
| ZURN SHOKTROL Z-1700 SERIES OR APPROVED EQUAL. | 100 | 200 | 300 | 400 |
|---|---|---|---|---|
| P.D.I. UNITS | A | B | C | D |
| W.S.F.U.'S | 1-11 | 12-32 | 33-60 | 61-113 |

1 SHOCK/HAMMER ARRESTOR DETAIL NTS



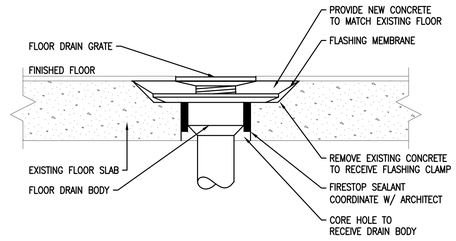

NOTE:
REFER TO CONTRACT SPECIFICATIONS FOR CLEANOUT TYPE

2 END OF RUN FCO INSTALLATION NTS

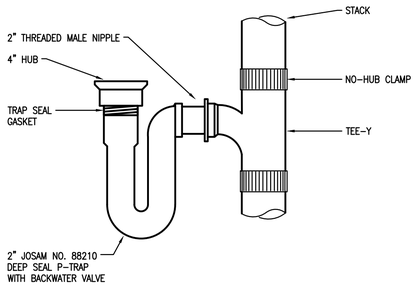



NOTE:
REFER TO CONTRACT SPECIFICATIONS FOR CLEANOUT TYPE

3 FLUSH WALL CLEANOUT DIAGRAM NTS

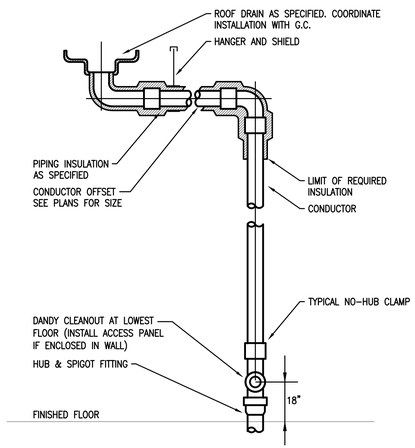



4 FLOOR DRAIN INSTALLATION - EXISTING SLAB NTS

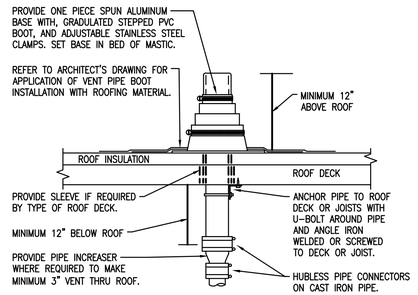



NOTE:
TRAP TO BE INSTALLED ABOVE CEILING. PROVIDE ACCESS PANEL AS REQUIRED.

5 HUB DRAIN DIAGRAM NTS

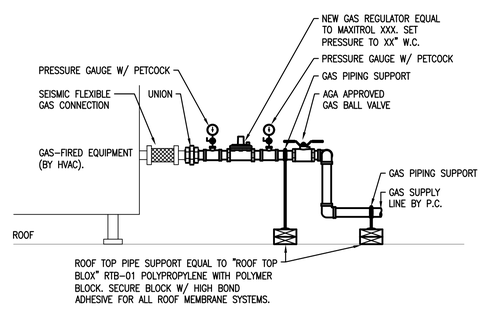



6 TYPICAL CONDUCTOR PIPING DIAGRAM NTS




NOTE:
REFER TO PLANS FOR VTR PIPE SIZES AND LOCATIONS. LOCATE VENT THRU ROOF MINIMUM TEN FEET HORIZONTAL OR THREE FEET VERTICAL ABOVE ANY BUILDING OPENING OR FRESH AIR INTAKE, AND ONE FOOT FROM ANY VERTICAL SURFACE. PROVIDE 1" FIBERGLASS INSULATION WITH ALL-SERVICE JACKET ON VENT PIPE INSIDE BUILDING WITHIN SIX FEET OF VENT THRU ROOF LOCATION. VERIFY FLASHING AND COUNTER FLASHING WITH ROOFING CONTRACTOR.

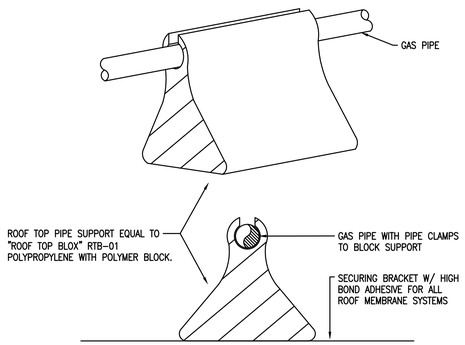
7 VENT THRU ROOF DETAIL NTS




NOTES:
1) SUPPORTS SHALL BE INSTALLED A MINIMUM OF 6'-0" ON CENTER AND AT EACH CHANGE OF DIRECTION OF PIPING.

2) ALL EXPOSED GAS PIPING ON ROOF SHALL BE PAINTED WITH ONE COAT OF PRIMER AND FINISHED WITH TWO (2) COATS OF RUST INHIBITIVE PAINT. REFER TO ARCHITECTURAL CONTRACT DOCUMENTS.

8 ROOFTOP GAS FIRED UNIT PIPING DIAGRAM W/ GAS REGULATOR NTS

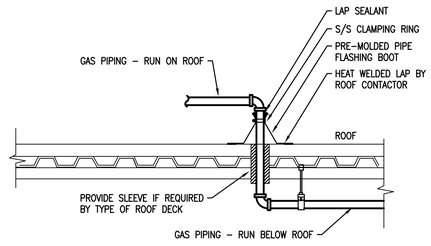



NOTES:
1) SUPPORTS SHALL BE INSTALLED A MINIMUM OF 6'-0" ON CENTER AND AT EACH CHANGE OF DIRECTION OF PIPING.

2) ALL EXPOSED GAS PIPING ON ROOF SHALL BE PAINTED WITH ONE COAT OF PRIMER AND FINISHED WITH TWO (2) COATS OF RUST INHIBITIVE PAINT. REFER TO ARCHITECTURAL CONTRACT DOCUMENTS.

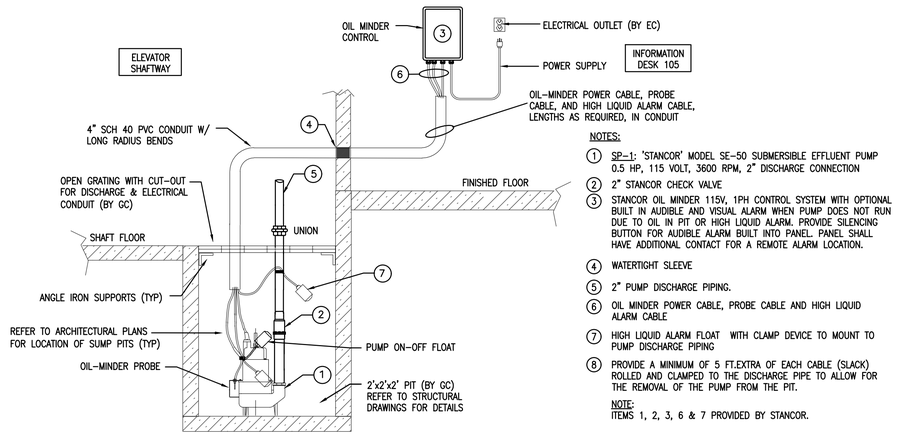
9 ROOF GAS SUPPORT PIPING DIAGRAM NTS

NOTE:
CONTRACTOR SHALL VERIFY ALL MECHANICAL GAS FIRED EQUIPMENT CONNECTION LOCATIONS IN THE FIELD PRIOR TO INSTALLING ANY GAS PIPE MAINS OR BRANCHES.




NOTE:
ALL GAS PIPING ABOVE ROOF SHALL BE PAINTED W/ TWO (2) COATS OF RUST INHIBITIVE PAINT (BY G.C.). COORDINATE COLOR W/ ARCHITECT.

10 GAS PIPE ROOF PENETRATION NTS




NOTES:
1. SP-1: 'STANCOR' MODEL SE-50 SUBMERSIBLE EFFLUENT PUMP 0.5 HP, 115 VOLT, 3600 RPM, 2" DISCHARGE CONNECTION
2. 2" STANCOR CHECK VALVE
3. STANCOR OIL MINDER 115V, 1PH CONTROL SYSTEM WITH OPTIONAL BUILT IN AUDIBLE AND VISUAL ALARM WHEN PUMP DOES NOT RUN DUE TO OIL IN PIT OR HIGH LIQUID ALARM. PROVIDE SILENCING BUTTON FOR AUDIBLE ALARM BUILT INTO PANEL. PANEL SHALL HAVE ADDITIONAL CONTACT FOR A REMOTE ALARM LOCATION.
4. WATERTIGHT SLEEVE
5. 2" PUMP DISCHARGE PIPING.
6. OIL MINDER POWER CABLE, PROBE CABLE AND HIGH LIQUID ALARM CABLE
7. HIGH LIQUID ALARM FLOAT WITH CLAMP DEVICE TO MOUNT TO PUMP DISCHARGE PIPING
8. PROVIDE A MINIMUM OF 5 FT.EXTRA OF EACH CABLE (SLACK) ROLLED AND CLAMPED TO THE DISCHARGE PIPE TO ALLOW FOR THE REMOVAL OF THE PUMP FROM THE PIT.

NOTE:
ITEMS 1, 2, 3, 6 & 7 PROVIDED BY STANCOR.

11 SUMP PUMP/PIT DETAIL AT HYDRAULIC ELEVATOR NTS

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street, N. Easton, MA 02356, T 508.230.0260, F 508.230.0265, ber@ber-engineering.com
Office Commons 95, 351 Centerville Road, Warwick, RI 02886, T 401.384.7682, www.ber-engineering.com

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
PLUMBING
DETAILS

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: AG
PROJECT NUMBER:
#2415

SHEET NUMBER: P2.2
REV: ~

BER # 24237

## FIRE PROTECTION GENERAL NOTES:

1. THE WORK COVERED CONSISTS OF FURNISHING ALL LABOR AND MATERIALS NECESSARY TO INSTALL, COMPLETE AND READY FOR CONTINUOUS OPERATION, THE FIRE PROTECTION SYSTEMS, APPARATUS AND EQUIPMENT FOR THIS PROJECT. AS SHOWN ON DRAWING, PLUS AS REQUIRED BY NFPA-13 AS REFERENCED IN THE STATE & LOCAL BUILDING & FIRE CODES AND THE AUTHORITY HAVING JURISDICTION.
2. ALL EQUIPMENT AND MATERIALS FURNISHED UNDER THE FIRE PROTECTION SUBCONTRACT, LABOR AND TESTING PERFORMED HEREIN SHALL BE IN COMPLETE ACCORDANCE WITH THE STATE & LOCAL BUILDING & FIRE CODES.
3. ANY AND ALL PERMITS REQUIRED FOR INSTALLATION OF ANY MATERIAL SHALL BE OBTAINED AS PART OF THE WORK INCLUDING ALL FEES OR EXPENSES INCURRED.
4. THESE DRAWINGS ARE DIAGRAMMATIC AND ARE NOT INTENDED TO SHOW EACH AND EVERY OFFSET WITH REGARD TO THE PIPING THAT IS TO BE INSTALLED. THE CONTRACTOR SHALL VISIT THE SITE, READ ALL DRAWINGS, AND MAKE DETAILED NOTES OF ALL NECESSARY OFFSETS REQUIRED WITH THE INSTALLATION OF THEIR WORK. NO EXTRA PAYMENT WILL BE ALLOWED FOR ADDITIONAL WORK CAUSED BY UNFAMILIARITY WITH SITE AND PROJECT CONDITIONS.
5. UNLESS OTHERWISE NOTED, IT IS THE INTENT OF THESE DOCUMENTS THAT THIS AREA SHALL BE 100% SPRINKLERED.
6. ALL SPRINKLERS PROTECTING LIGHT HAZARD AREAS SHALL BE QUICK RESPONSE.
7. THE FIRE PROTECTION CONTRACTOR IS RESPONSIBLE TO PROVIDE A COMPLETE SET OF SHOP DRAWINGS AND HYDRAULIC CALCULATIONS WHICH SHALL BEAR THE SEAL OF A FIRE PROTECTION ENGINEER DULY LICENSED IN THE STATE WHERE WORK IS PERFORMED.
8. THE SPRINKLER CONTRACTOR SHALL PERFORM A HYDRANT FLOW TEST AND SHALL BASE THEIR HYDRAULIC CALCULATIONS ON THEIR TEST RESULTS.
9. THE SPRINKLER CONTRACTOR SHALL PREPARE THEIR OWN FABRICATION/WORKING DRAWINGS OF THE SPRINKLER WORK AND OBTAIN APPROVALS FROM AUTHORITIES HAVING JURISDICTION PRIOR TO INSTALLATION, AND SUBMIT TO THE ARCHITECT/ENGINEER FOR APPROVAL.
10. SPRINKLERS SHALL BE LOCATED ABOVE AND BELOW ALL DUCTWORK GREATER THAN 4'-0" WIDE.
11. ROUTING OF SPRINKLER MAINS, BRANCHES AND SPRINKLERS SHALL BE THOROUGHLY COORDINATED WITH OTHER TRADES AND BUILDING STRUCTURE PRIOR TO SUBMISSION OF COORDINATED SHOP DRAWINGS. FIRE PROTECTION CONTRACTOR IS RESPONSIBLE FOR COORDINATING, PREPARING, AND SUBMITTING COORDINATION DRAWINGS FOR APPROVAL.
12. ALL SLEEVES THROUGH CONCRETE FLOORS AND FIRE RATED WALLS OR PARTITIONS SHALL BE FIRE STOPPED WITH UL RATED ASSEMBLIES OF EQUAL FIRE RATING.
13. THE FIRE PROTECTION CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL, STORAGE AND CUTTING OF ANY CEILING TILES TO ACCOMMODATE SPRINKLERS. THEY SHALL ALSO REINSTALL THE CEILING TILES AND REPLACE ANY DAMAGED TILES.
14. SPRINKLERS IN AREAS WITH NO FINISHED CEILING SHALL BE LOCATED AS HIGH AS POSSIBLE. SPRINKLERS SUBJECT TO PHYSICAL DAMAGE SHALL BE INSTALLED WITH PROTECTIVE CAGES.
15. PATCH PIPE CORES WHERE FIRE PROTECTION PIPING HAS BEEN INSTALLED. PAINT PATCH WORK TO MATCH SURFACES.
16. CONTRACTOR IS TO CLEAN/FLUSH ENTIRE SYSTEM BACK TO THE STREET WATER MAIN.
17. AT THE COMPLETION, TEST ENTIRE SYSTEM PER NFPA-13 AND NFPA-25. FILE ALL REPORTS AND CERTIFICATIONS. SUBMIT TO OWNER COPIES OF ALL REPORTS AND CERTIFICATIONS, TOGETHER WITH A COPY OF NFPA-25.
18. INSTRUCT THE OWNER ON MAINTENANCE PROCEDURES AND SYSTEM OPERATION.
19. SUBMIT ACCURATE AS-BUILT DRAWINGS.
20. PROVIDE PROPER SEISMIC RESTRAINTS FOR ALL REQUIRED FIRE PROTECTION PIPING PER NFPA AND LOCAL BUILDING CODES.
21. PRESSURE TEST ALL PIPING AND ALARMS PER NFPA.
22. WHERE ALL SPRINKLER PIPING IS EXPOSED, COORDINATE PAINTING PIPING AND SPRINKLERS WITH ARCHITECT/ENGINEER. SPRINKLERS SHALL BE FACTORY PAINTED AND NOT FIELD PAINTED.
23. EXTERIOR CANOPIES CONSTRUCTED OF NON-COMBUSTIBLE CONSTRUCTION DO NOT REQUIRE SPRINKLER PROTECTION PER NFPA-13.
24. INSTALL ALL PENDENT SPRINKLERS LOCATED ON SUSPENDED CEILINGS ON CENTER OF CEILING TILES BOTH WAYS. IF SPRINKLERS ARE LOCATED IN GYPSUM CEILINGS, INSTALL AND ALIGN HORIZONTALLY AND VERTICALLY WITH LIGHT FIXTURES AS MUCH AS POSSIBLE SPACING REQUIREMENTS ALLOW.

## FIRE PROTECTION LEGEND

| | | |
|---|---|---|
| | | NEW WORK PIPING (INDICATED AS HEAVY LINE) |
| F | F | FIRE SERVICE BELOW GRADE OR BURIED |
| | WS | WET SPRINKLER PIPE |
| D | D | SPRINKLER DRAIN |
| FDC | FDC | FIRE DEPARTMENT CONNECTION PIPE |
| | | PIPE TEE LOOKING UP |
| | | PIPE TEE LOOKING DOWN |
| | UP/RISE | PIPE RISER |
| | DN/DR | PIPE ELBOW DOWN OR DROP |
| | | CONTINUATION |
| | | FLOW IN DIRECTION OF ARROW |
| | UN | UNION |
| | PG | PRESSURE GAUGE WITH PETCOCK |
| FS | FS | FLOW SWITCH |
| PS | PS | PRESSURE SWITCH |
| | CV | CHECK VALVE |
| | | INDICATING BUTTERFLY VALVE |
| | GV | GATE VALVE |
| | PRV | PRESSURE REDUCING/REGULATING VALVE |
| | OS&Y | OS&Y GATE VALVE |
| | BV | BALL VALVE |
| | VIV | VALVE IN VERTICAL |
| | WACV | ALARM CHECK VALVE (WET SYSTEM) |
| | DACV | ALARM CHECK VALVE (DRY SYSTEM) |
| | DCVA | HORIZONTAL DOUBLE CHECK VALVE ASSEMBLY |
| | WTS | WATER TIGHT SLEEVE |
| | DV | DRAIN VALVE WITH HOSE END |
| | FDC | SIAMESE FIRE DEPARTMENT CONNECTION |
| | U | UPRIGHT WET SPRINKLER |
| | P | CONCEALED PENDENT WET SPRINKLER |
| A | P | CONCEALED PENDENT WET SPRINKLER W/ UPRIGHT ABOVE CEILING |
| T | P | WAX-COATED CONCEALED PENDENT WET SPRINKLER |
| TA | P | WAX-COATED CONCEALED PENDENT WET SPRINKLER W/ UPRIGHT ABOVE CEILING |
| | | INSTITUTIONAL WET SPRINKLER |
| A | | INSTITUTIONAL WET SPRINKLER SPRINKLER W/ UPRIGHT ABOVE CEILING |
| | UG | UPRIGHT W/ GUARD |
| D | UD | UPRIGHT DRY SPRINKLER |
| D | PD | CONCEALED PENDENT DRY SPRINKLER |
| DA | PD | CONCEALED PENDENT DRY SPRINKLER W/ UPRIGHT ABOVE CEILING |
| D | SD | SIDEWALL DRY SPRINKLER |
| # | | PIPE NODE NUMBER |
| # | | SPRINKLER NODE NUMBER |
| | EB / WMG | ELECTRIC BELL / WATER MOTOR GONG |
| | TS | TAMPER SWITCH |
| | TYP | TYPICAL |
| | VIF | VERIFY EXACT LOCATION, SIZE & CONNECTION IN FIELD |
| | AFF | ABOVE FINISHED FLOOR |
| | LFPC | LIMIT OF FIRE PROTECTION CONTRACT |
| | GC | GENERAL CONTRACTOR |
| | FPC | FIRE PROTECTION CONTRACTOR |
| | PC | PLUMBING CONTRACTOR |
| | EC | ELECTRICAL CONTRACTOR |
| | HVAC | HVAC CONTRACTOR |


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street
N. Easton, MA 02356
T 508.230.0260
F 508.230.0265
ber@ber-engineering.com
Office Commons 95
351 Centerville Road
Warwick, RI 02886
T 401.384.7682
www.ber-engineering.com


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
FIRE PROTECTION LEGEND, NOTES, & ABBREVIATIONS

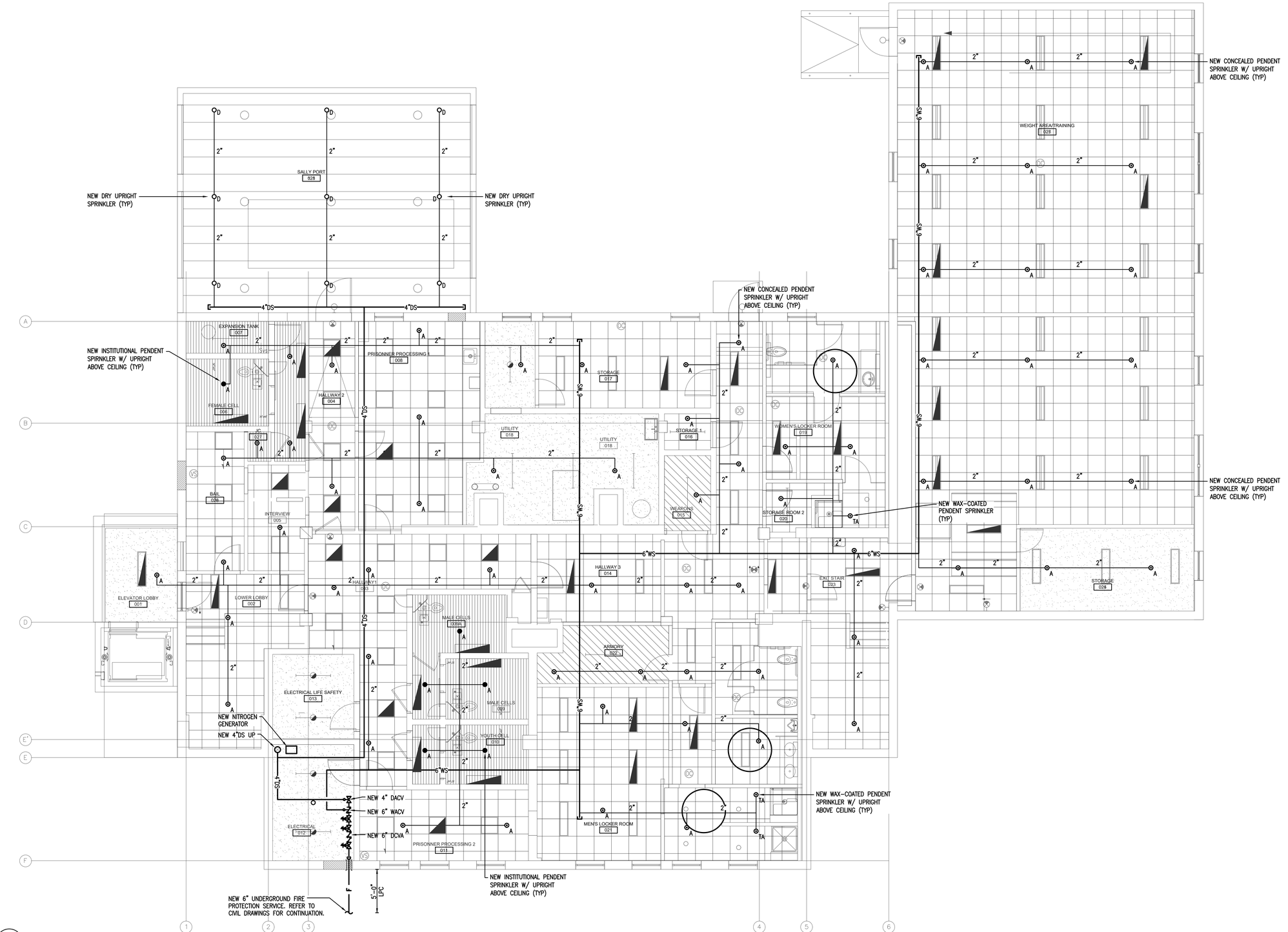
PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: AG

PROJECT NUMBER:
#2415

SHEET NUMBER: FP0.1
REV: ~

BER # 24237




1 FP1.1 PROPOSED LOWER LEVEL FLOOR PLAN - FIRE PROTECTION
3/16"=1'-0"


Signal Works

11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street, N. Easton, MA 02356, T 508.230.0260, F 508.230.0265, ber@ber-engineering.com
Office Commons 95, 351 Centerville Road, Warwick, RI 02886, T 401.384.7682, www.ber-engineering.com


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
FIRE PROTECTION
PROPOSED LOWER LEVEL PLAN

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: AG

PROJECT NUMBER:
#2415

SHEET NUMBER: FP1.1
REV: ~

BER # 24237




1 FP1.2 PROPOSED UPPER LEVEL FLOOR PLAN - FIRE PROTECTION
3/16"=1'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com


CONSULTANT:


B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street
N. Easton, MA 02356
T 508.230.0260
F 508.230.0265
ber@ber-engineering.com
Office Commons 95
351 Centerville Road
Warwick, RI 02886
T 401.384.7682
www.ber-engineering.com


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
FIRE PROTECTION
PROPOSED UPPER LEVEL PLAN

PROJECT NORTH:

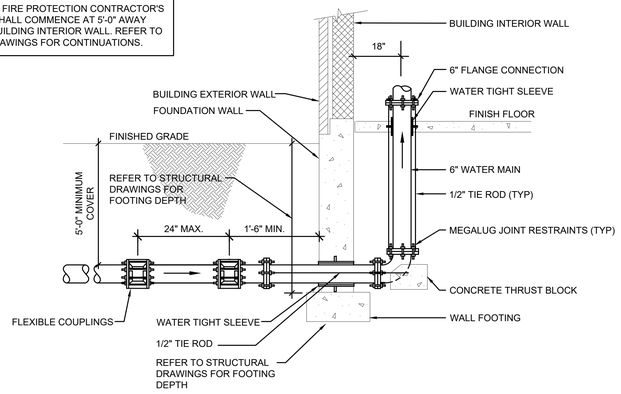
PROJECT ARCHITECT: BTB
DRAWN: AG

PROJECT NUMBER:
#2415

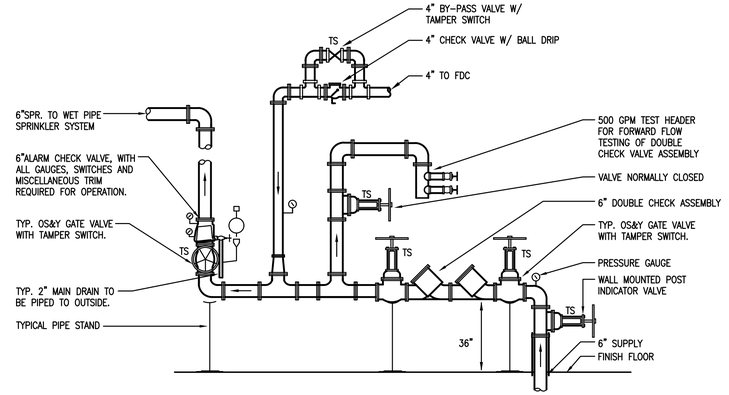
SHEET NUMBER: FP1.2
REV: ~

BER # 24237

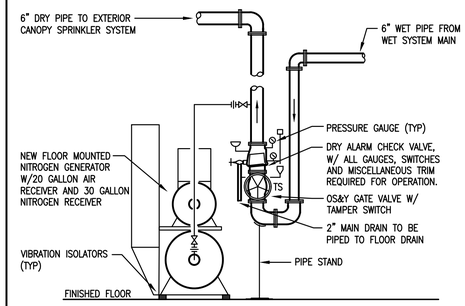
NOTE:
LIMIT OF FIRE PROTECTION CONTRACTOR'S WORK SHALL COMMENCE AT 5'-0" AWAY FROM BUILDING INTERIOR WALL. REFER TO CIVIL DRAWINGS FOR CONTINUATIONS.




1 WATER ENTRANCE ENTRANCE THRU FLOOR NTS

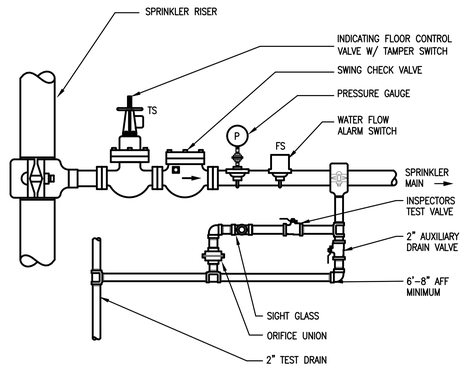



2 WET SPRINKLER RISER ASSEMBLY DIAGRAM NTS

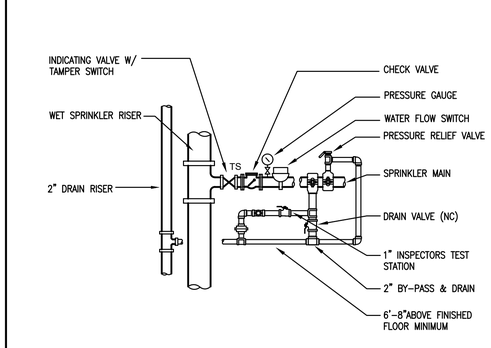



NOTE:
PROVIDE & INSTALL NEW FLOOR MOUNTED NITROGEN COMPRESSOR FOR DRY SYSTEM EQUAL TO GENERAL AIR PRODUCT #NGP500 W/ FLOOR MOUNTED 20 GAL AIR RECIEVER & 30 GALLON NITROGEN RECEIVER TANKS. DRY SYSTEM CAPACITY = 500 GAL AT 40 PSI. PROVIDE W/ AIR MAINTENCE DEVICE EQUAL TO GENERAL AIR PRODCUTS #AMD-1 & PURGE VENT/SAMPLING PORT EQUAL TO GENERAL AIR PRODUCTS #NCP-PV-1. PROVIDE RELIEF VALVE AT NITROGOEN AIR SUPPLY SET TO 5PSI ABOVE MAX AIR PRESSURE. INCLUDE ALL NECESSARY PIPING, VALVES AND APPURTANENCES REQUIRED TO INSTALL IN STRICT CONFORMANCE WITH MANUFACTURER'S INSTALLATION REQUIREMENTS AND FM CLOBAL DATA SHEETS. PROVIDE & INSTALL VIBRATION ISOLATION PER CONTRACT SPECIFICATIONS. ELECTRICAL: 115/1/60;18 A, 1 HP.

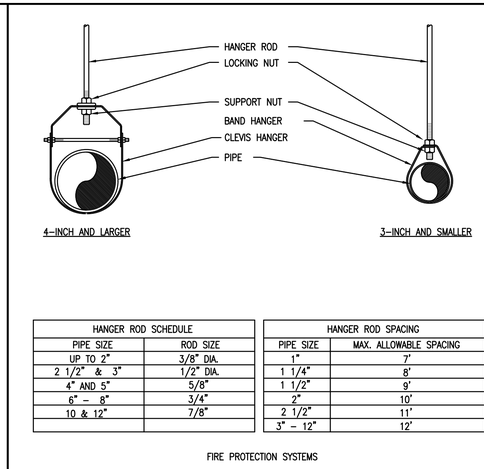
3 DRY PIPE SPRINKLER RISER DIAGRAM NTS




4 SPRINKLER/STANDPIPE RISER W/ FZCVA NTS




5 FLOOR ZONE CONTROL VALVE ASSEMBLY NTS

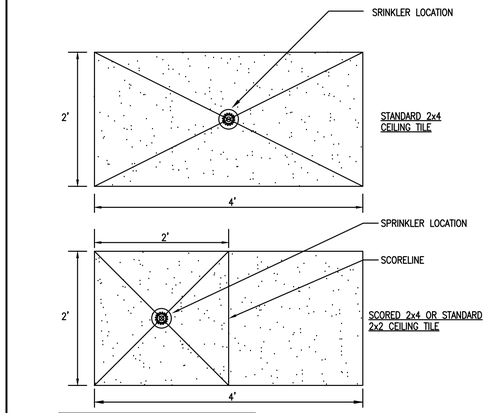



| HANGER ROD SCHEDULE | |
|---|---|
| PIPE SIZE | ROD SIZE |
| UP TO 2" | 3/8" DIA. |
| 2 1/2" & 3" | 1/2" DIA. |
| 4" AND 5" | 5/8" |
| 6" – 8" | 3/4" |
| 10 & 12" | 7/8" |
| | |

| HANGER ROD SPACING | |
|---|---|
| PIPE SIZE | MAX. ALLOWABLE SPACING |
| 1" | 7' |
| 1 1/4" | 8' |
| 1 1/2" | 9' |
| 2" | 10' |
| 2 1/2" | 11' |
| 3" – 12" | 12' |

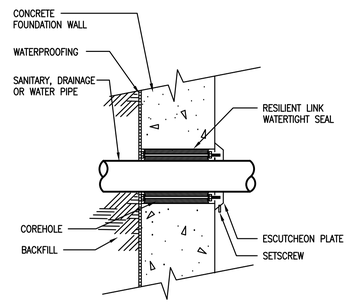
FIRE PROTECTION SYSTEMS

6 TYPICAL PIPE HANGER DIAGRAM NTS



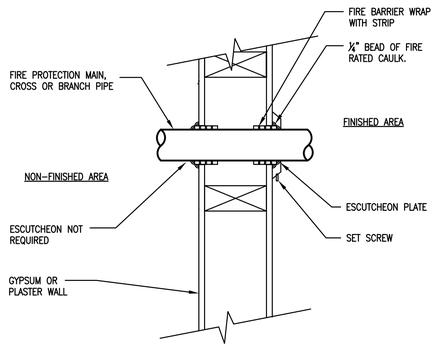

NOTE:
REFER TO SPECIFICATIONS FOR SPRINKLER TYPES AND LOCATION REQUIREMENTS.

7 SPRINKLER LOCATION IN CEILING TILES NTS



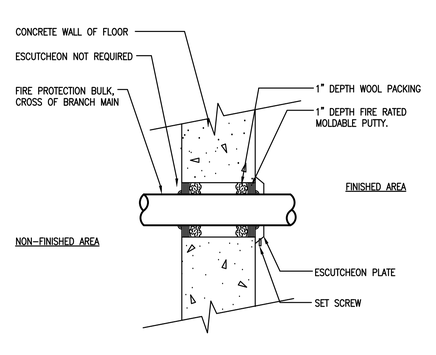

8 WATER TIGHT SLEEVE DIAGRAM NTS

NOTE:
FIRESTOP SEALANTS AND PIPING PENETRATIONS THROUGH FIRE RATED ASSEMBLIES SHALL COMPLY WITH THE UL FIRE RESISTANCE DIRECTORY.




9 STUD WALL FIRE RATED SLEEVE DIAGRAM NTS

NOTE:
FIRESTOP SEALANTS AND PIPING PENETRATIONS THROUGH FIRE RATED ASSEMBLIES SHALL COMPLY WITH THE UL FIRE RESISTANCE DIRECTORY.




10 MASONRY WALL FIRE RATED SLEEVE NTS


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com


CONSULTANT:


B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street, N. Easton, MA 02356, T 508.230.0260, F 508.230.0265, ber@ber-engineering.com
Office Commons 95, 351 Centerville Road, Warwick, RI 02886, T 401.384.7682, www.ber-engineering.com


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
FIRE PROTECTION DETAILS

PROJECT NORTH:

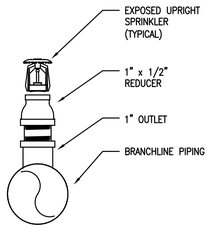
PROJECT ARCHITECT: BTB
DRAWN: AG

PROJECT NUMBER:
#2415

SHEET NUMBER:
FP2.1

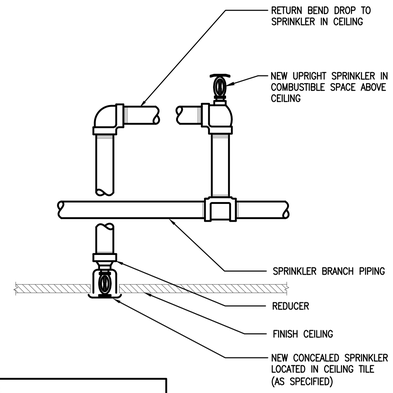
REV:
~

BER # 24237



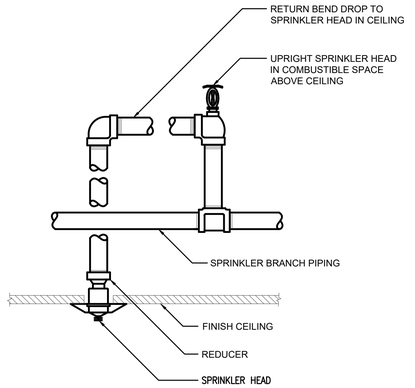

NOTE:
REFER TO SPECIFICATIONS FOR SPRINKLER TYPES AND LOCATION REQUIREMENTS.

1 EXPOSED UPRIGHT SPRINKLER NTS



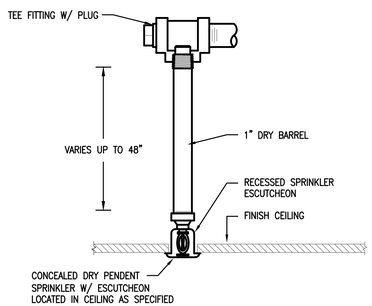

NOTE:
REFER TO SPECIFICATIONS FOR SPRINKLER TYPES AND LOCATION REQUIREMENTS.

2 CONCEALED PENDENT SPRINKLER RETURN BEND DROP W/ UPRIGHT SPRINKLER NTS



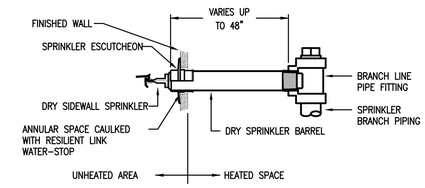

NOTE:
REFER TO SPECIFICATIONS FOR SPRINKLER TYPES AND LOCATION REQUIREMENTS.

3 TYPICAL INSTITUTIONAL SPRINKLER HEAD RETURN BEND DROP WITH UPRIGHT HEAD NTS



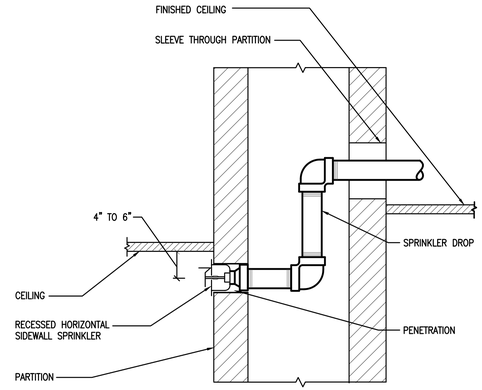

NOTE:
REFER TO SPECIFICATIONS FOR SPRINKLER TYPES AND LOCATION REQUIREMENTS.

4 CONCEALED DRY PENDENT SPRINKLER DIAGRAM NTS



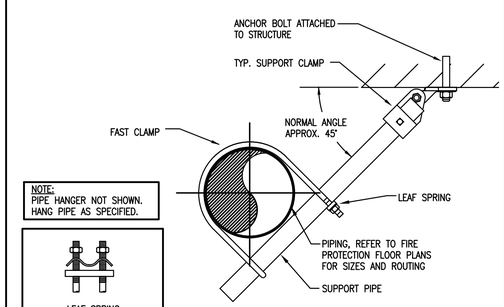

NOTE:
REFER TO SPECIFICATIONS FOR SPRINKLER TYPES AND LOCATION REQUIREMENTS.

5 DRY HORIZONTAL SIDEWALL SPRINKLER NTS




NOTE:
REFER TO SPECIFICATIONS FOR SPRINKLER TYPES AND LOCATION REQUIREMENTS.

6 SIDEWALL SPRINKLER DIAGRAM NTS

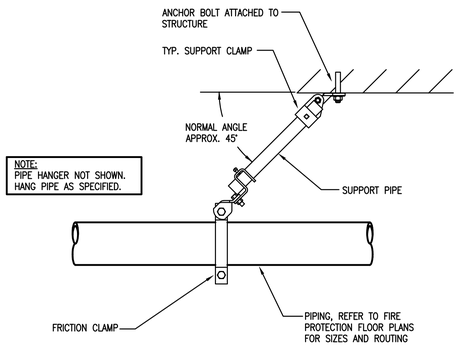



NOTE:
PIPE HANGER NOT SHOWN. HANG PIPE AS SPECIFIED.



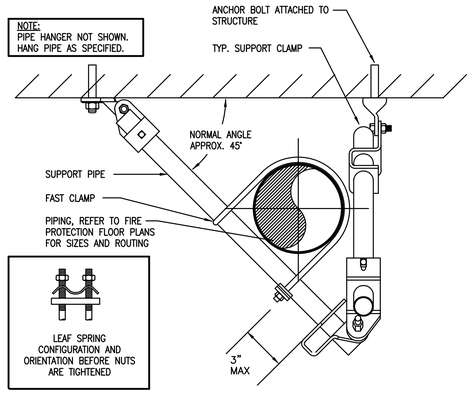
LEAF SPRING CONFIGURATION AND ORIENTATION BEFORE NUTS ARE TIGHTENED

7 LATERAL SEISMIC BRACING DIAGRAM NTS




NOTE:
PIPE HANGER NOT SHOWN. HANG PIPE AS SPECIFIED.

8 LONGITUDINAL SEISMIC BRACING DIAGRAM NTS






LEAF SPRING CONFIGURATION AND ORIENTATION BEFORE NUTS ARE TIGHTENED

9 4-WAY LONGITUDINAL SEISMIC BRACING NTS

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street
N. Easton, MA 02356
T 508.230.0260
F 508.230.0265
ber@ber-engineering.com
Office Commons 95
351 Centerville Road
Warwick, RI 02886
T 401.384.7682
www.ber-engineering.com

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
FIRE PROTECTION DETAILS

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: AG
PROJECT NUMBER:
#2415

SHEET NUMBER: FP2.2
REV: ~

BER # 24237

## HYDRONIC PIPING DIAGRAM LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| | PUMP, ## REPRESENTS PUMP P-## |
| | PUMP & PUMP ACCESSORY FLOOR SUPPORT |
| | REINFORCED CONCRETE HOUSEKEEPING PAD |
| | FLOW DIRECTION |
| | NON-SLAM CHECK VALVE, GLOBE STYLE |
| | SWING CHECK VALVE |
| | WYE STRAINER |
| | WYE STRAINER WITH BLOWDOWN VALVE |
| | MULTI-PURPOSE/TRIPLE DUTY VALVE |
| | SUCTION DIFFUSER |
| | TWO WAY CONTROL VALVE, TWO POSITION |
| | TWO WAY CONTROL VALVE, MODULATING |
| | THREE WAY CONTROL VALVE, TWO POSITION |
| | THREE WAY CONTROL VALVE, MODULATING |
| | ASME RELIEF VALVE |
| | PRESSURE REGULATING/REDUCING VALVE |
| | QUARTER TURN SHUT-OFF VALVE |
| | MANUAL BALANCING VALVE |
| | AUTOMATIC BALANCING VALVE |
| | FLEXIBLE CONNECTION |
| | HOSE CONNECTION |
| | GAUGE COCK (NEEDLE VALVE) |
| | COIN VENT - TACO 417 |
| | AUTOMATIC AIR VENT - TACO HY-VENT/414 |
| | AUTOMATIC AIR VENT - TACO 409 |
| | REDUCER |
| | PRESSURE GAUGE (WITH GAUGE COCK) |
| | THERMOMETER (WITH GAUGE COCK) |
| | CONTROL SYSTEM PRESSURE SENSOR |
| | CONTROL SYSTEM TEMPERATURE SENSOR |
| | PRESSURE & TEMPERATURE TEST PORT |
| | 3/4" BALL DRAIN VALVE WITH HOSE THREAD |
| | COMBINATION AUTOMATIC BALANCING VALVE |
| | COMBINATION STRAINER |
| | COMBINATION BALL VALVE WITH PT PORTS |
| | COMBINATION UNION WITH PT PORTS |
| | PRESSURE INDEPENDENT CONTROL VALVE (BY DANFOSS MODEL AB-QM) |

## CONTROL VALVE NOTATION LEGEND

| TWO WAY | THREE WAY |
|---|---|
| FC: FAIL CLOSED | FC: FAIL TO COIL |
| FO: FAIL OPEN | FB: FAIL TO BYPASS |
| CES: CLOSED END SWITCH | CES: OPEN TO COIL END SWITCH |
| OES: OPEN END SWITCH | BES: OPEN TO BYPASS END SWITCH |

EXAMPLES

| FO/CES | FC |
|---|---|
| TWO WAY TWO POSITION FAIL OPEN CLOSED END SWITCH | THREE WAY MODULATING FAIL TO COIL |

## HYDRONIC PIPING DIAGRAM NOTES

- APPLICATION: THESE NOTES APPLY TO ALL OF THE HYDRONIC PIPING DIAGRAMS, AS APPLICABLE
- AIR VENTS, AUTOMATIC & MANUAL: LOCATE AT THE HIGHEST POINT OF PIPING. LOCATION INDICATED ON PIPING DIAGRAM MAY NOT NECESSARILY BE THE HIGHEST POINT OF ACTUAL PIPING.
- AIR VENTS, AUTOMATIC, TACO HY-VENT/414: PIPE INDEPENDENTLY TO FLOOR DRAIN OR GLYCOL TANK
- DRAIN VALVES: LOCATE AT THE LOWEST POINT OF PIPING. LOCATION INDICATED ON PIPING DIAGRAM MAY NOT NECESSARILY BE THE LOWEST POINT OF ACTUAL PIPING.
- FLANGES & UNIONS: FLANGES AND UNIONS ARE NOT SHOWN ON THE HYDRONIC PIPING DIAGRAMS. PROVIDE FLANGES AND UNIONS SUCH THAT THE FOLLOWING CAN BE REPLACED BY THE USE OF WRENCHES ONLY: COILS, CONTROL VALVES, CABINET UNIT HEATERS, WATER SOURCE HEAT PUMPS, FAN COIL UNITS, UNIT VENTILATORS, FIN TUBE BASEBOARD, RADIATORS, CONVECTORS, VAV TERMINAL UNITS, HEAT EXCHANGER TUBE BUNDLES, HEAT EXCHANGERS.
- PRESSURE GAUGES: PROVIDE WITH GAUGE COCKS (NEEDLE VALVES), PRESSURE SNUBBERS, AND SIPHONS
- PUMP & PUMP ACCESSORY FLOOR SUPPORTS: PROVIDE PAD, MASON INDUSTRIES MODEL BBNR, AT BASE
- REDUCERS: ALL REDUCERS REQUIRED ARE NOT SHOWN ON THE PIPING DIAGRAMS. PROVIDE REDUCERS WHERE INDICATED AND REQUIRED.
- RELIEF VALVES: SHALL BE ASME RATED FOR MINIMUM 150% OF THE CAPACITY OF THE EQUIPMENT SERVED. PIPE DISCHARGE FULL SIZE TO FLOOR DRAIN OF GLYCOL TANK.
- THERMOMETERS: PROVIDE WITH THERMOWELLS

## DUCTWORK PLAN GENERAL NOTES

1. UOI, DUCTWORK SHALL BE MOUNTED AS HIGH AS POSSIBLE, EXCEPT THAT DUCTWORK HEIGHT SHALL BE ADJUSTED AS NECESSARY FOR THE PROPER INSTALLATION OF EQUIPMENT, PIPING, AND CONDUIT.
2. UOI, FLEXIBLE DUCTS ARE ALLOWED ONLY AT CONNECTIONS TO DIFFUSERS AND GRILLES. FLEXIBLE DUCTS SHALL BE MAXIMUM 5'-0" LONG, SHALL BE LOCATED ABOVE ACCESSIBLE CEILINGS ONLY, AND SHALL BE SUSPENDED OFF OF THE CEILING.
3. WHERE BRANCH DUCT SIZES TO DIFFUSERS AND GRILLES ARE NOT INDICATED, SEE THE BRANCH DUCT COLUMN OF THE DIFFUSER AND GRILLE SCHEDULE.
4. WHERE VOLUME DAMPERS ARE INACCESSIBLE, PROVIDE WORM GEAR DRIVE AND CABLE ASSEMBLIES SIMILAR TO METROPOLITAN AIR TECHNOLOGIES ROTOTWIST MODEL RT-200/250 SERIES WITH MODEL RT-CCR CEILING CAP. TO THE GREATEST EXTENT POSSIBLE, GROUP CEILING CAPS IN SPACES SUCH AS STORAGE ROOMS, CLOSETS, JANITORS ROOMS, MECHANICAL/ELECTRICAL ROOMS, ETC.
5. DUCTWORK VISIBLE THROUGH THE FACE OF DIFFUSERS, GRILLES, AND LOUVERS SHALL BE PAINTED BLACK
6. EXPOSED ROUND DUCTWORK SHALL BE SPIRAL LOCKSEAM TYPE.
7. UOI, ACOUSTICAL LINING SHALL BE 1" THICK.
8. DUCTWORK DIMENSIONS INDICATED ARE INSIDE CLEAR DIMENSIONS

## HVAC DEMOLITION GENERAL NOTES

1. ALL DEMOLITION WORK PERFORMED SHALL BE DONE IN ACCORDANCE WITH THE APPLICABLE NATIONAL, STATE AND LOCAL CODES, LAWS AND ORDINANCES.
2. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND FILING ALL PLANS, SPECIFICATIONS AND OTHER DOCUMENTS, PAY ALL REQUISITE FEES AND SECURE ALL PERMITS, INSPECTIONS AND APPROVALS NECESSARY FOR THE LEGAL INSTALLATION AND OPERATION OF THE SYSTEM AND/OR EQUIPMENT FURNISHED UNDER THIS SECTION OF THE SPECIFICATIONS.
3. INCLUDE ALL LABOR, MATERIALS, EQUIPMENT, APPLIANCES AND SERVICES NECESSARY TO REMOVE AND DISPOSE OF ALL EXISTING HVAC SYSTEM
4. PRIOR TO SUBMITTING BID, THE CONTRACTOR SHALL VISIT THE PROJECT SITE TO BECOME FAMILIAR WITH ALL EXISTING CONDITIONS AND TO DETERMINE THE EXTENT OF WORK TO REMOVE THE EXISTING HVAC SYSTEM COMPLETELY. IF DISCREPANCIES EXIST BETWEEN DRAWINGS AND/OR SITE CONDITIONS, THE HVAC CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE OWNER PRIOR TO SIGNING OF CONTRACT. REQUESTS FOR COMPENSATION FOR EXTRA WORK, WHICH WOULD HAVE BEEN EVIDENT BY COMPLIANCE WITH THE PREVIOUS STATEMENT, WILL NOT BE CONSIDERED.
5. EQUIPMENT AND DUCTWORK LAYOUTS ON THIS DRAWING ARE DIAGRAMMATIC ONLY AND SHALL NOT BE CONSTRUED AS BEING 100% ACCURATE. WHERE ITEMS ARE SHOWN TO BE DEMOLISHED OR ALTERED ON THESE PLANS THAT ARE NOT REPRESENTED ACCURATELY, THE DEMOLITION SUBCONTRACTOR SHALL ISSUE FORMAL RFI'S AS REQUIRED PRIOR TO COMPLETING THE REQUIRED WORK.
6. REFER TO ARCHITECTURAL DEMOLITION DRAWINGS FOR DEMOLITION WORK. CONTRACTOR SHALL COORDINATE WITH CONSTRUCTION PHASE PRIOR TO REMOVING ANY PIECE OF EQUIPMENT OR PIPING.
7. ALL MAIN AND BRANCH DUCT SIZES INDICATED ARE FOR REFERENCE ONLY AND ARE BASED ON OBSERVATION ONLY, NOT EXACT MEASUREMENT OR SURVEYS.
8. WHERE VOIDS OR OPENINGS IN THE DUCTWORK ARE FOUND AND ARE NOT SPECIFICALLY SHOWN TO BE CAPPED OR PATCHED, IT SHALL BE THE INTENT OF THIS DEMOLITION PLAN THAT CAPPING AND PATCHING IS COMPLETED TO PROVIDE A CLOSED/SEALED SUPPLY AIR SYSTEM TO ACCOMMODATE THE NEW WORK.
9. DEMOLITION OF ALL OTHER COMPONENTS SHALL INCLUDE PLACEMENT INTO CONTAINER, REMOVAL FROM SITE AND PROPER DISPOSAL OF, WITH PERMITS AND FEES INCLUDED. REFER TO NEW FLOOR PLANS FOR EXISTING SYSTEMS BEING USED UNDER THE NEW CONSTRUCTION. ALL SYSTEMS FOUND TO BE ABANDONED ARE TO BE REMOVED.
10. COORDINATE ALL SHUT-DOWNS, TIE-INS, ETC., WITH THE G.C. ELECTRICAL MAKE-SAFE OF HVAC EQUIPMENT REQUIRING DEMOLITION SHALL BE COMPLETED BY THE ELECTRICAL SUBCONTRACTOR.
11. DEMOLITION SUBCONTRACTOR MUST PROTECT EXISTING SLAB, WALL, FENCING AND BUILDING STRUCTURE DURING DEMOLITION PHASE. DAMAGE TO EXISTING STRUCTURE SHALL BE REPAIRED AT DEMOLITION SUBCONTRACTORS EXPENSE.
12. PRIOR TO START OF DEMOLITION WORK, THE CONTRACTOR SHALL COORDINATE WITH THE OWNER TO DETERMINE IF ANY EQUIPMENT CALLED TO BE DISPOSED ON THE PLAN SHALL BE RETURNED TO THE OWNER AND STORED PER OWNERS REQUEST.

## ABBREVIATIONS

| ABBREVIATION | DESCRIPTION |
|---|---|
| AD | ACCESS DOOR |
| AFF | ABOVE FINISHED FLOOR |
| AP | ACCESS PANEL |
| AH | AIR HANDLER |
| AHJ | AUTHORITY HAVING JURISDICTION |
| AHU | AIR HANDLING UNIT |
| APD | AIR PRESSURE DROP |
| AS | AIR SEPARATOR |
| ATC | AUTOMATIC TEMPERATURE CONTROL |
| AWT | AVERAGE WATER TEMPERATURE |
| B | BOILER |
| BHP | BREAK HORSEPOWER |
| BTU | BRITISH THERMAL UNIT |
| BTUH | BTU/HOUR |
| BMS | BUILDING MANAGEMENT SYSTEM |
| CAP | CAPACITY |
| CFM | CUBIC FEET PER MINUTE |
| CH | CHILLER |
| CNV | CONVECTOR |
| COP | COEFFICIENT OF PERFORMANCE |
| CRD | CEILING RADIATION DAMPER |
| CT | COOLING TOWER |
| CU | CONDENSING UNIT |
| CUH | CABINET UNIT HEATER |
| dB | DECIBELS |
| DAH | DUCTLESS AIR HANDLER |
| DHP | DUCTLESS HEAT PUMP |
| DN | DOWN |
| DX | DIRECT EXPANSION |
| EAT | ENTERING AIR TEMPERATURE (DRY BULB) |
| EBB | ELECTRIC BASEBOARD |
| E.C. | ELECTRICAL CONTRACTOR |
| EDB | ENTERING DRY BULB TEMPERATURE |
| EER | ENERGY EFFICIENCY RATIO |
| EF | EXHAUST FAN |
| EH | ELECTRIC HEATER |
| ESP | EXTERNAL STATIC PRESSURE |
| ET | EXPANSION TANK |
| ETR | EXISTING TO REMAIN |
| EWB | ENTERING WET BULB TEMPERATURE |
| EWT | ENTERING WATER TEMPERATURE |
| °F | DEGREES FAHRENHEIT |
| FD | FIRE DAMPER |
| FN | FURNACE |
| FSD | COMBINATION FIRE/SMOKE DAMPER |
| FT | FEET |
| FT WG | FEET WATER GAUGE |
| FLA | FULL LOAD AMPS |
| FPM | FEET PER MINUTE |
| G.C. | GENERAL CONTRACTOR |
| GPH | GALLONS PER HOUR |
| GPM | GALLONS PER MINUTE |
| HP | HORSEPOWER |
| HSPF | HEATING SEASON PERFORMANCE FACTOR |
| HW | HOT WATER |
| IN | INCHES |
| IPLV | INTEGRATED PART LOAD VALUE |
| IN WG | INCHES WATER GAUGE |
| KW | KILOWATTS |
| L | LOUVER |
| LAT | LEAVING AIR TEMPERATURE |
| LDB | LEAVING DRY BULB |
| LWB | LEAVING WET BULB |
| LWT | LEAVING WATER TEMPERATURE |
| MAX | MAXIMUM |
| MBH | THOUSANDS OF BTU / HOUR |
| M.C. | MECHANICAL CONTRACTOR |
| MCA | MINIMUM CIRCUIT AMPACITY |
| MIN | MINIMUM |
| MOP | MAXIMUM OVERCURRENT PROTECTION |
| NC | NORMALLY CLOSED |
| NO | NORMALLY OPEN |
| NTS | NOT TO SCALE |
| OA | OUTSIDE AIR |
| OAT | OUTSIDE AIR TEMPERATURE (DRY BULB) |
| ODB | OUTSIDE DRY BULB TEMPERATURE |
| OWB | OUTSIDE WET BULB TEMPERATURE |
| P | PUMP |
| PH | PHASE |
| PRV | PRESSURE REDUCING VALVE |
| PSIG | POUNDS PER SQUARE INCH GAUGE |
| QTY | QUANTITY |
| RE | REMOVE EXISTING |
| RF | RETURN FAN |
| RPM | REVOLUTIONS PER MINUTE |
| RPZB | REDUCED PRESSURE ZONE BACKFLOW PREVENTER |
| RTU | ROOFTOP UNIT |
| SD | SMOKE DAMPER |
| SEER | SEASONAL ENERGY EFFICIENCY RATIO |
| SF | SUPPLY FAN |
| SP | STATIC PRESSURE |
| SPD | STATIC PRESSURE DROP |
| SST | SATURATED SUCTION PRESSURE |
| TF | TRANSFER FAN |
| TSP | TOTAL STATIC PRESSURE |
| TYP | TYPICAL |
| UH | UNIT HEATER |
| UOI | UNLESS OTHERWISE INDICATED |
| VAV | VARIABLE AIR VOLUME |
| VD | VOLUME DAMPER |
| VFD | VARIABLE FREQUENCY DRIVE |
| VRF | VARIABLE REFRIGERANT FLOW |
| WPD | WATER PRESSURE DROP |

## MECHANICAL LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| | DUCTWORK (DOUBLE LINE) |
| | DUCTWORK WITH ACOUSTICAL LINING (DOUBLE LINE) |
| | DUCTWORK (SINGLE LINE) |
| | DUCTWORK WITH ACOUSTICAL LINING (SINGLE LINE) |
| | FLEXIBLE DUCTWORK |
| | DUCTWORK, PIPING AND EQUIPMENT TO BE DEMOLISHED |
| | RECTANGULAR/ROUND SUPPLY AIR DUCTWORK UP |
| | RECTANGULAR/ROUND RETURN AIR DUCTWORK UP |
| | RECTANGULAR/ROUND EXHAUST AIR DUCTWORK UP |
| | RECTANGULAR/ROUND SUPPLY AIR DUCTWORK DOWN |
| | RECTANGULAR/ROUND RETURN AIR DUCTWORK DOWN |
| | RECTANGULAR/ROUND EXHAUST AIR DUCTWORK DOWN |
| | VOLUME DAMPER |
| | CONTROL DAMPER |
| | FIRE DAMPER OR CEILING RADIATION DAMPER |
| | SMOKE DAMPER |
| | COMBINATION FIRE/SMOKE DAMPER |
| | GRAVITY BACKDRAFT DAMPER |
| | COUNTERBALANCED BACKDRAFT DAMPER |
| HWS | HOT WATER SUPPLY PIPING |
| HWR | HOT WATER RETURN PIPING |
| REF | REFRIGERANT PIPING |
| CON | COOLING COIL CONDENSATE PIPING |
| | ELBOW UP |
| | ELBOW DOWN |
| | TEE DOWN |
| | TEE UP |
| | PIPE GUIDE |
| | PIPE ANCHOR |
| | FLOW DIRECTION |
| | PIPE CLEANOUT |
| | CONNECT TO EXISTING |
| | AIR ENTERING OPENING |
| | AIR LEAVING OPENING |
| | UNDERCUT DOOR |
| C | CO2 SENSOR |
| H | RELATIVE HUMIDITY SENSOR |
| P | PRESSURE SENSOR - DUCT MOUNTED |
| SD | SMOKE DETECTOR - DUCT MOUNTED |
| S | SWITCH |
| T | THERMOSTAT OR TEMPERATURE SENSOR |
| | CONTROL CONNECTION |

## TAG LEGEND

| | |
|---|---|
| EQUIPMENT (REQUIRING POWER) | EQUIPMENT DESIGNATION<br>NUMBER |
| EQUIPMENT (NON-POWERED) | EQUIPMENT DESIGNATION<br>NUMBER |
| REGISTERS, GRILLES & DIFFUSERS | TYPICAL FOR #<br>DESIGNATION<br>BALANCE TO CFM INDICATED |
| SECTION CALL-OUT | DESIGNATION<br>DRAWING REFERENCE |


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
MECHANICAL LEGEND, NOTES, & ABBREVIATIONS

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: JPK

PROJECT NUMBER:
#2415

SHEET NUMBER:
M0.1

REV:
~

## PACKAGED ROOFTOP GAS FIRED AIR CONDITIONING UNIT SCHEDULE

| GENERAL | | PERFORMANCE | | | | | | | | | | | | | | | | | | | | ELECTRICAL | | | | PHYSICAL | | | REMARKS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | COOLING | | | | | | EVAPORATOR FAN | | | | HEATING | | | | | | | | MINIMUM OUTSIDE AIR | | | | | | | | | | | |
| TAG | LOCATION | NOMINAL TONS | TOTAL MBH | SENSIBLE MBH | LATENT MBH | SEER | EER | EAT DB F° | LAT DB F° | CFM | ESP (IN WG) | RPM | HP | HIGH FIRE (MBH) INPUT | HIGH FIRE (MBH) OUTPUT | THERMAL EFF. (%) | STAGES | MIN GAS PRESSURE | MAX GAS PRESSURE | EAT F° | LAT F° | CFM | % | MCA | MOP | VOLTAGE | PHASE | WEIGHT (LBS) | # OF COMP. | MANUFACTURER MODEL | TYPE | RATINGS | FEATURES | INSTALL |
| RTU-1 | ROOF | 4.0 | 50.14 | 36.04 | 14.09 | 17.0 | 13.0 | 80.0 | 57.76 | 1,600 | 1.0 | 931 | 3.0 | 130.0 | 105.30 | 81.0 | 2.0 | 4.5 | 14.0 | 60.0 | 120.15 | 160 | 10% | 28.0 | 40.0 | 208 | 3 | 1,100 | 1.0 | TRANE YHK048A3S0H | ① | ①②③ | 1 2 3 4 5 6 7 8 | ①②③④ |
| RTU-2 | ROOF | 3.0 | 38.93 | 28.88 | 10.06 | 17.0 | 13.0 | 80.0 | 58.70 | 1,200 | 1.0 | 1,045 | 0.75 | 120.0 | 97.20 | 81.0 | 2.0 | 4.5 | 14.0 | 60.0 | 134.44 | 120 | 10% | 22.0 | 30.0 | 208 | 3 | 858.0 | 1.0 | TRANE YHK036A3S0H | ① | ①②③ | 1 2 3 4 5 6 7 8 | ①②③④ |
| RTU-3 | ROOF | 4.0 | 50.14 | 36.04 | 14.09 | 17.0 | 13.0 | 80.0 | 57.76 | 1,600 | 1.0 | 931 | 3.0 | 130.0 | 105.30 | 81.0 | 2.0 | 4.5 | 14.0 | 60.0 | 120.15 | 160 | 10% | 28.0 | 40.0 | 208 | 3 | 1,100 | 1.0 | YHK048A3S0H | ① | ①②③ | 1 2 3 4 5 6 7 8 | ①②③④ |
| RTU-4 | ROOF | 4.0 | 50.14 | 36.04 | 14.09 | 17.0 | 13.0 | 80.0 | 57.76 | 1,600 | 1.0 | 931 | 3.0 | 130.0 | 105.30 | 81.0 | 2.0 | 4.5 | 14.0 | 60.0 | 120.15 | 240 | 15% | 28.0 | 40.0 | 208 | 3 | 1,100 | 1.0 | TRANE YHK048A3S0H | ① | ①②③ | 1 2 3 4 5 6 7 8 | ①②③④ |
| RTU-5 | ROOF | 7.5 | 93.62 | 73.00 | 20.63 | 17.0 | 12.0 | 80.0 | 59.03 | 3,000 | 1.0 | 1,255 | 3.0 | 200.0 | 162.00 | 81.0 | 2.0 | 4.5 | 14.0 | 60.0 | 109.52 | 300 | 10% | 43.0 | 50.0 | 208 | 3 | 1,243 | 2.0 | TRANE YHK090A3S0H | ① | ①②③ | 1 2 3 4 5 6 7 8 | ①②③④ |

① PACKAGED ROOFTOP HVAC UNIT, NATURAL GAS FIRED, VERTICAL SUPPLY, VERTICAL RETURN, R-454B REFRIGERANT

① RATINGS IN ACCORDANCE TO ARI STANDARD 210
② RATINGS IN ACCORDANCE TO ARI STANDARDS 360 & 370
③ COOLING PERFORMANCE AT ARI CONDITIONS 95°F ODB, 80°F EDB, 67°F EWB, NOMINAL CFM

1 FUSED DISCONNECT
2 GFI SERVICE OUTLET (FACTORY WIRED)
3 ENTHALPY ECONOMIZER

4 DUCT MOUNTED CO2 SENSOR AND CONTROLS
5 MERV 13 FILTERS
6 BAROMETRIC RELIEF

7 BACNET INTERFACE MODULE
8 14" SEISMIC VIBRATION CURB

① INSTALL PER MANUFACTURERS INSTRUCTION AND REFER TO ROOFTOP/DEDICATED OUTDOOR AIR UNIT DETAIL
② UNIT SHALL BE PROGRAMMED TO MAINTAIN DISCHARGE AIR TEMPERATURE (70°F ADJ.).
③ SECURE ROOF CURB TO ROOF STRUCTURE PER ROOF CURB MANUFACTURERS INSTRUCTIONS
④ TIE CONTROLS BACK TO EXISTING JOHNSON BUILDING MANAGEMENT SYSTEM,

## DEDICATED OUTDOOR AIR UNIT SCHEDULE

| GENERAL | | | | | PERFORMANCE | | | | | | | | | | | | | | | | | | | | ELECTRICAL | | | | PHYSICAL | | REMARKS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ENTHALPY RECOVERY EFFICIENCY | | | | OUTSIDE AIR FAN | | | | EXHAUST AIR FAN | | | | HEATING | | | | | | COOLING | | | | | | | | | | | | | | | |
| | SUMMER (%) | | WINTER (%) | | | | | | | | | | HIGH FIRE (MBH) | | PERFORMANCE | | | | TONS | PERFORMANCE | | MBH | | | | | | | | | | | |
| TAG | LATENT | SENSIBLE | LATENT | SENSIBLE | CFM | ESP (IN WG) | # OF FANS | HP | CFM | ESP (IN WG) | # OF FANS | HP | INPUT | OUTPUT | EAT (F°) | LAT (F°) | TEMP. RISE (°F) | MINIMUM GAS PRESS | MAXIMUM GAS PRESS | (NOMINAL) | EAT (DB/WB) | LAT (DB/WB) | TOTAL | SENSIBLE | MCA | MOP | VOLTAGE | PHASE | WEIGHT (LBS) | MANUFACTURER MODEL | TYPE | RATINGS | FEATURES | INSTALL |
| DOAS-1 | 67.2 | 70.9 | 64.9 | 70.5 | 1,500 | 1.0 | 1 | 1.0 | 1,500 | 1.0 | 1 | 1.0 | 100.0 | 81.0 | 48.2 | 98.2 | 50.0 | 6.0 | 14.0 | 5.0 | 79.4/67.4 | 51.9/51.9 | 70.7 | 45.2 | 32.8 | 45.0 | 208 | 3 | 2,815 | GREENHECK RVE-40-30D-51-C-A1 | ① | ① | 1 THRU 34 | ①②③④⑤⑥ |

① NATURAL GAS FIRED, DX COOLING, ENERGY RECOVERY VENTILATING UNIT WITH POLYMER WHEEL, BOTTOM DISCHARGE, BOTTOM RETURN

① AHRI CERTIFIED

1 UNIT INSTALLATION – OUTDOOR
2 UNIT CONSTRUCTION – DOUBLE WALL
3 INSULATION – 2" 2.4# R13 FOAM
4 CORROSION RESISTANT FASTENERS
5 HINGED ACCESS
6 FACTORY WIRED NON-FUSED DISCONNECT SWITCH
7 DIRECT DRIVE PLENUM BLOWER & MOTOR ASSEMBLIES
8 FACTORY WIRED VFD'S
9 UNIT FINISH – PERMTECTOR, CONCRETE GRAY (RAL 7023)
10 SHORT CIRCUIT CURRENT – 5KA
11 ENERGY RECOVERY DEVICE – POLYMER WHEEL W/SILICA GEL DESICCANT
12 UNIT CONTROLS – FULL CONTROL
13 INTERNALLY MOUNTED CONTROL CENTER WITH 24 VAC CONTROL TRANSFOMERS

13 BMS PROTOCOL – BACNET MSTP
14 SUPPLY FAN CONTROL – CONSTANT VOLUME ADJ. SETPOINT
15 EXHAUST FAN CONTROL – CONSTANT VOLUME ADJ. SETPOINT
16 ECONOMIZER CONTROL – TEMP/ENTHALPHY
17 WEB-BASED USER INTERFACE
18 ENERGY WHEEL ECONOMIZER CONTROL – MODULATING WHEEL W/ VFD WHEEL
19 ENERGY WHEEL ROTATION SENSOR
20 DAMPER CONTROL – 100% OA-NO RE-CIRCULATION
21 DIRTY FILTER SENSOR(S) – SUPPLY
22 PHASE/BROWNOUT PROTECTION
23 FROST CONTROL MODULATING WHEEL – MODULATING WHEEL

25 OUTDOOR AIR DAMPER – LOW LEAKAGE
26 RETURN AIR DAMPER – LOW LEAKAGE
27 18" INSULATED VIBRATION ISOLATION ROOF CURB
28 MERV 13 FILTERS – ALL AIRSTREAMS
29 SPARE FILTERS
30 SERVICE OUTLET – FACTORY MOUNTED AND WIRED
31 EXHAUST DISCHARGE GRAVITY BACKDRAFT DAMPER
32 SMOKE DETECTOR – SUPPLY – SHIPPED LOOSE
33 FURNACE CONTROL – 16:1 MODULATING
34 POWER VENTING

① INSTALL PER MANUFACTURERS INSTRUCTION AND REFER TO ROOFTOP/DEDICATED OUTDOOR AIR UNIT DETAIL
② UNIT SHALL BE PROGRAMMED PER OWNERS REQUIREMENTS AND HOURS OF OPERATION.
③ UNITS SHALL BE INSTALLED ON A VIBRATION ISOLATION ROOF CURB.
④ UNIT SHALL BE CONTROLLED TO MAINTAIN DISCHARGE AIR TEMPERATURE (70° ADJ.).
⑤ REFER TO DETAIL FOR ACOUSTICAL ATTENUATION AND FURTHER DUCTWORK REQUIREMENTS.
⑥ TIE CONTROLS BACK TO EXISTING JOHNSON BUILDING MANAGEMENT SYSTEM,

## MOTORIZED DAMPER SCHEDULE

MD-1 LOW LEAKAGE, CLASS 2 MOTORIZED DAMPER WITH 120/1/60 POWERED ACTUATOR. DAMPER SHALL BE INTERLOCK WITH BOILER OPERATION. REFER TO PLANS FOR SIZE AND QUANTITY.

## DIFFUSER AND GRILLE SCHEDULE

| GENERAL | PHYSICAL | | | | REMARKS | | |
|---|---|---|---|---|---|---|---|
| TAG | SIZE (IN) | BLOW PATTERN | BRANCH DUCT (IN) | MANUFACTURER MODEL | TYPE | FEATURES | INSTALL |
| S4W | SEE PLANS | 4W | SEE PLANS | PRICE AMX | ① | 1 2 | ①② |
| S3W | SEE PLANS | 3W | SEE PLANS | PRICE AMX | ① | 1 2 | ①② |
| S2W | SEE PLANS | 2W | SEE PLANS | PRICE AMX | ① | 1 2 | ①② |
| 2WC | SEE PLANS | 2WC | SEE PLANS | PRICE AMX | ① | 1 2 | ①② |
| S1W | SEE PLANS | 1W | SEE PLANS | PRICE AMX | ① | 1 2 | ①② |
| S-1 | 24x24 | 4W | SEE PLANS | PRICE PPD2 | ② | 1 3 | ①② |
| R-1 | SEE PLANS | R | SEE PLANS | PRICE 635 | ③ | 1 | ①② |
| E-1 | SEE PLANS | E | SEE PLANS | PRICE 635 | ③ | 1 | ①② |
| E-2 | SEE PLANS | E | SEE PLANS | KEES SEG-9SP2 | ④ | 1 4 | ①② |
| T-1 | SEE PLANS | T | SEE PLANS | PRICE 635 | ③ | 1 | ①② |

① HIGH INDUCTION DIRECTIONAL DIFFUSER, T-BAR LAY-IN, SQUARE TO ROUND NECK ADAPTER, INSULATED BACK PAN, ALUMINUM, COLOR TO BE SELECTED BY ARCHITECT.

② SQUARE PLAQUE PRODIGY VAV COOLING & HEATING DIFFUSER, FLUSH FACE, ROUND NECK, 24"x24" PANEL, ALUMINUM CONSTRUCTION, 24 VOLT POWER. WHITE FINISH, PROVIDE WALL MOUNTED LCD T-STAT. BAC NET INTERFACE. POWER MODULE.

③ RETURN/EXHAUST/TRANSFER GRILLE, 45° FIXED BLADES ON ¾" CENTERS, BLADES PARALLEL TO LONG DIMENSION, ALUMINUM, T-BAR LAY-IN, COLOR TO BE SELECTED BY ARCHITECT.

④ SECURITY EXHAUST GRILLE, 1/8" HOLES STAGGERED ON 3/16" CENTERS COLOR TO BE SELECTED BY ARCHITECT.

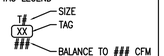
1 REFER TO MECHANICAL AND ARCHITECTURAL FOR MOUNTING TYPE.
2 INSULATED BACK PAN
3 115/24 VOLT TRANSFORMER WITH JUNCTION BOX
4 FRONT OPERATED OPPOSED BLADE DAMPER

① WHERE NO BRANCH DUCT SIZE IS INDICATED ON PLAN, USE BRANCH DUCT SIZE INDICATED HEREIN
② PROVIDE A DUCT MOUNTED VOLUME DAMPER WHETHER OR NOT A DUCT MOUNTED VOLUME DAMPER IS INDICATED ON PLAN. EXCEPTIONS:
- TRANSFER AIR APPLICATIONS (GRILLE IS NOT CONNECTED BY A DUCTWORK SYSTEM TO A FAN)
- EXHAUST AND RETURN GRILLES WHERE ONLY ONE GRILLE SERVES THE FAN/AIR HANDLING SYSTEM
- GRILLES CONNECTED TO RELIEF AIR HOODS AND RELIEF AIR LOUVERS

PATTERN




TAG LEGEND




## FAN SCHEDULE

| GENERAL | | | PERFORMANCE | | | | ELECTRICAL | | | | | PHYSICAL | | REMARKS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TAG | LOCATION | SERVICE | CFM | ESP (IN WG) | RPM | SONES | MCA | MOP | HP | VOLTAGE | PHASE | WEIGHT (LBS) | MANUFACTURER MODEL | TYPE | RATINGS | FEATURES | INSTALL |
| EF-1 | ROOF | REFER TO PLANS | 320 | .50 | 1725 | 5.8 | 7.25 | 15.0 | 1/4 | 115 | 1 | 46 | GREENHECK G-098-A | ① | ① | 1 2 3 | ①② |

① CENTRIFUGAL ROOF EXHAUST, DOWNBLAST, DIRECT DRIVE

① CERTIFIED IN ACCORDANCE TO AMCA 211 & 311

1 DIAL ON MOTOR SPEED CONTROLLER FOR BALANCING ONLY
2 14" HIGH ROOF CURB WITH SEAL, BIRDSCREEN
3 BACKDRAFT DAMPER

① TIE CONTROLS BACK TO EXISTING JOHNSON BUILDING MANAGEMENT SYSTEM,
② SEE ROOF MOUNTED EXHAUST FAN DETAIL

## HYDRONIC FIN TUBE & PANEL RADIATION SCHEDULE

| GENERAL | PERF. | PHYSICAL | | | | | | | | | REMARKS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ENCLOSURE | | | TIERS | | ELEMENT | | | | | | | |
| TAG | BTUH PER FOOT | WIDTH (IN) | HEIGHT (IN) | MOUNTING HEIGHT (IN) | NUMBER | CENTERS (IN) | TUBE SIZE (IN) | FIN WIDTH (IN) | FIN HEIGHT (IN) | FINS PER FT | MANUFACTURER MODEL | TYPE | RATINGS | FEATURES | INSTALL |
| FTR-1 | 810 | 5-5/16 | 11 | 15 | 1 | 6 | 3/4 | 3-1/4 | 3-1/4 | 50 | STERLING MODEL JVB-ARS CLASSIC SLOPE | ① | ① | 1 2 4 | ① |
| FTR-2 | 608 | 5-1/16 | 10-3/4 | 10-3/4 | 1 | 6 | 3/4 | 4-1/4 | 3-5/8 | 50 | STERLING MODEL JVB-PM | ② | ① | 1 3 4 | ① |

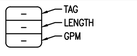
① SLOPED TOP FIN-TUBE
② PEDESTAL TOP FIN-TUBE

① 170°F AVERAGE WATER TEMPERATURE

1 COPPER TUBE, 0.20" THICK ALUMINUM FINS
2 16 GAGE ENCLOSURE
3 ADJUSTABLE PEDESTAL BRACKET WITH ALUMINUM FLOOR FLANGE
4 COLOR TO BE SELECTED BY ARCHITECT

① SEE DETAIL FOR PIPING

SYMBOL DESCRIPTION




## CABINET UNIT HEATER SCHEDULE

| GENERAL | | PERFORMANCE | | | ELECTRICAL | | | | PHYSICAL | REMARKS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TAG | CAPACITY (MBH) | GPM | WPD (FT WG) | CFM | WATTS | HP | VOLTAGE | PHASE | MANUFACTURER MODEL | TYPE | RATINGS | FEATURES | INSTALL |
| CUH-1 | 4.9 | 2.0 | 1.3 | 81 | 41 | – | 120 | 1 | SLANT/FIN TK-90 | ① | ① | 1 2 | ① |
| CUH-2 | 2.7 | 1.0 | 1.3 | 72 | 37 | – | 120 | 1 | SLANT/FIN TK-70 | ① | ① | 1 2 | ① |

① VERTICAL RECESSED

① 180°F EWT, 60°F EAT

1 RECESSED WALL MOUNTING KIT
2 INTEGRAL AQUASTAT CONTROLLER

① SEE PIPING DETAIL

## ELECTRIC BASEBOARD SCHEDULE

| GENERAL | | CAPACITY | ELECTRICAL | | | PHYSICAL | | REMARKS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TAG | LOCATION | BTUH | WATTS | AMPS | VOLTS | LENGTH (IN) | MANUFACTURER MODEL | TYPE | RATINGS | FEATURES | INSTALL |
| EBB-1 | ENTRY LEVEL ELEV. LOBBY | 3413 | 1000 | 8.3 | 120 | 4'-0" | QMARK QMKC2514 | ① | ① | 1 2 | ① |

① COMMERCIAL GRADE ELECTRIC BASEBOARD

① SINGLE PHASE POWER

1 DISCONNECT SWITCH
2 INTEGRAL THERMOSTAT

① PER MANUFACTURERS INSTRUCTIONS


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
MECHANICAL SCHEDULES

PROJECT NORTH:




PROJECT ARCHITECT: BTB
DRAWN: JPK
PROJECT NUMBER:
#2415

SHEET NUMBER:
M0.2
REV:
~

## VRF HEAT RECOVERY UNIT SCHEDULE

| GENERAL | | PERFORMANCE | | | | | ELECTRICAL | | | | PHYSICAL | | REMARKS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TAG | SERVES | NOMINAL TONS | COOLING CAPACITY | HEATING CAPACITY | IEER | SCHE | MCA | MOP | VOLTAGE | PHASE | MANUFACTURER MODEL | WEIGHT (LBS) | TYPE | RATINGS | FEATURES | INSTALL |
| HRU-1 | ROOF | 6.0 | 72.0 | 80.0 | 22.2 | 25.9 | 33.0 | 50.0 | 208 | 3 | TRANE MITSUBISHI TURY-E072JAN41AN | 519.0 | (1) | (1) | [1][2][3][4] | (1)(2)(3)(4) |

(1) A VARIABLE REFRIGERANT FLOW HEAT RECOVERY SYSTEM, CONSISTING OF A SINGLE MODULE.

(1) RATED PER AHRI

[1] REFRIGERANT PIPING LINE-SET FOR EACH INDOOR UNIT.
[2] TOUCH SCREEN CENTRAL CONTROLLER MODEL TE-200A (WITH BACNET)
[3] LOW AMBIENT KIT
[4] QUICK SLING STAND.

(1) PROVIDE REFRIGERANT PIPING BETWEEN AIR HANDLER(S) AND MATCHED COMPRESSOR UNIT, SIZED AND CONFIGURED PER THE MANUFACTURER'S RECOMMENDATIONS. ROUTE PIPING CONCEALED TO THE GREATEST EXTENT POSSIBLE.

(2) PROVIDE POWER AND NETWORK CABLE WITH IP ADDRESS FOR THE CENTRAL CONTROLLER

(3) REFER TO DETAIL FOR MOUNTING.

(4) THE SYSTEM MANUFACTURER SHALL PROVIDE A COMPLETE CONTROLS SYSTEM TO MAINTAIN SPACE TEMPERATURE SET-POINT. REFER TO EQUIPMENT SCHEDULE FOR A LIST OF EQUIPMENT TO BE INSTALLED AND PROGRAMMED. PROVIDE ALL SENSORS AND WIRING AS REQUIRED. THE CONTRACTOR SHALL INSTALL AND PROGRAM THE SYSTEM PER THE MANUFACTURER'S INSTRUCTIONS. TIE NEW VRF CONTROLLER TO THE EXISTING JOHNSON BUILDING MANAGEMENT SYSTEM.

## BRANCH CIRCUIT CONTROLLER SCHEDULE

| | ELECTRICAL | | | | PHYSICAL | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TAG | MCA | MOP | VOLTAGE | PHASE | MANUFACTURER MODEL | INDOOR UNIT CAPACITY (MBH) | WEIGHT (LBS) | TOTAL NUMBER OF PORTS | NUMBER OF SPARE PORTS |
| BC-1 | 1.1 | 20.0 | 208 | 1 | TRANE-MITSUBISHI TCMBG1012SJ21N4 | 54.0 | 109.0 | 12.0 | 3.0 |

NOTES:
1. SUSPEND UNIT FROM STRUCTURE ABOVE INSTALL PER MANUFACTURERS INSTRUCTIONS.

## VRF AIR HANDLING UNIT SCHEDULE CONT.

| PERFORMANCE | | | | | ELECTRICAL | | | | PHYSICAL | REMARKS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TAG | NOMINAL COOLING MBH | NOMINAL HEATING MBH | FAN CFM | FAN SPEED | MCA | MOP | VOLTAGE | PHASE | MANUFACTURER MODEL | TYPE | RATINGS | FEATURES | INSTALL |
| AH-1.1 | 6.0 | 6.7 | 307 | HIGH | 0.25 | 15.0 | 208 | 1 | TRANE-MITSUBISHI TPMFYP006BM140G | (1) | (1) | [1][2][3][4] | (1)(2)(3)(4)(5) |
| AH-1.2 | 6.0 | 6.7 | 307 | HIGH | 0.25 | 15.0 | 208 | 1 | TRANE-MITSUBISHI TPMFYP006BM140G | (1) | (1) | [1][2][3][4] | (1)(2)(3)(4)(5) |
| AH-1.3 | 8.0 | 9.0 | 328 | HIGH | 0.25 | 15.0 | 208 | 1 | TRANE-MITSUBISHI TPMFYP008BM140G | (1) | (1) | [1][2][3][4] | (1)(2)(3)(4)(5) |
| AH-1.4 | 6.0 | 6.7 | 307 | HIGH | 0.25 | 15.0 | 208 | 1 | TRANE-MITSUBISHI TPMFYP006BM140G | (1) | (1) | [1][2][3][4] | (1)(2)(3)(4)(5) |
| AH-1.5 | 8.0 | 9.0 | 328 | HIGH | 0.25 | 15.0 | 208 | 1 | TRANE-MITSUBISHI TPMFYP008BM140G | (1) | (1) | [1][2][3][4] | (1)(2)(3)(4)(5) |
| AH-1.6 | 8.0 | 9.0 | 328 | HIGH | 0.25 | 15.0 | 208 | 1 | TRANE-MITSUBISHI TPMFYP008BM140G | (1) | (1) | [1][2][3][4] | (1)(2)(3)(4)(5) |
| AH-1.7 | 6.0 | 6.7 | 307 | HIGH | 0.25 | 15.0 | 208 | 1 | TRANE-MITSUBISHI TPMFYP006BM140G | (1) | (1) | [1][2][3][4] | (1)(2)(3)(4)(5) |
| AH-1.8 | 24.0 | 27.0 | 812 | HIGH | 0.54 | 15.0 | 208 | 1 | TRANE-MITSUBISHI TPLFYP024EM142A | (2) | (1) | [1][2][3][4] | (1)(2)(3)(4)(5) |
| AH-1.9 | 24.0 | 27.0 | 812 | HIGH | 0.54 | 15.0 | 208 | 1 | TRANE-MITSUBISHI TPLFYP024EM142A | (2) | (1) | [1][2][3][4] | (1)(2)(3)(4)(5) |

(1) 1-WAY CEILING CASSETTE
(2) 4-WAY CEILING CASSETTE

(1) RATED PER AHRI

[1] CONDENSATE SAFETY SHUTDOWN SWITCH,
[2] HARD WIRED, WIFI PROGRAMMABLE THERMOSTAT W/ BACNET
[3] BUILT-IN LIFT MECHANISM
[4] REFRIGERANT PIPING LINE-SET FROM BC CONTROLLER TO AIR HANDLING UNIT

(1) REFRIGERANT PIPING, CONDENSATE PIPING, CONTROL WIRING AND CONDUIT, POWER WIRING AND CONDUIT, RELAYS, AND OTHER DEVICES SHALL BE CONCEALED; THE ONLY COMPONENT VISIBLE SHALL BE THE AIR HANDLER OR PUMP WHERE INDICATED. LOCATE DEVICES REQUIRING ACCESS IN ACCESSIBLE LOCATIONS; COORDINATE LOCATIONS WITH THE ARCHITECT AND PROVIDE ACCESS PANELS WHERE REQUIRED.

(2) PROVIDE AND INSTALL CONDENSATE OVERFLOW SWITCH DEVICE AT EACH UNIT CONFORMING TO UL-508 TO SHUT OFF THE UNIT IN THE EVENT THAT THE DRAIN IS BLOCKED.

(3) MOUNT INDOOR AIR HANDLING UNIT TO STRUCTURE WITH VIBRATION ISOLATION HANGERS. MAINTAIN MANUFACTURERS CLEARANCES REQUIREMENTS ON ALL SIDES OF AIR HANDLING UNIT.

(4) LABEL EACH THERMOSTAT TO MATCH CORRESPONDING INDOOR AIR HANDLING UNIT.

(5) PROVIDE A MINIMUM OF 12" STRAIGHT RUN OF REFRIGERANT PIPING PRIOR TO CONNECTION OF REFRIGERANT PIPING TO INDOOR AIR HANDLER.

## DUCTLESS SPLIT HEAT PUMP UNIT SCHEDULE

| GENERAL | | PERFORMANCE | | | | ELECTRICAL | | | | PHYSICAL | | REMARKS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TAG | SERVES | NOMINAL COOLING MBH @95° | NOMINAL HEATING MBH @47°F WB | SEER | EER | MCA (EA) | MOP (EA) | VOLTAGE (EA) | PHASE (EA) | MANUFACTURER MODEL | WEIGHT (LBS) | TYPE | RATINGS | FEATURES | INSTALL |
| DHP-1 | DAH-1 | 12.0 | 20.0 | 24.8 | 17.1 | 20.0 | 30.0 | 208 | 1 | TRANE-MITSUBISHI PUZ-AK12NL | 99.0 | (1) | (1) | [1][2][3] | (1)(2)(3) |
| DHP-2 | DAH-2 | 12.0 | 20.0 | 24.8 | 17.1 | 20.0 | 30.0 | 208 | 1 | TRANE-MITSUBISHI PUZ-AK12NL | 99.0 | (1) | (1) | [1][2][3] | (1)(2)(3) |
| DHP-3 | DAH-3 | 12.0 | 20.0 | 24.8 | 17.1 | 20.0 | 30.0 | 208 | 1 | TRANE-MITSUBISHI PUZ-AK12NL | 99.0 | (1) | (1) | [1][2][3] | (1)(2)(3) |
| DHP-4 | DAH-4 | 12.0 | 20.0 | 24.8 | 17.1 | 20.0 | 30.0 | 208 | 1 | TRANE-MITSUBISHI PUZ-AK12NL | 99.0 | (1) | (1) | [1][2][3] | (1)(2)(3) |
| DHP-5 | DAH-5A DAH-5B | 23.6 | 30.6 | 20.0 | 13.0 | 30.0 | 40.0 | 208 | 1 | TRANE-MITSUBISHI MXZ-3D24NLHZ | 152.0 | (2) | (1) | [1][2][3] | (1)(2)(3) |

(1) ONE TO ONE HEAT PUMP UNIT - 454B REFRIGERANT
(2) MULTI-ZONE HYPER HEAT PUMP UNIT - 454B REFRIGERANT

(1) RATED PER AHRI

[1] BACNET INTERFACE MODULE
[2] DISCONNECT SWITCH
[3] 18" QUICKSLING STAND

(1) PROVIDE SPLIT SYSTEM REFRIGERANT PIPING BETWEEN AIR HANDLER(S) AND MATCHED COMPRESSOR UNIT, SIZED AND CONFIGURED PER THE MANUFACTURER'S RECOMMENDATIONS. ROUTE PIPING CONCEALED TO THE GREATEST EXTENT. POSSIBLE.

(2) INSTALL PER MANUFACTURERS RECOMMENDATIONS.

(3) TIE CONTROLS BACK TO EXISTING JOHNSON BUILDING MANAGEMENT SYSTEM.

## DUCTLESS SPLIT AIR HANDLER UNIT SCHEDULE

| PERFORMANCE | | | | | | ELECTRICAL | | | | PHYSICAL | REMARKS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TAG | NOMINAL COOLING MBH | NOMINAL HEATING MBH @47° | FAN CFM | FAN ESP (IN WC) | FAN SPEED | MCA | MOP | VOLTAGE | PHASE | MANUFACTURER MODEL | TYPE | RATINGS | FEATURES | INSTALL |
| DAH-1 | 12.0 | 20.0 | 530 | - | HIGH | INDOOR UNIT POWERED BY OUTDOOR UNIT | | | | TRANE-MITSUBISHI PLA-AE12NL | (1) | (1) | [1][2][3] | (1)(2) |
| DAH-2 | 12.0 | 20.0 | 530 | - | HIGH | INDOOR UNIT POWERED BY OUTDOOR UNIT | | | | TRANE-MITSUBISHI PLA-AE12NL | (1) | (1) | [1][2][3] | (1)(2) |
| DAH-3 | 12.0 | 20.0 | 530 | - | HIGH | INDOOR UNIT POWERED BY OUTDOOR UNIT | | | | TRANE-MITSUBISHI PLA-AE12NL | (1) | (1) | [1][2][3] | (1)(2) |
| DAH-4 | 12.0 | 20.0 | 530 | - | HIGH | INDOOR UNIT POWERED BY OUTDOOR UNIT | | | | TRANE-MITSUBISHI PLA-AE12NL | (1) | (1) | [1][2][3] | (1)(2) |
| DAH-5A DAH-5B | 10.9 | 12.0 | 335 | - | HIGH | INDOOR UNIT POWERED BY OUTDOOR UNIT | | | | TRANE-MITSUBISHI SLZ-AF12NL | (1) | (1) | [1][2][3] | (1)(2) |

(1) 4-WAY CEILING CASSETTE

(1) RATED PER AHRI

[1] HARD WIRED WALL MOUNT PROGRAMMABLE THERMOSTAT - MODEL - TAR-42MAAUB
[2] BUILT-IN CONDENSATE PUMP
[3] CONDENSATE SAFETY SWITCH

(1) REFRIGERANT PIPING, CONDENSATE PIPING, CONTROL WIRING AND CONDUIT, POWER WIRING AND CONDUIT, RELAYS, AND OTHER DEVICES SHALL BE CONCEALED; THE ONLY COMPONENT VISIBLE SHALL BE THE AIR HANDLER OR PUMP WHERE INDICATED. LOCATE DEVICES REQUIRING ACCESS IN ACCESSIBLE LOCATIONS; COORDINATE LOCATIONS WITH THE ARCHITECT AND PROVIDE ACCESS PANELS WHERE REQUIRED.

(2) INDOOR UNIT SHALL BE POWERED FROM THE OUTDOOR UNIT.

*CONDENSATE PUMPS SHALL HAVE CAPABILITY FOR 208V CONNECTION FROM INDOOR UNIT

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
MECHANICAL SCHEDULES

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: JPK

PROJECT NUMBER:
#2415

SHEET NUMBER: M0.3
REV: ~

SHEET SPECIFIC MECHANICAL DEMOLITION KEYED NOTES:

1. REMOVE & DISCARD EXISTING AIR HANDLER, INTAKE LOUVER, DUCTWORK, DIFFUSERS, INSULATION, HANGERS AND ALL ASSOCIATED APPURTENANCES IN ITS ENTIRETY.
2. REMOVE & DISCARD EXISTING EXHAUST FAN, EXHAUST LOUVER, DUCTWORK, GRILLES, HANGERS, CONTROLS AND ALL ASSOCIATED APPURTENANCES IN ITS ENTIRETY.
3. REMOVE & DISCARD EXISTING HWS/HWR PIPING, INSULATION, HANGERS, AND ALL ASSOCIATED APPURTENANCES IN ITS ENTIRETY TO POINT INDICATED ON DRAWING. MAKE WATER TIGHT.
4. REMOVE & DISCARD EXISTING FIN-TUBE RADIATION, HWS/HWR PIPING, INSULATION, HANGERS, CONTROLS AND ALL ASSOCIATED APPURTENANCES IN ITS ENTIRETY TO POINT INDICATED ON DRAWING.
5. CONTRACTOR SHALL REMOVE SECTION OF FIN-TUBE RADIATION TO POINT INDICATED FOR NEW DOOR OR WALL. MODIFY AS REQUIRED. SALVAGE EXISTING COVER, SPLINE PIECES AND END CAPS TO BE REUSED WHERE NEEDED. REFER TO NEW WORK PIPING DRAWING FOR MORE INFORMATION.
6. REMOVE & DISCARD EXISTING INTAKE LOUVER, AND ALL ASSOCIATED APPURTENANCES IN ITS ENTIRETY. COORDINATE PATCHING EXISTING OPENING WITH G.C/ARCHITECT. REFER TO NEW WORK DRAWING M2.1 FOR MORE INFORMATION.
7. CAREFULLY REMOVE & RELOCATE EXISTING HOT WATER UNIT HEATER, CONTROLS, AND ALL ASSOCIATED APPURTENANCES IN ITS ENTIRETY. REFER TO NEW WORK DRAWING M2.1 FOR NEW LOCATION.
8. REMOVE & DISPOSE OF EXISTING CONTROL VALVE AND ALL ASSOCIATED APPURTENANCES IN ITS ENTIRETY. REFER TO NEW WORK DRAWING M2.1 FOR MORE INFORMATION.

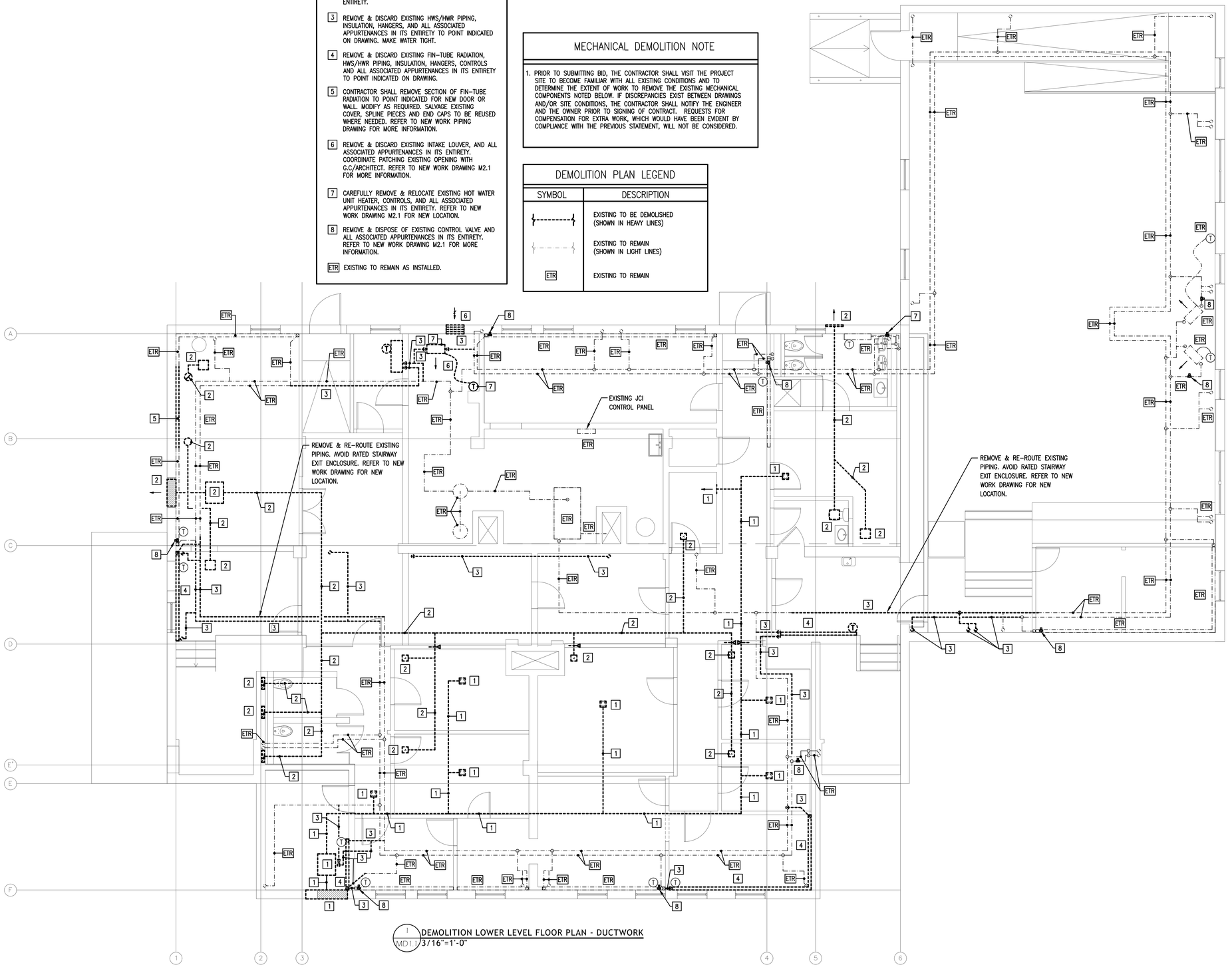
ETR EXISTING TO REMAIN AS INSTALLED.

## MECHANICAL DEMOLITION NOTE

1. PRIOR TO SUBMITTING BID, THE CONTRACTOR SHALL VISIT THE PROJECT SITE TO BECOME FAMILIAR WITH ALL EXISTING CONDITIONS AND TO DETERMINE THE EXTENT OF WORK TO REMOVE THE EXISTING MECHANICAL COMPONENTS NOTED BELOW. IF DISCREPANCIES EXIST BETWEEN DRAWINGS AND/OR SITE CONDITIONS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE OWNER PRIOR TO SIGNING OF CONTRACT. REQUESTS FOR COMPENSATION FOR EXTRA WORK, WHICH WOULD HAVE BEEN EVIDENT BY COMPLIANCE WITH THE PREVIOUS STATEMENT, WILL NOT BE CONSIDERED.

## DEMOLITION PLAN LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| | EXISTING TO BE DEMOLISHED (SHOWN IN HEAVY LINES) |
| | EXISTING TO REMAIN (SHOWN IN LIGHT LINES) |
| ETR | EXISTING TO REMAIN |




1 MD1.1 DEMOLITION LOWER LEVEL FLOOR PLAN - DUCTWORK
3/16"=1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
MECHANICAL
DEMOLITION LOWER LEVEL
PLAN - DUCTWORK

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: JPK
PROJECT NUMBER:
#2415

SHEET NUMBER: MD1.1
REV: ~

SHEET SPECIFIC MECHANICAL DEMOLITION KEYED NOTES:

1. REMOVE & DISCARD EXISTING DUCTWORK, DIFFUSERS/GRILLES, INSULATION, HANGERS AND ALL ASSOCIATED APPURTENANCES IN ITS ENTIRETY.
2. REMOVE & DISCARD EXISTING EXHAUST FAN, EXHAUST LOUVER, DUCTWORK, GRILLES, HANGERS, CONTROLS AND ALL ASSOCIATED APPURTENANCES IN ITS ENTIRETY. COORDINATE PATCHING EXISTING OPENING WITH G.C/ARCHITECT.
3. REMOVE & DISCARD EXISTING FIN-TUBE RADIATION, HWS/HWR PIPING, INSULATION, HANGERS, CONTROLS AND ALL ASSOCIATED APPURTENANCES IN ITS ENTIRETY TO POINT INDICATED ON DRAWING.
4. CONTRACTOR SHALL REMOVE SECTION OF FIN-TUBE RADIATION TO POINT INDICATED FOR NEW DOOR OR WALL. MODIFY AS REQUIRED. SALVAGE EXISTING COVER, SPLINE PIECES AND END CAPS TO BE REUSED WHERE NEEDED. REFER TO NEW WORK PIPING DRAWING FOR MORE INFORMATION.
5. CAREFULLY REMOVE & RETURN WINDOW AIR CONDITIONER & ALL ASSOCIATED APPURTENANCES TO OWNER. COORDINATE EXACT STORAGE LOCATION WITH OWNER PRIOR TO REMOVAL.
6. REMOVE & DISPOSE OF EXISTING CONTROL VALVE AND ALL ASSOCIATED APPURTENANCES IN ITS ENTIRETY. REFER TO NEW WORK DRAWING M2.2 FOR MORE INFORMATION.
6. REMOVE & DISPOSE OF EXISTING SPLIT SYSTEM AIR HANDLER, ALL PIPING, CONTROLS, AND ALL ASSOCIATED APPURTENANCES IN ITS ENTIRETY.

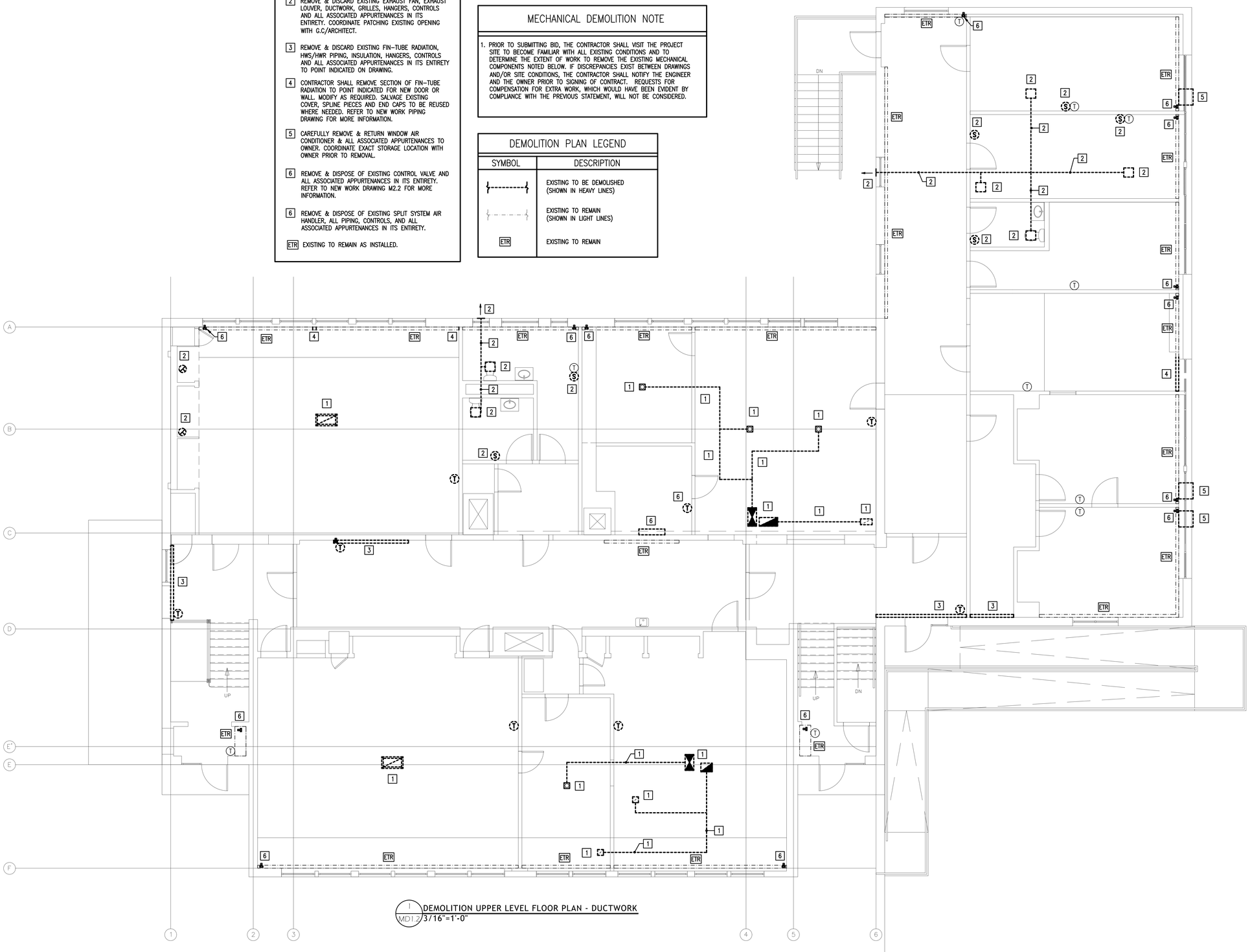
ETR EXISTING TO REMAIN AS INSTALLED.

## MECHANICAL DEMOLITION NOTE

1. PRIOR TO SUBMITTING BID, THE CONTRACTOR SHALL VISIT THE PROJECT SITE TO BECOME FAMILIAR WITH ALL EXISTING CONDITIONS AND TO DETERMINE THE EXTENT OF WORK TO REMOVE THE EXISTING MECHANICAL COMPONENTS NOTED BELOW. IF DISCREPANCIES EXIST BETWEEN DRAWINGS AND/OR SITE CONDITIONS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE OWNER PRIOR TO SIGNING OF CONTRACT. REQUESTS FOR COMPENSATION FOR EXTRA WORK, WHICH WOULD HAVE BEEN EVIDENT BY COMPLIANCE WITH THE PREVIOUS STATEMENT, WILL NOT BE CONSIDERED.

## DEMOLITION PLAN LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| | EXISTING TO BE DEMOLISHED (SHOWN IN HEAVY LINES) |
| | EXISTING TO REMAIN (SHOWN IN LIGHT LINES) |
| ETR | EXISTING TO REMAIN |




1 MD1.2 DEMOLITION UPPER LEVEL FLOOR PLAN - DUCTWORK
3/16"=1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
MECHANICAL
DEMOLITION UPPER LEVEL
PLAN - DUCTWORK

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: JPK
PROJECT NUMBER:
#2415

SHEET NUMBER: MD1.2
REV: ~

## MECHANICAL DEMOLITION NOTE

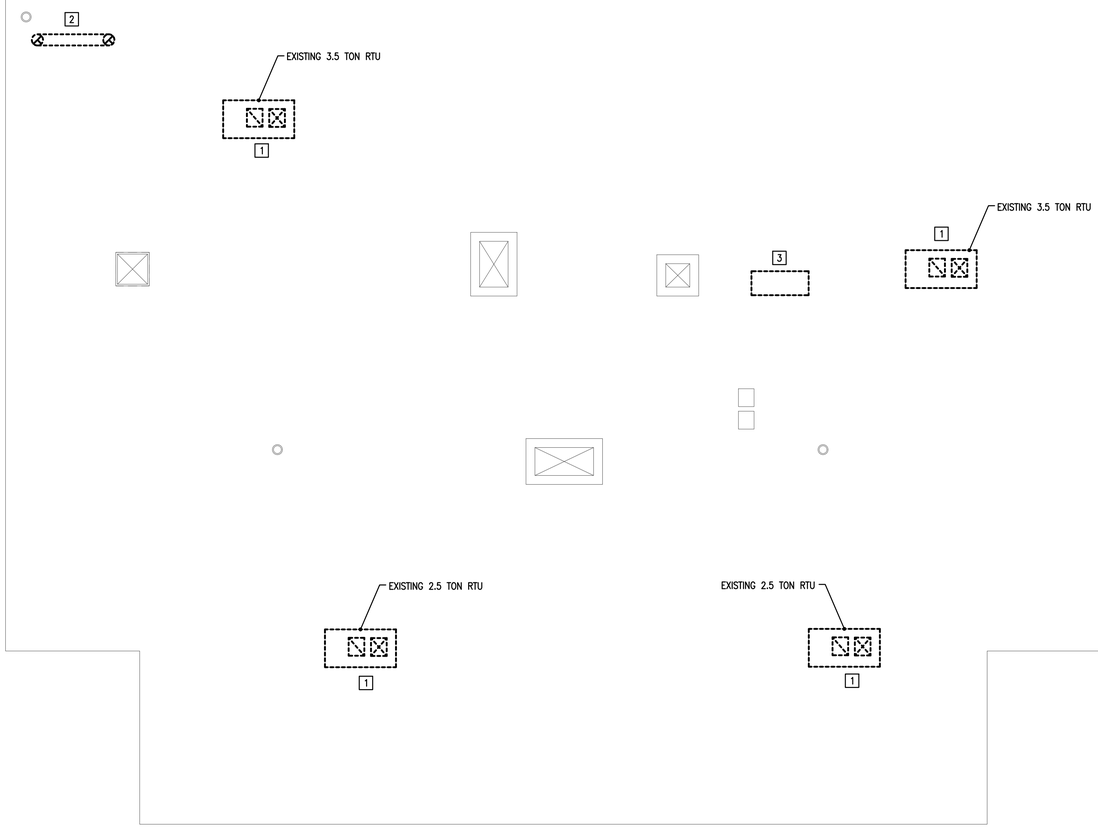
1. PRIOR TO SUBMITTING BID, THE CONTRACTOR SHALL VISIT THE PROJECT SITE TO BECOME FAMILIAR WITH ALL EXISTING CONDITIONS AND TO DETERMINE THE EXTENT OF WORK TO REMOVE THE EXISTING MECHANICAL COMPONENTS NOTED BELOW. IF DISCREPANCIES EXIST BETWEEN DRAWINGS AND/OR SITE CONDITIONS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE OWNER PRIOR TO SIGNING OF CONTRACT. REQUESTS FOR COMPENSATION FOR EXTRA WORK, WHICH WOULD HAVE BEEN EVIDENT BY COMPLIANCE WITH THE PREVIOUS STATEMENT, WILL NOT BE CONSIDERED.

## DEMOLITION PLAN LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| | EXISTING TO BE DEMOLISHED (SHOWN IN HEAVY LINES) |
| | EXISTING TO REMAIN (SHOWN IN LIGHT LINES) |
| ETR | EXISTING TO REMAIN |

SHEET SPECIFIC MECHANICAL DEMOLITION KEYED NOTES:

1. REMOVE & DISCARD EXISTING ROOFTOP UNIT, ROOF CURB, DUCTWORK, INSULATION, HANGERS AND ALL ASSOCIATED APPURTENANCES IN ITS ENTIRETY.
2. REMOVE & DISCARD EXISTING EXHAUST DUCTWORK, HANGERS, AND ALL ASSOCIATED APPURTENANCES IN ITS ENTIRETY.
3. REMOVE & DISCARD EXISTING CONDENSING UNIT, SLEEPERS, REFRIGERANT PIPING, CONTROLS, AND ALL ASSOCIATED APPURTENANCES IN ITS ENTIRETY.




1 / MD1.3 DEMOLITION ROOF PLAN - MECHANICAL
3/16"=1'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:


PROJECT TITLE:
PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

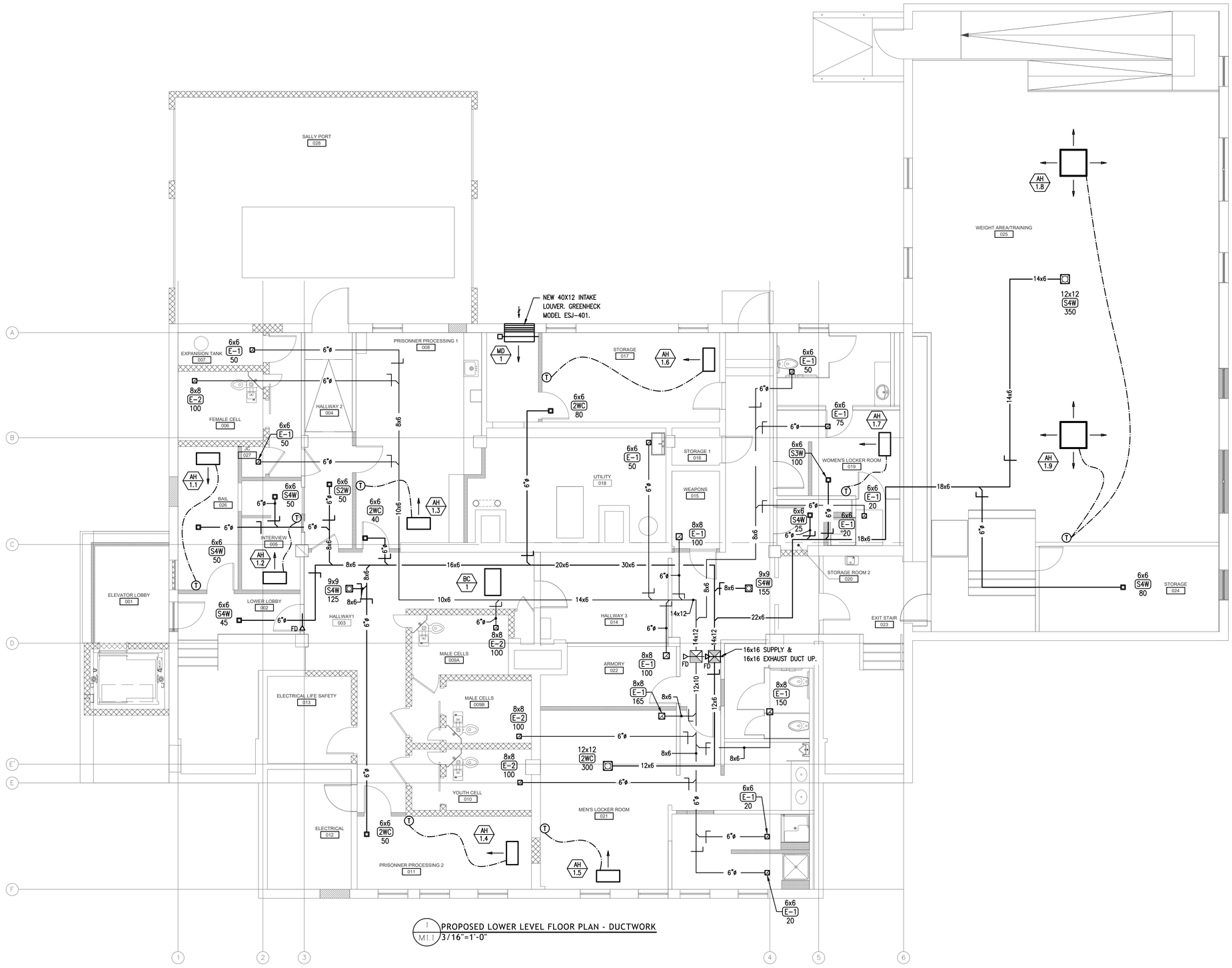
STAMP:

SHEET TITLE:
MECHANICAL
DEMOLITION ROOF PLAN

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: JPK
PROJECT NUMBER:
#2415

SHEET NUMBER: MD1.3
REV: ~




Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

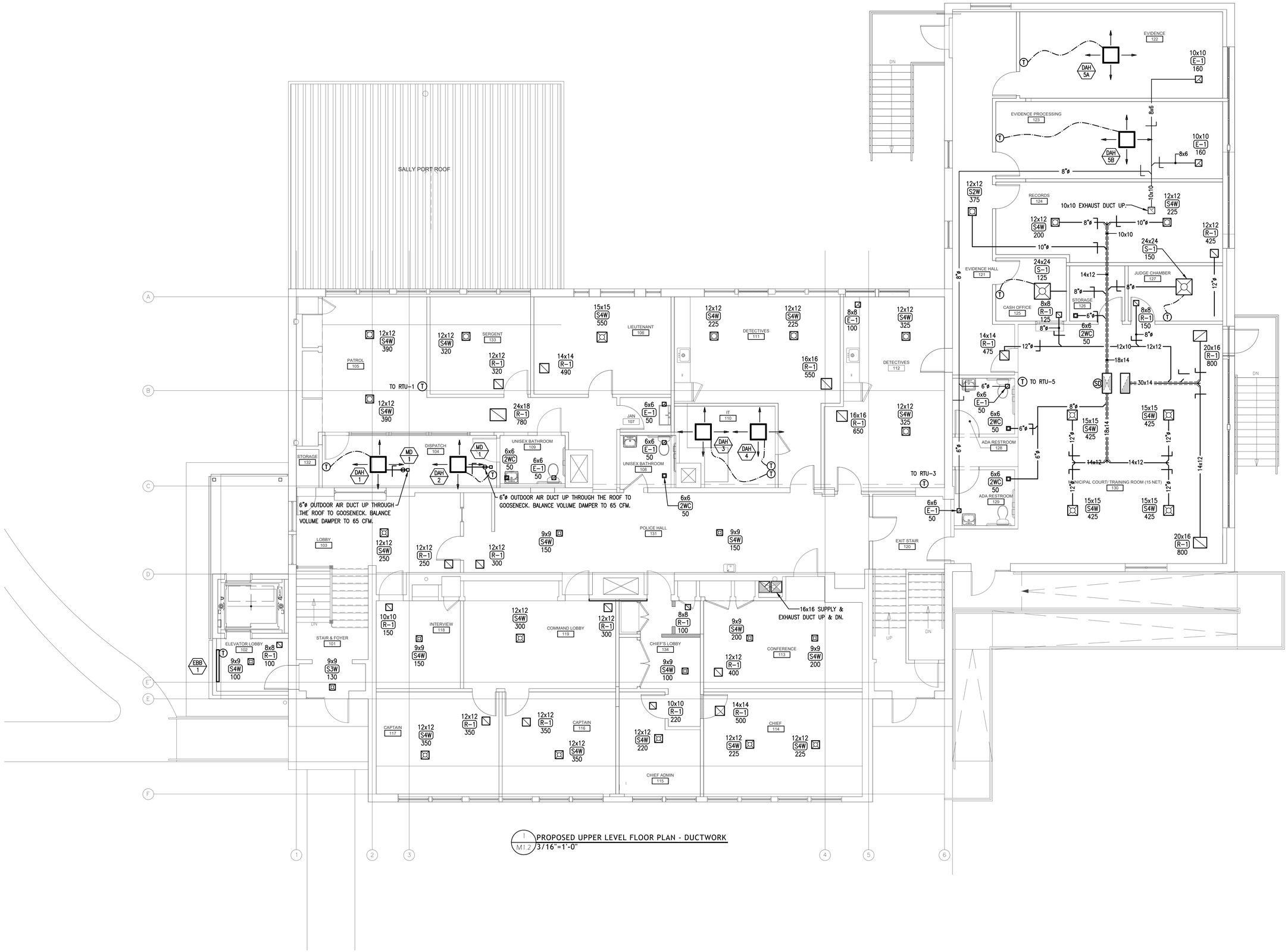
SHEET TITLE:
MECHANICAL
PROPOSED LOWER LEVEL PLAN - DUCTWORK

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: JPK

PROJECT NUMBER:
#2415

SHEET NUMBER: M1.1
REV: ~




1 M1.2 PROPOSED UPPER LEVEL FLOOR PLAN - DUCTWORK
3/16"=1'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

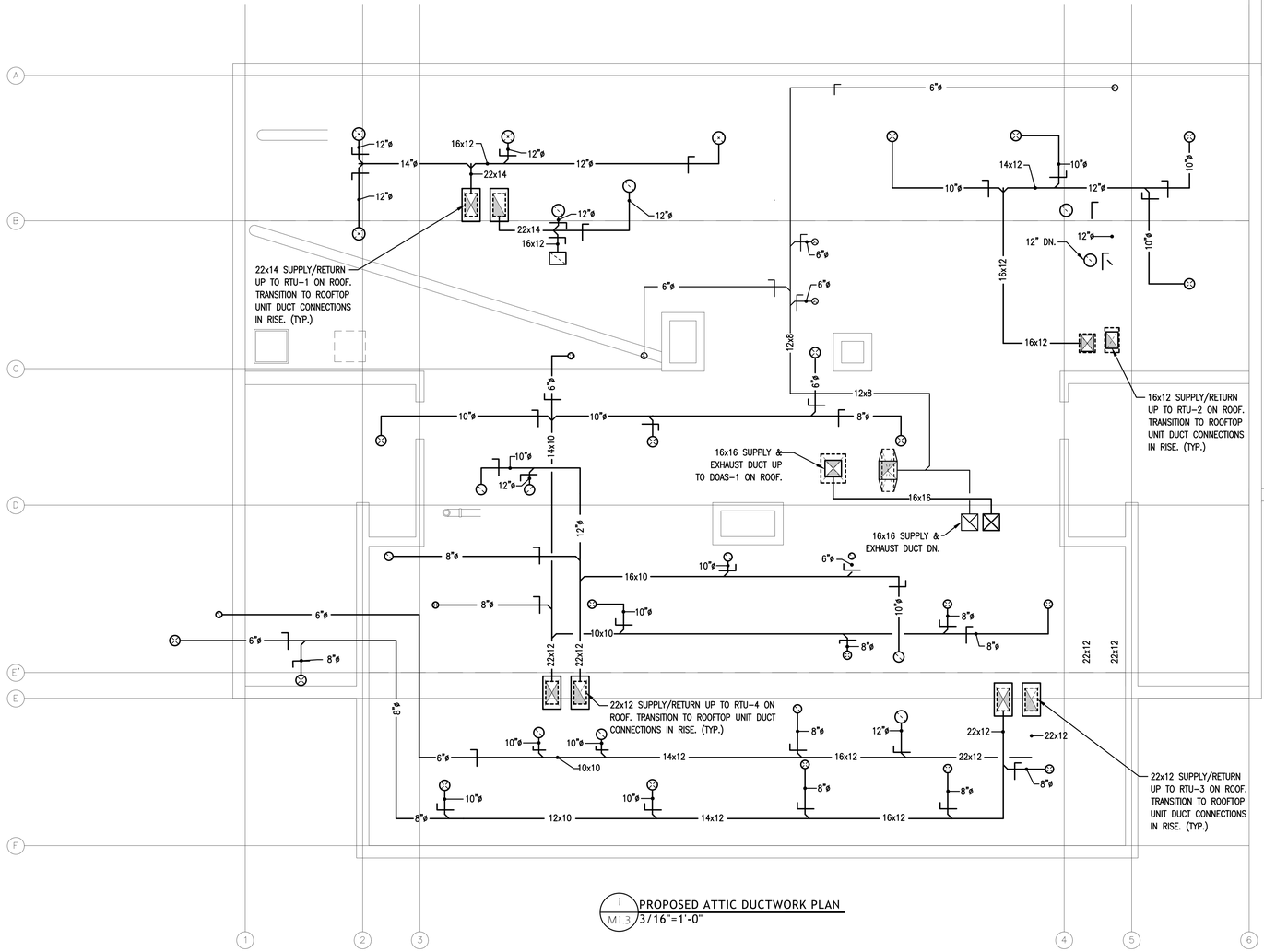
SHEET TITLE:
MECHANICAL
PROPOSED UPPER LEVEL PLAN
- DUCTWORK

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: JPK

PROJECT NUMBER:
#2415

SHEET NUMBER: M1.2
REV: ~




1 M1.3 PROPOSED ATTIC DUCTWORK PLAN
3/16"=1'-0"

**NOTE**

1. WRAP ALL DUCTWORK WITHIN ATTIC SPACE WITH A MINIMUM R-6 DUCT INSULATION.


Signal Works

11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

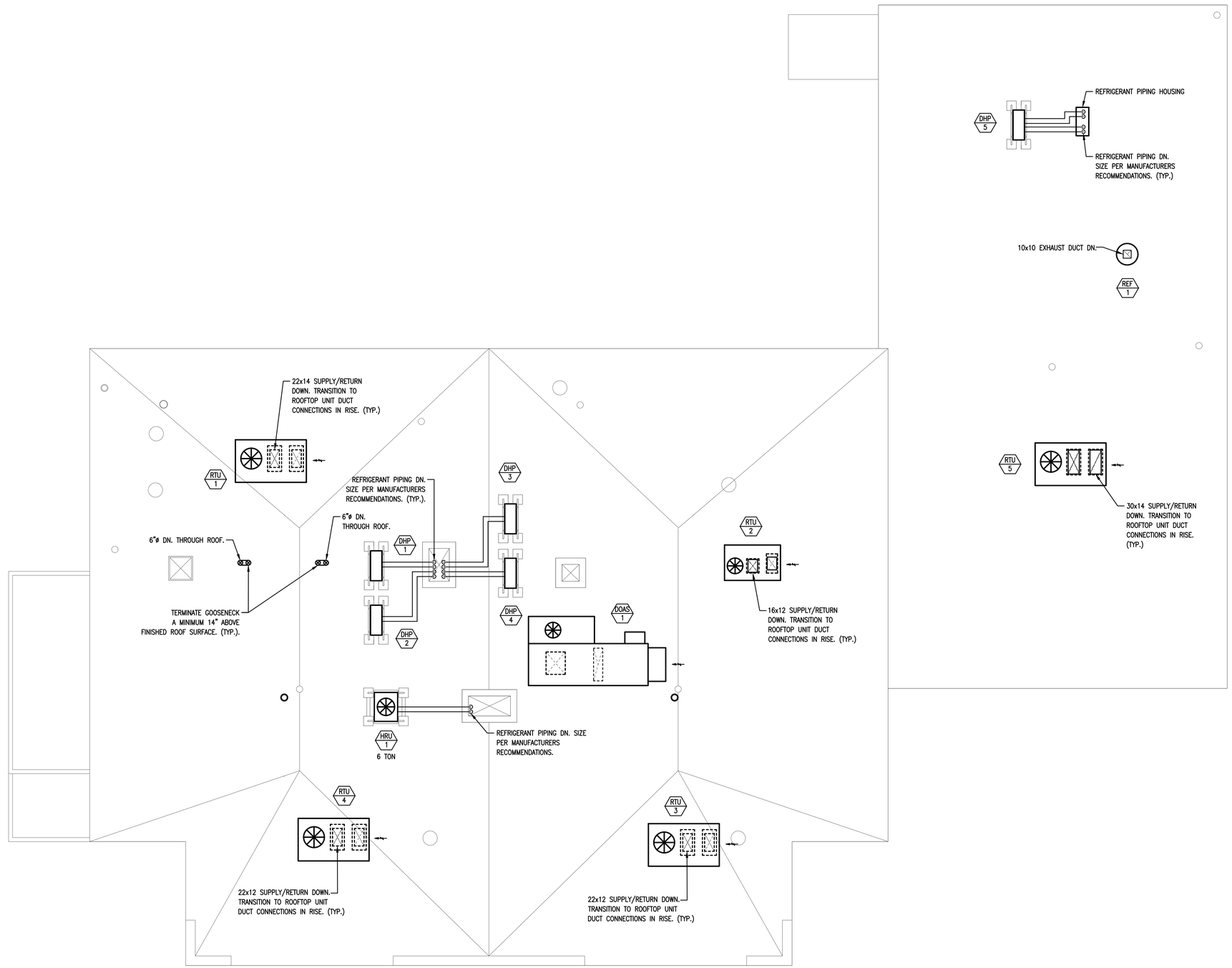
SHEET TITLE:
PROPOSED ATTIC DUCTWORK PLAN

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: JPK

PROJECT NUMBER:
#2415

SHEET NUMBER: M1.3
REV: ~




1 M1.4 PROPOSED ROOF PLAN - MECHANICAL
3/16"=1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
MECHANICAL
PROPOSED ROOF PLAN

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: JPK

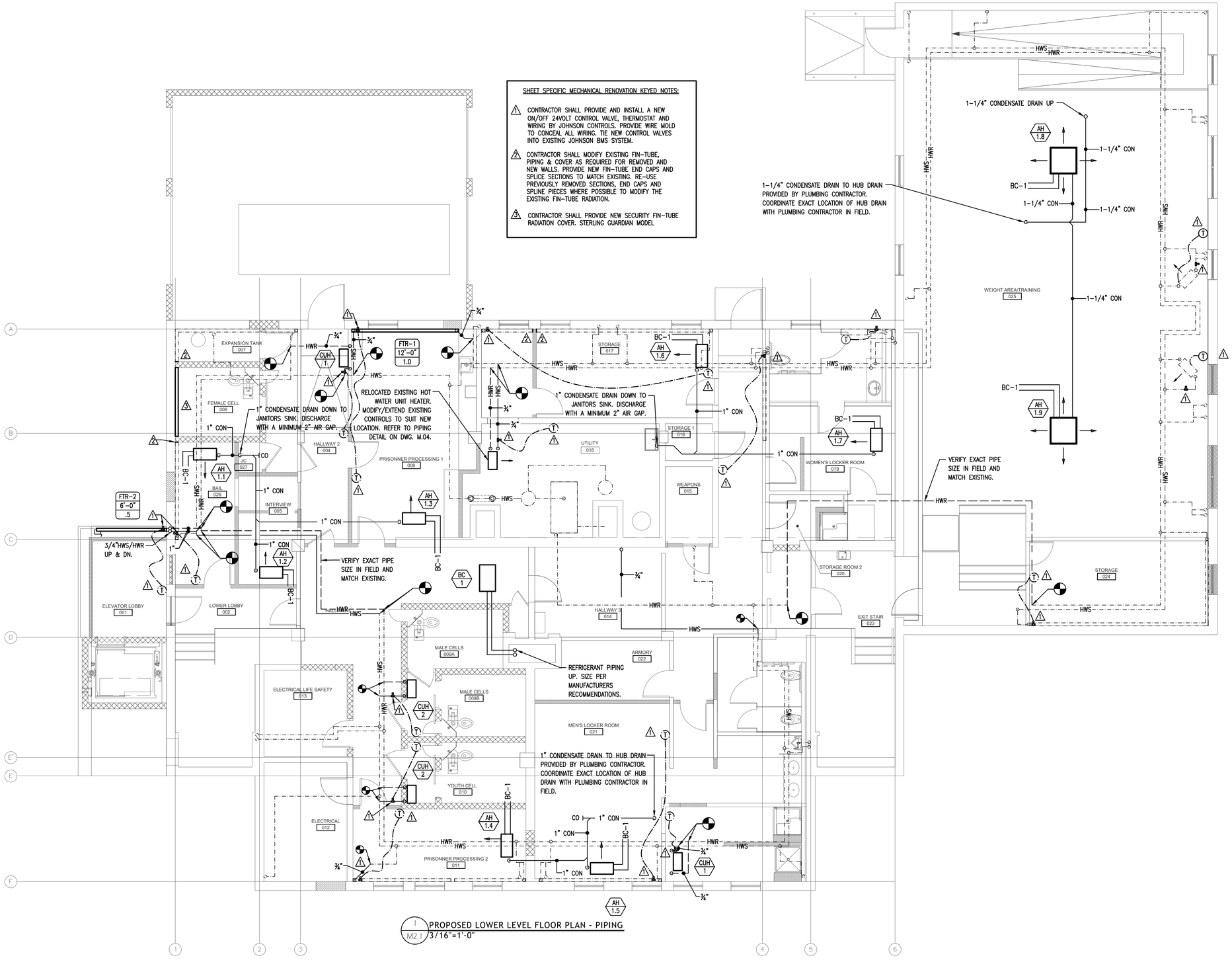
PROJECT NUMBER:
#2415

SHEET NUMBER:
M1.4

REV:
~

SHEET SPECIFIC MECHANICAL RENOVATION KEYED NOTES:

1. CONTRACTOR SHALL PROVIDE AND INSTALL A NEW ON/OFF 24VOLT CONTROL VALVE, THERMOSTAT AND WIRING BY JOHNSON CONTROLS. PROVIDE WIRE MOLD TO CONCEAL ALL WIRING. TIE NEW CONTROL VALVES INTO EXISTING JOHNSON BMS SYSTEM.
2. CONTRACTOR SHALL MODIFY EXISTING FIN-TUBE, PIPING & COVER AS REQUIRED FOR REMOVED AND NEW WALLS. PROVIDE NEW FIN-TUBE END CAPS AND SPLICE SECTIONS TO MATCH EXISTING. RE-USE PREVIOUSLY REMOVED SECTIONS, END CAPS AND SPLINE PIECES WHERE POSSIBLE TO MODIFY THE EXISTING FIN-TUBE RADIATION.
3. CONTRACTOR SHALL PROVIDE NEW SECURITY FIN-TUBE RADIATION COVER. STERLING GUARDIAN MODEL




1 PROPOSED LOWER LEVEL FLOOR PLAN - PIPING
M2.1 3/16"=1'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
MECHANICAL
PROPOSED LOWER LEVEL PLAN - PIPING

PROJECT NORTH:

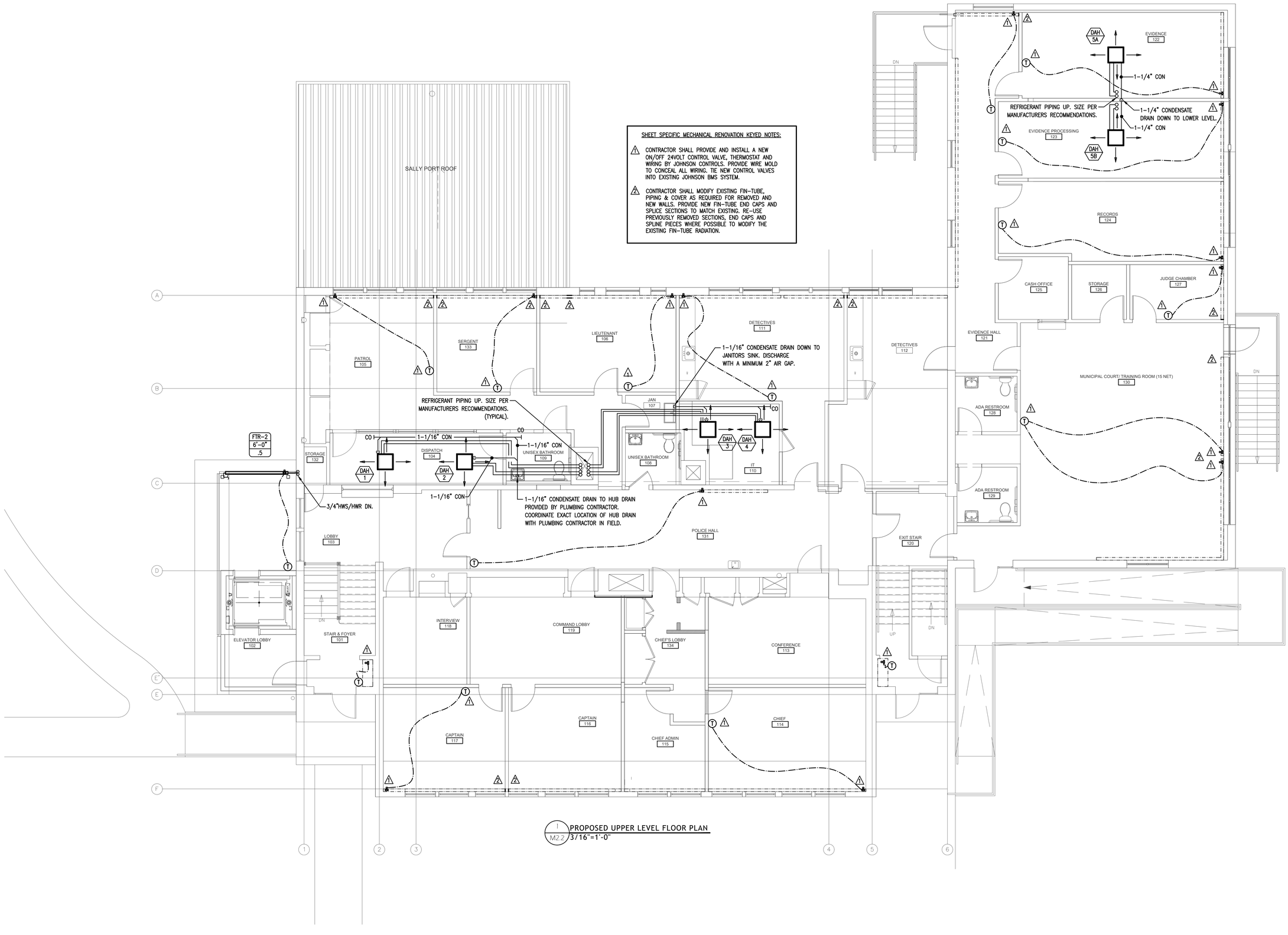
PROJECT ARCHITECT: BTB
DRAWN: JPK

PROJECT NUMBER:
#2415

SHEET NUMBER: M2.1
REV: ~

SHEET SPECIFIC MECHANICAL RENOVATION KEYED NOTES:

1. CONTRACTOR SHALL PROVIDE AND INSTALL A NEW ON/OFF 24VOLT CONTROL VALVE, THERMOSTAT AND WIRING BY JOHNSON CONTROLS. PROVIDE WIRE MOLD TO CONCEAL ALL WIRING. TIE NEW CONTROL VALVES INTO EXISTING JOHNSON BMS SYSTEM.
2. CONTRACTOR SHALL MODIFY EXISTING FIN-TUBE, PIPING & COVER AS REQUIRED FOR REMOVED AND NEW WALLS. PROVIDE NEW FIN-TUBE END CAPS AND SPLICE SECTIONS TO MATCH EXISTING. RE-USE PREVIOUSLY REMOVED SECTIONS, END CAPS AND SPLINE PIECES WHERE POSSIBLE TO MODIFY THE EXISTING FIN-TUBE RADIATION.




1 M2.2 PROPOSED UPPER LEVEL FLOOR PLAN
3/16"=1'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

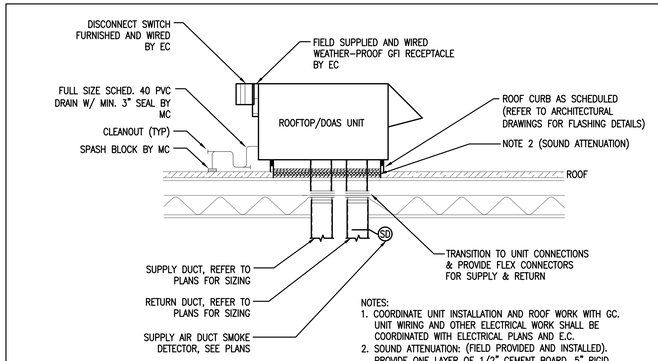
STAMP:

SHEET TITLE:
MECHANICAL
PROPOSED UPPER LEVEL PLAN
- PIPING

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: JPK
PROJECT NUMBER:
#2415

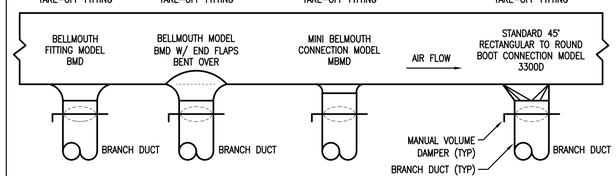
SHEET NUMBER: M2.2
REV: ~




NOTES:
1. COORDINATE UNIT INSTALLATION AND ROOF WORK WITH GC. UNIT WIRING AND OTHER ELECTRICAL WORK SHALL BE COORDINATED WITH ELECTRICAL PLANS AND E.C.
2. SOUND ATTENUATION: (FIELD PROVIDED AND INSTALLED). PROVIDE ONE LAYER OF 1/2" CEMENT BOARD, 5" RIGID INSULATION AND TWO LAYERS OF 1/2" CEMENT BOARD ON TOP. SEAL AROUND DUCT AND STAGGER JOINTS OF TOP LAYERS OF CEMENT BOARD. PROVIDE SUPPORTS FOR THE ABOVE WORK INSIDE THE CURB.

ROOFTOP/DEDICATED OUTDOOR AIR UNIT DETAIL | NTS

NOTE: ALTERNATE FITTINGS TO BE USED WHEN DUCT HEIGHT DOES NOT PERMIT THE USE OF THE FULL SIZE, PREFERRED BELLMOUTH

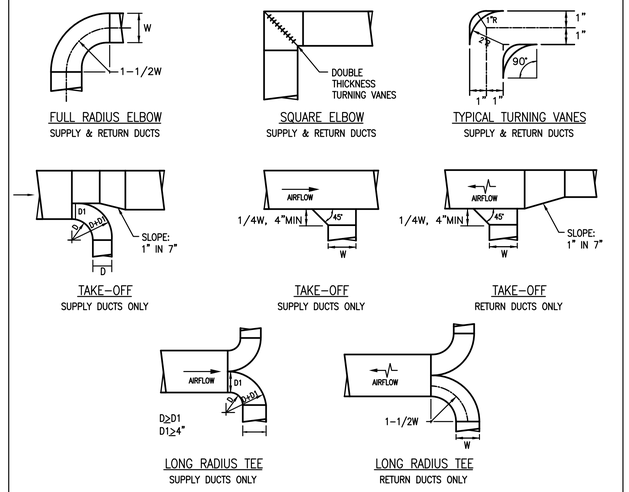



| DUCT SIZE | HOLE SIZE | MINIMUM DUCT HEIGHT |
|---|---|---|
| 5" | 8" | 9" |
| 6" | 9" | 10" |
| 7" | 10" | 11" |
| 8" | 11" | 12" |
| 9" | 12" | 13" |
| 10" | 13" | 14" |
| 12" | 15" | 16" |
| 14" | 17" | 18" |
| 16" | 19" | 20" |

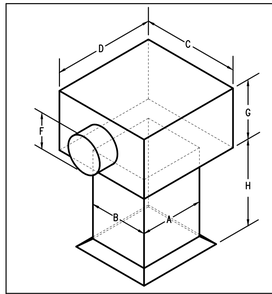
| DUCT SIZE | HOLE SIZE | MINIMUM DUCT HEIGHT |
|---|---|---|
| 5" | – | – |
| 6" | 7" | 9" |
| 7" | – | – |
| 8" | 9" | 11" |
| 9" | – | – |
| 10" | 11" | 13" |
| 12" | – | – |
| 14" | – | – |
| 16" | – | – |

| DUCT SIZE | HOLE SIZE | MINIMUM DUCT HEIGHT |
|---|---|---|
| 5" | 5"x10" | 7" |
| 6" | 6"x12" | 8" |
| 7" | 6"x12" | 8" |
| 8" | 6.5"x12" | 8.5" |
| 9" | 6.5"x14" | 8.5" |
| 10" | 6.5"x16" | 8.5" |
| 12" | 8.5"x18" | 12" |
| 14" | 10"x20" | 10.5" |
| 16" | – | – |

ROUND BRANCH DUCT TAKE-OFF DETAIL | NTS



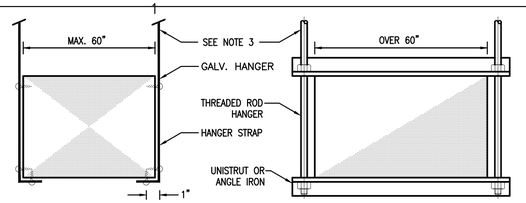

TYPICAL DUCT ELBOWS AND TAKE-OFFS DETAIL | NTS




NECK = A X B
C= B+2" (MIN)
D= A+2" (MIN)
G= F+2" (MIN)
H= 6" (MIN)
F= ROUND CONNECT SIZE OR DEPTH OF AN EQUIVALENT OVAL HAVING THE SAME CIRCUMFERENCE AS THE ROUND

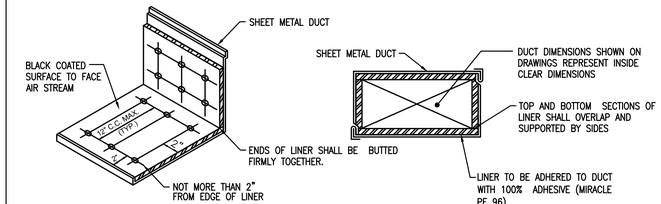
NOTES:
1. PROVIDE A MINIMUM 3'-0" AND A MAXIMUM 5'-0" OF FLEX DUCT AT EACH CEILING MOUNTED GRILLE/DIFFUSER.

SPQUARE DIFFUSER CONNECTION BOOT DETAIL | NTS

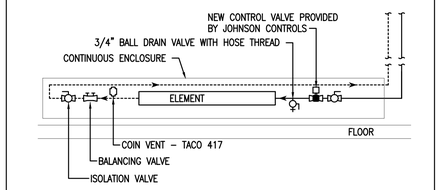



NOTES:
1. ON DUCTS OVER 48" WIDE, BOTTOM SHALL BE BRACED BY ANGLE. FOR CROSS SECTION AREA MORE THAN 8 SQ. FT., DUCT SHALL BE BRACED BY ANGLES ON ALL FOUR SIDES.
2. CUTTING AND PATCHING SHALL BE LIMITED TO A MINIMUM AS REQUIRED FOR PROPER INSTALLATION.
3. SUPPORTS SHALL BE SPACED AND SIZED PER SMACNA STANDARDS.

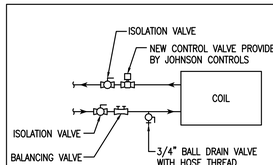
DUCT HANGER/SUPPORT DETAIL | NTS



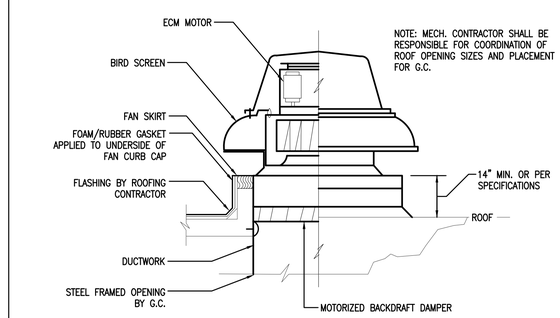

DUCT LINER DETAIL | NTS




FIN TUBE HYDRONIC PIPING DIAGRAM | NTS




CUH & UH HYDRONIC PIPING DIAGRAM | NTS




ROOF MOUNTED EXHAUST FAN DETAIL | NTS

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
MECHANICAL DETAILS

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: JPK
PROJECT NUMBER:
#2415

SHEET NUMBER: M3.1
REV: ~

NORTH SMITHFIELD PUBLIC SAFETY COMPLEX

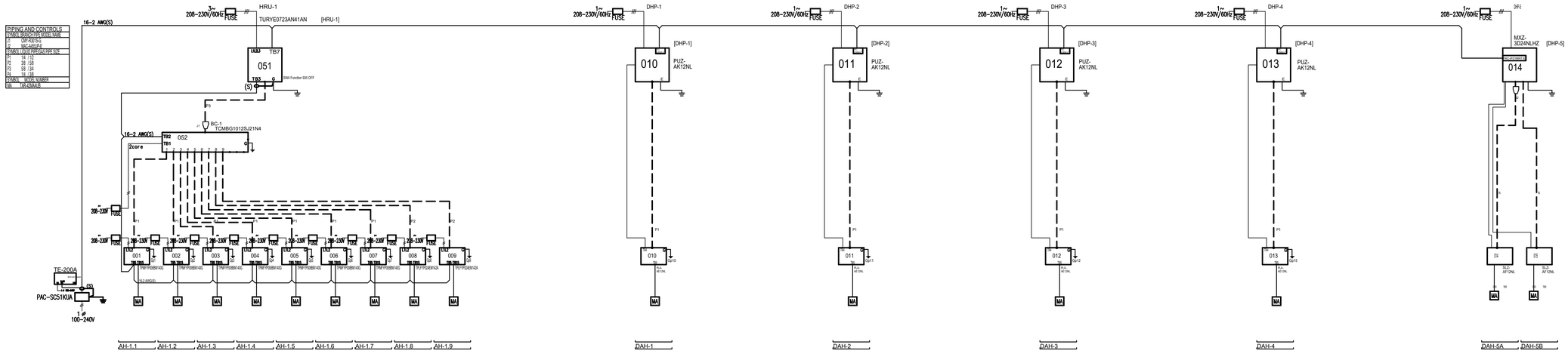
| DIAGRAM SYMBOL LEGEND | | | |
|---|---|---|---|
| DISPLAY | DESCRIPTION | CONT.No | PAGE |
| | POWER WIRE | | |
| | CONTROL WIRE | | |
| | REF. PIPE | | |

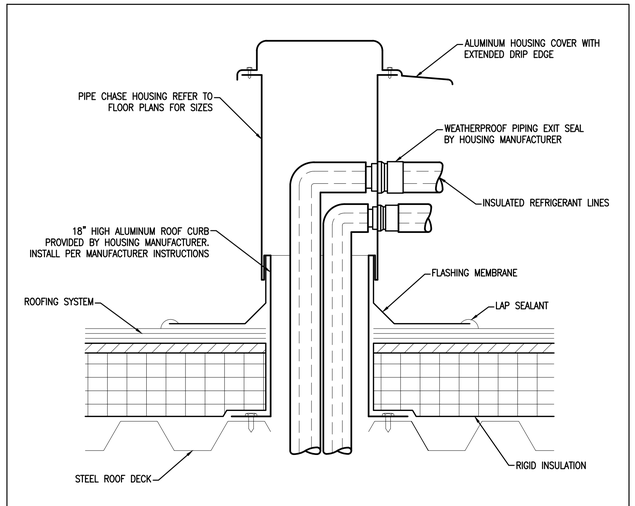
This drawing is schematic in nature. Final routing of piping & wiring shall be determined by the installing contractor and/or designer of record

Additional refrigerant charge is needed depending on the size and length of extended piping. Please refer the amount of pre-charge and the formula of calculation which is mentioned on the data book.

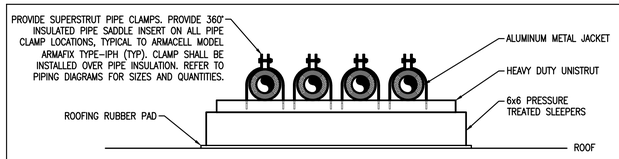
1.25mm²(16 AWG) : 1.25mm²(16 AWG) or more, 0.75mm²(20 AWG) : between 0.5mm²(24 AWG) and 0.75mm²(20 AWG).

Coded Notes
NOTE 1: Install twinning Y's within 10 degrees of level and with 20 inches of straight pipe on converging connection - reference installation manual for additional details including but not limited to special trapping requirements when twinning, and pipe slope requirements.



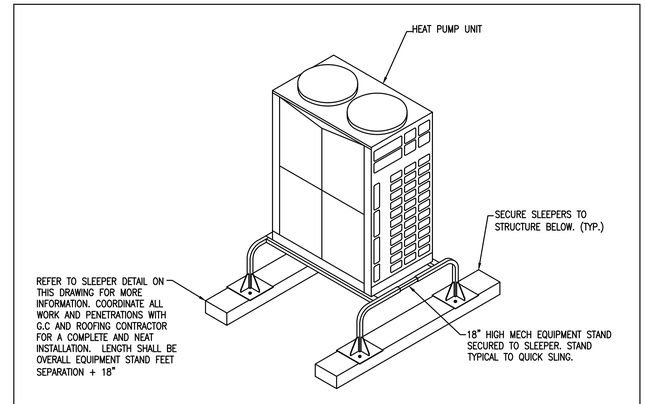

PIPE CHASE HOUSING DETAIL | NTS



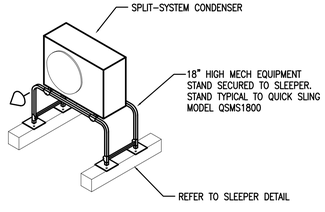

**GENERAL NOTES:**

1. DETAIL IS SHOWN DIAGRAMATICALLY. PROVIDE ALL FRAMING CHANNELS, FITTINGS, BRACKETS, BOLTS, PLATES AND ALL REQUIRED ACCESSORIES TO BUILD A COMPLETE PIPE SUPPORT STRUCTURE.
2. PIPE SUPPORT SHALL BE EVERY 8'–0" O.C. AND AT EACH CHANGE OF DIRECTION.
3. PIPING CLAMP SHALL BE INSTALLED OVER THE TOP OF PIPE INSULATION.
4. PROVIDE GOLDGUARD FINISH.

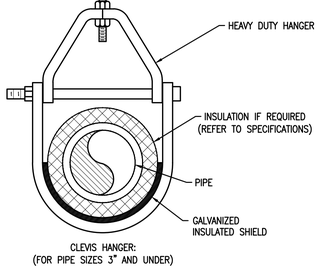
EXTERIOR REFRIGERANT PIPING SUPPORT SYSTEM DETAIL | NTS



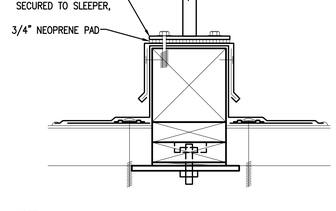

VRF CONDENSING UNIT MOUNTING DETAIL | NTS




SPLIT SYSTEM CONDENSER MOUNTING DETAIL | NTS




PIPE HANGER LOWER END ATTACHMENT DETAIL | NTS




NOTE:

1. REFER TO ARCHITECTURAL DETAIL 14/A3.3 FOR ROOFING WORK AND STRUCTURAL DETAIL 8/S2.1 FOR STRUCTURAL WORK.

EQUIPMENT SLEEPER DETAIL | NTS


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
MECHANICAL DETAILS

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: JPK
PROJECT NUMBER:
#2415

SHEET NUMBER: M3.2
REV: ~

## LEGEND

* MOUNTING HEIGHTS SHALL BE AS INDICATED UNLESS SHOWN OTHERWISE ON ELECTRICAL DRAWINGS OR ARCHITECTURAL ELEVATIONS.
* ALL SYMBOLS MAY NOT BE SHOWN ON PLANS

## RACEWAYS AND WIRING

P4-1,3,5 — SINGLE PHASE HOMERUNS TO PANELBOARD. "P4" DENOTES PANEL, "1,3,5" DENOTES CIRCUIT NUMBERS, [(3) 20A, 1P CIRCUITS] NUMBER OF SLASH MARKS DENOTES NUMBER OF #12AWG CONDUCTORS IN MINIMUM 3/4"C. NO SLASH MARKS INDICATE 2#12 & 1#12G-3/4"C UNLESS INDICATED OTHERWISE.

P4-2, 20/3 — MULTI-POLE HOMERUN TO PANELBOARD. "P4" DENOTES PANEL, "2" DENOTES CIRCUIT NUMBER, 20 AMP 3 POLE C/B. NUMBER OF SLASH MARKS DENOTES NUMBER OF #12AWG CONDUCTORS IN MINIMUM 3/4"C.

NOTES:
1. GREEN GROUND CONDUCTOR NOT INDICATED BUT SHALL BE INCLUDED IN EACH RACEWAY. SIZE SHALL BE #12AWG UNLESS INDICATED OTHERWISE.

— E — 2#10,#10G EMERGENCY ONLY WIRING

— P — PRIMARY CONDUIT DUCT BANK

— S — SECONDARY CONDUIT DUCT BANK

— T — TELEPHONE SERVICE CONDUIT DUCT BANK

— CATV — CABLE TELEVISION CONDUIT DUCT BANK

## LIGHTING FIXTURES

A, 2a — FLUORESCENT LIGHTING FIXTURE CEILING OR RECESSED MOUNTED. "A" DENOTES FIXTURE TYPE, "2" DENOTES CIRCUIT NUMBER, "a" DENOTES SWITCH CONTROL,

LIGHT FIXTURE WIRED TO CONSTANT-ON OR NORMAL EMERGENCY CIRCUIT

FLUORESCENT BARE LAMP STRIP OR INDUSTRIAL STRIP

INCANDESCENT OR COMPACT FLUORESCENT RECESSED OR SURFACE MOUNTED LIGHTING FIXTURE

WALL MOUNTED LIGHTING FIXTURE

WALL WASH OR DIRECTIONAL LIGHTING FIXTURE

CEILING MOUNTED ILLUMINATED EXIT SIGN, ARROWS AS INDICATED ON DRAWINGS

WALL MOUNTED ILLUMINATED EXIT SIGN - SHADING INDICATES FACE PLATE(S)

EB — EMERGENCY BATTERY UNIT

REMOTE EMERGENCY ONLY LIGHT HEADS - SINGLE OR DOUBLE AS SHOWN

WP — WEATHER PROOF EMERGENCY ONLY LIGHT FIXTURE

TRACK LIGHTING AND HEADS, LENGTH OF TRACK AND QUANTITY OF HEADS AS SHOWN ON FLOOR PLANS

## TOGGLE SWITCHES (MOUNTED 48" AFF)

| | |
|---|---|
| Svs a | DUAL TECHNOLOGY LINE VOLTAGE WALL VACANCY SENSOR SWITCH. PROVIDE CURRENT #LHRMTS1-G-COLOR BY THE ARCHITECT OR APPROVED EQUAL. 'a' DENOTES LIGHTING FIXTURE CONTROL. |
| S3 | THREE WAY TOGGLE SWITCH |
| S4 | FOUR WAY TOGGLE SWITCH |
| SK | KEY OPERATED SWITCH |
| SP | SINGLE POLE TOGGLE SWITCH WITH PILOT LIGHT |
| SD | DIMMER SWITCH |
| OC | CEILING MOUNTED OCCUPANCY SENSOR LIGHTING CONTROL. REFER TO LIGHTING PLANS FOR EXACT CATALOG NUMBER |
| VS | VACANCY SENSOR |

## RECEPTACLES (MOUNTED 18" AFF OR AS INDICATED ON ARCHITECTURAL PLANS)

IG, GFI, 2, WP — DUPLEX RECEPTACLE, "2" DENOTES CIRCUIT NUMBER, "GFI" DENOTES GROUND FAULT CIRCUIT INTERRUPTER TYPE DEVICE, "IG" DENOTES ISOLATED GROUND TYPE DEVICE, "WP" DENOTES WEATHER PROOF COVER

DUPLEX RECEPTACLE MOUNTED 6" ABOVE COUNTER TOP OR AS INDICATED ON ARCHITECTURAL PLANS

DOUBLE DUPLEX RECEPTACLE MOUNTED 6" ABOVE COUNTER TOP OR AS INDICATED ON THE ARCHITECTURAL PLANS

DOUBLE DUPLEX RECEPTACLE

DUPLEX RECEPTACLE ONE HALF SWITCH CONTROLLED

EWC — GFI DUPLEX RECEPTACLE FOR ELECTRIC WATER COOLER

DUPLEX RECEPTACLE FLOOR MOUNTED

L6-30 — SPECIAL PURPOSE RECEPTACLE, "L6-30" DENOTES TYPE, SEE POWER PLANS FOR EXACT TYPES USED

12 — FACTORY WIRED, FIELD ASSEMBLED UL LISTED, MULTIOUTLET ASSEMBLY. "12" DENOTES SINGLE RECEPTACLES MOUNTED ON 12" CENTERS

FIELD WIRED, UL LISTED, OF MULTIOUTLET ASSEMBLY, QUANTITY AND TYPE DEVICES AS INDICATED

SINGLE RECEPTACLE

T — TAMPER RESISTANT DUPLEX RECEPTACLE

PP — POWER POLE ASSEMBLY

SURFACE MOUNTED RACEWAY, DIVIDED RACEWAY WITH DATA AND DUPLEX RECEPTACLES AS INDICATED

## TELECOMMUNICATIONS (MOUNTED 18" AFF)

TELEPHONE OUTLET

W — TELEPHONE OUTLET MOUNTED 54"AFF

TELEPHONE OUTLET FLOOR MOUNTED

COMBINATION TELEPHONE/DATA OUTLET

T/D, PP — COMBINATION TELEPHONE/DATA POWER POLE ASSEMBLY

NOTE: E.C. SHALL PROVIDE A DOUBLE GANG BACK BOX WITH SINGLE GANG REDUCER, 3/4" CONDUIT AND PULLSTRING STUBBED OUT ABOVE ACCESSIBLE CEILING.

## POWER DISTRIBUTION EQUIPMENT

DISTRIBUTION PANEL

PANELBOARD, SURFACE MOUNTED

PANELBOARD, FLUSH MOUNTED

J — JUNCTION BOX, SIZED PER NEC

2 — MOTOR, "2" DENOTES HORSEPOWER

MAGNETIC MOTOR STARTER WITH ENCLOSURE, MINIMUM SIZE NEMA 1

P — MANUAL MOTOR STARTER WITH THERMAL OVERLOAD. "P" DENOTES PILOT LIGHT

30/3 — NON-FUSED DISCONNECT SWITCH: "30/3" DENOTES 30 AMP/3 POLE SWITCH

30/20/3 — FUSED DISCONNECT SWITCH: "30/20/3" DENOTES 30 AMP/3 POLE SWITCH, 20 AMP FUSES

COMBINATION MAGNETIC STARTER AND FUSED DISCONNECT SWITCH. SIZE OF STARTER, SWITCH AND FUSE AS REQUIRED

T — DRY-TYPE DISTRIBUTION TRANSFORMER

KT2 — "K" FACTOR DRY TYPE TRANSFORMER. "2" DENOTES SIZE

TVSS — TRANSIENT VOLTAGE SURGE SUPPRESSION

T — PAD MOUNTED TRANSFORMER

GROUND ROD, REFER TO PLANS FOR EXACT SIZE

## MISCELLANEOUS

J — JUNCTION BOX WITH FLEXIBLE CONNECTION TO EQUIPMENT

EF — EXHAUST FAN

CP — CONTROL PANEL

PB — PULL BOX - SIZED PER NEC FOR CONDUITS ENTERING AND LEAVING

FIRE RATED POKE-THRU WITH FLUSH MOUNTED DEVICES AS INDICATED

T/D, T — FIRE RATED POKE-THRU WITH FLEXIBLE CONNECTION TO FURNITURE SYSTEM "T/D" DENOTES TEL/DATA SYSTEM DEVICE

TV — CABLE TELEVISION OUTLET, WALL MOUNTED. E.C. SHALL PROVIDE 3/4" EMPTY CONDUIT WITH PULL STRING TO NEAREST ACCESSIBLE CEILING. PROVIDE FACEPLATE WITH TYPE "F" CONNECTOR AT BOX.

C — 120 VOLT CLOCK HANGER OUTLET

B — BUZZER/BELL, LOW VOLTAGE

TL — LOW VOLTAGE TRANSFORMER

PC — PHOTO-CELL

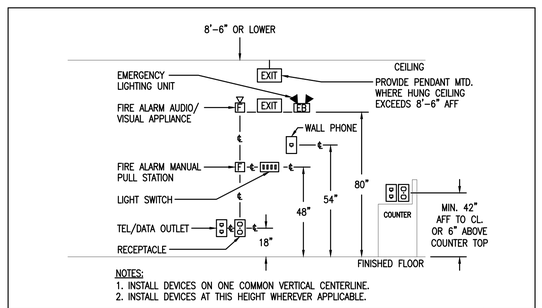
TC — TIME CLOCK

KP — KEY PAD

## MECHANICAL EQUIPMENT TAG ABBREVIATIONS

AH 1 — DENOTES EQUIPMENT TYPE; DENOTES UNIT NUMBER

| | |
|---|---|
| ACC | AIR-COOLED CONDENSER |
| AHU | AIR HANDLING UNIT |
| B | BOILER |
| CH | CHILLER |
| CUH | CABINET UNIT HEATER |
| EBB | ELECTRIC BASEBOARD |
| EF | EXHAUST FAN |
| EH | EXHAUST HOOD |
| EWH | ELECTRIC WALL HEATER |
| FC | FAN COIL |
| HP | HEAT PUMP |
| MAU | MAKE-UP AIR UNIT |
| P | PUMP |
| RTU | ROOF TOP UNIT |
| UH | UNIT HEATER |
| VAV | VARIABLE AIR VOLUME BOX |
| WH | ELECTRIC WATER HEATER |




NOTES:
1. INSTALL DEVICES ON ONE COMMON VERTICAL CENTERLINE.
2. INSTALL DEVICES AT THIS HEIGHT WHEREVER APPLICABLE.

DETAIL OF TYPICAL DEVICE MOUNTING HEIGHTS | NTS

## ABBREVIATIONS

| | |
|---|---|
| 3R | NEMA 3R RATING |
| 4X | NEMA 4X RATING |
| A | AMPERES |
| AFF | ABOVE FINISHED FLOOR |
| AFG | ABOVE FINISHED GRADE |
| AIC | AMPERE INTERRUPTING CAPACITY |
| ARCH | ARCHITECT |
| AWG | AMERICAN WIRE GAUGE |
| C | CONDUIT |
| C/B | CIRCUIT BREAKER |
| CAT | CATALOG |
| CKT | CIRCUIT |
| CU | COPPER |
| DWG | DRAWING |
| E | WIRED ON EMERGENCY CIRCUIT |
| EC | ELECTRICAL CONTRACTOR |
| ETD | EXISTING TO BE DEMOLISHED |
| ETR | EXISTING TO REMAIN |
| ETRL | EXISTING TO BE RELOCATED |
| ETRP | EXISTING TO BE REPLACED |
| G | GROUND |
| GC | GENERAL CONTRACTOR |
| GFI | GROUND FAULT INTERRUPTER |
| HVAC | HEATING, VENTILATION, AIR CONDITIONING CONTRACTOR |
| IG | ISOLATED GROUND |
| KCMIL | ONE THOUSAND CIRCULAR MILS |
| KVA | KILOVOLT-AMPERES |
| KW | KILOWATTS |
| MCB | MAIN CIRCUIT BREAKER |
| MLO | MAIN LUGS ONLY |
| NEC | NATIONAL ELECTRICAL CODE |
| NTS | NOT TO SCALE |
| ø | PHASE |
| P | POLE |
| PC | PLUMBING CONTRACTOR |
| P.T. | POTENTIAL TRANSFORMER |
| PVC | POLYVINYL CHLORIDE |
| RL | NEW LOCATION OF RELOCATED DEVICE |
| SM | SURFACE MOUNT |
| T/D | TEL/DATA |
| TEL | TELEPHONE |
| UG | UNDERGROUND |
| UNO | UNLESS NOTED OTHERWISE |
| V | VOLT |
| VIF | VERIFY IN FIELD |
| W | WATT |
| WP | WEATHERPROOF |

## BRANCH CIRCUIT WIRING NOTES:

1. WIRING IS SHOWN ON DRAWINGS ONLY FOR SPECIFIC ROUTES OR SPECIAL CONDITIONS.
2. WIRING AND CONDUIT SHALL BE REQUIRED BETWEEN ALL OUTLETS INDICATED WITH CIRCUIT NUMBERS AND PANEL DESIGNATIONS.
3. ALL SWITCH CONTROLS SHALL BE PROVIDED WITH WIRING AND CONDUIT AS REQUIRED.
4. ALTHOUGH ALL BRANCH CIRCUIT WIRING AND CONDUIT IS NOT SHOWN, IT IS THE INTENT OF THESE DOCUMENTS THAT A COMPLETE BRANCH CIRCUIT WIRING SYSTEM BE INSTALLED.
5. A GREEN GROUNDING CONDUCTOR SHALL BE RUN WITH ALL CIRCUITS. VERIFY CONDUIT SIZE TO ENSURE IT CAN ACCOMMODATE ALL PHASE, NEUTRAL AND GROUND CONDUCTORS.
6. PROVIDE A NEUTRAL CONDUCTOR TO ALL NEW LIGHTING SWITCH BOXES PER NEC ARTICLE 404.2.
7. ALL 15A AND 20A, 125V RECEPTACLES IN NON-DWELLING TYPE OCCUPANCIES SHALL BE GFCI PROTECTED PER NEC ARTICLE 210.8(B).
8. WHERE EXISTING SWITCHES AND RECEPTACLES ARE INDICATED TO REMAIN, THIS CONTRACTOR SHALL REPLACE SAID DEVICE(S) AND DEVICE PLATE(S) WITH NEW TO MATCH THE NEW CONSTRUCTION. WHERE THEY ARE INDICATED AS RELOCATED, EXTEND BRANCH CIRCUIT WIRING TO NEW LOCATION AND PROVIDE NEW DEVICE AND DEVICE PLATE TO MATCH NEW CONSTRUCTION.
9. ALL SELF CONTAINED EMERGENCY LIGHTING UNITS AND EXIT LIGHTING SHALL BE CONNECTED TO THE NEAREST UNSWITCHED LIGHTING CIRCUIT IN THE BUILDING WITH 2 #12, #12G, 3/4" CONDUIT.


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street, N. Easton, MA 02356, T 508.230.0260, F 508.230.0265, ber@ber-engineering.com
Office Commons 95, 351 Centerville Road, Warwick, RI 02886, T 401.384.7682, www.ber-engineering.com


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
ELECTRICAL
LEGEND, NOTES, & ABBREVIATIONS

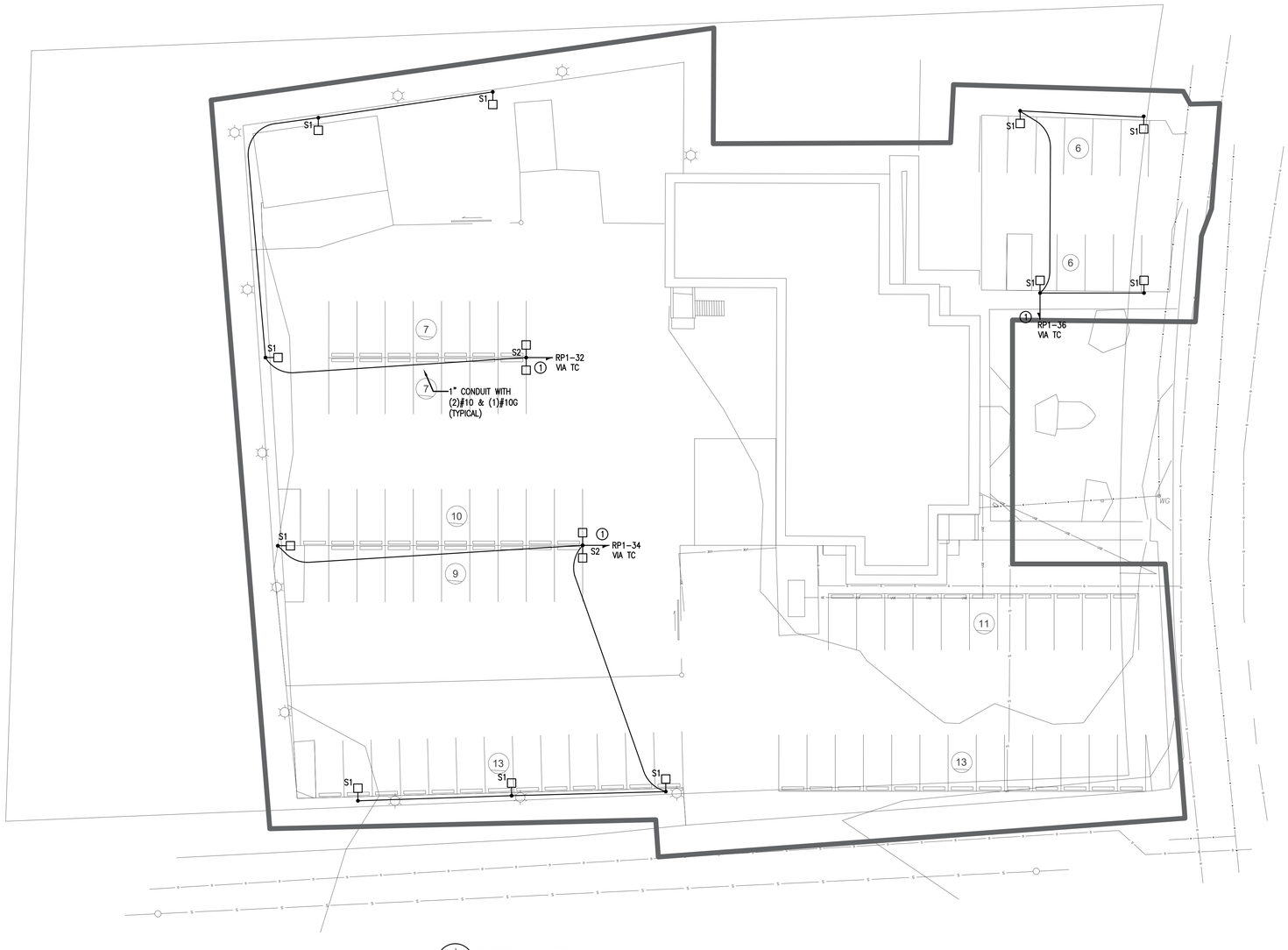
PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: WMS

PROJECT NUMBER:
#2415

SHEET NUMBER: E0.1
REV: ~

BER # 24237




1 ES1.1 ELECTRICAL SITE PLAN
1"= 20'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street
N. Easton, MA 02356
T 508.230.0260
F 508.230.0265
ber@ber-engineering.com
Office Commons 95
351 Centerville Road
Warwick, RI 02886
T 401.384.7682
www.ber-engineering.com

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
ELECTRICAL
SITE PLAN

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: WMS

PROJECT NUMBER:
#2415

SHEET NUMBER: ES1.1
REV: ~

BER # 24237

## DEMOLITION AND REMOVAL WORK

A. REMOVE ALL ELECTRICAL EQUIPMENT, WIRING, AND OTHER ELECTRICAL WORK AS REQUIRED. DISCONNECT LOAD AND LINE END OF CONDUCTORS FEEDING DEVICES WHICH ARE TO BE REMOVED OR ABANDONED, REMOVE CONDUCTORS NO LONGER IN USE. CUT BACK TO FLOOR, WALL, OR CEILING AND PLUG BOTH ENDS OF CONCEALED CONDUITS MADE OBSOLETE BY THIS ALTERATION. REMOVE EXPOSED OR ABANDONED CIRCUITS AND OUTLETS. REMOVE MATERIAL AND EQUIPMENT AND DISPOSE OF AS DIRECTED.

B. WHEREVER IT IS REQUIRED TO DISCONNECT OR REMOVE ANY PART OF AN EXISTING CIRCUIT, IMMEDIATELY RECONNECT THAT CIRCUIT OR REESTABLISH SERVICE IN THE REMAINING PORTION OF THE CIRCUIT.

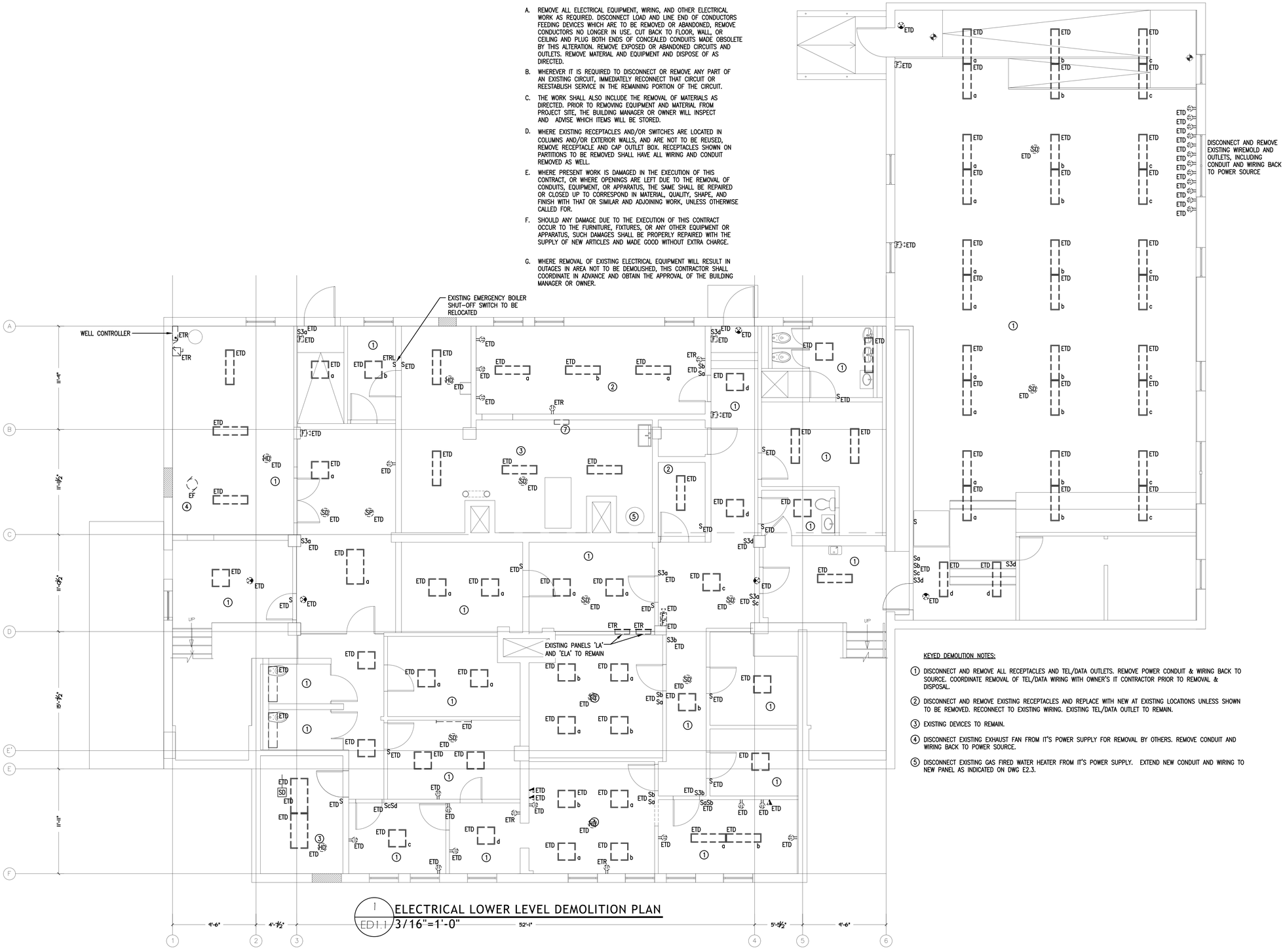
C. THE WORK SHALL ALSO INCLUDE THE REMOVAL OF MATERIALS AS DIRECTED. PRIOR TO REMOVING EQUIPMENT AND MATERIAL FROM PROJECT SITE, THE BUILDING MANAGER OR OWNER WILL INSPECT AND ADVISE WHICH ITEMS WILL BE STORED.

D. WHERE EXISTING RECEPTACLES AND/OR SWITCHES ARE LOCATED IN COLUMNS AND/OR EXTERIOR WALLS, AND ARE NOT TO BE REUSED, REMOVE RECEPTACLE AND CAP OUTLET BOX. RECEPTACLES SHOWN ON PARTITIONS TO BE REMOVED SHALL HAVE ALL WIRING AND CONDUIT REMOVED AS WELL.

E. WHERE PRESENT WORK IS DAMAGED IN THE EXECUTION OF THIS CONTRACT, OR WHERE OPENINGS ARE LEFT DUE TO THE REMOVAL OF CONDUITS, EQUIPMENT, OR APPARATUS, THE SAME SHALL BE REPAIRED OR CLOSED UP TO CORRESPOND IN MATERIAL, QUALITY, SHAPE, AND FINISH WITH THAT OR SIMILAR AND ADJOINING WORK, UNLESS OTHERWISE CALLED FOR.

F. SHOULD ANY DAMAGE DUE TO THE EXECUTION OF THIS CONTRACT OCCUR TO THE FURNITURE, FIXTURES, OR ANY OTHER EQUIPMENT OR APPARATUS, SUCH DAMAGES SHALL BE PROPERLY REPAIRED WITH THE SUPPLY OF NEW ARTICLES AND MADE GOOD WITHOUT EXTRA CHARGE.

G. WHERE REMOVAL OF EXISTING ELECTRICAL EQUIPMENT WILL RESULT IN OUTAGES IN AREA NOT TO BE DEMOLISHED, THIS CONTRACTOR SHALL COORDINATE IN ADVANCE AND OBTAIN THE APPROVAL OF THE BUILDING MANAGER OR OWNER.




1 ED1.1 ELECTRICAL LOWER LEVEL DEMOLITION PLAN
3/16"=1'-0"

KEYED DEMOLITION NOTES:

1. DISCONNECT AND REMOVE ALL RECEPTACLES AND TEL/DATA OUTLETS. REMOVE POWER CONDUIT & WIRING BACK TO SOURCE. COORDINATE REMOVAL OF TEL/DATA WIRING WITH OWNER'S IT CONTRACTOR PRIOR TO REMOVAL & DISPOSAL.
2. DISCONNECT AND REMOVE EXISTING RECEPTACLES AND REPLACE WITH NEW AT EXISTING LOCATIONS UNLESS SHOWN TO BE REMOVED. RECONNECT TO EXISTING WIRING. EXISTING TEL/DATA OUTLET TO REMAIN.
3. EXISTING DEVICES TO REMAIN.
4. DISCONNECT EXISTING EXHAUST FAN FROM IT'S POWER SUPPLY FOR REMOVAL BY OTHERS. REMOVE CONDUIT AND WIRING BACK TO POWER SOURCE.
5. DISCONNECT EXISTING GAS FIRED WATER HEATER FROM IT'S POWER SUPPLY. EXTEND NEW CONDUIT AND WIRING TO NEW PANEL AS INDICATED ON DWG E2.3.


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street, N. Easton, MA 02356, T 508.230.0260, F 508.230.0265, ber@ber-engineering.com
Office Commons 95, 351 Centerville Road, Warwick, RI 02886, T 401.384.7682, www.ber-engineering.com


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
ELECTRICAL
LOWER LEVEL
DEMOLITION PLAN

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: WMS
PROJECT NUMBER:
#2415

SHEET NUMBER: ED1.1
REV: ~

BER # 24237

## DEMOLITION AND REMOVAL WORK

A. REMOVE ALL ELECTRICAL EQUIPMENT, WIRING, AND OTHER ELECTRICAL WORK AS REQUIRED. DISCONNECT LOAD AND LINE END OF CONDUCTORS FEEDING DEVICES WHICH ARE TO BE REMOVED OR ABANDONED, REMOVE CONDUCTORS NO LONGER IN USE. CUT BACK TO FLOOR, WALL, OR CEILING AND PLUG BOTH ENDS OF CONCEALED CONDUITS MADE OBSOLETE BY THIS ALTERATION. REMOVE EXPOSED OR ABANDONED CIRCUITS AND OUTLETS. REMOVE MATERIAL AND EQUIPMENT AND DISPOSE OF AS DIRECTED.

B. WHEREVER IT IS REQUIRED TO DISCONNECT OR REMOVE ANY PART OF AN EXISTING CIRCUIT, IMMEDIATELY RECONNECT THAT CIRCUIT OR REESTABLISH SERVICE IN THE REMAINING PORTION OF THE CIRCUIT.

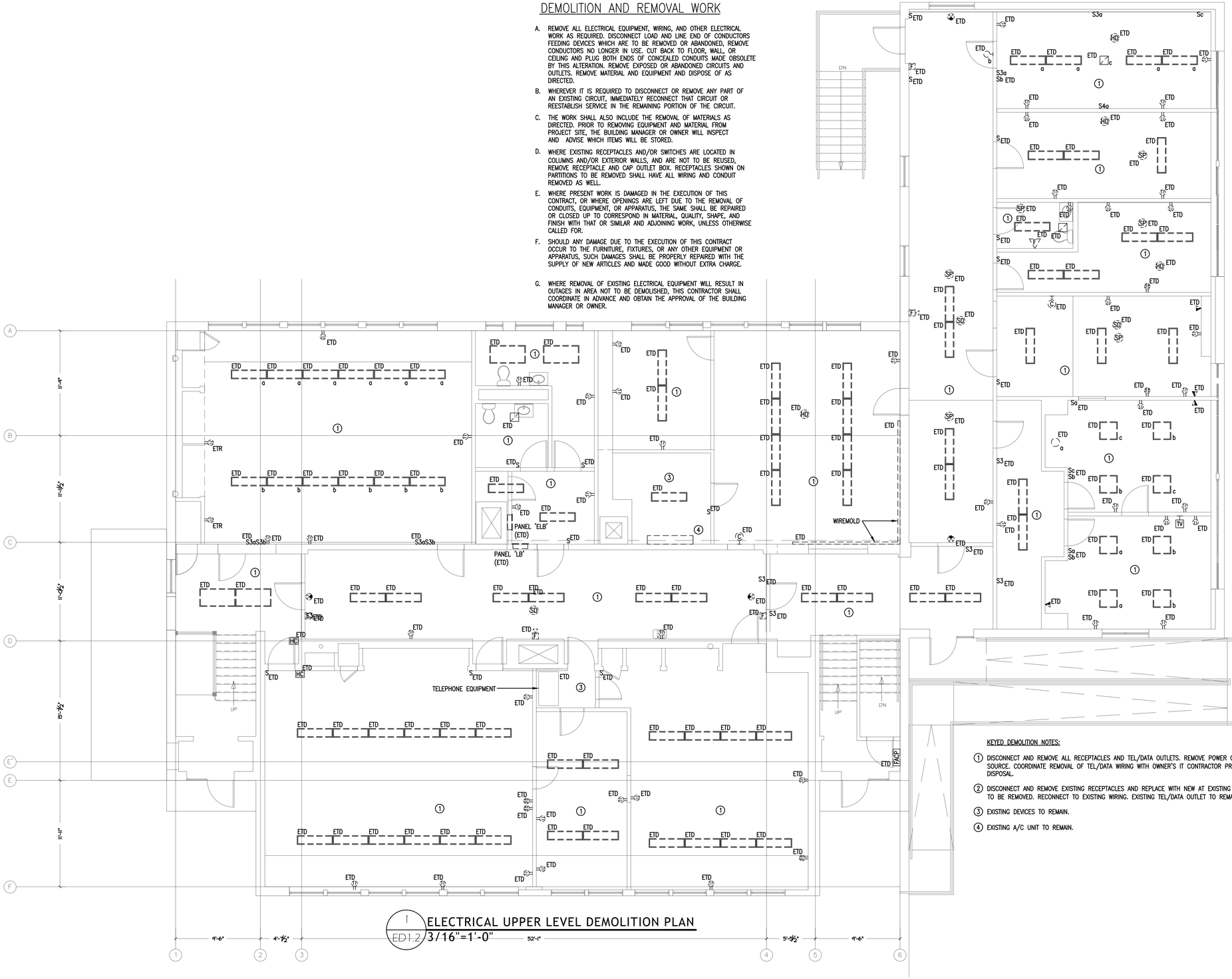
C. THE WORK SHALL ALSO INCLUDE THE REMOVAL OF MATERIALS AS DIRECTED. PRIOR TO REMOVING EQUIPMENT AND MATERIAL FROM PROJECT SITE, THE BUILDING MANAGER OR OWNER WILL INSPECT AND ADVISE WHICH ITEMS WILL BE STORED.

D. WHERE EXISTING RECEPTACLES AND/OR SWITCHES ARE LOCATED IN COLUMNS AND/OR EXTERIOR WALLS, AND ARE NOT TO BE REUSED, REMOVE RECEPTACLE AND CAP OUTLET BOX. RECEPTACLES SHOWN ON PARTITIONS TO BE REMOVED SHALL HAVE ALL WIRING AND CONDUIT REMOVED AS WELL.

E. WHERE PRESENT WORK IS DAMAGED IN THE EXECUTION OF THIS CONTRACT, OR WHERE OPENINGS ARE LEFT DUE TO THE REMOVAL OF CONDUITS, EQUIPMENT, OR APPARATUS, THE SAME SHALL BE REPAIRED OR CLOSED UP TO CORRESPOND IN MATERIAL, QUALITY, SHAPE, AND FINISH WITH THAT OR SIMILAR AND ADJOINING WORK, UNLESS OTHERWISE CALLED FOR.

F. SHOULD ANY DAMAGE DUE TO THE EXECUTION OF THIS CONTRACT OCCUR TO THE FURNITURE, FIXTURES, OR ANY OTHER EQUIPMENT OR APPARATUS, SUCH DAMAGES SHALL BE PROPERLY REPAIRED WITH THE SUPPLY OF NEW ARTICLES AND MADE GOOD WITHOUT EXTRA CHARGE.

G. WHERE REMOVAL OF EXISTING ELECTRICAL EQUIPMENT WILL RESULT IN OUTAGES IN AREA NOT TO BE DEMOLISHED, THIS CONTRACTOR SHALL COORDINATE IN ADVANCE AND OBTAIN THE APPROVAL OF THE BUILDING MANAGER OR OWNER.




1 ED1.2 ELECTRICAL UPPER LEVEL DEMOLITION PLAN
3/16"=1'-0"

KEYED DEMOLITION NOTES:

1. DISCONNECT AND REMOVE ALL RECEPTACLES AND TEL/DATA OUTLETS. REMOVE POWER CONDUIT & WIRING BACK TO SOURCE. COORDINATE REMOVAL OF TEL/DATA WIRING WITH OWNER'S IT CONTRACTOR PRIOR TO REMOVAL & DISPOSAL.
2. DISCONNECT AND REMOVE EXISTING RECEPTACLES AND REPLACE WITH NEW AT EXISTING LOCATIONS UNLESS SHOWN TO BE REMOVED. RECONNECT TO EXISTING WIRING. EXISTING TEL/DATA OUTLET TO REMAIN.
3. EXISTING DEVICES TO REMAIN.
4. EXISTING A/C UNIT TO REMAIN.


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com


CONSULTANT:


B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street, N. Easton, MA 02356, T 508.230.0260, F 508.230.0265, ber@ber-engineering.com
Office Commons 95, 351 Centerville Road, Warwick, RI 02886, T 401.384.7682, www.ber-engineering.com


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
ELECTRICAL
UPPER LEVEL
DEMOLITION PLAN

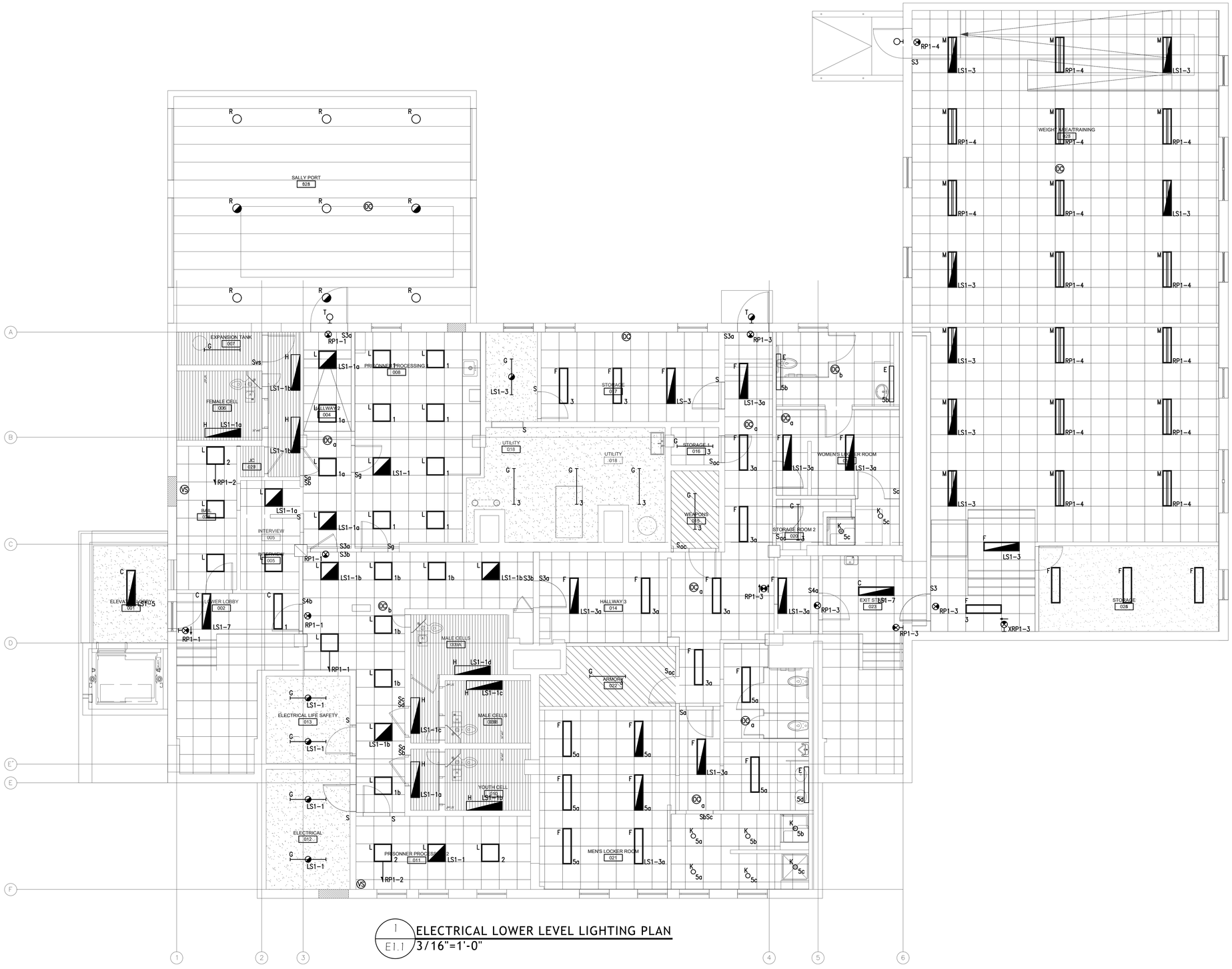
PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: WMS

PROJECT NUMBER:
#2415

SHEET NUMBER: ED1.2
REV: ~

BER # 24237




1 E1.1 ELECTRICAL LOWER LEVEL LIGHTING PLAN
3/16"=1'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com


CONSULTANT:


B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street
N. Easton, MA 02356
T 508.230.0260
F 508.230.0265
ber@ber-engineering.com
Office Commons 95
351 Centerville Road
Warwick, RI 02886
T 401.384.7682
www.ber-engineering.com


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
ELECTRICAL
LOWER LEVEL
LIGHTING PLAN

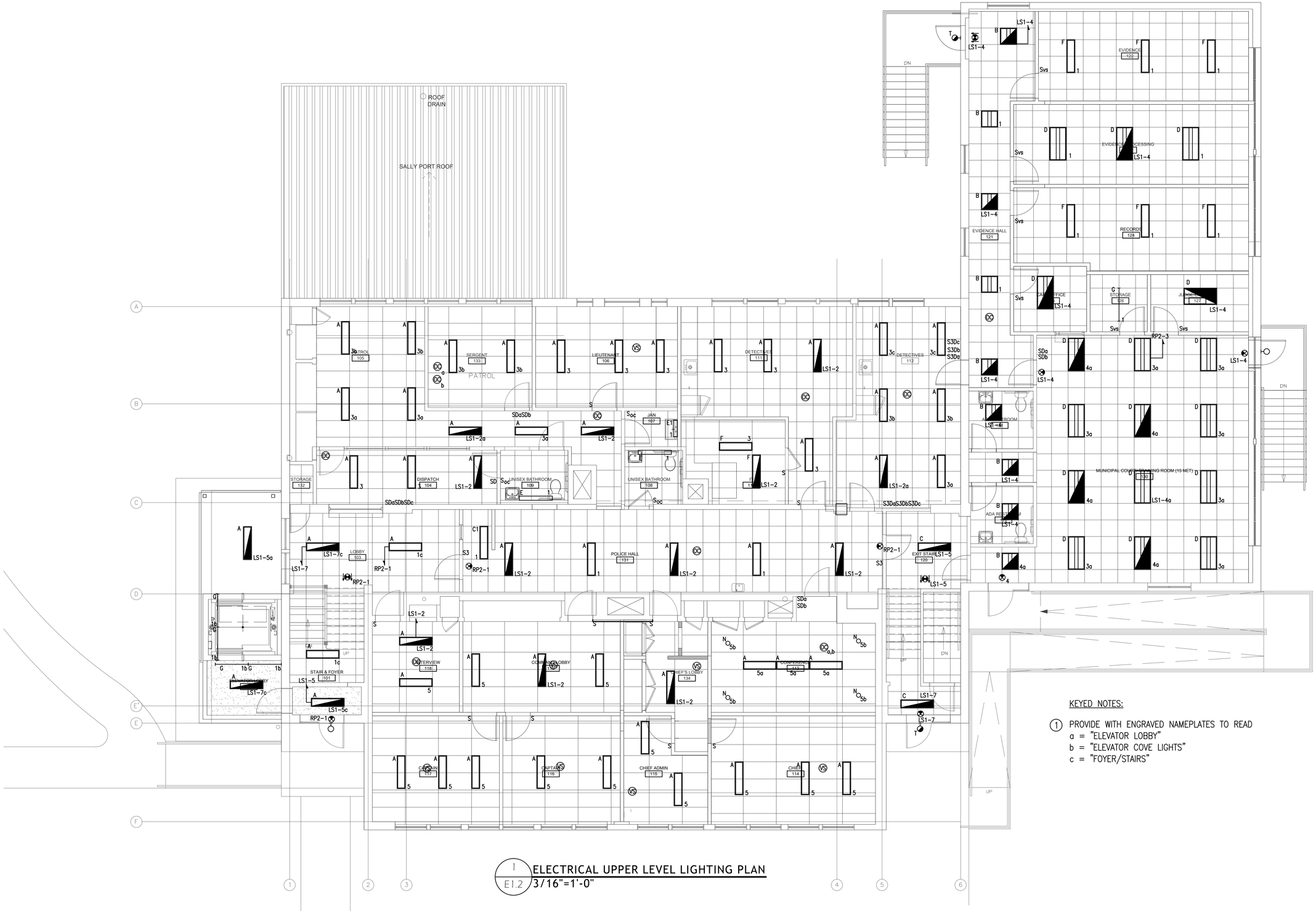
PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: WMS

PROJECT NUMBER:
#2415

SHEET NUMBER: E1.1
REV: ~

BER # 24237




1 E1.2 ELECTRICAL UPPER LEVEL LIGHTING PLAN
3/16"=1'-0"

KEYED NOTES:

1. PROVIDE WITH ENGRAVED NAMEPLATES TO READ
   a = "ELEVATOR LOBBY"
   b = "ELEVATOR COVE LIGHTS"
   c = "FOYER/STAIRS"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street, N. Easton, MA 02356, T 508.230.0260, F 508.230.0265, ber@ber-engineering.com
Office Commons 95, 351 Centerville Road, Warwick, RI 02886, T 401.384.7682, www.ber-engineering.com


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
ELECTRICAL
UPPER LEVEL
LIGHTING PLAN

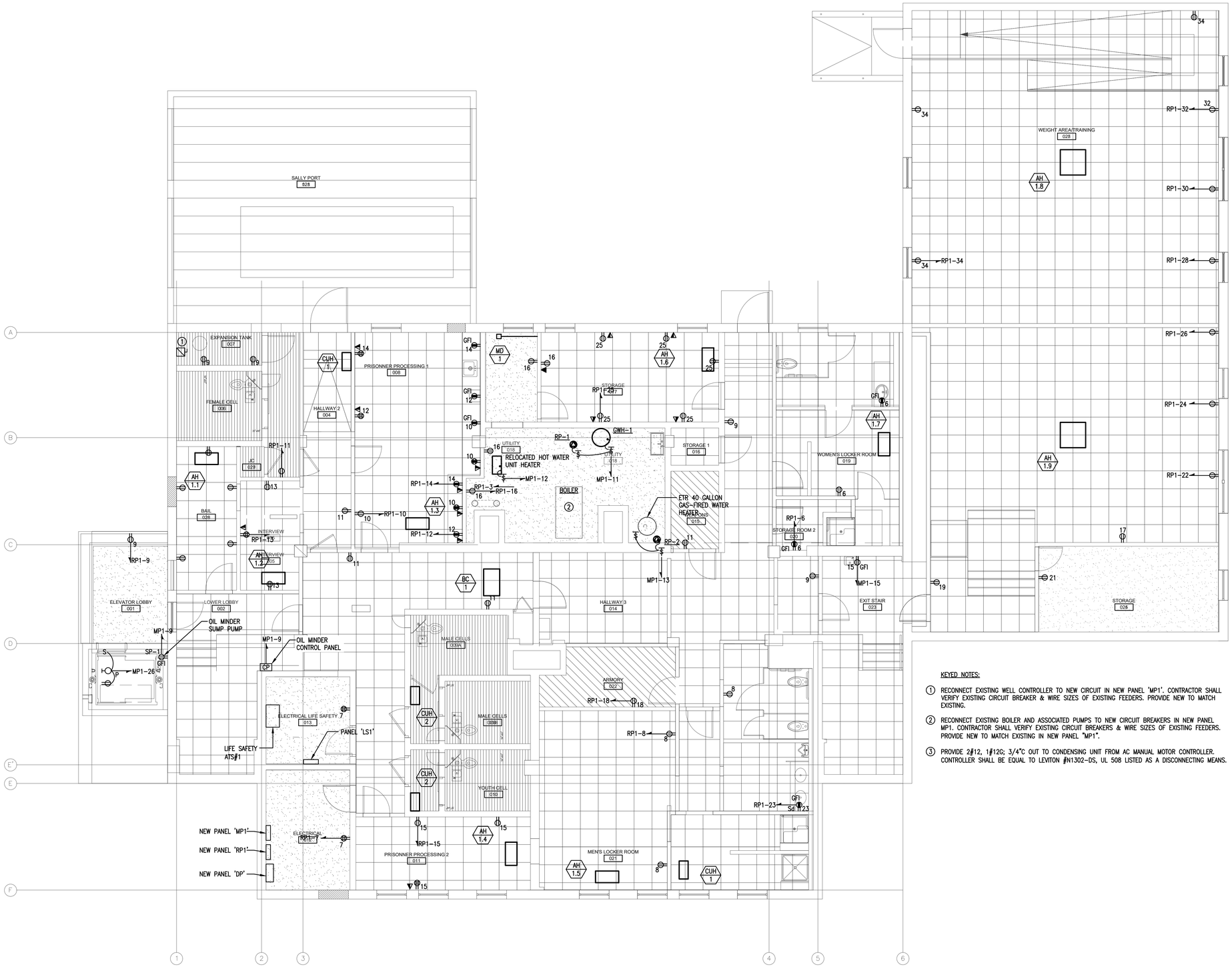
PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: WMS

PROJECT NUMBER:
#2415

SHEET NUMBER: E1.2
REV: ~

BER # 24237




1 E2.1 ELECTRICAL LOWER LEVEL POWER AND SYSTEMS PLAN
3/16"=1'-0"

KEYED NOTES:

1. RECONNECT EXISTING WELL CONTROLLER TO NEW CIRCUIT IN NEW PANEL 'MP1'. CONTRACTOR SHALL VERIFY EXISTING CIRCUIT BREAKER & WIRE SIZES OF EXISTING FEEDERS. PROVIDE NEW TO MATCH EXISTING.
2. RECONNECT EXISTING BOILER AND ASSOCIATED PUMPS TO NEW CIRCUIT BREAKERS IN NEW PANEL MP1. CONTRACTOR SHALL VERIFY EXISTING CIRCUIT BREAKERS & WIRE SIZES OF EXISTING FEEDERS. PROVIDE NEW TO MATCH EXISTING IN NEW PANEL "MP1".
3. PROVIDE 2#12, 1#12G; 3/4"C OUT TO CONDENSING UNIT FROM AC MANUAL MOTOR CONTROLLER. CONTROLLER SHALL BE EQUAL TO LEVITON #N1302-DS, UL 508 LISTED AS A DISCONNECTING MEANS.

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street
N. Easton, MA 02356
T 508.230.0260
F 508.230.0265
ber@ber-engineering.com
Office Commons 95
351 Centerville Road
Warwick, RI 02886
T 401.384.7682
www.ber-engineering.com

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
ELECTRICAL LOWER LEVEL POWER AND SYSTEMS PLAN

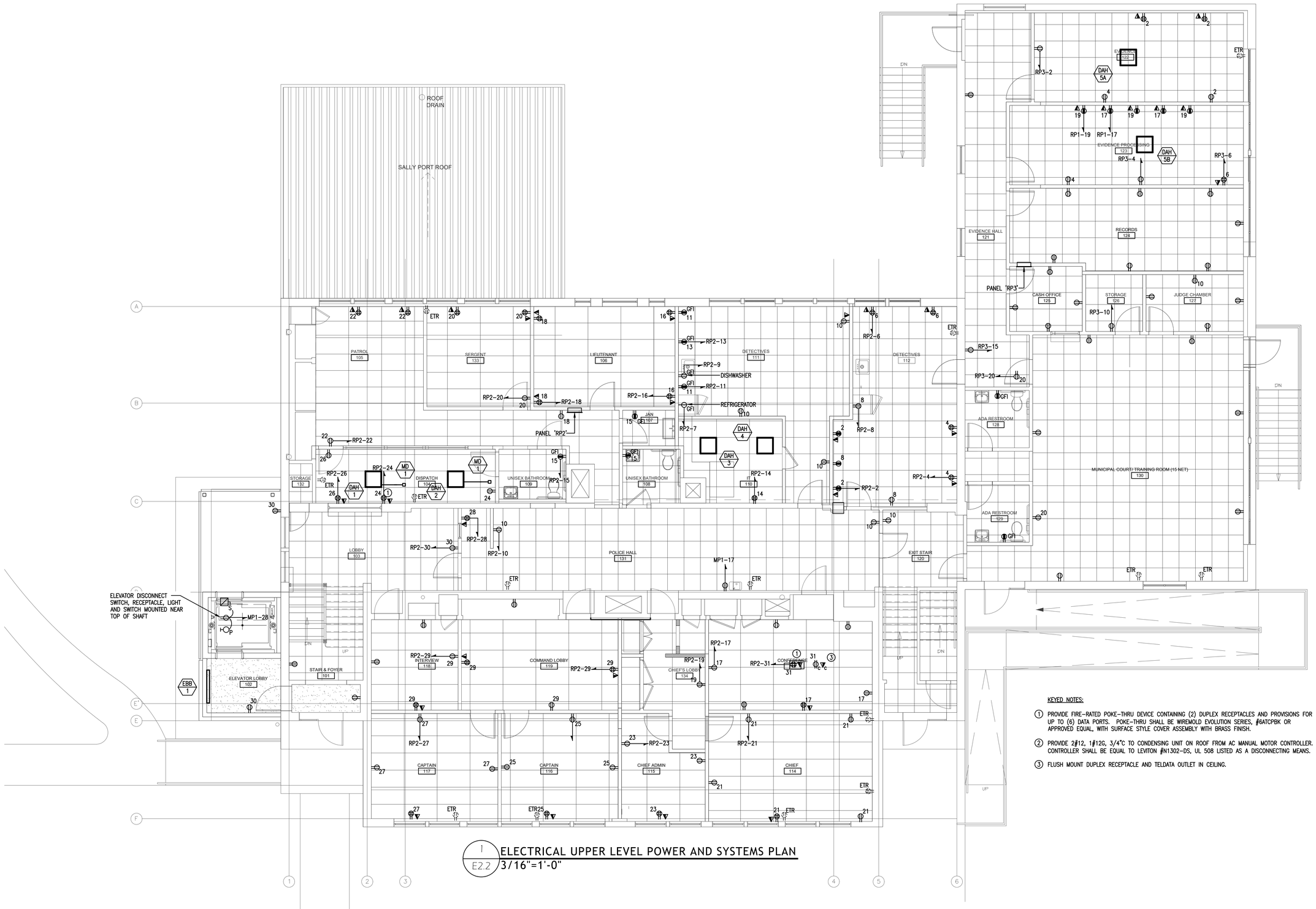
PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: WMS

PROJECT NUMBER:
#2415

SHEET NUMBER: E2.1
REV: ~

BER # 24237




1 E2.2 ELECTRICAL UPPER LEVEL POWER AND SYSTEMS PLAN
3/16"=1'-0"

ELECTRICAL UPPER LEVEL POWER AND SYSTEMS PLAN

KEYED NOTES:

1. PROVIDE FIRE-RATED POKE-THRU DEVICE CONTAINING (2) DUPLEX RECEPTACLES AND PROVISIONS FOR UP TO (6) DATA PORTS. POKE-THRU SHALL BE WIREMOLD EVOLUTION SERIES, #6ATCPBK OR APPROVED EQUAL, WITH SURFACE STYLE COVER ASSEMBLY WITH BRASS FINISH.
2. PROVIDE 2#12, 1#12G, 3/4"C TO CONDENSING UNIT ON ROOF FROM AC MANUAL MOTOR CONTROLLER. CONTROLLER SHALL BE EQUAL TO LEVITON #N1302-DS, UL 508 LISTED AS A DISCONNECTING MEANS.
3. FLUSH MOUNT DUPLEX RECEPTACLE AND TELDATA OUTLET IN CEILING.

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street
N. Easton, MA 02356
T 508.230.0260
F 508.230.0265
ber@ber-engineering.com
Office Commons 95
351 Centerville Road
Warwick, RI 02886
T 401.384.7682
www.ber-engineering.com

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
ELECTRICAL UPPER LEVEL POWER AND SYSTEMS PLAN

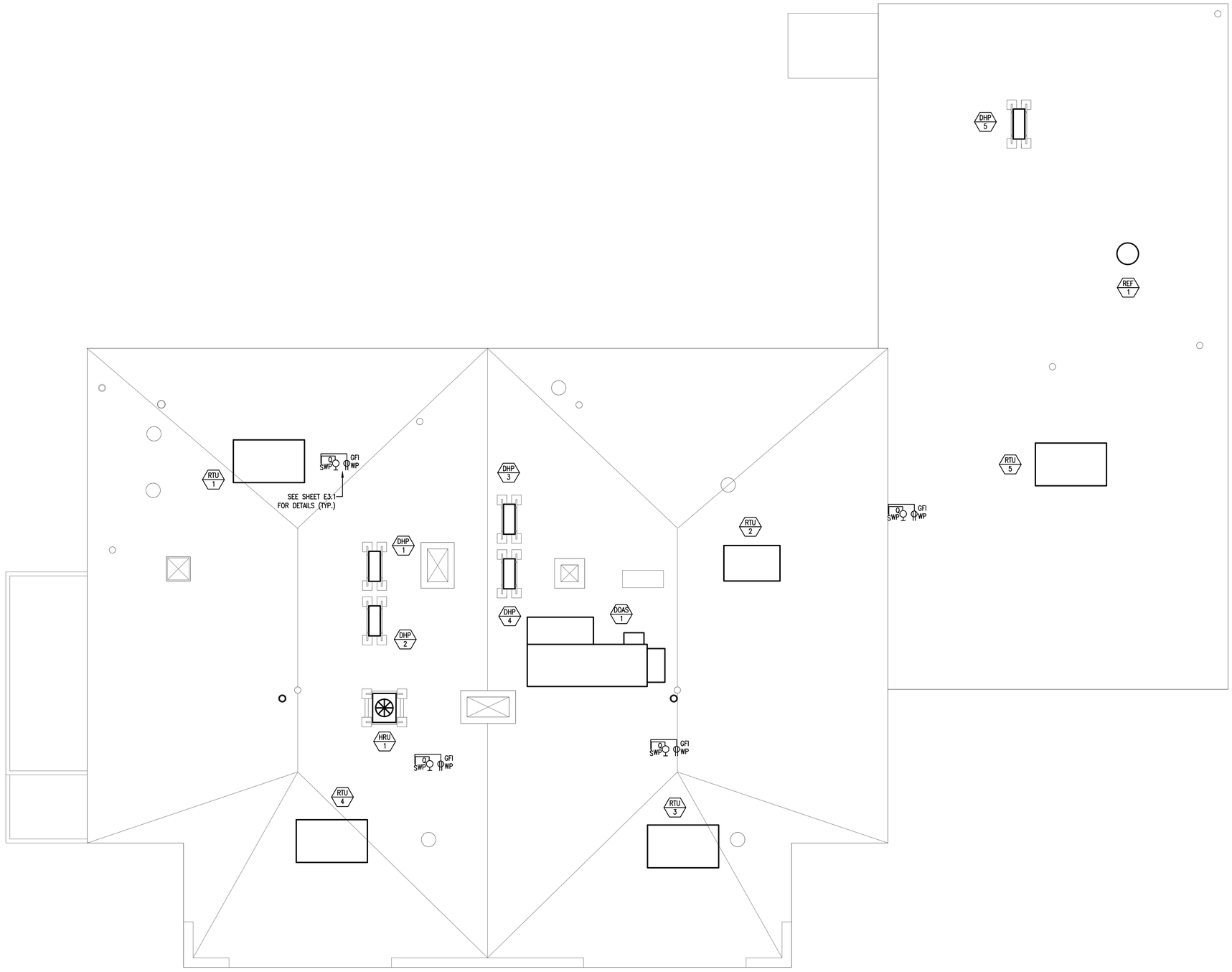
PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: WMS

PROJECT NUMBER:
#2415

SHEET NUMBER: E2.2
REV: ~

BER # 24237




1 / E2.3 ELECTRICAL ROOF LIGHTING AND POWER PLAN

3/16"=1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street
N. Easton, MA 02356
T 508.230.0260
F 508.230.0265
ber@ber-engineering.com
Office Commons 95
351 Centerville Road
Warwick, RI 02886
T 401.384.7682
www.ber-engineering.com

PROJECT TITLE:

# PUBLIC SAFETY COMPLEX

575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
ELECTRICAL ROOF
LIGHTING AND
POWER PLAN

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: WMS

PROJECT NUMBER:
#2415

SHEET NUMBER: E2.3

REV: ~

BER # 24237

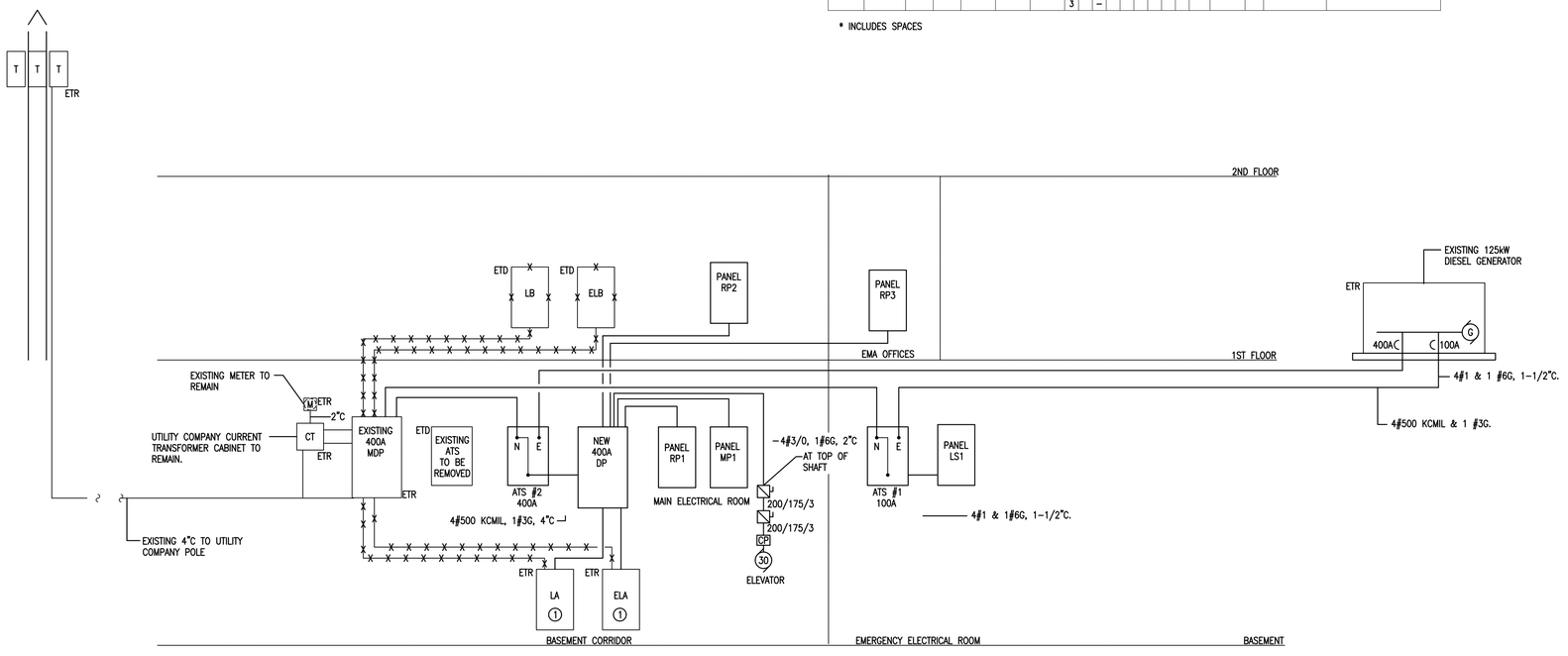
| EXISTING MAIN DISTRIBUTION PANEL "MDP" | | | | | 42,000 AIC |
|---|---|---|---|---|---|
| 400 AMP MAIN CIRCUIT BREAKER | | | | | |
| MAINS: 400 AMP MAIN BUS VOLTAGE: 120/208 PHASE: 3 WIRE: 4 | | | | | |
| CKT NO | OVERCURRENT DEVICE FRAME | OVERCURRENT DEVICE TRIP | DESCRIPTION OF LOAD | FEEDER | RACEWAY SIZE | CONNECTED LOAD |
| 1 | 400 | 400 | ATS #1 | 4#500kCMIL, 1#3G | 4" | |
| 2 | 100 | 100 | ATS #2 | 4#1, 1#6G | 1 1/2" | |
| 3 | 225 | – | SPACE AND PROVISIONS | | | |
| 4 | 225 | – | SPACE AND PROVISIONS | | | |

| DISTRIBUTION PANEL "DP" | | | | | 42,000 AIC |
|---|---|---|---|---|---|
| 400 AMP MAIN LUGS ONLY | | | | | |
| 400 AMP MAIN BUS VOLTAGE: 120/208 PHASE: 3 WIRE: 4 | | | | | |
| CKT NO | OVERCURRENT DEVICE FRAME | OVERCURRENT DEVICE TRIP | DESCRIPTION OF LOAD | FEEDER | RACEWAY SIZE | CONNECTED LOAD |
| 1 | 225 | 200 | ELEVATOR | 4#2/0, 1#6G | 2" | |
| 2 | 400 | 250 | PANEL "MP1" | 4#250 KCMIL, 1#4G | 3" | |
| 3 | 225 | 150 | PANEL "RP1" | 4#1/0, 1#6G | 1 1/2" | |
| 4 | 100 | 100 | PANEL "RP2" | 4#1, 1#8G | 1 1/2" | |
| 5 | 100 | 100 | PANEL "RP3" | 4#1, 1#8G | 1 1/2" | |
| 6 | 100 | 60 | SPARE | | | |
| 7 | 100 | 60 | SPARE | | | |
| 8 | 225 | – | SPACE AND PROVISIONS | | | |
| 9 | 225 | – | SPACE AND PROVISIONS | | | |
| 10 | 225 | 150 | EXISTING PANEL "LA" | 4#1/0, 1#6G | 2" | |
| 11 | 100 | 70 | EXISTING PANEL "ELA" | 4#4, 1#8G | 1 1/4" | |

PANELBOARD SCHEDULE

| PANEL DESIGNATION | VOLTS | PHASE | WIRES | MAINS MLO: MAIN LUGS ONLY MCB: MAIN CKT. BKR. BUS SIZE | OVERCURRENT DEVICE FRAME AMPS | OVERCURRENT DEVICE TRIP AMPS | BKR. POLES | BRANCH DEVICES BREAKER AMPS 15 | 20 | 25 | 30 | 40 | 50 | 60 | 70 | * TOTAL POLES | MOUNTING S: SURFACE F: FLUSH | GROUND BUS | ADDITIONAL BRANCH C.B.'S | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LS | 120/208 | 3 | 4 | 125 | 100 | 100 | 1 | | 20 | | 1 | | | | | 30 | S | ✓ | – | – |
| | | | | | | | 2 | | – | | | | | | | | | | | |
| | | | | | | | 3 | | – | | | | | | | | | | | |
| MP | 120/208 | 3 | 4 | 250 | MLO | MLO | 1 | | 22 | | | | | | | 60 | S | ✓ | – | PROVIDE IN SINGLE TUB |
| | | | | | | | 2 | | 7 | | | | | | | | | | | |
| | | | | | | | 3 | | | 1 | | 2 | 1 | 4 | | | | | | |
| RP1 | 120/208 | 3 | 4 | 250 | MLO | MLO | 1 | | 58 | | | | | | | 84 | S | ✓ | – | PROVIDE IN SINGLE TUB |
| | | | | | | | 2 | | 1 | | 1 | | | | | | | | | |
| | | | | | | | 3 | | – | | | | | | | | | | | |
| RP2 | 120/208 | 3 | 4 | 125 | MLO | MLO | 1 | | 42 | | | | | | | 60 | S | ✓ | – | PROVIDE IN SINGLE TUB |
| | | | | | | | 2 | | – | | | | | | | | | | | |
| | | | | | | | 3 | | – | | | | | | | | | | | |
| RP3 | 120/208 | 3 | 4 | 125 | MLO | MLO | 1 | | 30 | | | | | | | 60 | S | ✓ | – | PROVIDE IN SINGLE TUB |
| | | | | | | | 2 | | – | | | | | | | | | | | |
| | | | | | | | 3 | | – | | | | | | | | | | | |

* INCLUDES SPACES




KEYED NOTES:

(1) EXISTING BRANCH CIRCUITS ARE TO REMAIN WHERE NOT INDICATED TO BE REMOVED. PROVIDE NEW UPDATED TYEP-WRITTEN CIRCUIT DIRECTORY CARD.

1 / E3.1 POWER DISTRIBUTION DETAIL
NOT TO SCALE


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street
N. Easton, MA 02356
T 508.230.0260
F 508.230.0265
ber@ber-engineering.com
Office Commons 95
351 Centerville Road
Warwick, RI 02886
T 401.384.7682
www.ber-engineering.com


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
ELECTRICAL POWER DISTRIBUTION DETAIL

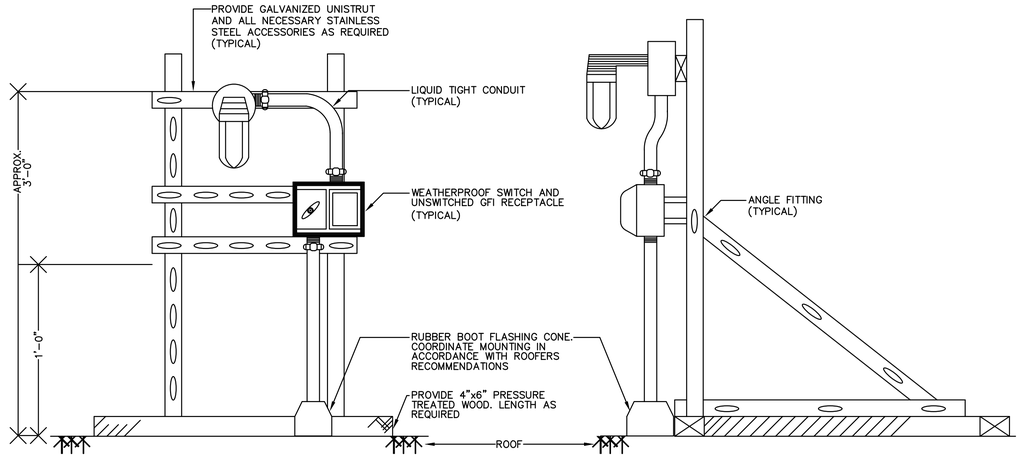
PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: WMS

PROJECT NUMBER:
#2415

SHEET NUMBER: E3.1
REV: ~

BER # 24237




ROOF RECEPTACLE AND LIGHT STANCHION DETAIL
NOT TO SCALE

MECHANICAL EQUIPMENT CONNECTION SCHEDULE

| ITEM | EQUIPMENT DESCRIPTION | ELECTRICAL RATING | | | | | | | | TYPE OF CONNECTION REQUIRED | | | | | | | | FEEDER INFORMATION | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | HP | FLA | KW | VOLTAGE | PH | PANEL | CIRCUIT | C/B SIZE | | | DIRECT CONN | | | | DISCONNECT CONFIGURATION | VFD | WP | |
| RTU 1 | ROOFTOP UNIT | | | | 208 | 3 | | | | | | | | | | | | | |
| RTU 2 | ROOFTOP UNIT | | | | 208 | 3 | | | | | | | | | | | | | |
| RTU 3 | ROOFTOP UNIT | | | | 208 | 3 | | | | | | | | | | | | | |
| RTU 4 | ROOFTOP UNIT | | | | 208 | 3 | | | | | | | | | | | | | |
| RTU 5 | ROOFTOP UNIT | | | | 208 | 3 | | | | | | | | | | | | | |
| MD | MOTORIZED DAMPER | | | | 120 | 1 | SEE FLOOR PLANS | SEE FLOOR PLANS | 20/1 | | ✓ | | | | | | | | (2) #12 & (1)#12 GRD. IN 3/4"C |
| BC 1 | BRANCH CIRCUIT CONTROLLER | | | | 208 | 1 | | | | | | | | | | | | | |
| EBB 1 | ELECTRIC BASEBOARD HEAT | | | 1 | 120 | | | | | | | | | | | | | | |
| EF 1 | EXHAUST FAN | 1/4 | | | 120 | 1 | | | | | | | | | | | | | |
| CUH 1 | CABINET UNIT HEATER | | | 0.041 | 120 | 1 | | | | | | | | | | | | | |
| CUH 2 | CABINET UNIT HEATER | | | 0.037 | 120 | 1 | | | | | | | | | | | | | |
| AH 1.1 | AIR HANDLER | | | | 208 | 1 | | | | | | | | | | | | | |
| AH 1.2 | AIR HANDLER | | | | 208 | 1 | | | | | | | | | | | | | |
| AH 1.3 | AIR HANDLER | | | | 208 | 1 | | | | | | | | | | | | | |
| AH 1.4 | AIR HANDLER | | | | 208 | 1 | | | | | | | | | | | | | |
| AH 1.5 | AIR HANDLER | | | | 208 | 1 | | | | | | | | | | | | | |
| AH 1.6 | AIR HANDLER | | | | 208 | 1 | | | | | | | | | | | | | |
| AH 1.7 | AIR HANDLER | | | | 208 | 1 | | | | | | | | | | | | | |
| AH 1.8 | AIR HANDLER | | | | 208 | 1 | | | | | | | | | | | | | |
| AH 1.9 | AIR HANDLER | | | | 208 | 1 | | | | | | | | | | | | | |
| DAH 1 | DUCTLESS AIR HANDLER | | | | | | | INDOOR UNIT POWERED BY OUTDOOR UNIT | | | | | | | | | | | |
| DAH 2 | DUCTLESS AIR HANDLER | | | | | | | INDOOR UNIT POWERED BY OUTDOOR UNIT | | | | | | | | | | | |
| DAH 3 | DUCTLESS AIR HANDLER | | | | | | | INDOOR UNIT POWERED BY OUTDOOR UNIT | | | | | | | | | | | |
| DAH 4 | DUCTLESS AIR HANDLER | | | | | | | INDOOR UNIT POWERED BY OUTDOOR UNIT | | | | | | | | | | | |
| DAH 5A-B | DUCTLESS AIR HANDLER | | | | | | | INDOOR UNIT POWERED BY OUTDOOR UNIT | | | | | | | | | | | |
| DHP 1 | DUCTLESS HEAT PUMP | | | | 208 | 1 | | | | | | | | | | | | | |
| DHP 2 | DUCTLESS HEAT PUMP | | | | 208 | 1 | | | | | | | | | | | | | |
| DHP 3 | DUCTLESS HEAT PUMP | | | | 208 | 1 | | | | | | | | | | | | | |
| DHP 4 | DUCTLESS HEAT PUMP | | | | 208 | 1 | | | | | | | | | | | | | |
| DHP 5 | DUCTLESS HEAT PUMP | | | | 208 | 1 | | | | | | | | | | | | | |
| DOAS 1 | DEDICATED OUTDDOOR AIR UNIT | | | | 208 | 3 | | | | | | | | | | | | | |
| HRU 1 | HEAT RECOVERY UNIT | | | | 208 | 3 | | | | | | | | | | | | | |

LIGHTING FIXTURE SCHEDULE

| TYPE | DESCRIPTION | MANUFACTURER & CATALOG NUMBER | LAMPS | | | | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | NUMBER | TYPE | VOLTS | WATTS | |
| A | DIRECT/INDIRECT PENDANT MOUNT LINEAR LED | LITECONTROL #STNC-PL-P-SI-LPA-4'-SOF-WHS -35K9-SSI100-D01-1C-UNV-FA1 | MULTI | LED | 120 | 28 | |
| B | 2X2 DIRECT/INDIRECT RECESSED LED BASKET FIXTURE | ORACLE LIGHTING #22-OEVHP-LED-2000L/3000L/ 4000L-DIM10-MVOLT- 35K/40K/50K-85 | MULTI | LED | 120 | 32 | |
| C | 1X4 SURFACE MOUNTED LED WRAPAROUND WITH INTEGRAL OCCUPANCY SENSOR | ECLIPSE LIGHTING #574-N-SM-SLED-SCCT -UNV-WH-OCC | MULTI | LED | 120 | 50 | DIM TO 50% WHEN AREA IS UNOCCUPIED |
| C1 | 1X4 CORNER MOUNT LED WRAPAROUND | ECLIPSE LIGHTING #575-N-4-SLED-SCCT -UNV-WH-OCC | MULTI | LED | 120 | 42 | DIM TO 50% WHEN AREA IS UNOCCUPIED |
| D | 2X4 DIRECT/INDIRECT RECESSED LED BASKET FIXTURE | ORACLE LIGHTING #24-OEVHP-LED-3000L/4000L/ 5000L-DIM10-MVOLT- 35K/40K/50K-85 | MULTI | LED | 120 | 39 | |
| E | 4' WALL MOUNTED LED VANITY LIGHT | INDESSA LIGHTING #412-2LED14-WHT-NB | MULTI | LED | 120 | 28 | |
| E1 | 2' WALL MOUNTED LED VANITY LIGHT | INDESSA LIGHTING #412-2LED9-WHT-NB | MULTI | LED | 120 | 18 | |
| F | 1X4 LED SURFACE MOUNTED WRAPAROUND | ORACLE LIGHTING #4-OER-LED-3000L/4000L/ 5000L-DIM10-MVOLT- 35K/40K/50K-85 | MULTI | LED | 120 | 37 | |
| G | 1X4 LENSED LED STRIP LIGHT | ORACLE LIGHTING #4-OC4-LED-4000L-DIM10 -MVOLT-35K-85 | MULTI | LED | 120 | 30 | |
| G2 | 1X2 LENSED LED STRIP LIGHT | ORACLE LIGHTING #2-OC4-LED-3000L-DIM10 -MVOLT-35K-85 | MULTI | LED | 120 | 24 | |
| H | 1X4 CORNER MOUNT HIGH ABUSE LED FIXTURE | CERTOLUX LIGHTING #VRC-3524-48-B-B-LED-8 -35K-078L-UNV-P13/P45 | MULTI | LED | 120 | 75 | |
| K | OUTLET BOX MOUNTED 6" ROUND LED SHOWER LIGHT | ELITE LIGHTING RL678-1000L-DIMTR-120 -30K-90-W-WH | MULTI | LED | 120 | 14 | |
| L | RECESSED 2X2 HIGH ABUSE LED FIXTURE | CERTOLUX LIGHTING #VRU-0-2X2-P-P-LED-8 -35K-070L-UNV | MULTI | LED | 120 | 70 | FIXTURE TO FIT INTO SECURITY CEILING - COORDINATE WITH ARCHITECTURAL DWGS. |
| M | 1X4 DIRECT/INDIRECT PENDANT LED | LITECONTROL #2L-P-ID-STD-4'-04-SOF-C1- 35K9-1750-1750-D01-1C -UNV-FA-W1 | MULTI | LED | 120 | 28.8 | AIRCRAFT CABLE - MOUNT AT 8'-0" AFF - REFER TO ARCHITECTURAL CEILING PLANS FOR TYPES |
| N | 6" ROUND RECESSED LED DOWNLIGHT | ELITE# HH6-LED-1500L-DIMIO-120-WD- 35K-HH6-6501-CL-WH | MULTI | LED | 120 | 18.1 | |
| P | WALL MOUNTED PIT LIGHT | ORACLE LIGHTING #4-OC4-LED-4000L-DIM10 -MVOLT-35K-85 | MULTI | LED | 120 | 30 | MOUNT AT 12" ABOVE PIT FLOOR OR AS INDICATED ON PLANS |
| Q | VAPORTIGHT LED UTILITY LIGHT | ORACLE LIGHTING #OVT-1500L-MVOLT-40K-GR-WM | | LED | UNV | 18 | |
| R | LED LOW BAY | | MULTI | LED | 120 | 31 | |
| T | LED WALLPACK | | MULTI | LED | 120 | 43 | |
| S1 | POLE MOUNTED LED LUMINAIRE | BEACON LIGHTING# VP-1-160L-100-4K7-4F-UNV-A -FINISH/SSS-B-20'-4" -125-1-XX-XX | MULTI | LED | 120 | 100 | PROVIDE 20' 4" SQUARE STEEL POLE |
| S2 | POLE MOUNTED LED LUMINAIRE | BEACON LIGHTING# (2)VP-1-160L-100-4K7-4F-UNV -A-FINISH/SSS-B-20'-4" -125-2-XX-XX | MULTI | LED | 120 | 200 | PROVIDE 20' 4" SQUARE STEEL POLE |
| ⊗ | WALL OR CEILING MOUNTEDLED EXIT SIGN WITH INTEGRAL BATTERY BACK-UP | EVENLITE TLX-EM-RU-W-SD | MULTI | LED | 120 | 2 | PROVIDE DIRECTIONAL CHEVRONS AND NUMBER OF FACEPLATES AS INDICATED ON PLANS. |
| WP ▼ | DECORATIVE EXTERIOR EMERGENCY FIXTURE W/BATTERY BACK-UP | EVENLITE WLEM-BZ-CT | MULTI | LED | 120 | 11 | MOUNT AT 8'-0" AFF |

## LIGHTING FIXTURE NOTES:

1. PROVIDE ACCESSORIES AND MOUNTING HARDWARE FOR ALL FIXTURES.
2. COLORS SHALL BE AS SELECTED BY ARCHITECT.
3. COORDINATE EXACT LOCATION WITH ARCHITECT PRIOR TO ROUGH-IN.
4. ALL COMPACT FLUORESCENT BALLASTS SHALL BE ELECTRONIC TYPE.
5. ALL LAMPS SHALL BE 3500'K.
6. E.C. SHALL COORDINATE THAT ALL DIMMER SWITCHES ARE COMPATIBLE WITH EACH FIXTURE INDICATED TO BE CONTROLLED AND PROVIDE DIMMER SWITCHES PER MANUFACTURER'S RECOMMENDATIONS AND REQUIREMENTS.
7. VERIFY THAT FIXTURE TYPE "L" WILL BE COMPATIBLE WITH CEILINGS AS SPECIFIED ON ARCHITECTURAL PLANS PRIOR TO ORDERING.

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street, N. Easton, MA 02356, T 508.230.0260, F 508.230.0265, ber@ber-engineering.com
Office Commons 95, 351 Centerville Road, Warwick, RI 02886, T 401.384.7682, www.ber-engineering.com

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

SHEET TITLE:
ELECTRICAL SCHEDULES AND DETAILS

PROJECT NORTH:
N

PROJECT ARCHITECT: BTB
DRAWN: WMS
PROJECT NUMBER:
#2415

SHEET NUMBER: E4.1
REV: ~

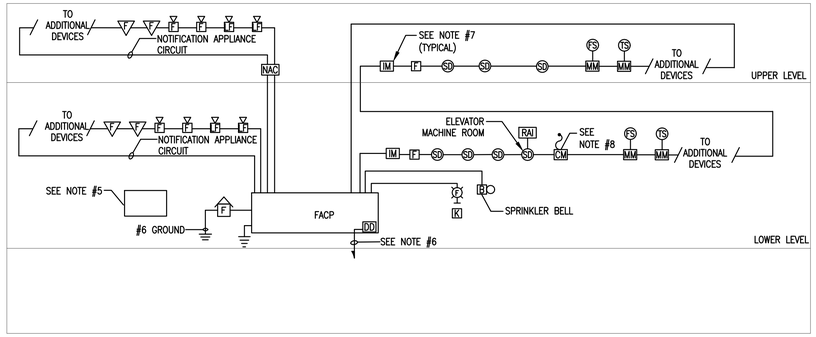
BER # 24237

## FIRE ALARM SYSTEM

| | |
|---|---|
| F | MANUAL PULL STATION MOUNTED 48" AFF |
| M F | AUDIO/VISUAL ALARM MOUNTED 80" AFF. "M" DENOTES MINI-UNIT |
| V | VISUAL ONLY UNIT MOUNTED 80" AFF. |
| I SD | PHOTOELECTRIC SMOKE DETECTOR: "I" DENOTES IONIZATION SMOKE DETECTOR |
| HD 190° | 135° FIXED TEMPERATURE HEAT DETECTOR. "190°" INDICATES 190°F FIXED TEMPERATURE |
| TS | SPRINKLER TAMPER SWITCH FURNISHED AND INSTALLED BY THE FIRE PROTECTION SUBCONTRACTOR, WIRED BY THE ELECTRICAL SUBCONTRACTOR |
| FS | SPRINKLER WATER FLOW SWITCH FURNISHED AND INSTALLED BY THE FIRE PROTECTION SUBCONTRACTOR, WIRED BY THE ELECTRICAL SUBCONTRACTOR. |
| DH | MAGNETIC DOOR HOLD OPEN DEVICE |
| M | FIRE ALARM MASTER BOX |
| SD | DUCT MOUNTED SMOKE DETECTOR WITH SAMPLING TUBE |
| RTS | REMOTE TEST STATION FOR DUCT SMOKE DETECTOR WITH NAMEPLATE LABELED ACCORDINGLY |
| RAI | REMOTE ALARM INDICATOR |
| FACP | FIRE ALARM CONTROL PANEL |
| FAA | FIRE ALARM REMOTE ANNUNCIATOR |
| CM | ADDRESSABLE CONTROL MODULE |
| MM | ADDRESSABLE MONITOR MODULE |
| | EXTERIOR FIRE ALARM BEACON |
| K | KNOX BOX |

NOTES FOR FIRE ALARM SYSTEM RISER DIAGRAM:

1. REFER TO FLOOR PLANS FOR EXACT QUANTITIES AND LOCATIONS OF ALL DEVICES. NOT ALL DEVICES AND APPLIANCES ARE INDICATED ON THE FIRE ALARM RISER DIAGRAM.
2. THE FIRE ALARM SYSTEM SHALL CONFORM WITH THE REQUIREMENTS OF THE LOCAL FIRE DEPARTMENT. SHOP DRAWINGS SHALL BE SUBMITTED TO THE LOCAL FIRE DEPARTMENT FOR APPROVAL.
3. ALL FIRE ALARM WIRING SHALL BE CLASS "A" PER THE MANUFACTURER'S RECOMMENDATIONS AND SHALL BE INSTALLED IN A MINIMUM 3/4" EMT CONDUIT.
4. ALL FIRE ALARM WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF NFPA, STATE, AND LOCAL BUILDING CODES AND THE AMERICANS WITH DISABILITIES ACT (ADA).
5. THE ELECTRICAL CONTRACTOR SHALL PROVIDE A NON-ILLUMINATED GRAPHIC MAP. THE EXACT LAYOUT OF NON-ILLUMINATED GRAPHIC MAP SHALL BE APPROVED BY THE LOCAL FIRE DEPARTMENT.
6. THE ELECTRICAL CONTRACTOR SHALL PROVIDE TWO (2) DEDICATED TELEPHONE LINES IN A 1" CONDUIT TO THE MAIN COMMUNICATIONS BACKBOARD LOCATED IN TELE/DATA ROOM.
7. THE ELECTRICAL CONTRACTOR SHALL PROVIDE THE ISOLATION MODULE. (NOTE: PROVIDE A MINIMUM OF ONE (1) ISOLATION MODULE PER FLOOR AND ONE (1) ISOLATION MODULE PER EVERY TWENTY FIVE (25) DEVICES.)
8. PROVIDE EIGHT CONTROL MODULES AS REQUIRED FOR AUTOMATIC RECALL TO MAIN AND ALTERNATE FLOORS AND FIREMAN'S "HAT" FUNCTIONS OF THE ELEVATOR(S). COORDINATE ALL WORK WITH THE ELEVATOR CONTRACTOR AS NECESSARY.




1 FIRE ALARM RISER SYSTEM DIAGRAM
NOT TO SCALE


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street, N. Easton, MA 02356, T 508.230.0260, F 508.230.0265, ber@ber-engineering.com
Office Commons 95, 351 Centerville Road, Warwick, RI 02886, T 401.384.7682, www.ber-engineering.com


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
FIRE ALARM
LEGEND & RISER
DIGRAM

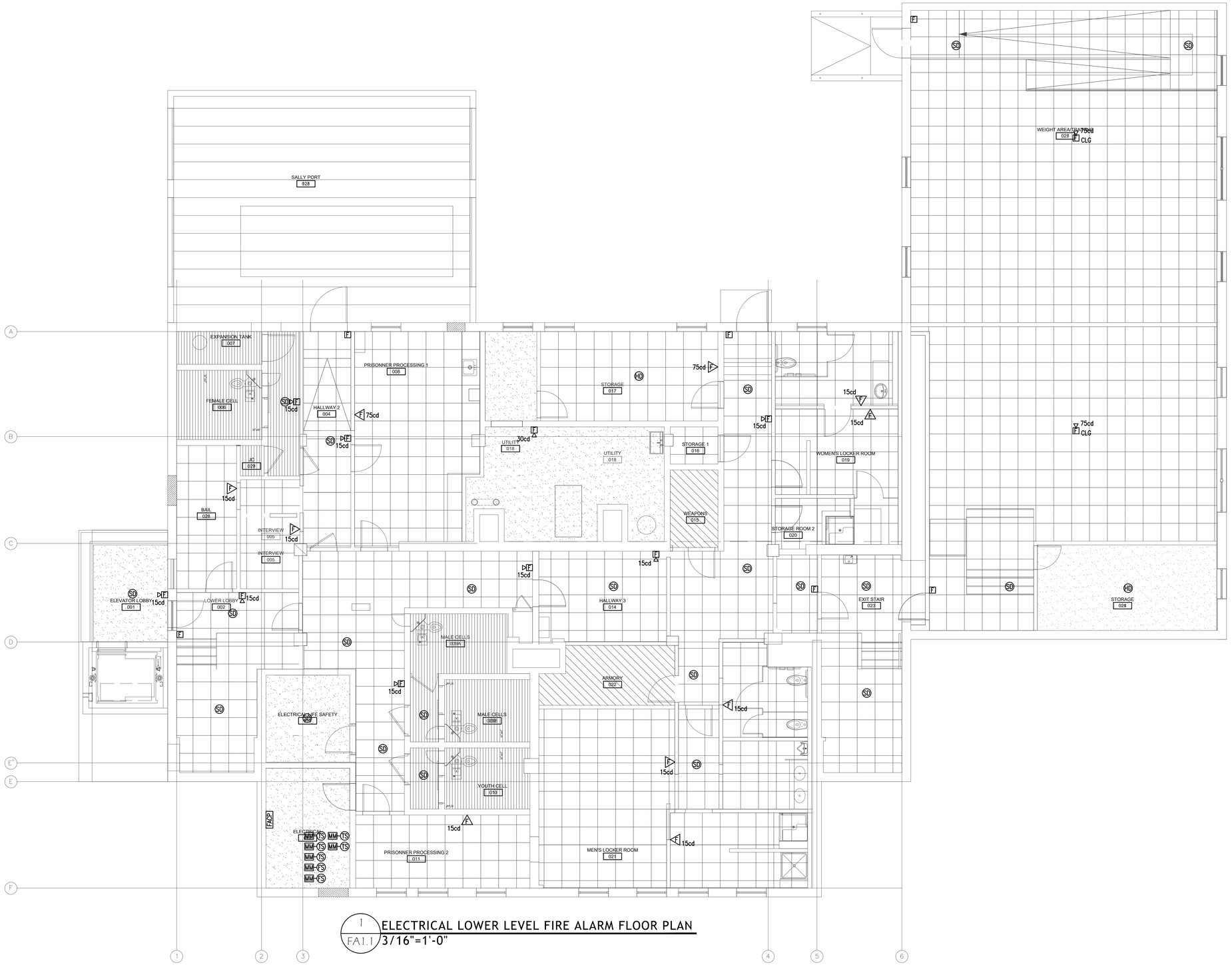
PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: WMS

PROJECT NUMBER:
#2415

SHEET NUMBER: FA0.1
REV: ~

BER # 24237




1 FA1.1 ELECTRICAL LOWER LEVEL FIRE ALARM FLOOR PLAN
3/16"=1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street
N. Easton, MA 02356
T 508.230.0260
F 508.230.0265
ber@ber-engineering.com
Office Commons 95
351 Centerville Road
Warwick, RI 02886
T 401.384.7682
www.ber-engineering.com

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

STAMP:

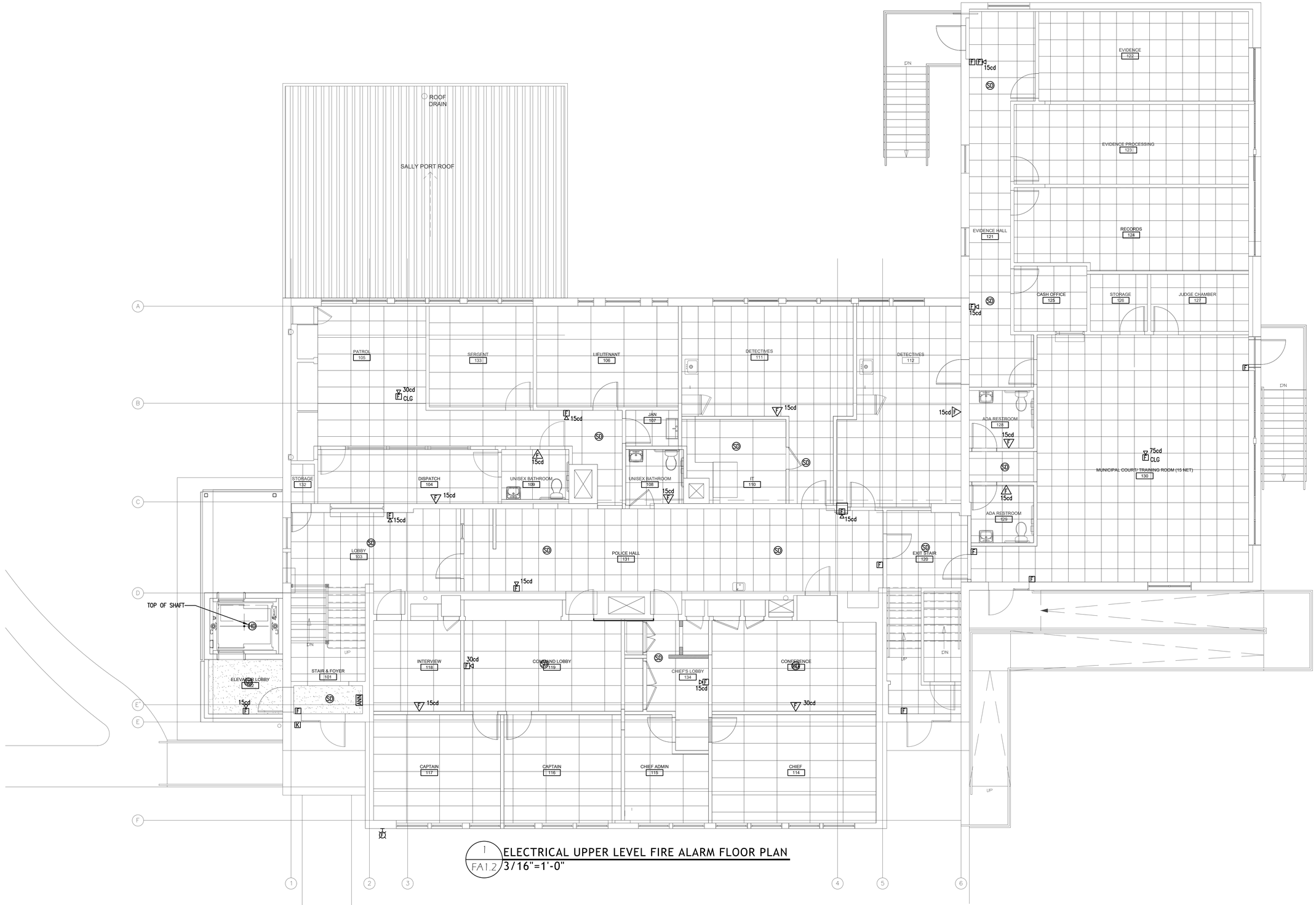
SHEET TITLE:
ELECTRICAL LOWER LEVEL FIRE ALARM PLAN

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: WMS
PROJECT NUMBER:
#2415

SHEET NUMBER: FA1.1
REV: ~

BER # 24237




1 FA1.2 ELECTRICAL UPPER LEVEL FIRE ALARM FLOOR PLAN
3/16"=1'-0"

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:

B|E|R
BUILDING ENGINEERING RESOURCES, INC.
66 Main Street
N. Easton, MA 02356
T 508.230.0260
F 508.230.0265
ber@ber-engineering.com
Office Commons 95
351 Centerville Road
Warwick, RI 02886
T 401.384.7682
www.ber-engineering.com

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
ELECTRICAL UPPER LEVEL FIRE ALARM PLAN

PROJECT NORTH:

PROJECT ARCHITECT: BTB
DRAWN: WMS

PROJECT NUMBER:
#2415

SHEET NUMBER: FA1.2
REV: ~

BER # 24237

## GENERAL NEW WORK NOTES

NOTE: ALL APPLICABLE PORTIONS SHALL APPLY TO THIS SCOPE OF WORK AS THOUGH WRITTEN HEREIN.

1. LOW VOLTAGE CONTRACTOR SHALL SUBMIT A VALID COPY OF TELECOMMUNICATIONS SYSTEM CONTRACTORS (TSC) LICENSE AND TELECOMMUNICATIONS SYSTEM TECHNICAL (TST) LICENSE(S) AT THE TIME OF BID AND DURING THE SUBMITTAL PHASE.
2. PROVIDE ALL MATERIALS AND LABOR AS REQUIRED TO ACHIEVE A COMPLETE AND OPERATIONAL SYSTEM.
3. COLOR CODE ALL WIRING.
4. PROVIDE CONDUIT SLEEVES AS REQUIRED. THROUGH FIRE RATED SEPARATIONS, FIRE SEAL AFTER WIRING IS COMPLETE.
5. CONCEAL ALL WIRING UNLESS OTHERWISE NOTED.
6. PROVIDE ALL GROUNDING INCLUDING GREEN EQUIPMENT GROUND IN ALL RACEWAYS. GROUND BUILDING SERVICE ACCORDING TO NEC AND ALSO TO STREET SIDE OF WATER METER AND TO APPROVED GROUND ROD.
7. WIRING SHALL NOT BE LAID ON, OR ATTACHED TO THE SUSPENDED CEILING OR ITS SUPPORT WIRES. ALL CABLES SHALL BE RUN PARALLEL OR PERPENDICULAR TO WALLS. DO NOT RUN CABLES DIAGONALLY THROUGH ANY SPACE.
8. INSTALL RACEWAY SYSTEMS AS FOLLOWS:
   a. ALL CONDUIT AND RACEWAY SYSTEMS SHALL COMPLY WITH NATIONAL, STATE, AND LOCAL CODES. PROVIDE GROUND WIRE IN ALL CONDUIT PATHWAYS. METALLIC CONDUIT SHALL NOT BE INSTALLED IN CONTACT WITH EARTH.
   b. USE RIGID GALVANIZED STEEL IN ALL AREAS EXPOSED TO WEATHER, PHYSICAL DAMAGE OR UNCONDITIONED SPACES.
   c. USE COMPRESSION TYPE FITTINGS FOR ELECTRICAL METALLIC TUBING WHERE UTILIZED.
   d. USE P.V.C. CONDUIT UNDERGROUND WITH CODE SIZED GROUND. CONDUIT RISERS AND STUBS ABOVE GRADE SHALL BE G.R.S. WITH HALF-LAPPED TAPE COVERING.
8. PROVIDE GROUNDING AND BONDING BUSHINGS FOR SERVICE RACEWAYS PER NEC. SIZE THE BONDING JUMPER PER NEC.
9. CONTRACTOR SHALL VISIT THE SITE AND FAMILIARIZE THEMSELF WITH THE EXISTING CONDITIONS. NO CLAIM FOR EXTRA COMPENSATION SHALL BE ENTERTAINED FOR WORK WHICH A PRELIMINARY EXAMINATION WOULD HAVE REVEALED. THE SUBMISSION OF A BID WILL BE CONSIDERED AS ACKNOWLEDGMENT ON THE PART OF THE BIDDER OF HIS VISITATION TO THE SITE.
10. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND CERTIFICATES. PRESENT SATISFACTORY PROOF OF FINAL INSPECTION AND APPROVAL BY AUTHORITIES HAVING JURISDICTION.
11. ALL FIXTURE, DEVICE, ETC.. LOCATIONS SHALL BE VERIFIED WITH OWNER AS WELL AS EQUIPMENT SUPPLIER REQUIREMENTS PRIOR TO ANY ROUGH-IN WORK.
12. ALL DEVICES SHALL BE MOUNTED AND SUPPORTED IN ACCORDANCE WITH OSHA STANDARDS AND ALL LOCAL, STATE, AND NATIONAL ELECTRICAL CODES.
13. CONTRACTOR SHALL PROVIDE DEVICE MOUNTING KITS AS REQUIRED TO SUIT THE EXACT TYPE OF CEILING OR SURFACE TO WHICH THEY ARE MOUNTED.
14. THESE DRAWINGS ARE DIAGRAMMATIC AND REPRESENT THE INTENT OF EQUIPMENT, DEVICES, ETC... TO BE CONNECTED AND THE CIRCUITS TO WHICH THEY ARE TO BE CONNECTED TO. CONTRACTOR SHALL INSTALL ALL CONDUIT, J-BOXES, ETC... AS REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM.
15. ALL EXTERIOR EQUIPMENT SHALL BE WEATHERPROOF.
16. ELECTRICAL CONTRACTOR SHALL PERFORM ALL WORK IN STRICT ACCORDANCE WITH ALL LOCAL, STATE, AND NATIONAL GOVERNING CODES.
17. ALL EQUIPMENT SHALL BE NEW AND BEAR A NRTL ("UL" OR "ETL") LABEL - UNLESS OTHERWISE NOTED.
18. ALL EQUIPMENT CHARACTERISTICS, LOCATIONS, AND CONNECTION REQUIREMENTS SHALL BE CERTIFIED PRIOR TO ANY ROUGH-IN WORK.
19. PENETRATIONS OF ALL FIRE RATED WALLS OR CEILINGS SHALL BE FIRE RATED IN ACCORDANCE WITH ALL LOCAL, STATE, AND NATIONAL CODES.
20. PROVIDE ENGRAVED PLASTIC NAMEPLATES FOR ALL MAJOR EQUIPMENT.
21. PROVIDE THE OWNER AND THE DEIGN TEAM WITH THREE SETS OF "AS-BUILTS" AT THE COMPLETION OF JOB.
22. ALL SECURITY SYSTEM CABLING SHALL BE INSTALLED IN CONDUIT. PATHWAYS SHALL BE APPROPRIATELY SIZED TO ACCOMMODATE ALL CABLING PER NEC, MAX 40% FILL. CONDUIT TO BE 3/4"C AT A MINIMUM UNLESS OTHERWISE NOTED.
23. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL MATERIALS AND EQUIPMENT/APPURTENANCES, AND MAINTAINING SAFE CONDITIONS WITHIN THE PROPOSED CONSTRUCTION AREA. CONTRACTOR SHALL ASSUME SOLE RESPONSIBILITY FOR ANY DAMAGES & INJURIES RESULTING FROM AND DURING THE EXECUTION OF THE WORK.
24. THE CONTRACTOR SHALL COORDINATE ALL WORK WITH THE OWNER, SUBCONTRACTORS & APPLICABLE DISCIPLINES.
25. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL OF ALL DEBRIS FROM SITE; REMOVE AND DISPOSE DAILY.
26. THE CONTRACTOR SHALL NOT SEPARATE CONSTRUCTION DOCUMENTS FOR DISTRIBUTION TO SUBCONTRACTORS. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING AND "CROSS-REFERENCING" DRAWINGS & SECTIONS OF THE PROJECT MANUAL.
27. CONTRACTORS SHALL VISIT THE SITE AND CAREFULLY EXAMINE THE AREAS IN QUESTION AS TO CONDITIONS WHICH MAY ADVERSELY AFFECT PROPER EXECUTION OF THE WORK. ALL DIMENSIONS AND QUANTITIES SHALL BE DETERMINED OR VERIFIED BY THE CONTRACTOR. NO CLAIMS FOR EXTRA COSTS WILL BE ALLOWED BECAUSE OF LACK OF FULL KNOWLEDGE OF THE EXISTING CONDITIONS UNLESS AGREED TO IN ADVANCE WITH THE OWNER &/OR ARCHITECT.
28. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL DEMOLITION REQUIRED FOR A COMPLETE AND PROPER JOB, WHETHER OR NOT REFERENCE IS MADE BY WAY OF NOTES AND DESIGNATIONS.
29. ALL WORK SHALL COMPLY WITH OSHA, FEDERAL, STATE BUILDING, AND FIRE AND LIFE/SAFETY CODES, WHICHEVER IS MOST STRINGENT.
30. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VISITING THE SITE AND EXAMINING THE EXISTING SYSTEMS, MATERIALS, EQUIPMENT AND OTHER RELATED ITEMS OF WORK PRIOR TO SUBMITTING BID AND PRIOR TO CONSTRUCTION.
31. EXISTING DIMENSIONS SHOWN ON DRAWINGS IS FOR REFERENCE ONLY; THE CONTRACTOR SHALL CHECK ALL DIMENSIONS AND ACCEPT RESPONSIBILITY FOR DIMENSIONAL CORRECTNESS.
32. THE CONTRACTOR SHALL CONFINE THEIR OPERATIONS TO THE AREA(S) DESIGNATED BY THE OWNER.
33. REPAIR/RESTORE, TO ORIGINAL/NEW CONDITION, AT NO COST TO THE OWNER, ALL EXISTING ITEMS, MATERIALS, SURFACES, ETC. (INCLUDING AREAS NOT DESIGNATED FOR NEW CONSTRUCTION SHOWN ON THE DRAWINGS) WHICH ARE DAMAGED DURING CONSTRUCTION. ALL RELATED COSTS SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
34. ANY WORK WHICH DEVIATES FROM THAT SPECIFIED IN THE CONSTRUCTION DOCUMENTS, CHANGED BY THE CONTRACTOR, INVOLVING THE SUBSTITUTION OF MATERIALS/EQUIPMENT SHALL BE THE SOLE RESPONSIBILITY OF THE GENERAL CONTRACTOR.
35. COORDINATE WITH OWNER, WORK AT BUILDING ENTRANCES AND MEANS OF EGRESS AND PARKING AREAS ADJACENT TO THE BUILDING. BUILDING AND SITE WILL BE OCCUPIED DURING CONSTRUCTION. CONTRACTOR SHALL PROVIDE ADEQUATE SIGNAGE TO DIRECT PEDESTRIAN TRAFFIC TO ALTERNATE ROUTES.
36. DELAYS CAUSED BY IMPROPER PLANNING WILL NOT BE TOLERATED, NOR ACCEPTABLE. CONTRACTOR SHALL ASSUME SOLE RESPONSIBILITY FOR UNNECESSARY DELAYS IN THE CONTRACT.
37. CONTRACTOR SHALL NOT PROCEED WITH ANY ADDITIONAL WORK ABOVE AND BEYOND THAT SPECIFIED IN THESE CONTRACT DOCUMENTS WITHOUT THE WRITTEN AUTHORIZATION OF THE ARCHITECT. CONTRACTOR SHALL OTHERWISE DO SO AT HIS OWN EXPENSE.
38. CONTRACTOR SHALL PROVIDE AND MAINTAIN TEMPORARY VISUAL AND PROTECTIVE PARTITIONS AROUND CONSTRUCTION AS MAY BE NECESSARY TO ASSURE THE SAFETY OF ALL PERSONS AUTHORIZED OR UNAUTHORIZED. ALL PARTITIONS ARE TO CONSTRUCTED AS REQUIRED BY LOCAL, STATE, AND FEDERAL LAWS, CODES OR REGULATIONS.

## TELECOMMUNICATIONS SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT.
   A.A. CLEARLY INDICATE ALL TYPES, PART NUMBERS, AND PROVIDED ACCESSORIES.
   A.B. PROVIDE WITH COVER LETTER AND TABLE OF CONTENTS.
   A.C. EACH PAGE SHALL BE SUBMITTED IN NUMERICAL ORDER WITH "PAGE # OF #" IN THE BOTTOM RIGHT SIDE OF EACH SHEET.
B. SHOP DRAWINGS: REVIEWED AND STAMPED BY RCDD.
   1. SYSTEM LABELING SCHEDULES: ELECTRONIC COPY OF LABELING SCHEDULES, IN SOFTWARE AND FORMAT SELECTED BY OWNER.
   2. CABLING ADMINISTRATION DRAWINGS AND PRINTOUTS. (LABELED DRAWINGS IN PDF AND AUTOCAD 2018 AND NEWER FORMAT.)
   3. WIRING DIAGRAMS AND INSTALLATION DETAILS OF TELECOMMUNICATIONS EQUIPMENT, TO SHOW LOCATION AND LAYOUT OF TELECOMMUNICATIONS EQUIPMENT, INCLUDING THE FOLLOWING:
      a. TELECOMMUNICATIONS ROOMS PLANS AND ELEVATIONS.
      b. TELECOMMUNICATIONS PATHWAYS.
      c. TELECOMMUNICATIONS GROUNDING SYSTEM.
      d. TELECOMMUNICATIONS CONDUCTOR DROP LOCATIONS.
      e. TYPICAL TELECOMMUNICATIONS DETAILS.
C. TWISTED PAIR CABLE TESTING PLAN.
D. SAMPLES: FOR TELECOMMUNICATIONS JACKS AND PLUGS, IN SPECIFIED FINISH, ONE FOR EACH TYPE AND CONFIGURATION.

## AUDIOVISUAL SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT.
   1. CLEARLY INDICATE ALL TYPES, PART NUMBERS, AND PROVIDED ACCESSORIES.
   2. PROVIDE WITH COVER LETTER AND TABLE OF CONTENTS.
   3. EACH PAGE SHALL BE SUBMITTED IN NUMERICAL ORDER WITH "PAGE # OF #" IN THE BOTTOM RIGHT SIDE OF EACH SHEET.
B. SHOP DRAWINGS: REVIEWED AND STAMPED BY AVIXA CERTIFIED TECHNOLOGY SPECIALIST (CTS).
   1. SYSTEM LABELING SCHEDULES: ELECTRONIC COPY OF LABELING SCHEDULES, IN SOFTWARE AND FORMAT SELECTED BY OWNER (EXCEL).
   2. CABLING ADMINISTRATION DRAWINGS AND PRINTOUTS. (LABELED DRAWINGS IN PDF AND AUTOCAD 2018 AND NEWER FORMAT.)
   3. WIRING DIAGRAMS AND INSTALLATION DETAILS OF AV EQUIPMENT, TO SHOW LOCATION AND LAYOUT OF AV EQUIPMENT, INCLUDING THE FOLLOWING:
      3.1. TYPICAL ROOM LAYOUT, PLANS, AND ELEVATIONS.
      3.2. PATHWAYS AND BACK BOX COORDINATION PLANS.
      3.3. NETWORK CONNECTION AND COORDINATION PLANS.
      3.4. TELECOMMUNICATIONS DROP LOCATIONS.
      3.5. TYPICAL MOUNTING DETAILS WITH HEIGHTS.
   4. TWISTED PAIR CABLE TESTING PLAN.
C. SAMPLES: FOR FACEPLATES JACKS AND PLUGS, IN SPECIFIED FINISH, ONE FOR EACH TYPE AND CONFIGURATION.

## TELECOMMUNICATIONS SPECIFICATION

QUALIFICATIONS:
1. SYSTEM INSTALLER MUST HAVE ON STAFF A RCDD (REGISTERED COMMUNICATION DISTRIBUTION DESIGNER) CERTIFIED BY BICSI (BUILDING INDUSTRY CONSULTING SERVICE INTERNATIONAL).
2. INSTALLATION SUPERVISION: INSTALLATION SHALL BE UNDER THE DIRECT SUPERVISION OF REGISTERED TECHNICIAN LEVEL 2 INSTALLER, WHO SHALL BE PRESENT AT ALL TIME WHEN WORK OF THIS SECTION IS PERFORMED AT PROJECT SITE.
3. SYSTEM INSTALLER MUST HOLD RELEVANT CERTIFICATIONS FOR ALL PRODUCTS AND MATERIALS REQUIRED BY THE SCOPE OF THIS PROJECT BEYOND THOSE LISTED ABOVE.
4. SYSTEM INSTALLER AND ALL ON SITE STAFF SHALL CARRY ALL STATE, FEDERAL AND LOCAL LICENSES.
   A. STATE OF RHODE ISLAND TELECOMMUNICATIONS SYSTEM CONTRACTOR (TSC) LICENSE
   B. STATE OF RHODE ISLAND TELECOMMUNICATIONS SYSTEM TECHNICIAN (TST) LICENSE

WARRANTY:
1. UTP CABLING TWENTY-FIVE (25) YEAR WARRANTY FOR PREMISE TELECOMMUNICATIONS WIRING.
2. THE SYSTEMS INTEGRATOR SHALL PROVIDE PROOF THAT THEY ARE AUTHORIZED AND CERTIFIED, IN GOOD STANDING, TO OFFER A 25-YEAR WARRANTY.
3. THE WARRANTY SHALL INCLUDE CONNECTING HARDWARE PRODUCTS AND INSTALLED CABLE AS PART OF THE STRUCTURAL CABLING SYSTEM.
4. THE STRUCTURAL CABLE SYSTEM SHALL INCLUDE:
   A. WORK AREA OUTLETS
   B. HORIZONTAL CABLE
   C. THE CONNECTING HARDWARE IN THE HORIZONTAL CROSS-CONNECT
   D. THE EQUIPMENT CORD AT THE WORK AREA
   E. THE PATCH CORD IN THE HORIZONTAL CROSS-CONNECT
5. THE WARRANTY SYSTEM PERFORMANCE GUARANTEES:
   A. THE STRUCTURAL CABLING SYSTEM SHALL BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP, FOR DURATION OF THE WARRANTY.
   B. THE STRUCTURAL CABLING SYSTEM SHALL SUPPORT ANY CURRENT OR FUTURE APPLICATION RATIFIED BY IEEE, ANSI, ISO, DESIGNED TO OPERATE COMPLIANT CATEGORY 3, 5, 5E, 6, OR 6A DRAFT OR STANDARD IN EFFECT AT THE TIME OF THE INSTALLATION, FOR THE DURATION OF THE WARRANTY.
6. IF THE STRUCTURAL CABLING SYSTEM IS DETERMINED TO BE DEFECTIVE WITHIN THE SCOPE OF THIS WARRANTY, THE PRODUCT FOUND TO BE NON-CONFORMING SHALL BE REPAIRED OR REPLACED UNDER THIS WARRANTY.

EXTRA MATERIALS:
1. FURNISH EXTRA MATERIALS THAT MATCH PRODUCTS INSTALLED AND THAT ARE PACKAGED WITH PROTECTIVE COVERING FOR STORAGE AND IDENTIFIED WITH LABELS DESCRIBING CONTENTS.
   FACEPLATES: 20% OF EACH TYPE.
   CONNECTORS: 20% OF EACH TYPE AND COLOR
   CABLING: (1) BOX OF EACH TYPE AND COLOR; 1000' SPOOL
   PATCH PANELS: (1) 48 PORT PATCH PANEL
   PATCH/EQUIPMENT CORDS: 20% OF EACH TYPE AND COLOR.

PATCH/EQUIPMENT CORDS:
A. PATCH/EQUIPMENT CORDS SHALL BE FACTORY MADE AND MATCH CABLING/CONNECTOR MANUFACTURER, FOUR PAIR CABLES WITH VARIED LENGTHS, TERMINATED WITH EIGHT POSITION MODULAR PLUGS AT EACH END.
B. PATCH/EQUIPMENT CORDS SHALL MEET OR EXCEED CATEGORY CABLE SPECIFIED, AND MEET TIA SPECIFICATIONS. COLOR CODED TO MATCH CABLING/ CONNECTORS FOR EASY IDENTIFICATION.
C. PROVIDE A MINIMUM OF (1) PATCH/EQUIPMENT CORD FOR EACH END OF HORIZONTAL PERMANENT LINK; (2) IN TOTAL. PATCH/EQUIPMENT CORD SHALL MATCH HORIZONTAL CATEGORY TYPE AND COLOR SCHEME.
D. PROVIDE A MINIMUM OF FIFTY (50) RED PATCH CORDS FOR "CRITICAL" PATCHING NEEDS PER THE TOWNS REQUEST.

## TELECOMMUNICATIONS TESTING SPECIFICATION

UNLESS OTHERWISE SPECIFIED BY THE OWNER OR THE OWNERS REPRESENTATIVE, EACH CABLING LINK SHALL BE IN TESTED AND SUBMITTED TO THE ENGINEER FOR:
1. WIRE MAP
2. LENGTH
3. PROPAGATION DELAY
4. DELAY SKEW
5. DC LOOP RESISTANCE - RECORDED FOR INFORMATION ONLY
6. DC RESISTANCE UNBALANCE - RECORDED FOR INFORMATION ONLY
7. INSERTION LOSS
8. NEXT (NEAR-END CROSSTALK)
9. PS NEXT (POWER SUM NEAR-END CROSSTALK)
10. ALL TESTING PROCEDURES AND FIELD-TEST INSTRUMENTS SHALL COMPLY WITH APPLICABLE REQUIREMENTS OF:
11. ANSI/TIA-1152-A, REQUIREMENTS FOR FIELD TEST INSTRUMENTS AND MEASUREMENTS FOR BALANCED TWISTED-PAIR CABLING
12. ANSI/TIA-568, GENERIC TELECOMMUNICATIONS CABLING FOR CUSTOMER PREMISES.
13. ANSI/TIA-568, COMMERCIAL BUILDING TELECOMMUNICATIONS CABLING STANDARD
14. ANSI/TIA_568, BALANCED TWISTED-PAIR TELECOMMUNICATIONS CABLING AND COMPONENTS STANDARDS.
15. ANSI/TIA-606, ADMINISTRATION STANDARD FOR COMMERCIAL TELECOMMUNICATIONS INFRASTRUCTURE, INCLUDING THE REQUIREMENTS SPECIFIED BY THE CUSTOMER, UNLESS THE CUSTOMER SPECIFIES THEIR OWN LABELING REQUIREMENTS.

EXECUTION:
A. FURNISH AND INSTALL TELECOMMUNICATION OUTLETS, BOXES, AND CONDUIT FOR ALL TELECOMMUNICATION OUTLET LOCATIONS INDICATED ON THE DRAWINGS, PROVIDE BACK BOXES, CONDUIT, PULLSTRINGS, ETC. AS PER DRAWINGS.
B. PROVIDE 10' SERVICE COIL IN TERMINATIONS ROOMS/RACKS ON ALL TELECOMMUNICATIONS, VOICE, AND DATA RUNS.
C. CABLE SUPPORT: NRTL LABELED FOR SUPPORT OF CATEGORY CABLING, SHALL USE VELCRO CABLE STRAPS DESIGNED TO PREVENT DEGRADATION OF CABLE PERFORMANCE AND PINCH POINTS THAT COULD DAMAGE CABLE FOR THE FOLLOWING APPLICATIONS. DO NOT USE TIE WRAPS.
D. INSTALL AND TERMINATE ALL CABLES PER TIA STANDARDS.
E. THE GENERAL CONTRACTOR SHALL ENSURE THAT THE PAINTING CONTRACTOR DOES NOT PAINT OR OVER SPRAY ANY SINGLE 4 PAIR HORIZONTAL OR CATEGORY CABLING. ANY PAINTED OR OVER SPRAYED CABLE SHALL BE REPLACED AT THE PAINTING CONTRACTOR'S EXPENSE.
F. INSTALL AND GROUND ALL ENCLOSURES/RACKS PER MANUFACTURES RECOMMENDATIONS.
G. DO NOT EXCEED MANUFACTURES RECOMMENDING BEND RADIUS FOR CATEGORY CABLING

## AUDIOVISUAL LEGEND

ALL ITEMS SHOWN ARE NOT NECESSARILY USED ON THIS PROJECT

AUDIO/VISUAL OUTLETS:
ALL OUTLETS SHALL BE MOUNTED AT 18" A.F.F. TO CENTER, UNLESS OTHERWISE NOTED. COORDINATE WITH ARCHITECTURAL ELEVATIONS PRIOR TO ROUGH-IN. ALL AV OUTLETS AND DEVICES SHALL BE FULLY CONCEALED UNLESS OTHERWISE NOTED.

- ##INCH — WALL MOUNTED DISPLAY WITH MOUNT; REFER TO DISPLAY SCHEDULE FOR ADDITIONAL INFORMATION. ## DENOTES DISPLAY SCREEN DIAGONAL DIMENSION.
- # DB — DISPLAY OUTLET BOX; WALL MOUNTED; REFER TO DISPLAY OUTLET DEVICE SCHEDULE FOR ADDITIONAL INFORMATION.
- # AV — AV DEVICE OUTLET; CEILING MOUNTED. NUMBER INDICATES DESIGNATED OUTLET DETAIL. REFER TO AUDIO VISUAL FACEPLATE DETAIL AND AV DETAILS FOR ADDITIONAL INFORMATION.
- # AVH — AV DEVICE OUTLET; WALL MOUNTED. NUMBER INDICATES DESIGNATED OUTLET DETAIL. REFER TO AUDIO VISUAL FACEPLATE DETAIL AND AV DETAILS FOR ADDITIONAL INFORMATION.
- # AV — AV DEVICE OUTLET IN FLOOR BOX OR POKE-THRU (PROVIDED BY DIVISION 26). NUMBER INDICATES DESIGNATED OUTLET DETAIL. REFER TO AUDIO VISUAL FACEPLATE DETAIL AND AV ONE-LINE(S) FOR ADDITIONAL INFORMATION.
- S — SPEAKER; CEILING MOUNTED. REFER TO AV DETAILS FOR ADDITIONAL INFORMATION.
- SH — SPEAKER; WALL MOUNTED. REFER TO AV DETAILS FOR ADDITIONAL INFORMATION.
- M — MICROPHONE OUTLET; CEILING MOUNTED. REFER TO AV DETAILS FOR ADDITIONAL INFORMATION.
- MH — MICROPHONE OUTLET; TABLETOP MOUNTED. REFER TO AV DETAILS FOR ADDITIONAL INFORMATION.
- OS — AV OCCUPANCY SENSOR; CEILING MOUNTED. REFER TO AV DETAILS FOR ADDITIONAL INFORMATION.
- # TS — AV TOUCHSCREEN CONTROL PANEL; REFER TO AV ONE-LINE(S) FOR ADDITIONAL INFORMATION.
  "D" INDICATES DESK MOUNTED
  "W" INDICATES WALL MOUNTED; 48"A.F.F. - DIV 26 TO PROVIDE BACKBOX AND 1INCH CONDUIT. IF PANEL SPECIFIC BACK BOX IS REQUIRED, AV CONTRACTOR SHALL FURNISH TO DIV 26 TO INSTALL WITH ASSOCIATED CONDUIT.
- V — VOLUME CONTROL SWITCH.
- AMP — LOCAL SOUND SYSTEM AMPLIFIER; RACK MOUNTED. FIRE ALARM PRIORITY OVERRIDE CONNECTED TO BUILDING FIRE ALARM SYSTEM BY DIVISION 28 (FIRE ALARM)
- AUDIOVISUAL SYSTEM VIDEO CONFERENCING CAMERA; CEILING MOUNTED.
- AUDIOVISUAL SYSTEM VIDEO CONFERENCING CAMERA; WALL MOUNTED. DIV 26 SHALL PROVIDE RANDL INDUSTRIES OR EQUAL 5" SQUARE BOX, 2-7/8" DEEP W/ INTEGRAL CABLE MANAGEMENT, SINGLE GANG RAISED COVER, AND 1INCH CONDUIT TO ABOVE ACCESSIBLE CEILING. AV CONTRACTOR TO PROVIDE SINGLE CABLE CABLE PASS-THRU AND DECORA FACEPLATE (FBA)

## ABBREVIATIONS

| | | | |
|---|---|---|---|
| 180° | ONE HUNDRED AND EIGHTY DEGREE FIELD OF VIEW | G | GROUND |
| 270° | TWO HUNDRED AND SEVENTY DEGREE FIELD OF VIEW | GEC | GROUNDING ELECTRODE CONDUCTOR |
| 360° | THREE HUNDRED AND SIXTY DEGREE FIELD OF VIEW | HH | HANDHOLE |
| A/AMP | AMPERE | HZ | HERTZ |
| AC | ALTERNATING CURRENT | IDS | INTRUSION DETECTION SYSTEM |
| ACS | ACCESS CONTROL SYSTEM | JB | JUNCTION BOX |
| ADA | AMERICAN WITH DISABILITIES ACT | LAN | LOCAL AREA NETWORK |
| AFF | ABOVE FINISHED FLOOR | MH | MANHOLE |
| AFG | ABOVE FINISHED GRADE | MTD | MOUNTED |
| AHJ | AUTHORITY HAVING JURISDICTION | MTG | MOUNTING |
| AWG | AMERICAN WIRE GAUGE | N/A | NOT APPLICABLE |
| AV | AUDIOVISUAL | NEC | NATIONAL ELECTRICAL CODE |
| B | BURIED | NIC | NOT IN CONTRACT |
| BFG | BELOW FINISHED GRADE | NSPD | NORTH SMITHFIELD POLICE DEPT. |
| BOF | BOTTOM OF FIXTURE | NTS | NOT TO SCALE |
| C | CONDUIT | NVR | NETWORK VIDEO RECORDER |
| CA | CABLE | # | NUMBER |
| CAT | CATEGORY | OPD | OVER CURRENT PROTECTION DEVICE |
| CATV | CABLE TELEVISION | P | POLE |
| CCTV | CLOSED CIRCUIT TELEVISION SYSTEM | PoE | POWER OVER ETHERNET |
| CB | CIRCUIT BREAKER | PT | POKE-THRU |
| CBA | COLOR BY ARCHITECT | PTZ | PAN TILT ZOOM |
| CKT | CIRCUITS | PVC | POLYVINYL CHLORIDE |
| CPU | CENTRAL PROCESSING UNIT | PWR | POWER |
| CONT. | CONTINUATION | RGS | RIGID GALVANIZED STEEL |
| CU | COPPER | RPM | REVOLUTIONS PER MINUTE |
| ℄ | CENTERLINE | STP | SHIELDED TWISTED PAIR |
| dB | DECIBEL | TTB | TELEPHONE TERMINAL BOARD |
| DC | DIRECT CURRENT | TEL | TELEPHONE |
| DEPT. | DEPARTMENT | TERMN | TERMINAL |
| DN | DOWN | TYP. | TYPICAL |
| DWG | DRAWING | UG | UNDERGROUND |
| EC | ELECTRICAL CONTRACTOR (DIV 26) | UL | UNDERWRITERS LABORATORIES |
| ECPS | EMPTY CONDUIT WITH PULLSTRING | UNO | UNLESS NOTED OTHERWISE |
| EG | EQUIPMENT GROUND | UON | UNLESS OTHERWISE NOTED |
| EMT | ELECTRIC METALLIC TUBING | UPS | UNINTERRUPTIBLE POWER SUPPLY |
| F | FAHRENHEIT | UTP | UNSHIELDED TWISTED-PAIR |
| FBA | FINISH BY ARCHITECT | V | VOLTS |
| FD | FIXED DOME | VOIP | VOICE OVER INTERNET PROTOCOL |
| FLA | FULL LOAD AMPERES | VSS | VIDEO SURVEILLANCE SYSTEM |
| FLMT | FLEXIBLE LIQUID TIGHT METALLIC TUBING | W | WATTS |
| FREQ | FREQUENCY | W/ | WITH |
| | | WAP | WIRELESS ACCESS POINT |
| | | WP | WEATHERPROOF |

## EXISTING AND DEMO LEGEND

- ETR OR NO DESIGNATION = EXISTING TO REMAIN.
- XE — XE IS EXISTING TO BE REMOVED IN ITS ENTIRETY. EXISTING BACK BOX, PATHWAY, ETC. SHALL BE FULLY REMOVED BACK TO SOURCE.
- RE — RE = EXISTING LOCATION TO BE REUSED. EXISTING DEVICE AND CABLING SHALL BE REMOVED IN ITS ENTIRETY. REUSE EXISTING CONDUIT PATHWAY FOR NEW CABLING.
- RX — RX = EXISTING TO BE REMOVED IN ITS ENTIRETY. PROVIDE CUSTOM METAL ENCLOSURE COVER TO FULLY COVER/CONCEAL EXISTING DEVICE/BACKBOX OPENING.
- RT — RT = DEVICE REMOVED AND TURNED OVER TO OWNER. CABLING, BACK BOX, PATHWAY, ETC. SHALL BE REMOVED IN ITS ENTIRETY.

NO DESIGNATION MEANS EXISTING TO REMAIN, UNLESS OTHER WISE NOTED.

## TELECOMMUNICATION LEGEND

ALL ITEMS SHOWN ARE NOT NECESSARILY USED ON THIS PROJECT

TELECOMMUNICATION OUTLETS: ALL OUTLETS SHALL BE MOUNTED AT 18" A.F.F. TO CENTER, UNLESS OTHERWISE NOTED. THE FOLLOWING DESIGNATIONS SHALL APPLY TO ALL OUTLET TYPES:

BMS = INDICATES FOR BMS AND/OR LIGHTING CONTROLS - 48"A.F.F.
C = INDICATES MOUNTED AT 6" ABOVE BACK SPLASH TO BOTTOM, REFER TO ARCHITECTURAL ELEVATIONS.
F = INDICATES FLOOR MOUNTED.
W = WALL PHONE MOUNTED AT NO HIGHER THAN 48" A.F.F. PER ADA.
H = INDICATES MOUNTED AT 82" A.F.F.
TV = FOR TV; MOUNTED IN DISPLAY ENCLOSURE BY DIV 26 CONCEALED BEHIND DISPLAY.
#C = INDICATED CABLE TV (COAX)
#D = INDICATES DATA.
#V = INDICATES VOICE.
P = POTS "PLAIN OLD TELEPHONE"
# = INDICATES NUMBER OF DROPS (CABLES). NO NUMBER INDICATES SINGLE DROP.

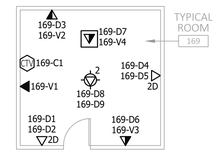
- #D/#V — TELECOMMUNICATIONS OUTLET, REFER TO TELECOMMUNICATIONS FACEPLATE DETAIL FOR ADDITIONAL INFORMATION.
- # — TELECOMMUNICATIONS OUTLET IN FLOOR BOX OR POKE-THRU (PROVIDED BY DIVISION 26), REFER TO TELECOMMUNICATIONS FACEPLATE DETAIL FOR ADDITIONAL INFORMATION.
- # — TELECOMMUNICATIONS CEILING OUTLET, REFER TO TELECOMMUNICATIONS FACEPLATE DETAIL FOR ADDITIONAL INFORMATION.
- DH — TELECOMMUNICATIONS FURNITURE FEED; WALL MOUNTED.
- D — TELECOMMUNICATIONS FLOOR BOX FURNITURE FEED (PROVIDED BY DIVISION 26)
- # — DATA OUTLET, REFER TO TELECOMMUNICATIONS FACEPLATE DETAIL FOR ADDITIONAL INFORMATION.
- # — DATA OUTLET IN FLOOR BOX OR POKE-THRU (PROVIDED BY DIVISION 26), REFER TO TELECOMMUNICATIONS FACEPLATE DETAIL FOR ADDITIONAL INFORMATION.
- # — DATA CEILING OUTLET, REFER TO TELECOMMUNICATIONS FACEPLATE DETAIL FOR ADDITIONAL INFORMATION.
- # — VOICE OUTLET, REFER TO TELECOMMUNICATIONS FACEPLATE DETAIL FOR ADDITIONAL INFORMATION.
- # — WIRELESS ACCESS POINT. CEILING OR WALL MOUNTED. REFER TO TELECOMMUNICATIONS FACEPLATE DETAIL FOR ADDITIONAL INFORMATION.
- CTV — CABLE TV OUTLET BOX; WALL MOUNTED; REFER TO TELECOMMUNICATIONS FACEPLATE DETAIL FOR ADDITIONAL INFORMATION.
- TMGB — MAIN TELECOMMUNICATIONS GROUND BAR EQUAL TO ERICO #TGBA20L12P; PROVIDED BY DIVISION 26. BONDED TO MAIN ELECTRICAL GROUND BAR.
- TGB — TELECOMMUNICATIONS GROUND BAR EQUAL TO ERICO #TGBA12L06P; PROVIDED BY DIVISION 26. BONDED TO MAIN TELECOMMUNICATIONS GROUND BAR.
- UPS #KVA — UNINTERRUPTED POWER SUPPLY UPS; # INDICATES KVA RATING. REFER TO TELECOMMUNICATIONS RACK ELEVATION FOR ADDITIONAL INFORMATION.

## MISCELLANEOUS LEGEND

ALL ITEMS SHOWN ARE NOT NECESSARILY USED ON THIS PROJECT

- TELECOMMUNICATION TERMINAL BOARD (TTB), PROVIDE GRADE "A", 3/4" PLYWOOD COMPLETELY (ALL SIDES) PAINTED WITH FIRE RETARDANT PAINT AS REQUIRED PER CODE. PAINT COLOR TO BE DIRECTED BY THE ARCHITECT.
- # L\V#.# — PARTIAL PLAN/DETAIL CALL OUT TAG; TOP NUMBER INDICATES PLAN/DETAIL AND BOTTOM NUMBER INDICATES SHEET CONTAINING PLAN/DETAIL.
- # L\V#.# — ELEVATION PLAN CALL OUT TAG; TOP NUMBER INDICATES PLAN/DETAIL AND BOTTOM NUMBER INDICATES SHEET CONTAINING PLAN/DETAIL.

## TELECOMMUNICATIONS LABELING SCHEME




GENERAL NOTES:
1. TELECOMMUNICATIONS CONTRACTOR SHALL LABEL TELECOMMUNICATIONS DROPS ACCORDING TO ABOVE TYPICAL SCHEME.
2. TELECOMMUNICATIONS CONTRACTOR SHALL SEE FLOOR PLANS FOR EXACT TELECOMMUNICATION OUTLET LOCATIONS.
3. IN NON-TYPICAL ROOM, TELECOMMUNICATIONS CONTRACTOR SHALL LOCATE REASONABLY WHAT WILL BE THE MA

## GENERAL SYSTEM INTEGRATOR NOTES

BIDDING REQUIREMENTS

A. INSTALLER QUALIFICATIONS, SUBMIT ON ALL THE FOLLOWING:
   1. INSTALLATION SUPERVISION: INSTALLATION SHALL BE UNDER THE DIRECT SUPERVISION OF REGISTERED TECHNICIAN LEVEL 2 INSTALLER, WHO SHALL BE PRESENT AT ALL TIME WHEN WORK OF THIS SECTION IS PERFORMED AT PROJECT SITE.
   2. SYSTEM INSTALLER SHALL BE A FACTORY CERTIFIED IN THE SPECIFIED VIDEO AND ACCESS CONTROL SYSTEM.
   3. SYSTEM INSTALLER MUST HOLD RELEVANT CERTIFICATIONS FOR ALL PRODUCTS AND MATERIALS REQUIRED BY THE SCOPE OF THIS PROJECT BEYOND THOSE LISTED ABOVE.
   4. SYSTEM INSTALLER SHALL CARRY ALL STATE, FEDERAL AND LOCAL LICENSES. THE CONTRACTOR SHALL HOLD AND MAINTAIN A VALID S-LICENSE FROM THE STATE OF MASSACHUSETTS DEPARTMENT OF PUBLIC SAFETY. INDIVIDUALS EMPLOYED BY S-LICENSE HOLDER MUST OBTAIN A CERTIFICATE OF CLEARANCE PRIOR TO ENGAGING IN ANY WORK ON THE PROJECT.
   5. SYSTEM INSTALLER SHALL CARRY OSHA 10 OR OSHA 30 CERTIFICATION.
   6. ON A SEPARATE SHEET, LIST 3-5 INTEGRATED SECURITY PROJECTS (OF GREATER OR EQUAL SIZE) YOUR ORGANIZATION HAS COMPLETED OR IS IN PROGRESS OF COMPLETING, THE PAST 5 YEARS. PROJECTS SHALL UTILIZE THE BASIS OF DESIGN PRODUCTS AND/OR SYSTEMS.
      a. NAME OF PROJECT:
      b. PROJECT SUMMARY:
      c. CONTACT NAME:
      d. CONTRACT AMOUNT:
      e. DATE OF COMPLETION:
      f. PERCENTAGE OF THE COST OF THE WORK PERFORMED WITH YOUR OWN FORCES:

## SECURITY SYSTEM GENERAL NOTES & SPECIFICATIONS

1. ALL GENERAL NOTES AND SPECIFICATIONS CONTAINED HEREIN APPLY TO THE SECURITY CONTRACTOR BIDDING THESES PLANS. THE SECURITY CONTRACTOR AND OWNER IS RESPONSIBLE FOR PROVIDING THIS SET OF PLANS TO ALL RELEVANT PARTIES.

2. SCOPE OF WORK: THE SCOPE OF WORK FOR THIS CONTRACTOR SHALL CONSIST OF DELIVERING A COMPLETE OPERATIONAL INSTALLATION BASED ON THE PLANS AND SPECIFICATIONS FOR THE FOLLOWING SECURITY SYSTEMS:

   VIDEO SURVEILLANCE SYSTEM

3. CONTRACTOR SHALL PROVIDE ALL REQUIRED MATERIAL (INCLUDING, BUT NOT LIMITED TO LOW-VOLTAGE CABLING, HARDWARE, ACCESSORIES, MODULES, LICENSES, ETC. WHETHER INDICATED HEREIN OR NOT), AND LABOR FOR A COMPLETE AND OPERABLE SYSTEM. FINAL SYSTEM SHALL ACCOMMODATE THE TOTAL NUMBER OF EXISTING CAMERAS AS A MINIMUM AND MEET THE SYSTEM INTENT OF THESE DOCUMENTS.

4. COORDINATION AND QUALITY ASSURANCE: ALL DESIGN, MATERIALS AND INSTALLATION METHODS EMPLOYED FOR THESE SYSTEM(S) SHALL BE COMPLIANT WITH THE MOST CURRENT VERSIONS OF ALL NATIONAL AND LOCALLY RECOGNIZED CODES AND REGULATIONS, INCLUDING REQUIREMENTS AS COORDINATED WITH, AND IDENTIFIED BY, THE OWNER. ITEM COORDINATION SHALL INCLUDE, BUT NOT BE LIMITED TO, SOFTWARE/PROGRAMMING PACKAGES, CAMERA FIELD-OF-VIEW AND FOCAL POINTS, FINAL HEAD END EQUIPMENT AND DEVICE LOCATIONS (INCLUDING MOUNTING TYPES AND HEIGHTS), SEQUENCE OF OPERATIONS, MANUFACTURER POWER REQUIREMENTS, INTEGRATIONS AND REQUIREMENTS WITH OTHER SYSTEMS, ETC. VERIFY WITH OWNER LEVEL OF INTEGRATION AND COMPARABILITY BETWEEN THESE SYSTEMS AND MANUFACTURES AS WELL AS ANY OTHER SPECIAL SYSTEMS NOT PART OF THIS SCOPE.

5. QUALIFICATIONS: CONTRACTOR(S) SHALL HOLD A VALID STATE LICENSE AND SHALL HAVE BEEN IN THE BUSINESS OF FURNISHING AND INSTALLING SIMILAR SYSTEMS OF SCOPE AND SIZE FOR A MINIMUM OF FIVE (5) YEARS. CONTRACTOR SHALL BE CAPABLE OF BEING BONDED TO ASSURE THE OWNER PERFORMANCE AND SATISFACTORY SERVICE DURING THE WARRANTY PERIOD AS OUTLINED IN DIVISION 01 SPECIFICATION.

6. INSTALLING CONTRACTOR SHALL BE A FACTORY AUTHORIZED DISTRIBUTOR, INSTALLER AND WARRANTY STATION FOR THE BRAND OF EQUIPMENT BEING OFFERED. IN ADDITION, CONTRACTOR SHALL FURNISH CERTIFICATES OF TRAINING FOR PERSONNEL PERFORMING WORK AND A LETTER FROM THE MANUFACTURER ADDRESSED TO THE OWNER (OR OWNER'S REPRESENTATIVE) CERTIFYING THAT THE CONTRACTOR IS THE AUTHORIZED DISTRIBUTOR AND INSTALLER OF SAID EQUIPMENT AND EQUIPMENT SHALL BE INSTALLED ACCORDING TO THE INTENDED MANUFACTURER'S PRACTICES. CONTRACTOR SHALL MAINTAIN A FULLY EQUIPPED SERVICE ORGANIZATION CAPABLE OF FURNISHING ADEQUATE REPAIR SERVICE WARRANTED EQUIPMENT WITH RESPONSE TIMES TO PROJECT SITE WITHIN 4 HOURS TIME.

7. SOFTWARE: ALL SYSTEM DESIRED SOFTWARE PLATFORMS AND QUANTITY OF LICENSES SHALL BE PROVIDED FOR ALL FURNISHED EQUIPMENT AS PART OF THE CONTRACTOR'S COMPLETE AND OPERABLE SYSTEM(S). ALL SYSTEM SOFTWARE PLATFORMS INSTALLED SHALL BE THE FULL AND COMPLETE VERSION OF THE MOST RECENT SOFTWARE PACKAGE AVAILABLE AT THE TIME OF INSTALLATION. OWNER SHALL BE PROVIDED FORMAL COPIES OF ALL LICENSES AND ALL USER NAMES AND PASSWORDS TO SYSTEMS AS PART OF CLOSE-OUT DOCUMENTATION.

8. SUBMITTALS: FURNISH VIA SUBMITTAL PROCESS COMPLETED CONSTRUCTION DOCUMENTS, SPECIFICATIONS, AND PRODUCT DATA CUT SHEETS FOR THE SYSTEMS IDENTIFIED ABOVE AND HEREIN. SUBMITTAL FOR THESE SYSTEMS MUST INCLUDE, AT A MINIMUM, THE FOLLOWING INFORMATION:
   A. COPY OF THE CONTRACTOR'S VALID AND CURRENT STATE LICENSE.
   B. COPY OF PROJECT LIST WITH (5) COMPLETED PROJECTS WITHIN THE LAST (5) YEARS.
   C. COPY OF MANUFACTURER'S AUTHORIZATION LETTERS IDENTIFYING THE CONTRACTOR AS AN AUTHORIZED DISTRIBUTOR AND INSTALLER.
   D. PROOF OF CONTRACTOR'S TRAINED PERSONNEL. AND PERSONNEL ARE LOCATED IN THE LOCAL FACILITY.
   E. PRODUCT DATA CUT SHEETS FOR EACH PRODUCT SPECIFIED AND BEING PROVIDED.
   E.A. PROVIDE CERTIFICATION LETTER FROM THE MANUFACTURER VERIFYING THAT EACH SUBMITTED PRODUCT IS NDAA COMPLIANT. ANY PRODUCT MISSING THIS CERTIFICATION LETTER WILL NOT BE APPROVED.
   F. MANUFACTURER'S WARRANTY.
   G. SAMPLE OF PROJECT 3 YEAR SERVICE MAINTENANCE AGREEMENT.
   H. PROPOSED MANUFACTURER AND SYSTEM IN ACCORDANCE WITH THIS CRITERIA INCLUDING DATA CUT SHEETS FOR ALL PRODUCT EQUIPMENT AND DEVICES.
   I. PROPOSED COMPLETE SYSTEM PROJECT SPECIFIC LAYOUT INDICATION LOCATIONS FOR ALL DEVICES, CONTROL POINTS, POWER-SUPPLIES, TERMINAL CABINETS CABLING, ETC. ASSOCIATED WITH THIS PROJECT, INCLUDING WIRING DIAGRAMS, WIRE LEGENDS, DEVICE AND BACK BOX MOUNTING HEIGHTS, ZONING SCHEDULE/LEGEND, ETC. PLANS SUBMITTED SHALL INCLUDE PROPOSED CABLING AND CONDUIT ROUTING ON LEGIBLE INDUSTRY STANDARD SCALED PLANS.
   J. RISER/SINGLE LINE DIAGRAMS AND CALCULATIONS SHOWING COMPLETE SYSTEM LAYOUT, INCLUDING BUT NOT LIMITED TO, CONNECTION DIAGRAMS FOR SYSTEMS AS WELL AS INTERFACE WITH OTHER SYSTEMS WHERE APPLICABLE, AND CONNECTIVITY,INCLUDING ANY BATTERY AND VOLTAGE DROP CALCULATIONS AS WELL AS VIDEO STORAGE CALCULATIONS.
   K. HEAD-END EQUIPMENT LOCATIONS AND ELEVATIONS.
   L. SUBSTITUTIONS - THE CONTRACTOR SHALL PROVIDE FULL DESIGN DOCUMENTS INDICATING CAMERA TYPES, LOCATIONS, AND COVERAGE PATTERNS THAT CLEARLY SHOW FOCAL POINTS AND FIELD OF VIEW LIMITS IN COMPARISONS TO ORIGINAL CONSTRUCTION DOCUMENTS.
   M. SUBMITTALS WITHOUT THE ABOVE INFORMATION SHALL BE DEEMED INCOMPLETE AND REJECTED.
   N. TESTING AND COMMISSIONING PER OWNERS REQUIREMENTS, INDUSTRY STANDARDS AND MANUFACTURER STANDARDS.

6. WARRANTY, SUPPORT, AND PROGRAMMING: CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR OBTAINING THE MANUFACTURER'S WARRANTY. ALL COMPONENTS, PARTS AND ASSEMBLIES SUPPLIED BY THE MANUFACTURER AND INSTALLED BY THE CONTRACTOR SHALL BE WARRANTEE AGAINST DEFECTS IN MATERIAL AND WORKMANSHIP (PARTS AND LABOR) FOR A PERIOD OF THREE (3) YEARS MINIMUM. CONTRACTOR SHALL INCLUDE IN BID ALL REQUIRED TECHNICAL SUPPORT, PROGRAMMING, PARTS AND LABOR TO SUCCESSFULLY EXECUTE AND MEET THE INTENT OF THIS CRITERIA. WARRANTY PERIOD SHALL BEGIN FROM THE DATE OF FINAL WRITTEN ACCEPTANCE BY THE OWNER. PROVIDE TYPED IDENTIFICATION/INFORMATION CARD AT HEAD END EQUIPMENT LOCATION INDICATING WARRANTY PERIOD START DATE AND COMPANY CONTACT INFORMATION FOR WARRANT SERVICE, INCLUDING COMPANY NAME, ADDRESS AND PHONE NUMBER.

7. TRAINING: INCLUDE AS PART OF BASE BID ALLOWANCE FOR UP TO (2) 4 HOUR TRAINING SESSIONS WITH ACCOMMODATIONS FOR A MAXIMUM OF (8) END-USER TRAINEES AT EACH SESSION. TRAINING SESSIONS SHALL BE HELD ON DIFFERENT DAYS AT A LOCATION DETERMINED BY OWNER. TRAINING SHALL BE PROVIDED WITHIN 30-DAYS OF PROJECT COMPLETION AND SESSION TIMES COORDINATED WITH OWNER PRIOR TO PROJECT COMPLETION. ONE OF THE (2) TRAINING SESSIONS SHALL INCLUDE SELECT NSPD OR RHODE ISLAND STATE POLICE DEPARTMENT PERSONNEL THAT NSPD WILL INDICATE. ALL TRAINING DAYS SHALL BE SCHEDULE WITH NSPD 72HOURS IN ADVANCE AT A MINIMUM.

8. BOOK SPECIFICATIONS: IN THE EVENT OF CONFLICTS BETWEEN CONSTRUCTION BID DOCUMENT SPECIFICATIONS AND THE CRITERIA ABOVE, THE MOST STRINGENT OF REQUIREMENTS SHALL APPLY.

9. ACCEPTABLE SYSTEM MANUFACTURERS:

BASIS OF DESIGN VIDEO SURVEILLANCE SYSTEM SOFTWARE:
- THE LATEST VERSION OF HANWHA WISENET WAVE 6.0 (OR NEWER) VIDEO MANAGEMENT SOFTWARE WITH LIFETIME PERPETUAL LICENSE WHICH INCLUDES ALL SOFTWARE AND SECURITY UPDATES/PATCHES.

APPROVED VIDEO SURVEILLANCE SYSTEM SOFTWARE EQUALS ARE AS FOLLOWS:
- THE LATESTS VERSION OF MILESTONE XPROTECT PROFESSIONAL+ WITH THREE (3) YEARS OF LICENSES AND SOFTWARE UPDATES INCLUDED.
- THE LATESTS VERSION OF QUMULEX (BY SYNERION) CLOUD BASED VIDEO SURVEILLANCE SYSTEM WITH THREE (3) YEARS OF LICENSES AND SOFTWARE UPDATES INCLUDED.

BASIS OF DESIGN ACCESS CONTROL SYSTEM SOFTWARE:
- THE LATESTS VERSION OF S2 SYSTEMS NETBOX EXTREME WITH THREE (3) YEARS OF LICENSES AND SOFTWARE UPDATES INCLUDED.

APPROVED ACCESS CONTROL SYSTEM SOFTWARE EQUALS:
- THE LATESTS VERSION OF QUMULEX (BY SYNERION) CLOUD BASED ACCESS CONTROL SYSTEM WITH THREE (3) YEARS OF LICENSES AND SOFTWARE UPDATES INCLUDED.
- THE LATESTS VERSION OF GALAXY ENTERPRISE SOFTWARE WITH THREE (3) YEARS OF LICENSES AND SOFTWARE UPDATES INCLUDED.

## VIDEO SURVEILLANCE SYSTEM GENERAL NOTES

1. CONTRACTOR SHALL PROVIDE, PROGRAM, AND COMMISSION A FULLY FUNCTIONAL, COMPLETE AND OPERATIONAL VIDEO SURVEILLANCE SYSTEM. PROVIDE ALL LABOR, ENGINEERING, DESIGN, TESTING, MATERIAL, COMPONENTS AND SUPERVISION NECESSARY AS PART OF HIS WORK.

2. VIDEO SURVEILLANCE SYSTEM, AT A MINIMUM, SHALL INCLUDE CONNECTION TO ALL CAMERAS INDICATED, RACK MOUNTED HEAD END EQUIPMENT (INCLUDING NETWORK VIDEO RECORDERS (NVR'S), VIDEO MANAGEMENT SOFTWARE, NETWORK CONNECTION (COORDINATED WITH KCWA IT MANAGEMENT), VIEWING WORKSTATION COMPUTER, SURGE PROTECTIONS, UNINTERRUPTED POWER SUPPLIES (UPS), CAT6A PATCH PANELS AND PATCHING CABLES.

3. VIDEO SURVEILLANCE SYSTEM PROGRAMMING SHALL INCLUDE CONFIGURATION OF THE FOLLOWING :
   A. MOBILE APPLICATION FOR A MINIMUM OF 25 USERS.
   B. MAP VIEW WITH CAMERA LOCATIONS INDICATED.
   C. INDIVIDUAL USER PROFILES FOR A MINIMUM OF 25 USERS INCLUDING BUT NOT LIMITED TO THE NORTH SMITHFIELD POLICE DEPARTMENT.
   D. ANALYTIC APPLICATIONS AND SETTINGS INCLUDING:
      D.A. LOITERING DETECTION.
      D.B. LINE CROSS DETECTION.
      D.C. FORENSIC SEARCH.

4. RECORDING PARAMETERS:
   A. PERIOD - ONE HUNDRED AND EIGHTY (180) DAYS
   B. TIMEFRAME - RECORD 24/7/365
   C. RESOLUTION- FULL CAMERA RESOLUTION
   D. FRAMERATE- 15 FPS (RECORDED), FULL CAMERA FRAMERATE (LIVE VIEW)
   E. REDUNDANCY- RAID 6, NO FAIL OVER
   F. PROVIDE 25% SPARE CAPACITY.

   SUBMIT CALCULATIONS DURING SUBMITTAL PROCESS.

5. ALL FIELD DEVICES SHALL BE INDIVIDUALLY HOMERUN TO NEAREST SECURITY EQUIPMENT LOCATION. ALL CABLING SHALL BE CONTINUOUS BETWEEN CAMERA AND SECURITY EQUIPMENT LOCATION.

6. ALL INSTALLED VIDEO SURVEILLANCE AND TELECOMMUNICATIONS DEVICES, HARDWARE, AND EQUIPMENT SHALL BE NATIONAL DEFENSE AUTHORIZATION ACT (NDAA) COMPLIANT. THE AWARDED CONTRACTOR SHALL PROVIDE CERTIFICATION LETTER FROM THE MANUFACTURER VERIFYING THAT EACH SUBMITTED PRODUCT IS NDAA COMPLIANT. ANY PRODUCT MISSING THIS CERTIFICATION LETTER WILL NOT BE APPROVED.

7. ALL HARDWARE IN PUBLICLY ACCESSIBLE AREAS SHALL BE SECURITY TYPE.

8. CONTRACTOR SHALL INCLUDE ALL ADJUSTMENTS TO SYSTEM DEVICES FOR CORRECT OPERATION IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND OWNER'S APPROVAL TO COMPLY WITH SPECIFIC OWNER'S NEEDS. CONTRACTOR SHALL PROVIDE ON-SITE REPRESENTATIVE TO ASSIST IN ADJUSTING TO SUIT ACTUAL OCCUPIED CONDITIONS AND TO OPTIMIZE PERFORMANCE OF THE INSTALLED EQUIPMENT. TASKS SHALL INCLUDE, BUT NOT BE LIMITED TO:

   A. SYSTEM CONNECTIONS.

   B. SETTING AND CONFIGURING MOTION AND FORENSIC WINDOWS/MASKS SETTINGS.

   C. TUNING RECORDING/RETENTION SETTINGS AND BANDWIDTH REQUIREMENTS.

   D. PROPER OPERATION OF CAMERA AND LENSES INCLUDING OPERATION OF AUTO=IRIS LENSES AND BACK FOCUS ADJUSTMENTS AS NECESSARY.

   E. ADJUSTMENTS OF PRE-SET POSITIONS TO MEET OWNER'S REQUIREMENTS.

   F. ADJUSTMENTS OF CAMERA VIEWS AS REQUIRED TO MEET OWNER'S REQUIREMENTS.

## ACCESS CONTROL SYSTEM GENERAL NOTES

1. CONTRACTOR SHALL PROVIDE AND COMMISSION A FULLY FUNCTIONAL, COMPLETE AND OPERATIONAL ZKTECO USA OR APPROVED EQUAL ACCESS CONTROL SYSTEM (ACS). PROVIDE ALL LABOR, ENGINEERING, DESIGN, TESTING, MATERIAL, COMPONENTS AND SUPERVISION NECESSARY AS PART OF THIS WORK.

2. ACCESS CONTROL SYSTEM, AT A MINIMUM, SHALL INCLUDE CARD READERS (INCLUDING SOFTWARE, HARDWARE, CABLE, PATHWAYS AND BOXES), ENCLOSURES, POWER SUPPLIES, BATTERIES, SOFTWARE AND DEVICE LICENSES, 120V POWER, UPS, ETC. COMPLETE WITH VIDEO MANAGEMENT SOFTWARE INTEGRATION.

3. SYSTEM SHALL:
   3.1. BE WEB-BASED INTERFACE TO ACCESS ACS FROM ANY STANDARD WEB BROWSER ENABLED DEVICE. WEB BASED ACCESS SHALL BE ABLE TO PROVIDE LIVE EVENT MONITORING, CARD HOLDER MANAGEMENT AND EVENT AND ALARM MONITORING.
   3.2. BE CONFIGURED FOR LOCAL OR REMOTE VIEWING, PROGRAMMING, AND UPDATES.
   3.3. BE PROVIDED WITH SECONDARY POWER BACK-UP (BATTERY BACKUP FOR 48HRS OF STANDBY)
   3.4. BE INTEGRATED INTO THE VIDEO MANAGEMENT SYSTEM FOR REAL TIME ACCESS AND VIDEO EVENT TRACKING AND LOGGING.
   3.5. BE PROGRAMMED WITH ASSOCIATED CAMERAS TO "CALL UP" VIEWS OF ALL EXTERIOR AND INTERIOR ACCESS CONTROL DOORS WITH CAMERA COVERAGE.

4. ALL FIELD DEVICES SHALL BE INDIVIDUALLY HOMERUN TO NEAREST NETWORK ROOM. ALL CABLING SHALL BE CONTINUOUS BETWEEN ACCESS CONTROL DEVICE AND ACCESS CONTROL PANEL LOCATION.

## SECURITY LEGEND

| | |
|---|---|
| UPS # | UNINTERRUPTED POWER SUPPLY (UPS); RACK MOUNTED. |
| SSW | SECURITY SYSTEM WORK STATION. |
| KWM | SECURITY SYSTEM RACK MOUNTED KVM SWITCH. |

VIDEO SURVEILLANCE SYSTEM SYMBOLS

| | |
|---|---|
| VSSS | VIDEO SURVEILLANCE SYSTEM SERVER; RACK MOUNTED. |
| VSNS # | VIDEO SURVEILLANCE POE NETWORK SWITCH; RACK MOUNTED.<br># INDICATES PORT COUNT. |
| VSPP # | VIDEO SURVEILLANCE CAT6 PATCH PANEL; RACK MOUNTED.<br># INDICATES PORT COUNT. |
| ### | VIDEO SURVEILLANCE SYSTEM CAMERA; CEILING MOUNTED.<br>### INDICATES CAMERA FIELD OF VIEW IN DEGREES. |
| ### | VIDEO SURVEILLANCE SYSTEM EXTERIOR CAMERA; WALL MOUNTED.<br>### INDICATES CAMERA FIELD OF VIEW IN DEGREES. |
| ### | VIDEO SURVEILLANCE SYSTEM EXTERIOR CAMERA; CORNER WALL MOUNTED.<br>### INDICATES CAMERA FIELD OF VIEW IN DEGREES. |

ACCESS CONTROL SYSTEM SYMBOLS

| | |
|---|---|
| CR # | ACCESS CONTROL SYSTEM CARD READER.<br>"M" INDICATES MULLION TYPE/MOUNTING.<br>"KP" INDICATES KEYPAD TYPE READER.<br>"LR" INDICATES LONG RANGER READER. |
| DR | ACCESS CONTROL DOOR RELEASE BUTTON<br>COUNTER MOUNTED (ON TOP OR UNDER) CONCEAL ALL CABLING. |
| DC | DOOR CONTACT - DOUBLE POLE DOUBLE THROW. CONCEALED. |
| OHD | OVERHEAD DOOR CONTACT - SURFACE MOUNTED. |
| ACP | ACCESS CONTROL SYSTEM PANEL; WALL MOUNTED. LOCKING ENCLOSURE WITH CONTROLLERS, POWER SUPPLIES, BATTERIES, AND FIRE ALARM INTEGRATION. |
| | ACCESS CONTROL SYSTEM CONNECTED DOOR; REFER TO DOOR HARDWARE SETS DETAILS FOR ADDITIONAL INFORMATION. |

ENTRY CONTROL SYSTEM SYMBOLS

| | |
|---|---|
| VI # | ENTRY CONTROL SYSTEM VIDEO INTERCOM STATION.<br>"W" INDICATES WALL MOUNTED; 48"A.F.F.<br>"P" INDICATES PEDESTAL MOUNTED; PROVIDE WITH MOUNTING KIT. |
| MI # | ENTRY CONTROL SYSTEM VIDEO MASTER INTERCOM SIP PHONE.<br>"W" INDICATES WALL MOUNTED; 48"A.F.F.<br>"D" INDICATES DESK MOUNTED |

## SECURITY CALL-OUT TAG LEGEND

| | |
|---|---|
| ACS-# | ACCESS CONTROL SYSTEM TAG, # INDICATES DOOR CONTROLLED; REFER TO ACCESS CONTROL SYSTEM SCHEDULE FOR TAG INDICATED. |
| VSS-# | VIDEO SURVEILLANCE SYSTEM TAG, # INDICATES DOOR OR AREA COVERED; REFER TO VIDEO SURVEILLANCE SYSTEM SCHEDULE FOR TAG INDICATED. |
| CA | CABLING TAG, # INDICATES CABLE TYPE; REFER TO CABLE LEGEND FOR TAG INDICATED. |


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:
CDS LLC.
Communications Design Services, LLC.
*Telecommunications | Security Audiovisual | Project Management*
401.749.6909
Rhode Island Telecommunications System Contractor (TSC) #8332
RI MBE #2335


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
LEGEND AND NOTES

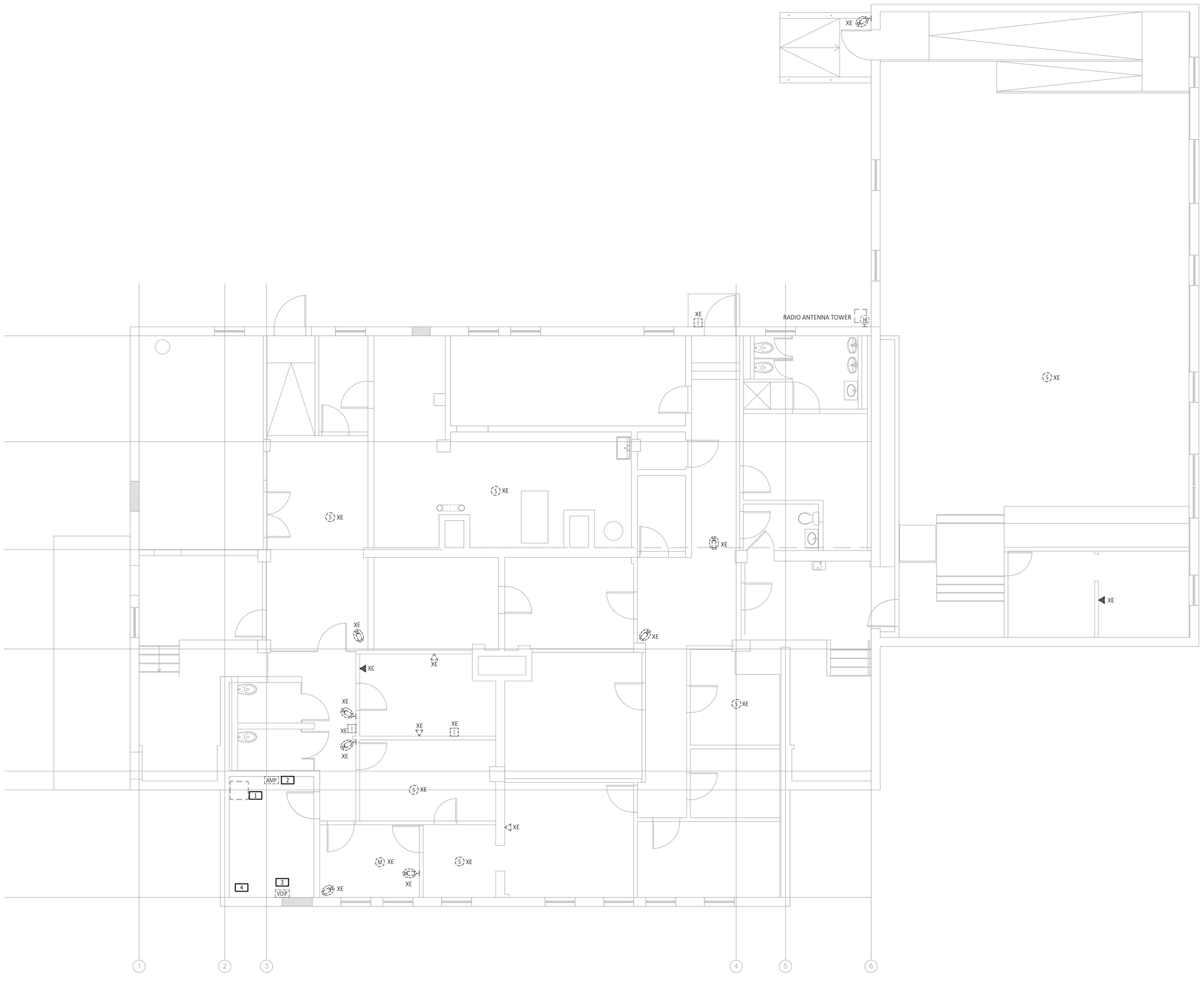
PROJECT NORTH:
N

DRAWN: CAD

PROJECT NUMBER:
#2415

SHEET NUMBER: LV0.2

REV: ~




1 LOWER LEVEL DEMOLITION PLAN
SCALE: 3/16" = 1'-0"
0 4'-0" 8'-0" 16'-0"

## GENERAL SHEET NOTES

1. ALL EXISTING TELECOMMUNICATIONS CABLING (VOICE, DATA, TV) SHALL BE FULLY REMOVED ONCE NEW INFRASTRUCTURE AND SYSTEMS ARE INSTALLED AND FULLY FUNCTIONAL. THIS WILL REQUIRE A MULTIPLE PHASE DEMOLITION SCHEDULE WHICH SHALL BE COORDINATED WITH THE OWNER, GENERAL CONTRACTOR, AND DESIGN TEAM.
2. COORDINATE ALL DEMOLITION WORK WITH THE OWNER PRIOR TO START OF ANY WORK.
3. PRIOR TO START OF ANY WORK, CONTRACTOR SHALL VERIFY ALL EQUIPMENT INDICATED TO BE REUSED IS IN FULL OPERATIONAL ORDER. EQUIPMENT INDICATED TO BE REUSED SHALL BE KEPT IN A SECURE, DRY, DUST FREE ENVIRONMENT DURING CONSTRUCTION.
4. PRIOR TO START OF ANY WORK, CONTRACTOR SHALL VERIFY ALL EQUIPMENT THAT IS REQUIRED TO BE TURNED OVER TO NSPD. EQUIPMENT IDENTIFIED TO BE TURNED OVER SHALL BE KEPT IN A SECURE, DRY, DUST FREE ENVIRONMENT DURING CONSTRUCTION. STORAGE LOCATION TO BE CONFIRMED WITH NSPD.
5. REMOVE ALL ABANDONED CABLING PER NEC 800.25 ABANDONED CABLES. THE ACCESSIBLE PORTION OF ABANDONED COMMUNICATIONS CABLES SHALL BE REMOVED. WHERE CABLES ARE IDENTIFIED FOR FUTURE USE WITH A TAG (MACHINE PRINTED); THE TAG SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED.

## KEYED SHEET NOTES

1. EXISTING WALL MOUNTED IT RACK TO REMAIN. EXISTING EQUIPMENT INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
   - STATE NCIC SWITCH (1RU).
   - ONE (1) 1RU ADTRAN TOTAL ACCESS 908E VOIP GATEWAY
   - ONE (1) 2RU NOKIA 7210 SAS-M 24 PORT SWITCH.
   - ONE (1) 2RU ADTRAN BATTERY BACKUP.
   - TWO (2) 2RU APC "COX" UPS.

   ONE (1) WALL MOUNTED COX FIBER ENCLOSURE.
2. EXISTING BUILDING PAGING SYSTEM SHELF MOUNTED AMPLIFIER.
3. EXISTING WALL MOUNTED AVAYA PHONE SYSTEM (SERVICED BY DICTRONICS 781-444-2010)
4. BUILDINGS ISP SERVICE ENTRANCE. EXISTING WALL MOUNTED HIGH COUNT PHONE TERMINATION BLOCKS.

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:
CDS LLC.
Communications Design Services. LLC.
*Telecommunications | Security*
*Audiovisual | Project Management*
401.749.6909
Rhode Island Telecommunications System Contractor (TSC) #8332
RI MBE #2335

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
LOWER LEVEL DEMOLITION PLAN

PROJECT NORTH:

DRAWN: CAD

PROJECT NUMBER:
#2415

SHEET NUMBER: LVD1.1 REV: ~




1 UPPER LEVEL DEMOLITION PLAN
SCALE: 3/16" = 1'-0"
0 4'-0" 8'-0" 16'-0"

## GENERAL SHEET NOTES

1. ALL EXISTING TELECOMMUNICATIONS CABLING (VOICE, DATA, TV) SHALL BE FULLY REMOVED ONCE NEW INFRASTRUCTURE AND SYSTEMS ARE INSTALLED AND FULLY FUNCTIONAL. THIS WILL REQUIRE A MULTIPLE PHASE DEMOLITION SCHEDULE WHICH SHALL BE COORDINATED WITH THE OWNER, GENERAL CONTRACTOR, AND DESIGN TEAM.
2. COORDINATE ALL DEMOLITION WORK WITH THE OWNER PRIOR TO START OF ANY WORK.
3. PRIOR TO START OF ANY WORK, CONTRACTOR SHALL VERIFY ALL EQUIPMENT INDICATED TO BE REUSED IS IN FULL OPERATIONAL ORDER. EQUIPMENT INDICATED TO BE REUSED SHALL BE KEPT IN A SECURE, DRY, DUST FREE ENVIRONMENT DURING CONSTRUCTION.
4. PRIOR TO START OF ANY WORK, CONTRACTOR SHALL VERIFY ALL EQUIPMENT THAT IS REQUIRED TO BE TURNED OVER TO NSPD. EQUIPMENT IDENTIFIED TO BE TURNED OVER SHALL BE KEPT IN A SECURE, DRY, DUST FREE ENVIRONMENT DURING CONSTRUCTION. STORAGE LOCATION TO BE CONFIRMED WITH NSPD.
5. REMOVE ALL ABANDONED CABLING PER NEC 800.25 ABANDONED CABLES. THE ACCESSIBLE PORTION OF ABANDONED COMMUNICATIONS CABLES SHALL BE REMOVED. WHERE CABLES ARE IDENTIFIED FOR FUTURE USE WITH A TAG (MACHINE PRINTED); THE TAG SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED.

## KEYED SHEET NOTES

1. EXISTING DECOMMISSIONED TOWN HALL IT WALL MOUNTED RACK TO BE FULLY REMOVED.
2. EXISTING MAIN IT 42RU ENCLOSURE TO REMAIN. EXISTING EQUIPMENT INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
   - E911 ROUTER (SHELF) AND SWITCH (1RU).
   - ONE (1) SHELF DELL 8 PORT FIREWALL.
   - ONE (1) ARUBA 48 PORT SWITCH.
   - ONE (1) HP PROCURVE 48 PORT SWITCH.
   - ONE (1) 3RU NEXLOG DX SERIES COMMUNICATIONS RECORDER WITH SHELF MOUNTED 8-BAY QNAP STORAGE ARRAY.
   - ONE (1) 1RU SHELF WITH WORKSTATION (FOR IMC MOBILE), KEYBOARD, MOUSE, AND ARRIS CM8200 MODEM.
   - THREE (3) 4-5RU SERVERS.
   - TWO (2) 2RU EATON UPS.
   - ONE (1) 1RU HORIZONTAL PDU.
3. TWO (2) WALL MOUNTED 24 PORT PATCH PANELS.
4. EXISTING NSPD COMPUTER, SERVER, END OF LIFE NETWORK EQUIPMENT.
5. EXISTING NSPD RADIO SYSTEM ENCLOSURE, ANTENNA TRANSMITTER COMBINERS, MOTOROLA MTR2000 BASE STATION, REPEATER AMPLIFIER, ETC. TO REMAIN.
6. DISPATCH STATION WITH THE FOLLOWING SYSTEMS:
   - CAMERA DIGITAL VIDEO RECORDER (DVR).
   - SERVER FOR MOBILE DATA TERMINALS.
   - 2-WAY COMMUNICATION SYSTEM WITH HOLDING CELLS.
   - DISPATCH WORKSTATION(S).
   - MAIN PHONE.

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:
CDS LLC.
Communications Design Services, LLC.
*Telecommunications | Security*
*Audiovisual | Project Management*
401.749.6909
Rhode Island Telecommunications System Contractor (TSC) #8332
RI MBE #2335

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

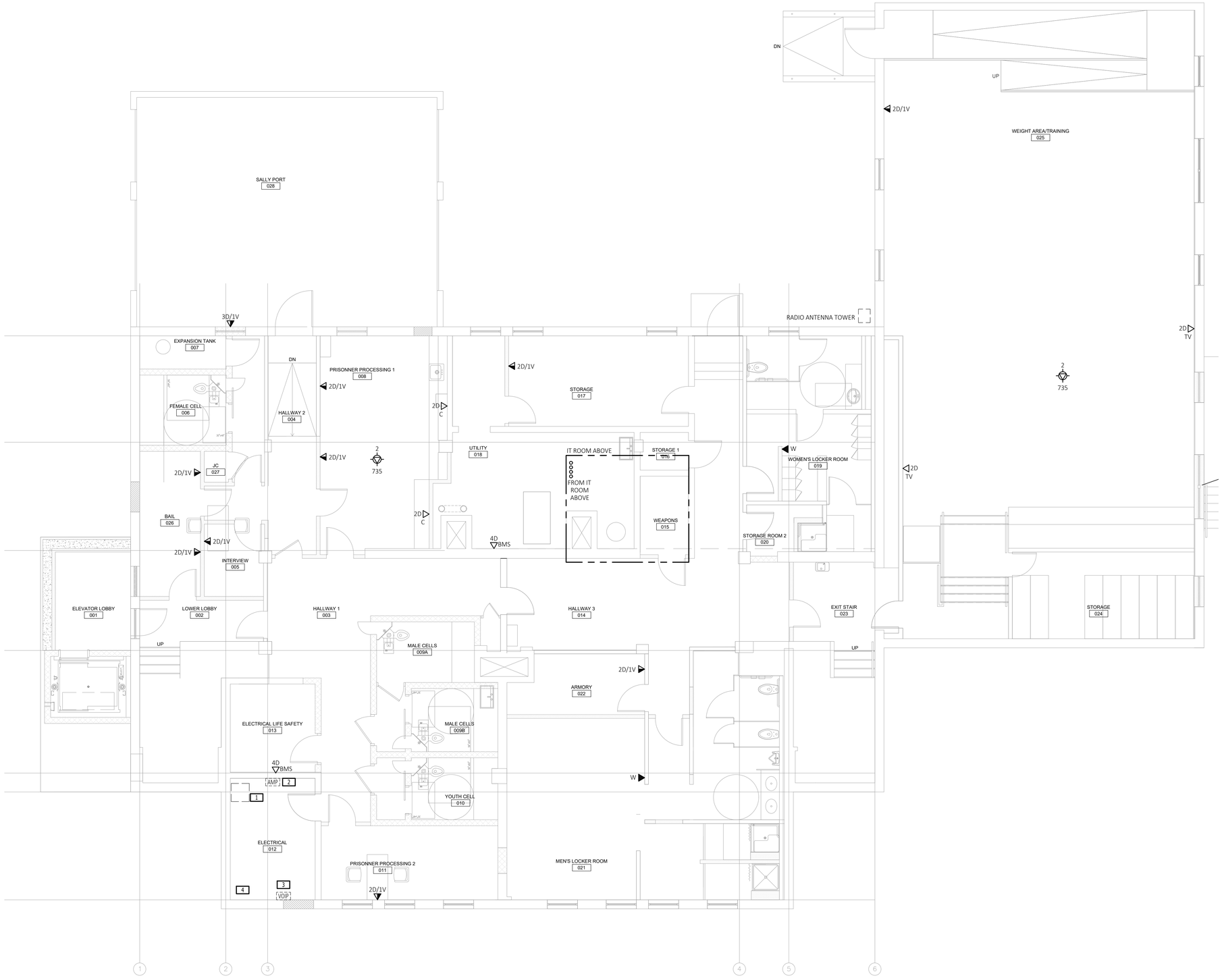
STAMP:

SHEET TITLE:
UPPER LEVEL DEMOLITION PLAN

PROJECT NORTH:

DRAWN: CAD
PROJECT NUMBER:
#2415

SHEET NUMBER: LVD1.2
REV: ~




1 LOWER LEVEL TELECOM PLAN

SCALE: 3/16" = 1'-0"

0 4'-0" 8'-0" 16'-0"

## GENERAL SHEET NOTES

1. REFER TO THE ARCHITECTURAL DRAWINGS FOR DEVICE LOCATIONS, ELEVATIONS, AND COORDINATION WITH MILLWORK AND FURNITURE.
2. ELECTRICAL CONTRACTOR (DIVISION 26) SHALL PROVIDE ALL CONDUIT PATHWAYS, FLOOR BOXES, POKE-THRUS, DISPLAY BACK BOXES AND BACK BOXES. LOW VOLTAGE CONTRACTOR SHALL PROVIDE J-HOOK PATHWAYS, AND CABLE TRAY IN THE IT ROOM AND CORRIDOR.
3. PROVIDE STI EZ PATH 44+ SERIES FIRE RATED PATHWAYS, OR APPROVED EQUAL, ON ALL TELECOMMUNICATIONS CABLING PENETRATING A FIRE RATED ASSEMBLY. PROVIDE ALL REQUIRED ACCESSORIES FOR A COMPLETE UL LISTED FIRE RATED ASSEMBLY. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT WALL TYPE LOCATIONS.
4. COORDINATE EXACT DISPLAY ELEVATION HEIGHTS DURING THE SHOP DRAWING PROCESS PRIOR TO ROUGH IN.

## KEYED SHEET NOTES

1. EXISTING WALL MOUNTED IT RACK TO REMAIN. EXISTING EQUIPMENT INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
   - STATE NCIC SWITCH (1RU).
   - ONE (1) 1RU ADTRAN TOTAL ACCESS 908E VOIP GATEWAY
   - ONE (1) 2RU NOKIA 7210 SAS-M 24 PORT SWITCH.
   - ONE (1) 2RU ADTRAN BATTERY BACKUP.
   - TWO (2) 2RU APC "COX" UPS.

   ONE (1) WALL MOUNTED COX FIBER ENCLOSURE.
2. EXISTING BUILDING PAGING SYSTEM SHELF MOUNTED AMPLIFIER.
3. EXISTING WALL MOUNTED AVAYA PHONE SYSTEM (SERVICED BY DICTRONICS 781-444-2010)
4. BUILDINGS ISP SERVICE ENTRANCE. EXISTING WALL MOUNTED HIGH COUNT PHONE TERMINATION BLOCKS.


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:
CDS LLC.
Communications Design Services, LLC.
*Telecommunications | Security*
*Audiovisual | Project Management*
401.749.6909
Rhode Island Telecommunications System Contractor (TSC) #8332
RI MBE #2335


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
LOWER LEVEL TELECOM PLAN

PROJECT NORTH:

DRAWN: CAD

PROJECT NUMBER:
#2415

SHEET NUMBER: LV1.1

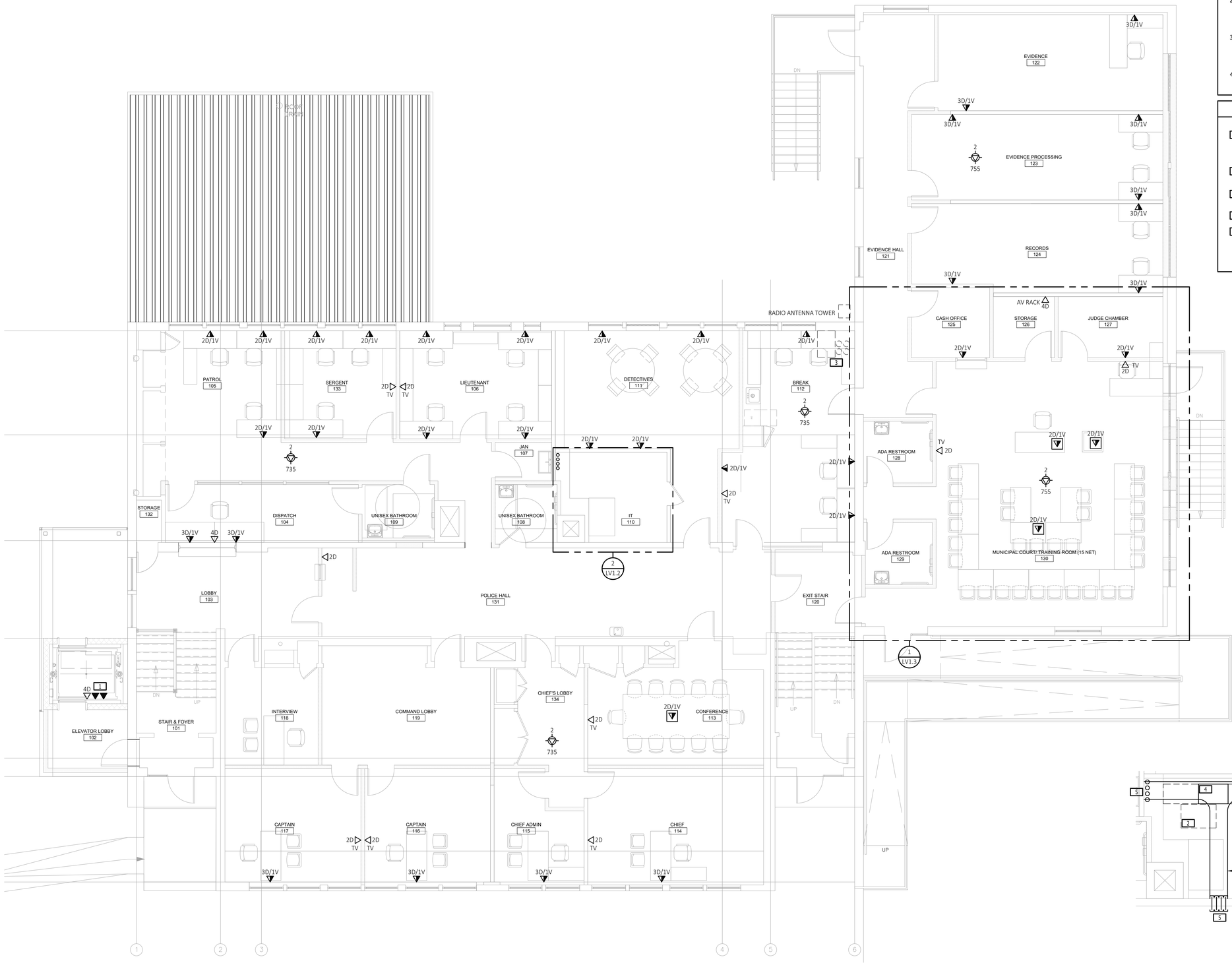
REV: ~

## GENERAL SHEET NOTES

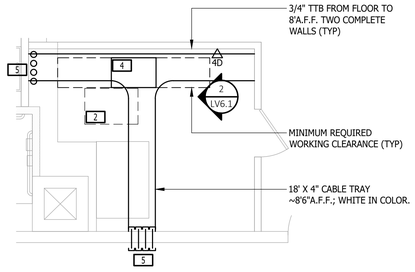
1. REFER TO THE ARCHITECTURAL DRAWINGS FOR DEVICE LOCATIONS, ELEVATIONS, AND COORDINATION WITH MILLWORK AND FURNITURE.
2. ELECTRICAL CONTRACTOR (DIVISION 26) SHALL PROVIDE ALL CONDUIT PATHWAYS, FLOOR BOXES, POKE-THRUS, DISPLAY BACK BOXES AND BACK BOXES. LOW VOLTAGE CONTRACTOR SHALL PROVIDE J-HOOK PATHWAYS, AND CABLE TRAY IN THE IT ROOM AND CORRIDOR.
3. PROVIDE STI EZ PATH 44+ SERIES FIRE RATED PATHWAYS, OR APPROVED EQUAL, ON ALL TELECOMMUNICATIONS CABLING PENETRATING A FIRE RATED ASSEMBLY. PROVIDE ALL REQUIRED ACCESSORIES FOR A COMPLETE UL LISTED FIRE RATED ASSEMBLY. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT WALL TYPE LOCATIONS.
4. COORDINATE EXACT DISPLAY ELEVATION HEIGHTS DURING THE SHOP DRAWING PROCESS PRIOR TO ROUGH IN.

## KEYED SHEET NOTES

1. FOR ELEVATOR TELEPHONE LINE CONNECTIONS. COORDINATE EXACT LOCATION WITH ELEVATOR CONTRACTOR PRIOR TO ROUGH-IN. CONNECT TO ANALOG DIRECT DIAL LINES PROVIDED BY COX (HFC). 4 DATA FOR IP CONNECTION OF THE ELEVATOR CONTROLLER; IF REQUIRED.
2. EXISTING MAIN IT 42RU ENCLOSURE TO REMAIN. REPOSITON/RELOCATE AS NEEDED TO PROVIDED REQUIRED WORKING CLEARANCES.
3. EXISTING NSPD RADIO SYSTEM ENCLOSURE, ANTENNA TRANSMITTER COMBINERS, MOTOROLA MTR2000 BASE STATION, REPEATER AMPLIFIER, ETC. TO REMAIN.
4. NEW 4 POST 45RU RACK FOR SECURITY AND TELECOM CABLING AND EQUIPMENT.
5. PROVIDE GANGED (QUANTITY SHOWN) STI EZ PATH SERIES 44+ FIRE-RATED PATHWAYS, OR APPROVED EQUAL, ON ALL AREAS WHERE SLEEVES PENETRATE A FIRE-RATED WALL OR FLOOR ASSEMBLY. PROVIDED CABLE WATERFALLS (WALL MOUNTED), GANGING PLATES, AND ALL REQUIRED ACCESSORIES FOR A COMPLETE UL LISTED FIRE-RATED ASSEMBLY. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT WALL TYPE LOCATION.




1 UPPER LEVEL TELECOM PLAN
SCALE: 3/16" = 1'-0"
0 4'-0" 8'-0" 16'-0"




2 IT ROOM ENLARGED PLAN
SCALE: 1/4" = 1'-0"
0 4'-0" 8'-0" 12'-0"


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:
CDS LLC.
Communications Design Services, LLC.
*Telecommunications | Security Audiovisual | Project Management*
401.749.6909
Rhode Island Telecommunications System Contractor (TSC) #8332
RI MBE #2335


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

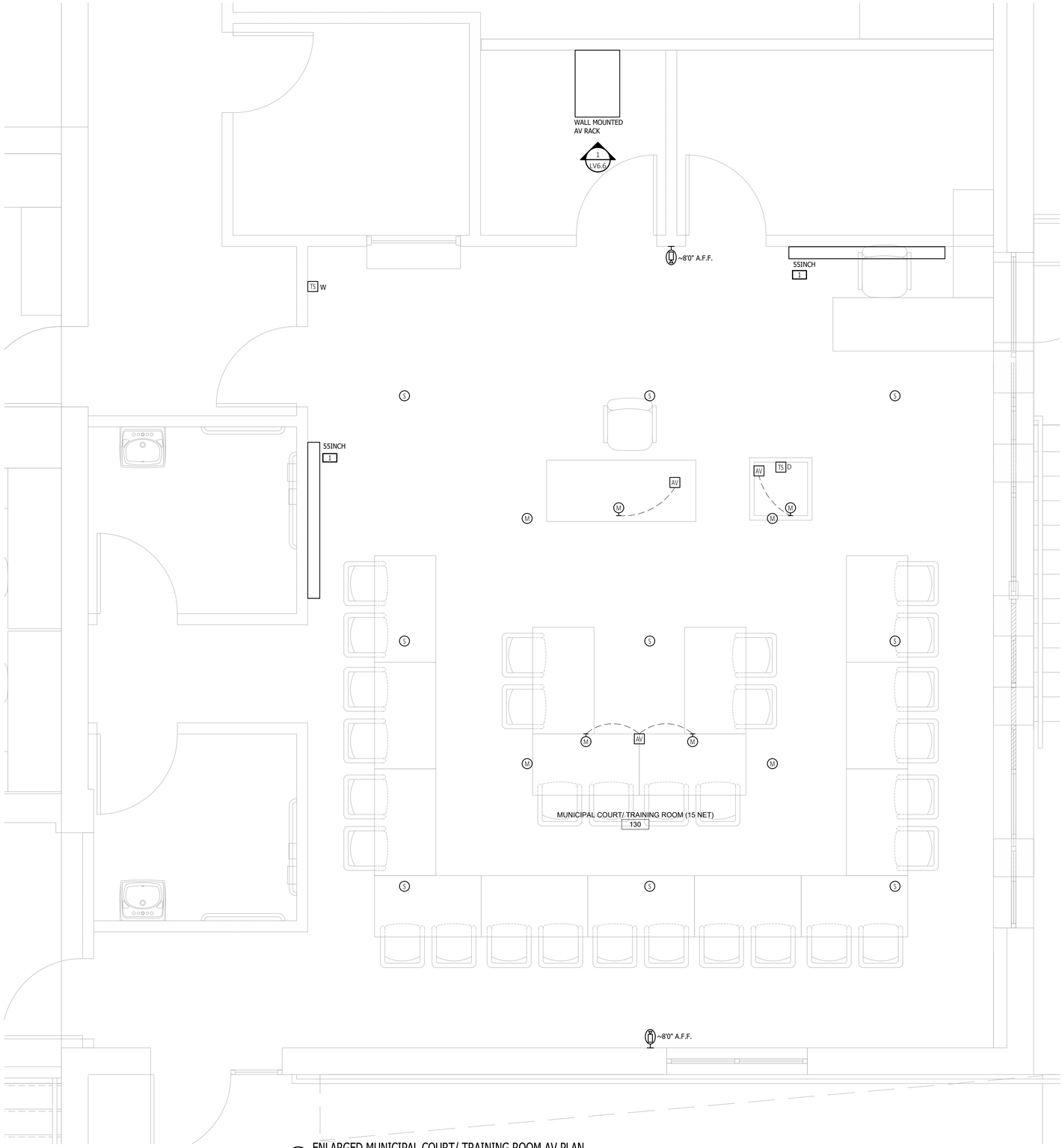
STAMP:

SHEET TITLE:
UPPER LEVEL TELECOM PLAN

PROJECT NORTH:

DRAWN: CAD
PROJECT NUMBER:
#2415

SHEET NUMBER: LV1.2
REV: ~




1 ENLARGED MUNICIPAL COURT/ TRAINING ROOM AV PLAN
SCALE: 1/2" = 1'-0"
0 2'-0" 4'-0" 6'-0"

## GENERAL SHEET NOTES

1. REFER TO THE ARCHITECTURAL DRAWINGS FOR DEVICE LOCATIONS, ELEVATIONS, AND COORDINATION WITH MILLWORK AND FURNITURE.
2. ELECTRICAL CONTRACTOR (DIVISION 26) SHALL PROVIDE ALL CONDUIT PATHWAYS, FLOOR BOXES, POKE-THRUS, DISPLAY BACK BOXES AND BACK BOXES. LOW VOLTAGE CONTRACTOR SHALL PROVIDE J-HOOK PATHWAYS, AND CABLE TRAY IN THE IT ROOM AND CORRIDOR.
3. PROVIDE STI EZ PATH 44+ SERIES FIRE RATED PATHWAYS, OR APPROVED EQUAL, ON ALL TELECOMMUNICATIONS CABLING PENETRATING A FIRE RATED ASSEMBLY. PROVIDE ALL REQUIRED ACCESSORIES FOR A COMPLETE UL LISTED FIRE RATED ASSEMBLY. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT WALL TYPE LOCATIONS.
4. COORDINATE EXACT DISPLAY ELEVATION HEIGHTS DURING THE SUBMITTAL/SHOP DRAWING PROCESS AS WELL AS ON SITE WITH THE OWNER PRIOR TO ROUGH IN.
5. COORDINATE EXACT CEILING DEVICE LOCATIONS WITH THE DESIGN TEAM DURING THE SUBMITTAL/SHOP DRAWING PROCESS. COORDINATED SPEAKER LOCATIONS CAN VARY ~2' FROM LOCATIONS INDICATED ON PLANS

## KEYED SHEET NOTES

1 COORDINATE EXACT MOUNTING HEIGHT DURING SHOP DRAWING PROCESS PRIOR TO ROUGH-IN.

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:
CDS LLC.
Communications Design Services, LLC.
*Telecommunications | Security*
*Audiovisual | Project Management*
401.749.6909
Rhode Island Telecommunications System Contractor (TSC) #8332
RI MBE #2335

PROJECT TITLE:
PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

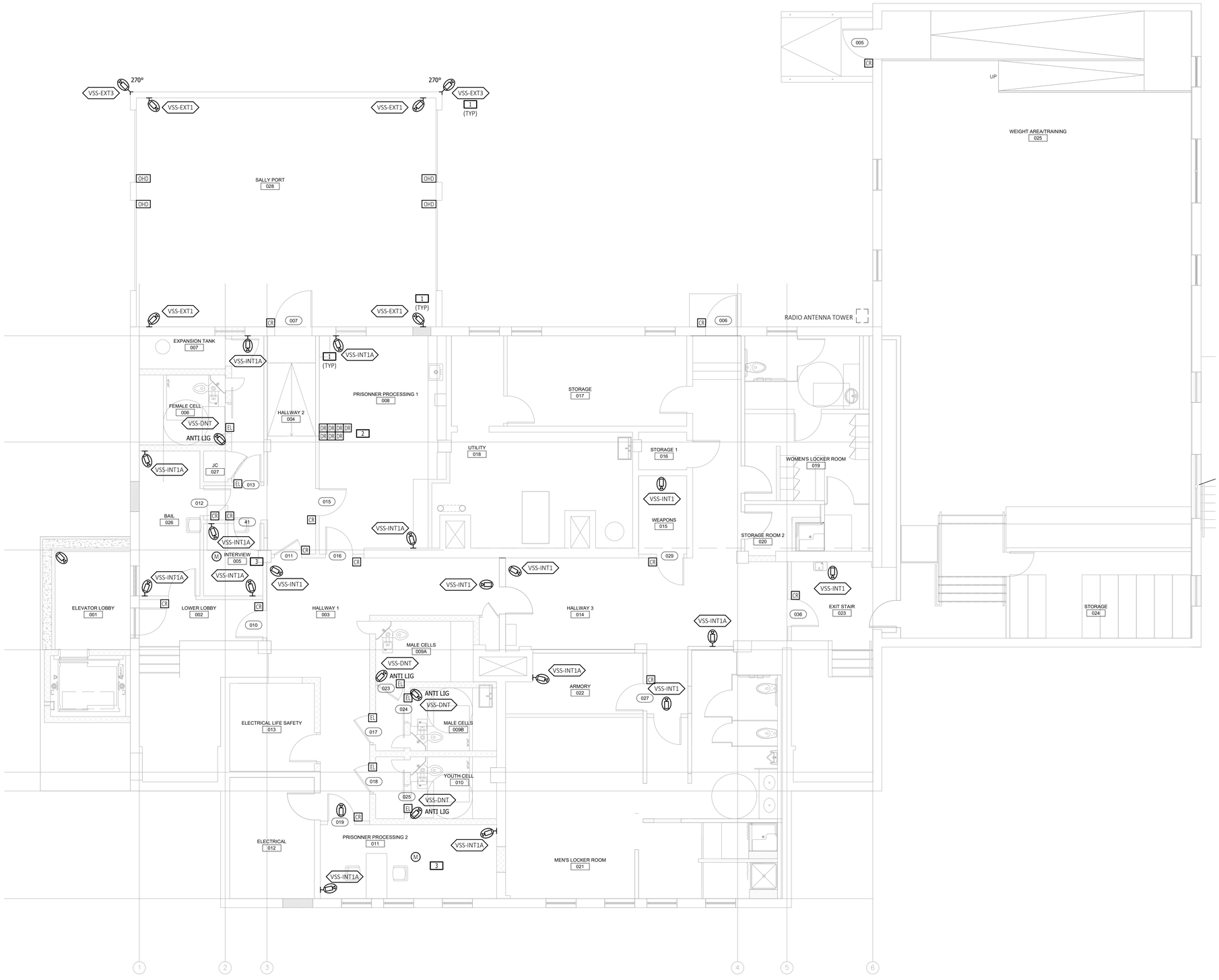
STAMP:

SHEET TITLE:
ENLARGED AUDIOVISUAL PLAN

PROJECT NORTH:
N

DRAWN: CAD
PROJECT NUMBER:
#2415

SHEET NUMBER: LV1.3
REV: ~




1 LOWER LEVEL SECURITY PLAN
SCALE: 3/16" = 1'-0"
0 4'-0" 8'-0" 16'-0"

## GENERAL SHEET NOTES

1. E.C. SHALL COORDINATE WITH SECURITY CONTRACTOR FOR FINAL DEVICE LOCATIONS AND ELEVATIONS IN FIELD PRIOR TO ROUGH-IN.
2. E.C. SHALL PROVIDE ALL REQUIRED RACEWAYS, 3/4" CONDUIT MINIMUM FOR ALL SECURITY CABLING IN EXPOSED AREAS, AND FIRE STOPPING. COORDINATE ALL PATHWAYS WITH SECURITY CONTRACTOR PRIOR TO ROUGH-IN. PROVIDE WITH PULL STRING.
3. TYPICALLY REFER TO DOOR HARDWARE, SCHEDULES & DRAWINGS FOR LOCATIONS & QUANTITIES OF HARDWARE EQUIPMENT AFFECTING THIS SECTION. PROVIDE ALL WORK AS REQUIRED.

## KEYED SHEET NOTES

1. COORDINATE EXACT MOUNTING HEIGHT DURING SHOP DRAWING PROCESS PRIOR TO ROUGH-IN.
2. DOOR RELEASE BUTTONS FOR REMOTE RELEASE OF DETENTION CELL DOORS AND SALLY PORT ENTRY. COORDINATE LOCATION (UNDER DESK OR ON DESK) DURING SHOP DRAWING PROCESS PRIOR TO ROUGH-IN.
3. CAMERA, MICROPHONE, AND OTHER ROOM/AREA DEVICES CONNECTED TO NSPD CASE CRACKER INTERVIEWING ROOM RECORDING SYSTEM PER REQUIREMENTS. HTTPS://WWW.CASECRACKER.COM/ COORDINATE EXACT REQUIREMENTS AND CONNECTION POINTS WITH NSPD.


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:
CDS LLC. Communications Design Services, LLC.
*Telecommunications | Security*
*Audiovisual | Project Management*
401.749.6909
Rhode Island Telecommunications System Contractor (TSC) #8332
RI MBE #2335


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025
REVISIONS:

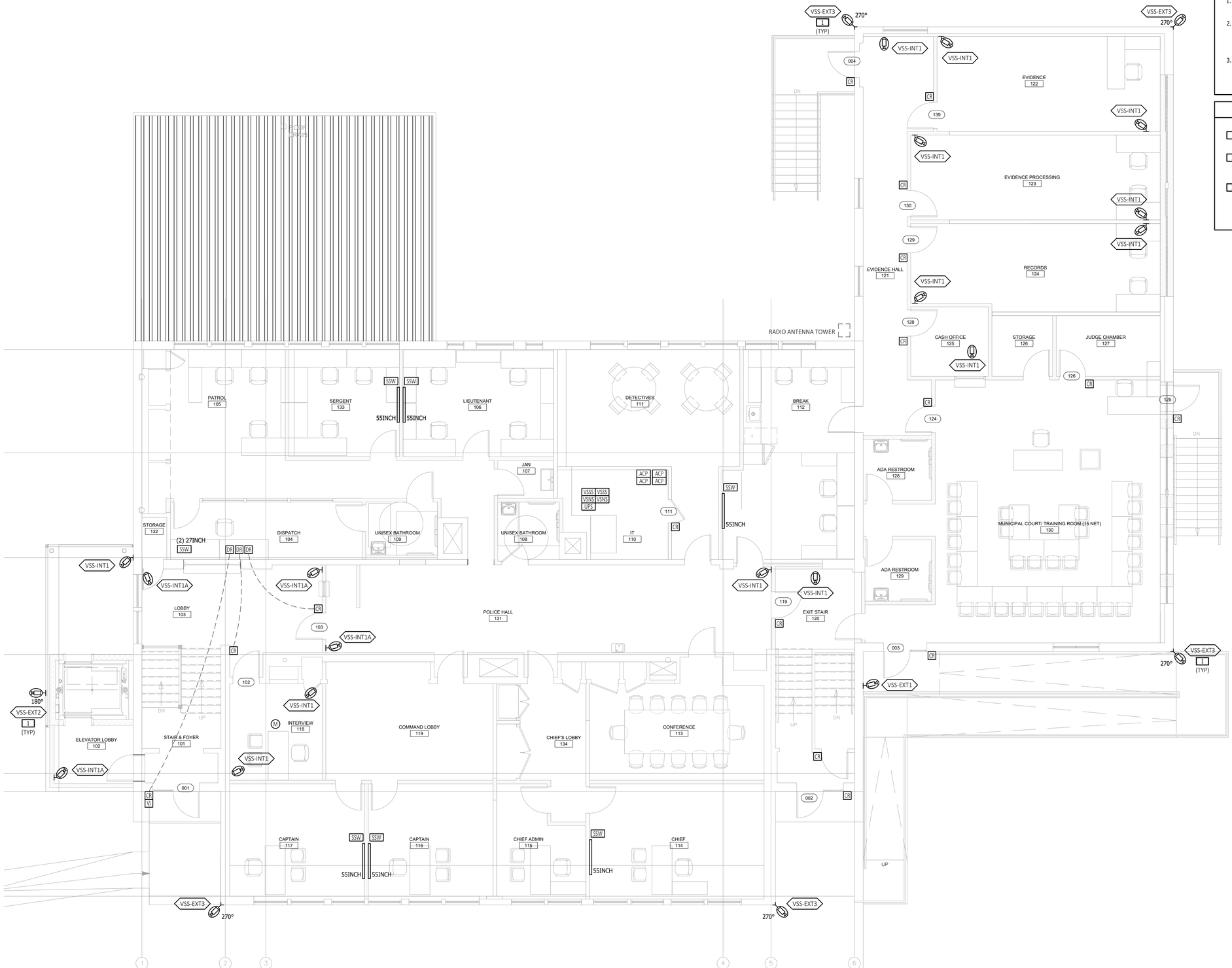
STAMP:

SHEET TITLE:
LOWER LEVEL SECURITY PLAN

PROJECT NORTH:

DRAWN: CAD
PROJECT NUMBER:
#2415

SHEET NUMBER: LV2.1
REV: ~




1 UPPER LEVEL SECURITY PLAN
SCALE: 3/16" = 1'-0"
0 4'-0" 8'-0" 16'-0"

## GENERAL SHEET NOTES

1. E.C. SHALL COORDINATE WITH SECURITY CONTRACTOR FOR FINAL DEVICE LOCATIONS AND ELEVATIONS IN FIELD PRIOR TO ROUGH-IN.
2. E.C. SHALL PROVIDE ALL REQUIRED RACEWAYS, 3/4" CONDUIT MINIMUM FOR ALL SECURITY CABLING IN EXPOSED AREAS, AND FIRE STOPPING. COORDINATE ALL PATHWAYS WITH SECURITY CONTRACTOR PRIOR TO ROUGH-IN. PROVIDE WITH PULL STRING.
3. TYPICALLY REFER TO DOOR HARDWARE, SCHEDULES & DRAWINGS FOR LOCATIONS & QUANTITIES OF HARDWARE EQUIPMENT AFFECTING THIS SECTION. PROVIDE ALL WORK AS REQUIRED.

## KEYED SHEET NOTES

1. COORDINATE EXACT MOUNTING HEIGHT DURING SHOP DRAWING PROCESS PRIOR TO ROUGH-IN.
2. DOOR RELEASE BUTTONS FOR REMOTE RELEASE OF DETENTION CELL DOORS AND SALLY PORT ENTRY. COORDINATE LOCATION (UNDER DESK OR ON DESK) DURING SHOP DRAWING PROCESS PRIOR TO ROUGH-IN.
3. CAMERA, MICROPHONE, AND OTHER ROOM/AREA DEVICES CONNECTED TO NSPD CASE CRACKER INTERVIEWING ROOM RECORDING SYSTEM PER REQUIREMENTS. HTTPS://WWW.CASECRACKER.COM/ COORDINATE EXACT REQUIREMENTS AND CONNECTION POINTS WITH NSPD.

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:
CDS LLC.
Communications Design Services, LLC.
*Telecommunications | Security*
*Audiovisual | Project Management*
401.749.6909
Rhode Island Telecommunications System Contractor (TSC) #8332
RI MBE #2335

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
UPPER LEVEL SECURITY PLAN

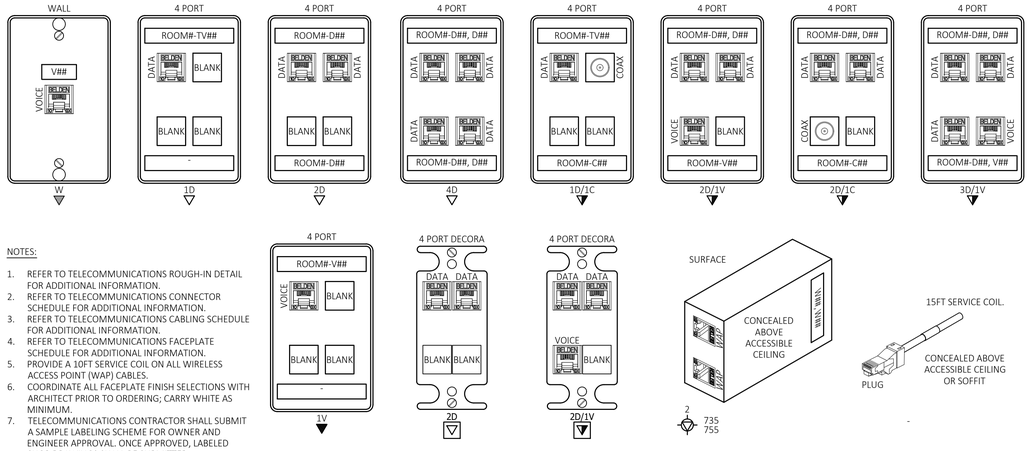
PROJECT NORTH:

DRAWN: CAD

PROJECT NUMBER:
#2415

SHEET NUMBER: LV2.2

REV: ~



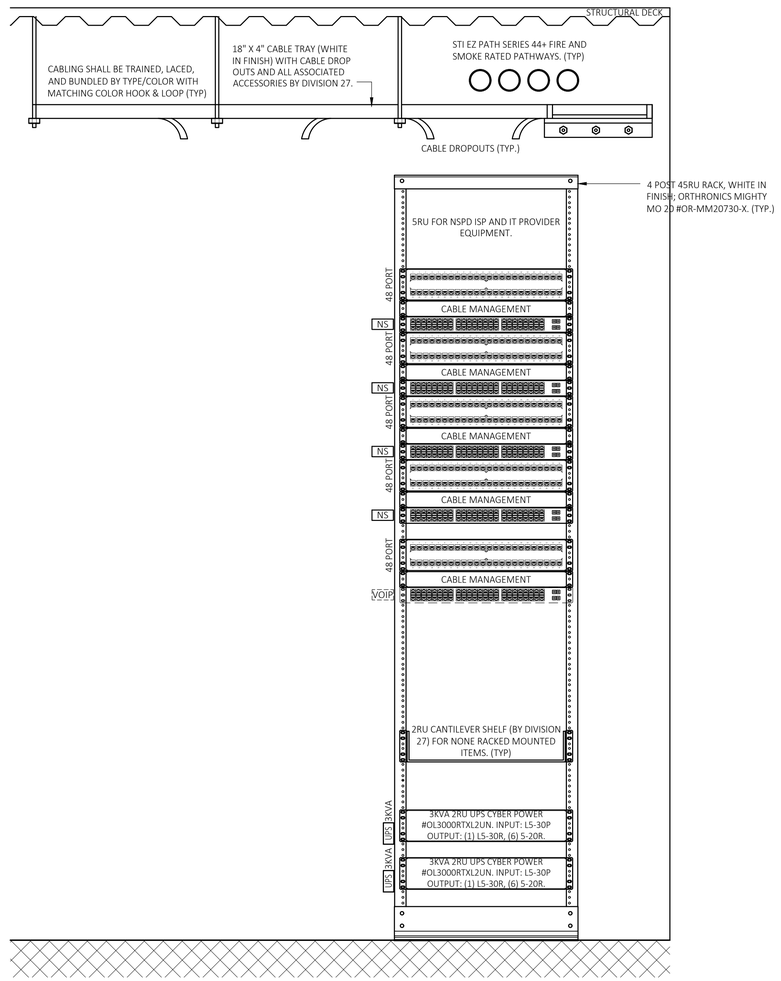

NOTES:

1. REFER TO TELECOMMUNICATIONS ROUGH-IN DETAIL FOR ADDITIONAL INFORMATION.
2. REFER TO TELECOMMUNICATIONS CONNECTOR SCHEDULE FOR ADDITIONAL INFORMATION.
3. REFER TO TELECOMMUNICATIONS CABLING SCHEDULE FOR ADDITIONAL INFORMATION.
4. REFER TO TELECOMMUNICATIONS FACEPLATE SCHEDULE FOR ADDITIONAL INFORMATION.
5. PROVIDE A 10FT SERVICE COIL ON ALL WIRELESS ACCESS POINT (WAP) CABLES.
6. COORDINATE ALL FACEPLATE FINISH SELECTIONS WITH ARCHITECT PRIOR TO ORDERING; CARRY WHITE AS MINIMUM.
7. TELECOMMUNICATIONS CONTRACTOR SHALL SUBMIT A SAMPLE LABELING SCHEME FOR OWNER AND ENGINEER APPROVAL. ONCE APPROVED, LABELED SHOP DRAWINGS SHALL BE SUBMITTED.




## 1 TELECOMMUNICATIONS FACEPLATE DETAIL

NOT TO SCALE




NOTES:

1. COORDINATE ENCLOSURE LAYOUT WITH OWNER AND OWNERS SERVICE PROVIDER PRIOR TO START OF ANY WORK.
2. BOND ENCLOSURE TO NEAREST TELECOMMUNICATIONS GROUND BAR VIA #6G AND PER MANUFACTURERS RECOMMENDATIONS BY E.C.
3. PROVIDE THE PROPER LENGTH POWER CORDS FOR ALL EQUIPMENT TO CONNECT TO UPS OR PDU.
4. PROVIDE (1) HORIZONTAL 1RU PDU CONNECTED TO THE UPS PER RACK; EQUAL TO TRIPPLITE #PDUMH20.

## 2 TELECOMMUNICATIONS ENCLOSURE ELEVATION

NOT TO SCALE

TC-03

## TELECOMMUNICATIONS PATCH PANEL SCHEDULE

NOTES:
1. REFER TO TELECOMMUNICATIONS ENCLOSURE ELEVATION FOR ADDITIONAL INFORMATION.
2. FIELD LOAD PATCH PANELS WITH CONNECTORS TO MATCH FACEPLATE CONNECTORS. REFER TO TELECOMMUNICATIONS CONNECTOR SCHEDULE FOR ADDITIONAL INFORMATION.

| TYPE | MANUFACTURER | PART # | CATEGORY | SHIELDING | PORT COUNT | CONNECTOR | NOTES | ALTERNATE MANUFACTURER |
|---|---|---|---|---|---|---|---|---|
| COPPER | | | | | | | | |
| 48PORT | LEVITON | 49255-L48 (WHITE) | 6A | DIELECTRIC | 48 (UNLOADED) | 8P8C | 1,2 | BELDEN #AX106289, PANDUIT #CPPL48W |
| 24PORT | LEVITON | 49255-L24 (WHITE) | 6A | DIELECTRIC | 24 (UNLOADED) | 8P8C | 1,2 | BELDEN #AX106288, PANDUIT #CPPL24W |
| FIBER | | | | | | | | |
| FIBER | LEVITON | 5R1UM-S03 | OM3 | - | 6 STRAND | LC | 1,2 | BELDEN #AX106289, CORNING #CCH-1U |

## TELECOMMUNICATIONS CABLING SCHEDULE

NOTES:
1. COORDINATE COLOR CODING SCHEME WITH OWNER PRIOR TO ORDERING.
2. PROVIDE FACTORY MADE PATCH CORDS THAT MATCH THE COLOR, MANUFACTURER AND CATEGORY OF HORIZONTAL CABLING IN WHICH IT IS PATCHING.
3. CABLING SHALL BE UL-LP (LIMITED POWER) LISTED FOR A MINIMUM OF 0.7A.
4. PROVIDE A 25FT SERVICE COIL ON ALL COAX CABLES AT TERMINATION BOARD. COORDINATE SPLITTER REQUIREMENT WITH ISP.
5. PROVIDE F-CONNECTOR EQUAL TO BELDEN #FSNS6U-25 TERMINATED ON BOTH ENDS OF EACH COAX CABLE.
6. PROVIDE A 20FT SERVICE COIL ON EACH END.

| TYPE | MANUFACTURER | PART # | CATEGORY | FLAME RATING | SHIELDING | COLOR | NOTES | ALTERNATE MANUFACTURER |
|---|---|---|---|---|---|---|---|---|
| COPPER | | | | | | | | |
| COAX | BELDEN | 1369P | RG-6 SDI | PLENUM | BONDED FOIL | BLACK | 4-5 | COMMSCOPE, HITACHI |
| DATA | LEVITON | LM-RDT | 6A | CMP | UTP | BLUE | 1-3 | BELDEN #10GXS13, PANDUIT #TX6A |
| WAP | LEVITON | LM-RDT | 6A | CMP | UTP | BLUE | 1-3 | BELDEN #10GXS13, PANDUIT #TX6A |
| VOICE | LEVITON | LM-RDT | 6A | CMP | UTP | WHITE | 1-3 | BELDEN #10GXS13, PANDUIT #TX6A |
| CRITICAL | LEVITON | LM-RDT | 6A | CMP | UTP | RED | 1-3 | BELDEN #10GXS13, PANDUIT #TX6A |
| TV | LEVITON | LM-RDT | 6A | CMP | UTP | YELLOW | 1-3 | BELDEN #10GXS13, PANDUIT #TX6A |
| FIBER | | | | | | | | |
| OM3 | LEVITON | PDP006-EB3010/25 | OM3 | PLENUM/ INDOOR/ OUTDOOR | N/A | AQUA | 6 | BELDEN, CORNING |

## TELECOMMUNICATIONS CONNECTOR SCHEDULE

NOTES:
1. REFER TO TELECOMMUNICATIONS FACEPLATE DETAIL FOR ADDITIONAL INFORMATION.
2. COORDINATE COLOR CODING SCHEME WITH OWNER'S PRIOR TO ORDERING.

| TYPE | MANUFACTURER | PART # | CATEGORY | CONNECTOR | COLOR | NOTES | ALTERNATE MANUFACTURER |
|---|---|---|---|---|---|---|---|
| COAX | PANDUIT | NKFAW | - | F-CONNECTOR | WHITE | 1, 2 | BELDEN, HUBBELL |
| DATA | LEVITON | 6AUJK-008-RL6 | 6A | 8P8C | BLUE | 1, 2 | BELDEN #RVAMJKU, PANDUIT #CJ6X88# |
| WAP | LEVITON | 6AUJK-010-RV6 | 6A | 8P8C | BLUE | 1, 2 | BELDEN #RVAMJKU, PANDUIT #CJ6X88# |
| VOICE | LEVITON | 6AUJK-002-RW6 | 6A | 8P8C | WHITE | 1, 2 | BELDEN #RVAMJKU, PANDUIT #CJ6X88# |
| CRITICAL | LEVITON | 6AUJK-012-RC6 | 6A | 8P8C | RED | 1, 2 | BELDEN #RVAMJKU, PANDUIT #CJ6X88# |
| TV | LEVITON | 6AUJK-012-RC6 | 6A | 8P8C | YELLOW | 1, 2 | BELDEN #RVAMJKU, PANDUIT #CJ6X88# |
| PLUG | LEVITON | - | 6A | 8P8C | - | 1, 2 | BELDEN #RVAFFPUBK18, PANDUIT #FP6X88MTG |

## TELECOMMUNICATIONS FACEPLATE SCHEDULE

NOTES:
1. REFER TO TELECOMMUNICATIONS FACEPLATE DETAIL FOR ADDITIONAL INFORMATION.
2. COORDINATE ALL FACEPLATE COLOR/FINISH SELECTIONS WITH ARCHITECT PRIOR TO ORDERING, CARRY WHITE AS A MINIMUM.
3. PROVIDE POKE-THRU OR FLOOR BOX SPECIFIC DECORA FACEPLATE.

| TYPE | GANG | MANUFACTURER | PART # | FINISH | NOTES | ALTERNATE MANUFACTURER |
|---|---|---|---|---|---|---|
| 2 PORT | SINGLE | LEVITON | 42080-2WS | WHITE | 1,2 | BELDEN #AX102655, PANDUIT #CFPL2WHY |
| 4 PORT | SINGLE | LEVITON | 42080-4WS | WHITE | 1,2 | BELDEN #AX102249, PANDUIT #CFPL4WY |
| 4 PORT DECORA | SINGLE | LEVITON | 41644-W | WHITE | 1,2,3 | BELDEN #AX106575-EW, PANDUIT #CFG4WH |
| 6 PORT | SINGLE | LEVITON | 42080-6WS | WHITE | 1,2 | BELDEN #AX102251, PANDUIT #CFPL6IWY |
| WALL PHONE | SINGLE | LEVITON | 4108W-1SP | STAINLESS | 1,2 | BELDEN #AX102005, PANDUIT #KWPY |
| SURFACE | - | LEVITON | 41089-2WP | WHITE | 1 | BELDEN #-, PANDUIT #CBXQ2WH-A |


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:
CDS LLC.
Communications Design Services, LLC.
*Telecommunications | Security Audiovisual | Project Management*
401.749.6909
Rhode Island Telecommunications System Contractor (TSC) #8332
RI MBE #2335


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
SCHEDULES AND DETAILS

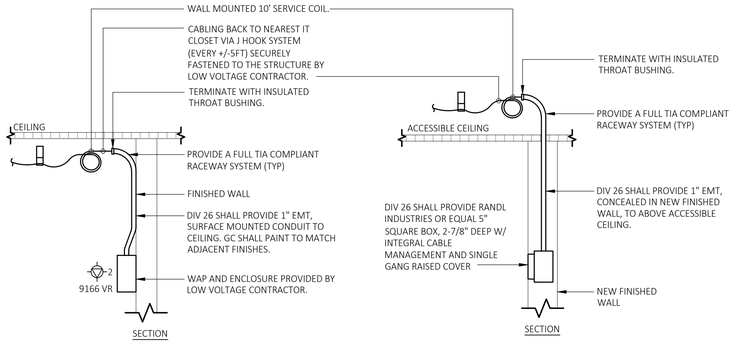
PROJECT NORTH:
N

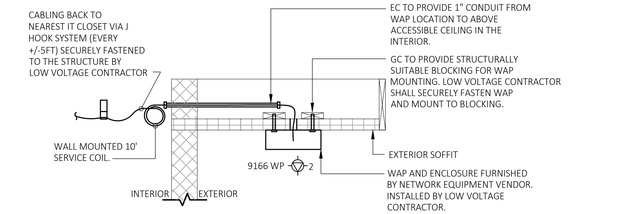
DRAWN: CAD

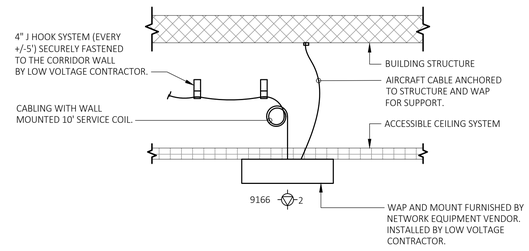
PROJECT NUMBER:
#2415

SHEET NUMBER:
LV6.1

REV:
~




NOTES:

1. REFER TO TELECOMMUNICATIONS FACEPLATE DETAIL FOR ADDITIONAL INFORMATION.
2. ELECTRICAL CONTRACTOR SHALL PROVIDE A FULL TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA) COMPLIANT RACEWAY SYSTEM.
3. ELECTRICAL CONTRACTOR SHALL PROVIDE PULL LINE IN ALL EMPTY CONDUITS/RACEWAYS AND BUSHED ENDS AT THE END OF EACH TERMINATED CONDUIT.
4. ELECTRICAL CONTRACTOR SHALL COORDINATE EXACT RACEWAY REQUIREMENTS WITH TELECOMMUNICATIONS CONTRACTOR PRIOR TO ORDERING.
5. DEBUR AND PROVIDED BANG ON THERMAL INSULATED BUSHING ON ALL CONDUIT ENDS.
6. PROVIDE SEALANT AS SPECIFIED BY THE ARCHITECT ON ALL PENETRATIONS.
7. GC TO PROVIDE BLOCKING AS REQUIRED FOR A SECURE MOUNTING SURFACE.

## 1 TELECOMMUNICATIONS ROUGH-IN DETAIL

NOT TO SCALE

## WIRELESS ACCESS POINT (WAP) EQUIPMENT SCHEDULE

NOTES:

1. WIRELESS ACCESS POINTS SHALL BE PROVIDED WITH ENTERPRISE CLOUD MANAGEMENT LICENSING.
2. EQUIPMENT SHALL BE PROVIDED WITH A 3 YEAR WARRANTY.
3. PROVIDE CUSTOM FINISH AS DIRECTED BY THE ARCHITECT. ALL EXPOSED FASTENERS SHALL BE STAINLESS STEEL SECURITY TYPE.
4. PROVIDE WITH RACK MOUNTED SURGE PROTECTION THAT IS BONDED TO THE TELECOM GROUNDING SYSTEM.

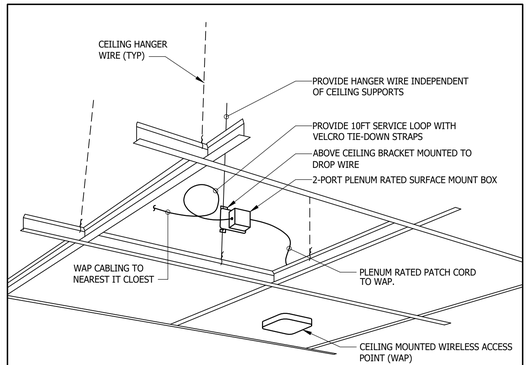
| TYPE | MANUFACTURER | PART # | MOUNTING | POWER | NOTES | ALTERNATE MANUFACTURER |
|---|---|---|---|---|---|---|
| 735 | HPE ARUBA | AP-735 | CEILING BRACKET | 802.3at 25W | 1,2 | NONE TOWN STANDARD |
| 755 | HPE ARUBA | AP-755 | CEILING BRACKET | 802.3at 25W | 1,2 | NONE TOWN STANDARD |

## NETWORK EQUIPMENT SCHEDULE

NOTES:

1. THE NSPD UTILIZES APEX TECHNOLOGIES FOR THEIR IT NETWORK MANAGED SYSTEM VENDOR. NETWORK SWITCHES AND FIREWALLS EQUIPMENT, CONFIGURATION, SETUP, LICENSES, ETC. WILL BE PROVIDED BY THE NSPD AS AN EXTENSION OF THEIR EXISTING SYSTEM.
2. PROVIDE ALL REQUIRED NETWORK ADVANTAGE LICENSES.
3. PROVIDE WITH LIFETIME WARRANTY.
4. PROVIDE ALL REQUIRED STACKING CABLE KITS FOR EACH SWITCH PROVIDED.
5. CONFIGURE THE FOLLOWING VIRTUAL NETWORKS IN COORDINATION WITH OWNERS IT REQUIREMENTS AND STANDARDS:
   - WIRELESS NETWORK
     - GUEST
     - STAFF
     - INTERNAL STAFF
   - BUILDING MANAGEMENT SYSTEM (LIGHTS, HVAC)
   - SECURITY
   - ADMINISTRATION
   - AUDIOVISUAL SYSTEM
   - VOIP PHONE SYSTEM
   - ELEVATOR/FIRE ALARM
6. THE NETWORK EQUIPMENT VENDOR SHALL PROVIDE ALL REQUIRED IP ADDRESSES TO ALL SUB CONTRACTORS CONNECTING TO THE NETWORK.
7. EQUIPMENT SHALL BE BONDED TO TMGB OR TGB VIA A MINIMUM OF #6G COPPER.
8. THE NSPD UTILIZES APEX TECHNOLOGIES FOR THEIR PHONE SYSTEM MANAGER. PHONES AND VOIP EQUIPMENT, EXTENSIONS, SETUP, LICENSES, ETC. WILL BE PROVIDED BY THE NSPD AS AN EXTENSION OF THEIR EXISTING SYSTEM.

| TYPE | MANUFACTURER | PART # | PORT COUNT | UPLINK | POE BUDGET | AC POWER SUPPLY | NOTES | ALTERNATE MANUFACTURER |
|---|---|---|---|---|---|---|---|---|
| NS | HPE ARUBA | CX 6300 SERIES | 48 | 2X 40G #C9300-NM-2Q | 822W | DUAL 1100W (TOTAL 1922W) | 1-6 | NONE PER NSPD STANDARD |
| VOIP | CISCO (BY OWNER) | - (BY OWNER) | VARIES | VARIES | - | - | 6-8 | BY OWNER |




NOTES:

1. REFER TO TELECOMMUNICATIONS FACEPLATE DETAIL FOR ADDITIONAL INFORMATION.
2. ELECTRICAL CONTRACTOR SHALL PROVIDE A FULL TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA) COMPLIANT RACEWAY SYSTEM.
3. ELECTRICAL CONTRACTOR SHALL PROVIDE PULL LINE IN ALL EMPTY CONDUITS/RACEWAYS AND BUSHED ENDS AT THE END OF EACH TERMINATED CONDUIT.
4. ELECTRICAL CONTRACTOR SHALL COORDINATE EXACT RACEWAY REQUIREMENTS WITH TELECOMMUNICATIONS CONTRACTOR PRIOR TO ORDERING.

## 2 WAP INSTALLATION DETAIL - ACCESSIBLE CEILING

NOT TO SCALE

TC-02

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:
CDS LLC.
Communications Design Services, LLC.
*Telecommunications | Security Audiovisual | Project Management*
401.749.6909
Rhode Island Telecommunications System Contractor (TSC) #8332
RI MBE #2335

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
SCHEDULES AND DETAILS

PROJECT NORTH:

DRAWN: CAD

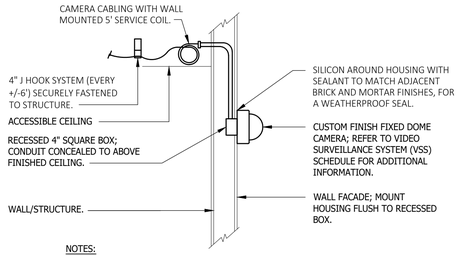
PROJECT NUMBER:
#2415

SHEET NUMBER: LV6.2

REV: ~

# VIDEO SURVEILLANCE SYSTEM (VSS) SCHEDULE

| ID TAG | MANUFACTURER | DESCRIPTION | MODEL # | MOUNTING DETAIL | MOUNTING HEIGHT | POWER REQUIREMENTS | LENS | RESOLUTION | FRAME RATE (FPS) | COMPRESSION TYPE | CAMERA ANGLE ADJUSTMENT | VIEW RANGE | FINISH | APPROVED MANUFACTURERS | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXTERIOR | | | | | | | | | | | | | | | |
| VSS-EXT1 | HANWHA | 8MP EXTERIOR FIXED DOME W/ IR ILLUMINATORS AND AI | CAMERA - QNV-C9011R, CAP ADAPTER - SBP-120HMW, WALL MOUNT -SBP-300WMW1, WALL BOX - SBP-300NBW | EXTERIOR WALL BRACKET; REFER TO DETAILS & PLANS | POE IEEE 802.3AF TYPE 1 CLASS 3 MAX 8.5W | 3.0MM F1.6 | 3840 X 2160 | 30 (REC@ 15FPS) | H.264/H.265 | PAN: 0~360° TILT: -45~85° ROTATION: 0~355° | H: 112~47° V: 58~26° D: 137~54° | WHITE | AXIS - #- BOSCH - #- IPRO - #- | PROVIDE WITH A 256GB CLASS 10 MICRO SD EXTREME PLUS MEMORY CARD CONFIGURED FOR FAIL OVER RECORDING WHEN VSSS CONNECTION IS LOST. |
| VSS-EXT2 | HANWHA | EXTERIOR 180° 8MP PANORAMIC MULTI-SENSOR W/ IR ILLUMINATORS AND AI | CAMERA - PNM-C9022RV, CAP - SBP-250MHW, WALL MOUNT - SBP-390WMW2, WALL BOX - SBP-300NBW | WALL MOUNTED; REFER TO DETAILS & PLANS | POE IEEE 802.3AT TYPE 2 CLASS 4 MAX 23.5W | 3.19MM F1.2 EACH LENS | 2592x1520 | 15 (REC@ 15FPS) | H.265 | - | 180° | WHITE | AXIS - #- BOSCH - #- IPRO - #- | PROVIDE WITH A 256GB CLASS 10 MICRO SD EXTREME PLUS MEMORY CARD CONFIGURED FOR FAIL OVER RECORDING WHEN VSSS CONNECTION IS LOST. |
| VSS-EXT2A | HANWHA | EXTERIOR 180° 8MP PANORAMIC MULTI-SENSOR W/ IR ILLUMINATORS AND AI | CAMERA - PNM-C9022RV, CAP - SBP-250MHW, WALL MOUNT - SBP-390WMW2, WALL BOX - SBP-300NBW | LIGHT POLE BRACKET MOUNTED; REFER TO DETAILS & PLANS | POE IEEE 802.3AT TYPE 2 CLASS 4 MAX 23.5W | 3.19MM F1.2 EACH LENS | 2592x1520 | 15 (REC@ 15FPS) | H.265 | - | 180° | WHITE | AXIS - #- BOSCH - #- IPRO - #- | PROVIDE WITH A 256GB CLASS 10 MICRO SD EXTREME PLUS MEMORY CARD CONFIGURED FOR FAIL OVER RECORDING WHEN VSSS CONNECTION IS LOST. |
| VSS-EXT3 | HANWHA | 4 LENS 4MP EACH EXTERIOR FIXED DOME CONFIGURED FOR 270° VIEW W/ IR ILLUMINATORS AND AI | CAMERA - PNM-C16013RVQ, CAP - SBP-200HMW, WALL - SBP-300WMW1, CORNER - SBP-300KMW1 | CORNER BRACKET MOUNTED; REFER TO DETAILS & PLANS | POE IEEE 802.3AT TYPE 2 CLASS 4 MAX 24.5W | 2.8MM F2.0 EACH LENS | 5120X1568 | 30 (REC@ 15FPS) | H.265 | - | 270° | WHITE | AXIS - #- BOSCH - #- IPRO - #- | PROVIDE WITH A 256GB CLASS 10 MICRO SD EXTREME PLUS MEMORY CARD CONFIGURED FOR FAIL OVER RECORDING WHEN VSSS CONNECTION IS LOST. |
| VSS-EXT3A | HANWHA | 4 LENS 4MP EACH EXTERIOR FIXED DOME CONFIGURED FOR 270° VIEW W/ IR ILLUMINATORS AND AI | CAMERA - PNM-C16013RVQ, CAP - SBP-200HMW, WALL - SBP-300WMW1, CORNER - SBP-300KMW1 | LIGHT POLE BRACKET MOUNTED; REFER TO DETAILS & PLANS | POE IEEE 802.3AT TYPE 2 CLASS 4 MAX 24.5W | 2.8MM F2.0 EACH LENS | 5120X1568 | 30 (REC@ 15FPS) | H.265 | - | 270° | WHITE | AXIS - #- BOSCH - #- IPRO - #- | PROVIDE WITH A 256GB CLASS 10 MICRO SD EXTREME PLUS MEMORY CARD CONFIGURED FOR FAIL OVER RECORDING WHEN VSSS CONNECTION IS LOST. |
| INTERIOR | | | | | | | | | | | | | | | |
| VSS-INT1 | HANWHA | 8MP EXTERIOR FIXED DOME W/ IR ILLUMINATORS AND AI | QND-7012R | RECESSED CEILING MOUNTED; REFER TO DETAILS & PLANS | POE IEEE 802.3AF TYPE 1 CLASS 3 MAX 7.9W | 2.8MM F2.0 | 2560 X 1440 | 30 (REC@ 15FPS) | H.264/H.265 | PAN: 0~360° TILT: 0~67° ROTATION: 0~355° | H: 107.5° V: 59.7° D: 122° | WHITE | AXIS - #M3206-LVE BOSCH - FLEXIDOME INTEOX #7100I IR IPRO - | PROVIDE WITH A 128GB CLASS 10 MICRO SD EXTREME PLUS MEMORY CARD CONFIGURED FOR FAIL OVER RECORDING WHEN VSSS CONNECTION IS LOST. |
| VSS-INT1A | HANWHA | 8MP EXTERIOR FIXED DOME W/ IR ILLUMINATORS AND AI | QND-7012R | RECESSED WALL MOUNTED; REFER TO DETAILS & PLANS | POE IEEE 802.3AF TYPE 1 CLASS 3 MAX 7.9W | 2.8MM F2.0 | 2560 X 1440 | 30 (REC@ 15FPS) | H.264/H.265 | PAN: 0~360° TILT: 0~67° ROTATION: 0~355° | H: 107.5° V: 59.7° D: 122° | WHITE | AXIS - #M3206-LVE BOSCH - FLEXIDOME INTEOX #7100I IR IPRO - | PROVIDE WITH A 128GB CLASS 10 MICRO SD EXTREME PLUS MEMORY CARD CONFIGURED FOR FAIL OVER RECORDING WHEN VSSS CONNECTION IS LOST. |
| VSS-INT2 | HANWHA | 8MP EXTERIOR FIXED DOME W/ IR ILLUMINATORS AND AI | QND-7012R | RECESSED CEILING MOUNTED; REFER TO DETAILS & PLANS | POE IEEE 802.3AF TYPE 1 CLASS 3 MAX 7.9W | 2.8MM F2.0 | 2560 X 1440 | 30 (REC@ 15FPS) | H.264/H.265 | PAN: 0~360° TILT: 0~67° ROTATION: 0~355° | H: 107.5° V: 59.7° D: 122° | WHITE | AXIS - #M3206-LVE BOSCH - FLEXIDOME INTEOX #7100I IR IPRO - | PROVIDE WITH A 128GB CLASS 10 MICRO SD EXTREME PLUS MEMORY CARD CONFIGURED FOR FAIL OVER RECORDING WHEN VSSS CONNECTION IS LOST. |
| VSS-DNT | HANWHA | 3MP ANTI-LIGATURE CORNER MOUNTED W/ 940NM IR ILLUMINATORS AND AI | TNV-C7013RC | CORNER CEILING MOUNTED; ANTI-LIG INSTALLATION | POE IEEE 802.3AF TYPE 1 CLASS 3 MAX 12.95W | 2.39MM F2.0 | 2048 X 1536 | 30 (REC@ 15FPS) | H.265 | - | H: 128° V: 100° | WHITE | AXIS - #M3206-LVE BOSCH - FLEXIDOME INTEOX #7100I IR IPRO - | PROVIDE WITH A 128GB CLASS 10 MICRO SD EXTREME PLUS MEMORY CARD CONFIGURED FOR FAIL OVER RECORDING WHEN VSSS CONNECTION IS LOST. |

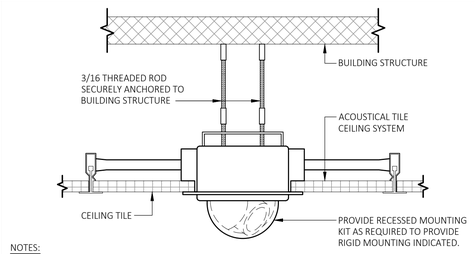



NOTES:

1. CAMERAS SHALL BE MOUNTED PER MANUFACTURERS RECOMMENDATIONS.
2. ALL MOUNTING HARDWARE SHALL BE SAE 316 STAINLESS STEEL.
3. PROVIDE ALL REQUIRED MANUFACTURER MOUNTING ACCESSORIES.

## 1 EXTERIOR CAMERA MOUNTING DETAIL

SCALE: N.T.S.

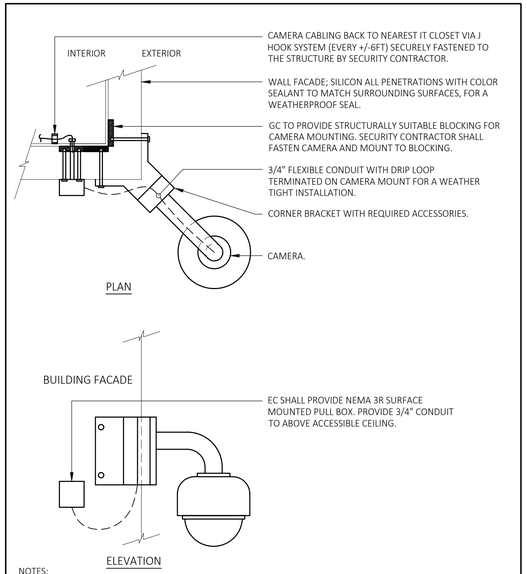



NOTES:

1. CAMERAS SHALL BE MOUNTED PER MANUFACTURERS RECOMMENDATIONS.
2. ALL MOUNTING HARDWARE SHALL BE SAE 316 STAINLESS STEEL SECURITY TYPE.
3. PROVIDE ALL REQUIRED MANUFACTURER MOUNTING ACCESSORIES.

## 2 RECESS MOUNTED SECURITY CAMERA DETAIL

NOT TO SCALE SS-01R

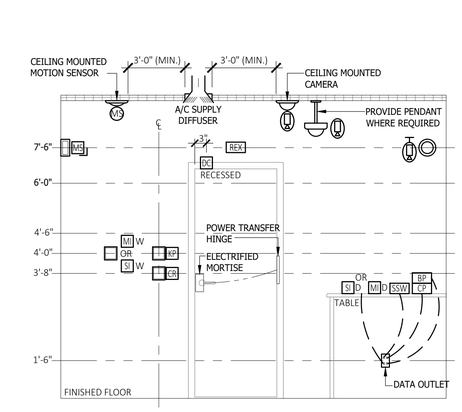



NOTES:

1. CAMERAS SHALL BE MOUNTED PER MANUFACTURERS RECOMMENDATIONS.
2. ALL MOUNTING HARDWARE SHALL BE SAE 316 STAINLESS STEEL, SECURITY TYPE.
3. PROVIDE A FULL TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA) COMPLIANT RACEWAY SYSTEM.
4. PROVIDE WEATHER TIGHT CONNECTION TO CAMERA AND AT ALL BUILDING PENETRATIONS.
5. REFER TO VIDEO SURVEILLANCE SYSTEM (VSS) SCHEDULE FOR ADDITIONAL INFORMATION.
6. PROVIDE CUSTOM FINISH ON ALL EXTERIOR CAMERAS, ACCESSORIES, AND DEVICES AS DIRECTED BY THE ARCHITECT.

## 3 EXTERIOR CORNER MOUNTED CAMERA DETAIL

NOT TO SCALE

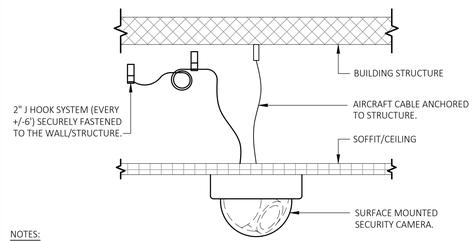



NOTES:

1. DEVICE LOCATIONS AND MOUNTING HEIGHTS SHALL BE CHECKED AGAINST THE ARCHITECTURAL PLANS AND ELEVATIONS PRIOR TO ROUGH-IN IN ORDER TO AVOID INTERFACES WITH CASEWORK, FURNITURE, WINDOWS, MIRRORS, EQUIPMENT, ETC.
2. LOCATIONS OF DEVICES AND EQUIPMENT AS INDICATED ON THE DRAWINGS ARE APPROXIMATE. THE EXACT CENTER OF ALL DEVICES SHALL BE PLACED IN COOPERATION WITH THE GENERAL CONTRACTOR AND ARCHITECT. CONTRACTOR SHALL EXAMINE ALL THE INTERIOR AND EXTERIOR DETAILS OF THE CONSTRUCTION DRAWINGS FOR DEVICE LOCATIONS NOT CONFORMING TO THE DETAIL ABOVE. WHERE DETAILED TO SPECIFIC LOCATIONS, THE ARCHITECTURAL DRAWINGS SHALL TAKE PRECEDENCE. IF AN DEVICE IS INSTALLED IN SUCH A LOCATION AS TO BE OUT OF PROPER RELATION TO BE CORRECTED BY AT THE EXPENSE OF THE CONTRACTOR UNDER THE DIRECTION OF THE ARCHITECT OR ENGINEER.
3. DEVICES SHALL BE CENTERED IN A COMMON VERTICAL PLANE. HEIGHT SHALL BE MEASURED FROM FINISHED FLOOR TO CENTERLINE OF DEVICE. COORDINATE LOCATIONS WITH MATERIALS SUCH AS MASONRY UNITS.
4. REFER TO THE ARCHITECTS ELEVATION DETAILS FOR EXACT MOUNTING HEIGHT AND LENGTH OF SURFACE TABLES. COORDINATE EXACT GOURMET LOCATIONS DURING THE MILLWORK SUBMITTAL PROCESS.

## 4 TYPICAL SECURITY DEVICE MOUNTING HEIGHTS DETAIL

NOT TO SCALE




NOTES:

1. CAMERAS SHALL BE MOUNTED PER MANUFACTURERS RECOMMENDATIONS.
2. ALL MOUNTING HARDWARE SHALL BE SAE 316 STAINLESS STEEL.
3. PROVIDE ALL REQUIRED MANUFACTURER MOUNTING ACCESSORIES.

## 5 SURFACE MOUNTED SECURITY CAMERA DETAIL

NOT TO SCALE SS-01S


Signal Works

11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:
CDS LLC.
Communications Design Services, LLC.
*Telecommunications | Security Audiovisual | Project Management*
401.749.6909
Rhode Island Telecommunications System Contractor (TSC) #8332
RI MBE #2335


PROJECT TITLE:
PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
SCHEDULES AND DETAILS

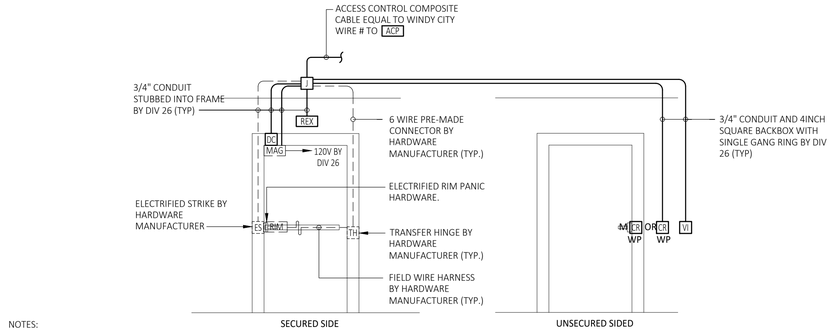
PROJECT NORTH:

DRAWN: CAD

PROJECT NUMBER:
#2415

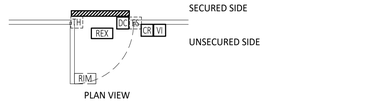
SHEET NUMBER: LV6.3

REV: ~



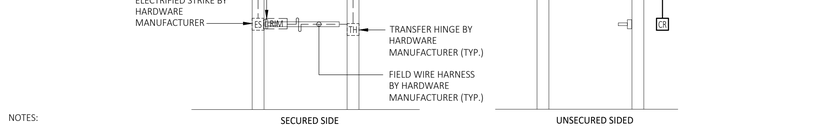

NOTES:

1. REFER TO DOOR HARDWARE SCHEDULE FOR ADDITIONAL INFORMATION.
2. REFER TO PLANS FOR CARD READER LOCATIONS.
3. ALL DOOR REMAINS LOCKED 24/7 (MINUS 001).
   3.1. DOOR 001 ON SCHEDULE INDICATED BY NSPD. WHEN LOCKED, RELEASE SHALL BE VIA VALID CREDENTIAL, DOOR RELEASE BUTTON IN MAIN OFFICE, ACCESS SYSTEM APP/WEB LINK (WITH LOGIN), AND/OR SIP VIDEO INTERCOM PHONE WITH PROGRAMMED RELEASE BUTTON WHILE ENTRY VIDEO CALL IS INCOMING, IN-PROGRESS, AND COMPLETED.
4. DOORS: 001 (ADD VIDEO INTERCOM), 002, 003, 004, 005, 006, 007, 125



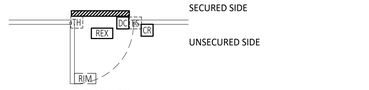

## ACCESS CONTROL DETAIL - EXTERIOR

NOT TO SCALE




NOTES:

1. REFER TO DOOR HARDWARE SCHEDULE FOR ADDITIONAL INFORMATION.
2. REFER TO PLANS FOR CARD READER LOCATIONS.
3. ALL DOOR REMAINS LOCKED 24/7.
   3.1. RELEASE SHALL BE VIA VALID CREDENTIAL, DOOR RELEASE BUTTON (DOORS 102, 103), AND/OR ACCESS SYSTEM APP/WEB LINK (WITH LOGIN)..
4. DOORS: 010, 011, 012, 013, 015, 016, 019, 027, 029, 036, 103, 111, 119, 124, 126, 128, 129, 130, 139




## ACCESS CONTROL DETAIL - INTERIOR

NOT TO SCALE

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:
CDS LLC.
Communications Design Services, LLC.
*Telecommunications | Security Audiovisual | Project Management*
401.749.6909
Rhode Island Telecommunications System Contractor (TSC) #8332
RI MBE #2335

PROJECT TITLE:
PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
SCHEDULES AND DETAILS

PROJECT NORTH:
N

DRAWN: CAD

PROJECT NUMBER:
#2415

SHEET NUMBER: LV6.4

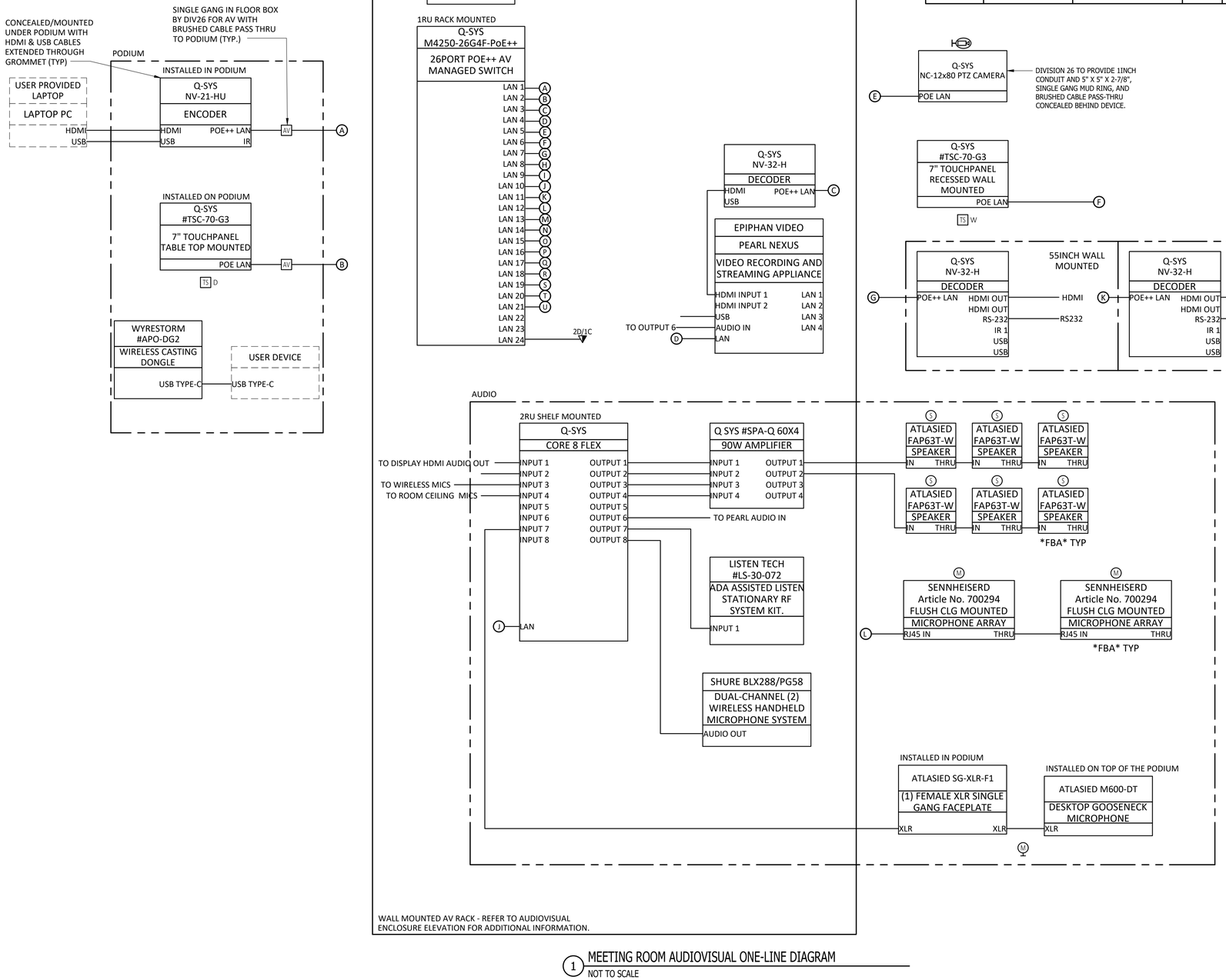
REV: ~

## DIGITAL DISPLAY SCHEDULE

NOTES:

1. COORDINATE MOUNTING WITH ARCHITECT AND GENERAL CONTRACTOR PRIOR TO ROUGH-IN.
2. REFER TO DISPLAY OUTLET DEVICE SCHEDULE FOR ADDITIONAL INFORMATION.
3. REFER TO AV ONE-LINES FOR ADDITIONAL INFORMATION.
4. PROVIDE WITH WINDOWS 11 PRO INSTALLED; COORDINATION DEVICE IT CONFIGURATION WITH THE NSPD IT DEPARTMENT. CONTRACTOR SHALL OWN IT COORDINATION AND PROGRAMMING TIME (ALLOCATE 2 HOURS PER DISPLAY)

| TYPE | MANUFACTURER | MODEL # | SIZE | RESOLUTION | MOUNT TYPE | MANUFACTURER | PART # | NOTES |
|---|---|---|---|---|---|---|---|---|
| 55INCH | PHILIPS | 55BDL3550Q | 55" | 3840 X 2160; 4K | 400MM X 400MM, M6 UNIVERSAL TILT WALL MOUNT | CRIMSON | T63A | 1-3 |
| 75INCH | PHILIPS | 75BDL4550D | 75" | 3840 X 2160; 4K | 600MM X 400MM, M8 ARTICULATING MOUNT | CRIMSON | A65 | 1-4 |
| 98INCH | PHILIPS | 98BDL4650D/00 | 98" | 3840 X 2160; 4K | 1000MM X 400MM, M8 ARTICULATING MOUNT | CRIMSON | RSA90 | 1-4 |




1 MEETING ROOM AUDIOVISUAL ONE-LINE DIAGRAM
NOT TO SCALE

NOTES:

1. INSTALLER SHALL BE Q-SYS LEVEL 2 AND CONTROL 201 CERTIFIED.
2. PROVIDE ALL REQUIRED Q-SYS LICENSES FOR A COMPLETE FULLY OPERATIONAL AND FUNCTIONAL SYSTEM.
3. FIRE ALARM SHALL SHUNT AUDIO REINFORCEMENT UPON FIRE ALARM ACTIVATION, BY FIRE ALARM CONTRACTOR.
4. PROVIDE ALL REQUIRED CABLING PER MANUFACTURERS RECOMMENDATIONS.
5. DIVISION 26 SHALL PROVIDE CONDUITS AND BACK BOXES FOR ALL DEVICES (MINIMUM 1INCH CONDUIT AND 5" X 5" X 2-7/8" BACKBOX WITH SINGLE GANG MUD RING. DEVICE SPECIFIC BACKBOXES SHALL BE TURNED OVER TO DIVISION 26 BY DIVISION 27 FOR INSTALLATION DURING ROUGH-IN.
6. REFER TO TELECOMMUNICATIONS CABLING AND CONNECTOR SCHEDULES FOR NETWORK CABLING SPECIFICATION. AV CABLING SHALL BE EQUAL TO WAP CABLING.
7. COORDINATE WITH OWNERS IT DEPARTMENT ON ALL AV DEVICES THAT NEED TO BE CONNECTED THE THE LOCAL AREA NETWORK (LAN). PROVIDE ALL PATCH CORDS TO MATCH BUILDING CABLING SPEC.
8. PROVIDE ALL PROGRAMING AND COMMISSIONING BY AV MANUFACTURER FOR A COMPLETE OPERATIONAL SYSTEM.
9. PROVIDE A 5 YEAR CERTIFIED SYSTEM WARRANTY ON ALL AV COMPONENTS.
10. PROVIDE A MINIMUM OF (2) DAYS (4HRS EACH DAY) OF AV MANUFACTURER TRAINING FOR OWNER AND OWNERS STAFF OPERATING AV SYSTEM. NOTICE AT A MINIMUM.
11. PROVIDE ALL REQUIRED CONTROL EQUIPMENT (PROCESSOR(S), CONTROLLER(S), GATEWAY(S), IR BLASTER(S), TOUCHPANEL(S), ETC.) FOR A COMPLETE FULLY FUNCTIONING INSTALLATION.

GENERAL AUDIOVISUAL PROGRAMMING INTENT

THE USER WALKS INTO THE TRAINING ROOM WHICH TRIGGERS THE ROOM TOUCHPANEL(S) TO WAKE AS THE USER APPROACHES. THE CONTROL PANEL SHALL TRANSITION FROM THE NORTH SMITHFIELD POLICE DEPARTMENT (NSPD) LOGO TO A ACTIVE INTERFACE WITH PROMPTS FOR ROOM CONTROL FOR DISPLAY ON/OFF, SOURCE SWITCHING, VOLUME CONTROL, VIDEO CONFERENCING, ETC. THE TOUCHPANEL PROMPTS THE USER TO INDICATE WHAT TYPE OF DEVICE ARE THEY USING.

1. USER-PROVIDED DEVICE (LAPTOP) CONNECTED VIA HDMI AND USB AT THE PODIUM.
   a. USER TURNS ON DISPLAYS VIA CONTROL PANEL.
   b. USER PLUGS IN DEVICE TO HDMI OR USB-C WHICH WILL AUTO ROUTE THE VIDEO AND AUDIO TO THE ROOM DISPLAYS.
      b.a. USER CHOICE FROM EXTENDED DISPLAY OR DUPLICATE/MIRROR
      b.b. USB-C IS NEEDED FOR CONNECTION TO THE ROOM MICROPHONE AND CAMERA.
2. WIRELESSLY PRESENTING VIA WYRESTORM.
   a. USER TURNS ON DISPLAYS VIA CONTROL PANEL.
   b. USER PLUGS IN THE USB-C PROVIDED DONGLE TO THEIR DEVICE WHICH WILL AUTO ROUTE THE VIDEO AND AUDIO TO THE ROOM DISPLAYS.
      b.a. A COMPUTER SYSTEM DRIVER DOWNLOAD MAYBE REQUIRED ON USER DEVICE IN ORDER TO USE THE ROOMS MICROPHONES AND CAMERA.
   c. ROOM DISPLAY WILL PROMPT THE WIRELESS CONNECTION INFORMATION WITH THE NSPD LOGO AS THE BACKGROUND WHEN THE DONGLE IS DISCONNECTED.
3. RECORDING AND STREAMING OF MEETING VIA EPIPHAN:
   a. USER TURNS ON DISPLAYS VIA CONTROL PANEL.
   b. SELECTS BETWEEN WIRED OR WIRELESS PRESENTATION VIA THE CABLE OR DONGLE.
   c. CONTROL PANEL PROVIDES THE PROMPT TO THE USER ASKING IF THEY WOULD LIKE TO RECORD THE SESSION.
      c.a. IF YES IS SELECTED, THE CONTROL PANEL SCREEN WILL DISPLAY A PAGE THAT WILL CONTROL THE EPIPHAN RECORDING DEVICE AND THE ROOMS CAMERA

AFTER 30MINS OF NO MOTION DETECTED BY THE CONTROL PANEL OR BY PRESSING THE POWER OFF BUTTON ON THE CONTROL PANEL, THE DISPLAYS WILL BE TRIGGERED TO TURN OFF AND THE TOUCHPANELS WILL BE PLACED INTO A "SLEEP MODE" DISPLAYING THE NSPD LOGO.

PROGRAMMING/FUNCTIONALITY FOR THE VIDEO RECORDING AND STREAMING APPLIANCE/SYSTEM SHALL BE COORDINATED WITH OWNER AND DESIGNER DURING THE SHOP DRAWING PROCESS. NSPD INTENDED USE INCLUDES RECORDING AND LIVE STREAMING POTENTIAL TOWN MEETINGS VIA ZOOM LINK, NSPD WEBSITE LIVESTREAM, YOUTUBE LIVESTREAM, AND/OR FACEBOOK LIVESTREAM. SYSTEM FUNCTIONALITY AND PROPOSED EASE OF USE SHALL BE REVIEWED DURING SHOP DRAWINGS PROCESS.


Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:
CDS LLC.
Communications Design Services, LLC.
*Telecommunications | Security*
*Audiovisual | Project Management*
401.749.6909
Rhode Island Telecommunications System Contractor (TSC) #8332
RI MBE #2335


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
AUDIOVISUAL ONE-LINE

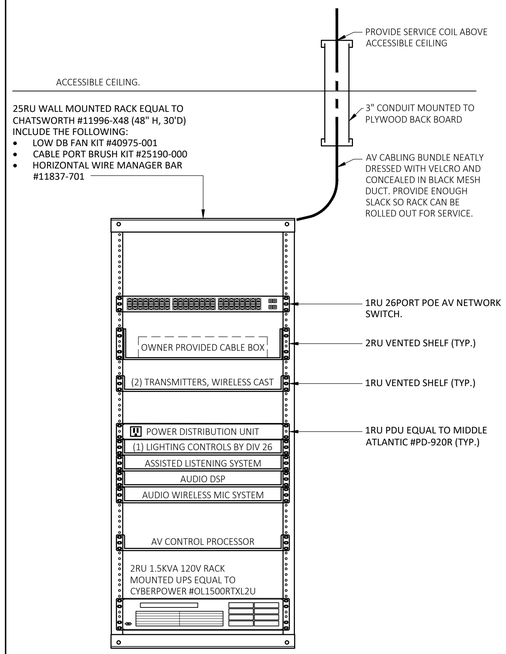
PROJECT NORTH:

DRAWN: CAD

PROJECT NUMBER:
#2415

SHEET NUMBER: LV6.5

REV: ~

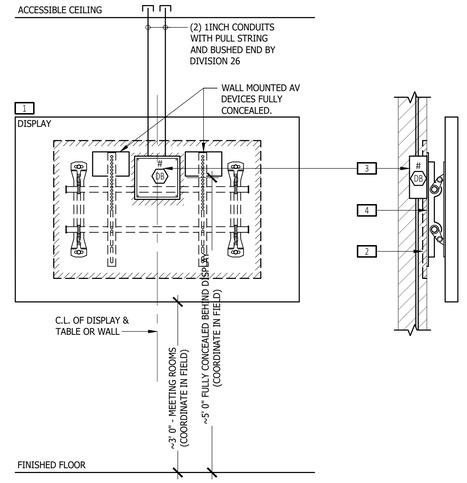



NOTES:

1. COORDINATE ENCLOSURE LAYOUT DURING SHOP DRAWING PROCESS PRIOR TO START OF ANY WORK.
2. PROVIDE STEEL VENTED FILLER PLATES TO FILL ALL NONE OCCUPIED RACK UNITS; 1RU, 2RU, 3RU, 4RU. VERIFY EXACT TYPE AND QUANTITIES PRIOR TO ORDERING. MIDDLE ATLANTIC PART# VT1, VT2, VT3, VT4.

## 1 AUDIOVISUAL ENCLOSURE ELEVATION

NOT TO SCALE TC-03




KEYED DETAIL NOTES:

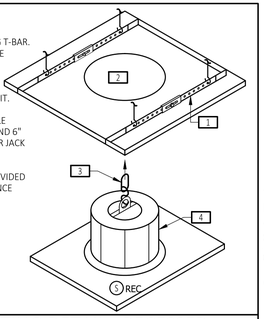
1. DISPLAY AND DISPLAY MOUNT SHALL BE PROVIDED BY THE AUDIO VISUAL CONTRACTOR. REFER TO DIGITAL DISPLAY SCHEDULE FOR ADDITIONAL INFORMATION.
2. G.C. TO PROVIDE BLOCKING. REFER TO ARCHITECTURAL DRAWINGS FOR ADDITIONAL INFORMATION.
3. DISPLAY BOX EQUAL TO CHIEF #PACS26, CENTERED AND FULLY CONCEALED BEHIND DISPLAY.
4. PROVIDE STRUCTURALLY SUITABLE ANCHORS FOR DISPLAY MOUNT.

## 2 DISPLAY MOUNTING DETAIL

SCALE: NTS

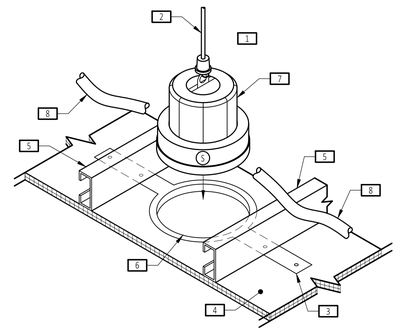
KEYED DETAIL NOTES:

1. CONTRACTOR TO INSTALL SPEAKER RAILS OVER CEILING T-BAR. PROVIDE SUPPORT CABLES FOR RAILS FROM STRUCTURE ABOVE.
2. CONTRACTOR SHALL CUT A HOLE IN THE CEILING TO ACCOMMODATE NEW SPEAKER. PROVIDE WITH TRIM KIT.
3. CONTRACTOR TO PROVIDE SUPPORT CABLE TO SUITABLE STRUCTURE ABOVE SPEAKER. SUPPORT CABLE TO EXTEND 6" BELOW FINISHED CEILING. PROVIDE AIRCRAFT CABLE OR JACK CHAIN AT A MINIMUM.
4. IN CEILING SPEAKER WITH MOUNTING HARDWARE PROVIDED BY CONTRACTOR. PROVIDE A MINIMUM OF 8" CLEARANCE ABOVE FINISHED CEILING AT SPEAKER LOCATION.




## 3 CEILING SPEAKER MOUNTING DETAIL - RECESSED

NOT TO SCALE AV-05




KEYED DETAIL NOTES:

1. G.C. TO VERIFY A MINIMUM OF 8" CLEARANCE ABOVE FINISHED CEILING AT SPEAKER LOCATION.
2. G.C. TO PROVIDE ONE SUPPORT CABLE TO BUILDING STRUCTURE ABOVE. SUPPORT CABLE TO EXTEND 6" BELOW FINISHED CEILING. PROVIDE AIRCRAFT CABLE AT MINIMUM.
3. NEW CONSTRUCTION BRACKET, PROVIDED BY A.V.C & INSTALLED BY G.C., TO ATTACH TO BUILDING STRUCTURE PRIOR TO DRYWALL OR CEILING MATERIAL INSTALLATION.
4. CEILING CONSTRUCTION PER ARCH. SPECIFICATIONS.
5. G.C. TO PROVIDE CEILING JOISTS OR SIMILAR SUPPORT FOR CONSTRUCTION BRACKETS.
6. G.C. TO CUT ONE (1) HOLE SIZED PER MANUFACTURER'S INSTRUCTIONS CENTERED AT SPEAKER LOCATION.
7. SPEAKER ENCLOSURE AND GRILLE ASSEMBLY TO BE PROVIDED AND INSTALLED BY A.V.C.
8. CONDUITS PROVIDED BY E.C.. CONDUITS TO EXTEND 6" BELOW FINISHED CEILING.

## 4 CEILING SPEAKER MOUNTING DETAIL - HARD CEILING

NOT TO SCALE AV-06

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:
CDS LLC.
Communications Design Services, LLC.
*Telecommunications | Security Audiovisual | Project Management*
401.749.6909
Rhode Island Telecommunications System Contractor (TSC) #8332
RI MBE #2335

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:
BIDDING
06/30/2025

REVISIONS:

STAMP:

SHEET TITLE:
AUDIOVISUAL ONE-LINE

PROJECT NORTH:

DRAWN: CAD

PROJECT NUMBER:
#2415

SHEET NUMBER: LV6.6

REV: ~

SignalWorks
Architecture

11 Aleppo Street
Providence RI 02909

# North Smithfield PSC: Add-Alternate Scope Narratives

**Regarding**: 575 Smithfield Road – North Smithfield, RI

## PURPOSE

This project has been intentionally structured to allow the Town to efficiently negotiate additive scopes of work as additional funding becomes available during construction. To facilitate this, the contract documents have been developed to illustrate all potential work—both base scope and add-alternates—as if the entire project were to be executed as a single unified construction package.

The purpose of this memorandum is to clearly distinguish between the base scope of work and the associated add-alternates. Due to the integrated nature of the design, and to avoid creating a fragmented or confusing set of drawings, this narrative is intended to serve as the primary reference for pricing, procurement, and execution strategies related to these additive scope items.

The add-alternate "scope packages" have been organized into three major categories:

- **EXT – Exterior & Site Improvements**: Includes building envelope enhancements, additions, and new construction elements.

- **SYS – Health & Safety System Replacements & Upgrades:** Focuses on upgrades that improve life safety, environmental health, and occupant wellness.

- **REN – Programmatic Optimization & Facility Renovations**: Targets improvements to building layout, function, and departmental efficiency.

Given the overlapping nature of these scopes across multiple trades, and in coordination with the Owner's Project Manager (OPM), the design team has determined that a separate, add-alternate drawing set would be impractical and potentially confusing. Instead, this memorandum outlines each add-alternate, references applicable drawings, and identifies the implications of including or excluding each from the final scope of work.

As a Construction Manager, your pricing should treat these scope packages as qualitative tools to refine the scope and value of each add-alternate. We recommend that you provide a Schedule of Values for each defined package. This pricing structure aligns with the approach previously communicated to the Town at the time of contract award and should guide your pricing and documentation efforts accordingly.

## OVERVIEW

### Scope Package Designations Overview

The below “packages” are bulks of the scopes of work, they will be referenced throughout this memorandum document by their designation (IE. EXT-01, REN-02, etc.).

**Base Scope Packages:**

- EXT-03: Replacement of Exterior Doors, Windows, Steel Lintels, and Restoration of Copper Coping
- SYS-01: HazMat Abatement
- SYS-02: Communications Equipment, Fire Alarm Upgrades / IT & Security Upgrades
- SYS-04: Mechanical Upgrades
- SYS-05: Interior Finishes Refresh & Interior Water-Damage Restoration
- SYS-06: Interior Lighting Replacement
- REN-02: Reconfiguration of Lower Level
- REN-03: Reconfiguration of Upper Level

**Add-Alternate Scope Packages:**

- EXT-01: Sally Port Addition
- EXT-02: Site Improvements & Enhancements
- SYS-03: FF&E Upgrades
- SYS-07: Fire Protection Upgrades
- REN-01: Entry Addition with Elevator
- REN-04: Municipal Court

---

## IMPLEMENTATION

### EXT-01 - Sally Port Addition

**Intent:** New Construction Addition focusing on increased security and operational safety

**Sheet References:**

| | | |
|---|---|---|
| **A1.0** - Architectural Site Plan | **A1.1** - Lower Level Floor Plan | **A1.2** - Upper Level Floor Plan |
| **C1.2 -** Site Plan | **S1.0 -** Foundation Plan | **S1.1** - First Floor Framing Plan |
| **S1.2 -** Roof Framing Plan | **S2.0 -** Foundation Details | **S2.1 -** Foundation Details |
| **S2.2** - Framing Details | **A2.1 -** Exterior Elevations | **A2.2 -** Exterior Elevations |
| **A2.4 -** Sally Port Elevations | **A3.2 -** Sally Port Sections | **A3.3 -** Garage Sections |
| **P1.1 -** Lower Level Plan - Domestic Water & Gas | **LV2.1 -** Lower Level Security Plan | |

**EXT-02 - Site Improvements & Enhancements**

Intent: Provide Additional Public Parking while Increasing Security & Storage Options for the Police Department

**Sheet References:**

| | | |
|---|---|---|
| **C1.2** - Site Plan | **C1.3** - Details | **AD1.0** - Site Demolition Plan |
| **A1.0 -** New Work Site Plan | **A1.4** - Garage New Work Plan | **A2.3** - Garage Plan & Elevations |
| **ES1.1 -** Electrical Site Plan | | |

**SYS-03: FF&E Upgrades**

**Intent:** New FF&E Throughout

**Sheet References:** *Not Applicable - Handled by 3rd Party if Scope is Accepted*

**SYS-07: Fire Protection Upgrades**

**Intent:** Provide Automatic Sprinkler System Throughout Building

**Sheet References:**

| | | |
|---|---|---|
| **FP1.1 -** Lower Level Plan | **FP1.2 -** Upper Level Plan | |

**REN-01: Entry Addition w/ Elevator**

**Intent:** Accessibility Upgrades

**Sheet References:**

| | | |
|---|---|---|
| **C1.2 -** Site Plan | **S1.0 -** Foundation Plan | **S1.1** - First Floor Framing Plan |
| **S1.2 -** Roof Framing Plan | **S2.0 -** Foundation Details | **S2.1 -** Foundation Details |
| **S2.2** - Framing Details | **A1.1 -** Lower Level New Work Plan | **A1.2 -** Upper Level New Work Plan |
| **A2.1 -** Exterior Elevations | **A2.2 -** Exterior Elevations | **A3.0 -** Elevator Addition Sections |
| **A5.1 -** Addition Details | **M2.1 -** Lower Level Piping | **M2.2 -** Upper Level Piping |
| **M1.2** - Upper Level Plan | **E1.1 -** Lower Level Lighting Plan | **E1.2 -** Upper Level Lighting Plan |
| **E2.1 -** Lower Level Power / Systems Plan | **E2.2** - Upper Level Power / Systems Plan | **FA1.1 -** Lower Level FA Plan |

| | | |
|---|---|---|
| **FA1.2 -** Upper Level FA Plan | **LV1.2 -** Upper Level Telecom Plan | **LV2.1 -** Lower Level Security Plan |
| **LV2.2 -** Upper Level Security Plan | | |

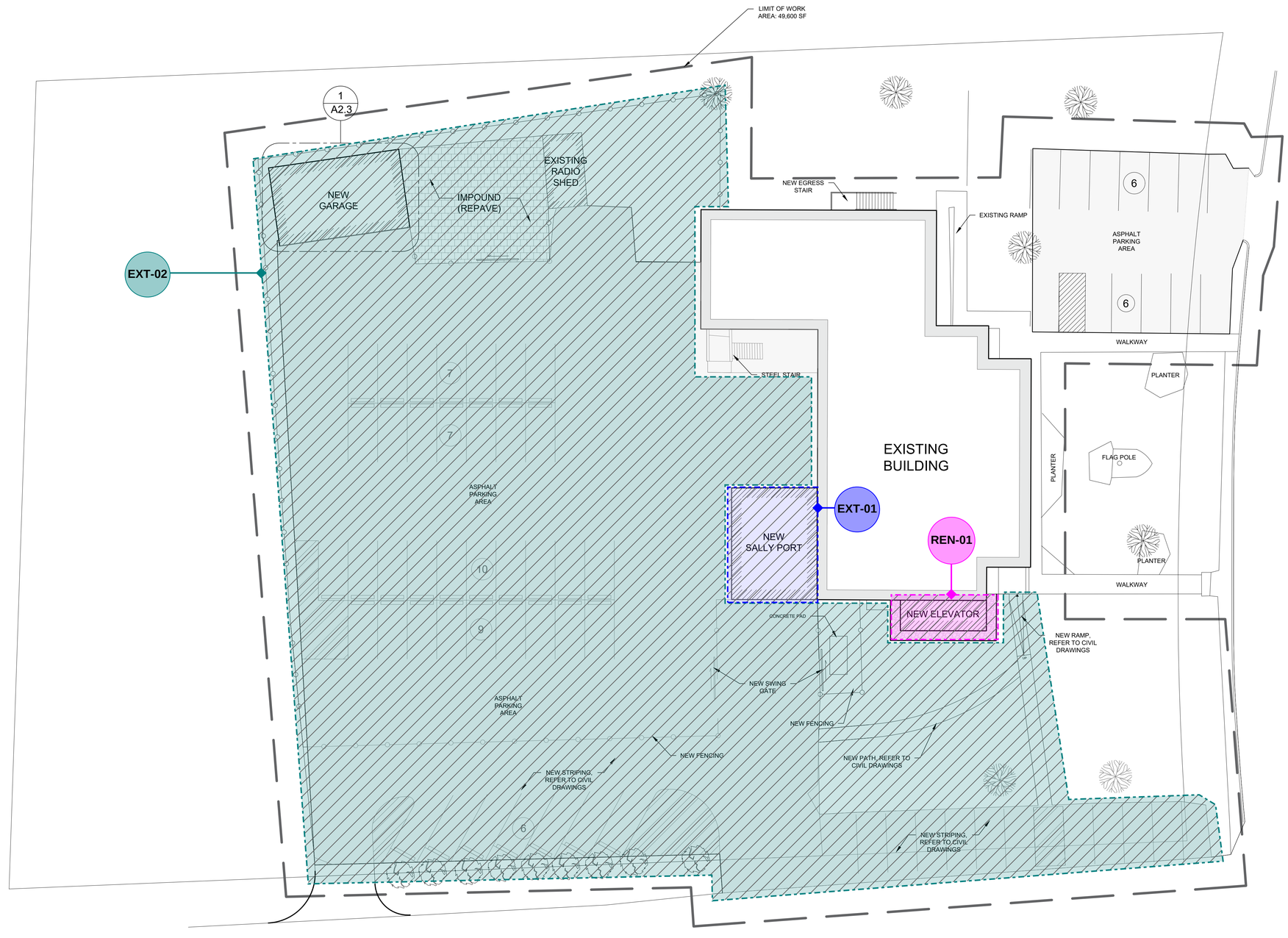
**REN-04 - Municipal Court**

**Intent:** Finish Construction to the Municipal Court Area

**Sheet References:**

| | | |
|---|---|---|
| **A1.2 -** Upper Level New Work Plan | **M0.3 -** Schedules | **M1.1 -** Upper Level Plan |
| **A1.6 -** Upper Level Finishes Pla**n** | **A1.8** - Upper Level RC Plan | **M1.4** - Roof Plan |
| **E1.2 -** Upper Level Lighting Plan | | |

FOR COORDINATION PURPOSES ONLY




1 / A1.0 NEW WORK SITE PLAN
1/16"=1'-0"

NOTES

1. MAINTAIN AND PROTECT ALL EXISTING BOLLARDS, FENCES, GATES, STAIRS, CONCRETE PADS, PLANTINGS, AND OTHER SITE FEATURES UNLESS OTHERWISE NOTED.

2. ENGINEER TO INSPECT ASPHALT BASE. REPAIR BASE AS REQUIRED BEFORE PAVEMENT OVERLAY.

3. COORDINATE BUILDING DOOR LOCATIONS, GRADE TRANSITIONS AT ENTRIES, RAMPS, STAIRS, AND RAILINGS WITH ARCHITECT.

4. COORDINATE ALL WORK WITHIN R.O.W. WITH TOWN OF NORTH SMITHFIELD AS REQUIRED. REFERENCE CIVIL DRAWINGS.

5. RESTRIPE REPAVED AREAS AS SHOWN. EPOXY RESIN WITH AASHTO M247 TYPE I GLASS BEADS OR APPROVED EQUAL. REFERENCE CIVIL DRAWINGS.

6. ALL PARKING SPACES SHALL HAVE CONC. WHEEL STOPS. REFERENCE CIVIL DRAWINGS.

Signal Works
11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com
CONSULTANT:

PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

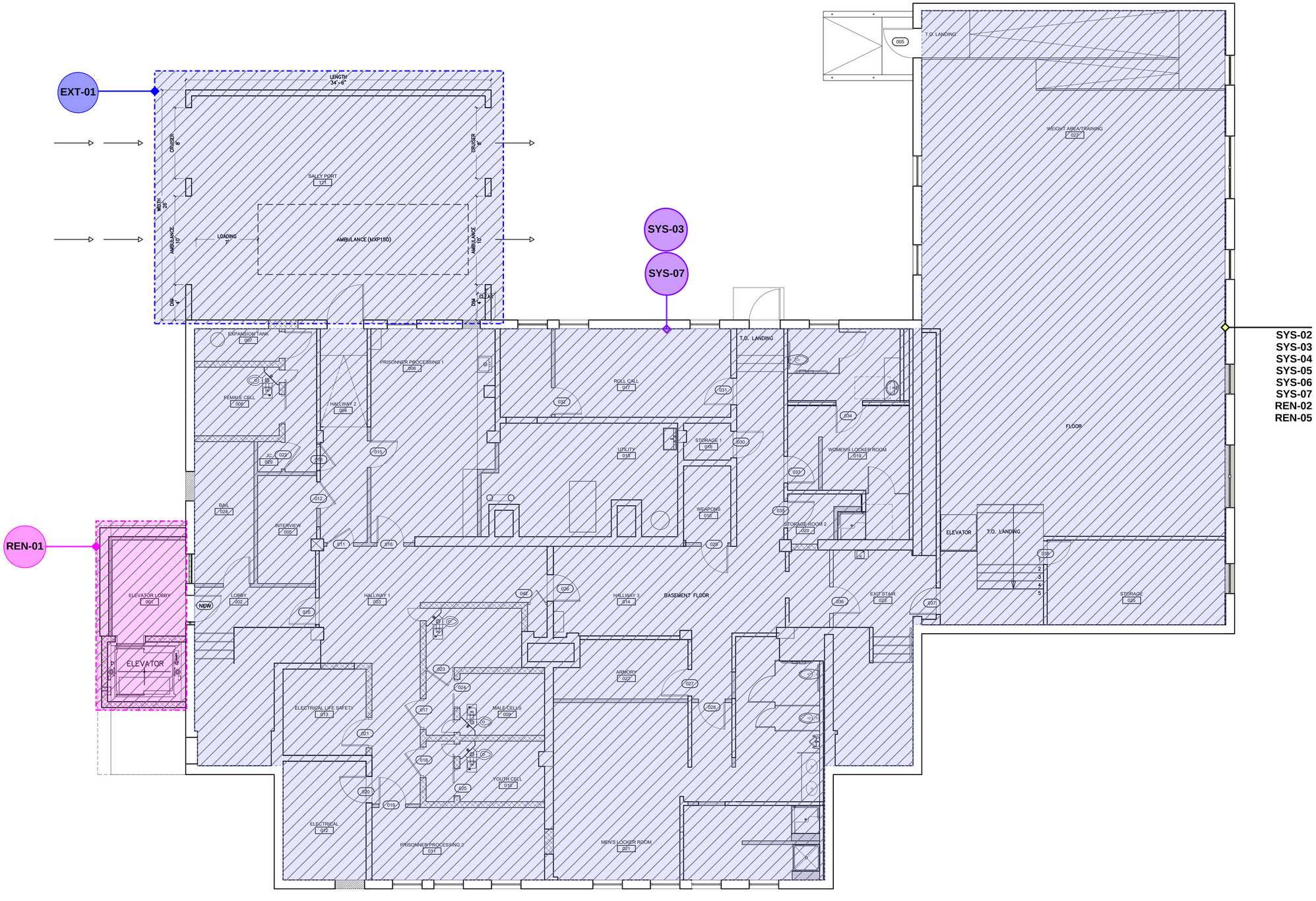
ISSUED FOR:

REVISIONS:

STAMP:

SHEET TITLE:
NEW WORK SITE PLAN

*FOR COORDINATION PURPOSES ONLY*




1 / A1.1 PROPOSED LOWER LEVEL FLOOR PLAN
3/16"=1'-0"


Signal Works

11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

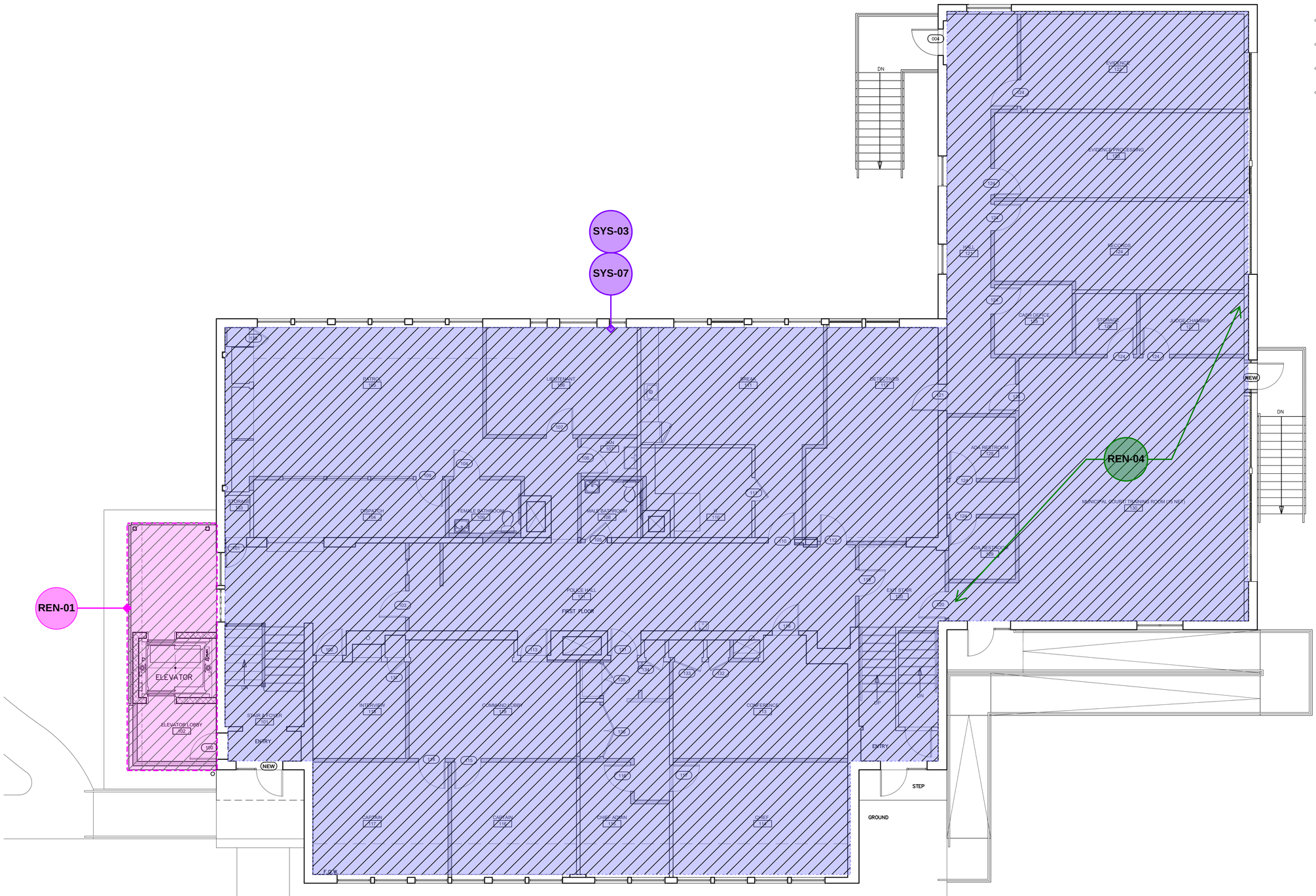
ISSUED FOR:

REVISIONS:

STAMP:

SHEET TITLE:
PROPOSED LOWER LEVEL FLOOR PLAN

*FOR COORDINATION PURPOSES ONLY*




1 A1.2 PROPOSED FIRST FLOOR PLAN
3/16"=1'-0"

## NOTES

1. REINSTALL SECURITY GLASS TO NEW LOCATION
2. ARMORCORE BULLET RESISTANT FIBERGLASS PANEL CONCEALLED BEHIND NEW DRYWALL LINING (PAINTED FINISH). LEVEL 7
3. NEW ENTRY RAMP AND HANDRAILS. REFER TO CIVIL ENGINEER DETAIL
4. NEW CHASE REQUIRED TO BE 1HR SHAFT SEALED AT FLOOR PENETRATIONS
5. CONSTRUCT CMU SHAFT ELEVATOR MFG REQUIREMENTS. REFER TO STRUCTURAL ENG. DETAILS
   REF TO A3.1 FOR DIMENSION SETOUTS


Signal Works

11 Aleppo Street
Providence RI 02909
401.400.2724
SignalWorksArchitecture.com

CONSULTANT:


PROJECT TITLE:
# PUBLIC SAFETY COMPLEX
575 Smithfield Rd #1,
North Smithfield, RI 02896

ISSUED FOR:

REVISIONS:

STAMP:

SHEET TITLE:
PROPOSED FIRST FLOOR PLAN

Signal Works Architecture

# PROJECT MANUAL

## North Smithfield Public Safety Complex
## **Town of North Smithfield**

BID SET
June 30, 2025

Signal Works Project
#2415

11 Aleppo Street, Providence, RI 02909 • 401.400.ARCH
bryan@signalworksarchitecture.com • http://www.signalworksarchitecture.com

**SECTION 00 0110**

**TABLE OF CONTENTS**

**PROCUREMENT AND CONTRACTING REQUIREMENTS**

**DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS**

TO BE PROVIDED BY CONSTRUCTION MANAGER FOR OWNER'S APPROVAL

**PART 1 – PROJECT SPECIFICATIONS**

**DIVISION 01 -- GENERAL REQUIREMENTS**

01 1000 – SUMMARY
01 1100 – VOC LIMITS FOR ADHESIVES, SEALANTS & PAINTS
01 2000 – PRICE & PAYMENT PROCEDURES
01 2300 – ALTERNATES
01 3000 – ADMINISTATIVE REQUIREMENTS
01 3300 – SUBMITALL PROCEDURES
01 3516 – ALTERATIONS PROJECT PROCEDURES
01 4000 – QUALITY REQUIREMENTS
01 4500 – QUALITY CONTROL
01 5000 – TEMPORARY FACILITIES & CONTROLS
01 6000 – PRODUCT REQUIREMENTS
01 6350 – SUBSTITUTION PROCEDURES
01 7000 – EXECUTION & CLOSEOUT REQUIREMENTS
01 7310 – CUTTING & PATCHING
01 9000 – LIFE CYCLE ACTIVITIES
01 9113 – GENERAL COMMISSIONING REQUIREMENTS

**DIVISION 02 -- EXISTING CONDITIONS**

02 4100 – DEMOLITION
02 4113 – SELECTIVE DEMOLITION
02 8200 – ASBESTOS REMEDIATION

**DIVISION 03 -- CONCRETE**

03 3000 – CAST-IN-PLACE CONCRETE
03 5400 – FLOOR LEVELING LIGHTWEIGHT

**DIVISION 04 – MASONRY**

04 0100 – MAINTENANCE OF MASONRY
04 2100 – CLAY UNIT MASONRY
04 2200 – CONCRETE MASONRY UNIT
04 8100 – REINFORCED MASONRY

**DIVISION 05 -- METALS**

05 0100 – MAINTENANCE OF METALS
05 0150 – MAINTENANCE OF ARCHITECTURAL METALS
05 1200 – STRUCTURAL STEEL
05 2100 – OPEN WEB STEEL BAR JOISTS
05 3100 – METAL DECK
05 5000 – METAL FABRICATION
05 5100 – METAL STAIRS
05 5200 – METAL RAILINGS
05 5213 – PIPE & TUBE RAILINGS
05 5963 – DETENTION ENCLOSURES
05 7000 – DECORATIVE METAL

**DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES**

06 1000 – ROUGH CARPENTRY
06 1100 – WOOD FRAMING
06 1600 – SHEATHING
06 4023 – INTERIOR ARCHITECTURAL WOODWORK
06 4100 – CASEWORK HARDWARE

**DIVISION 07 – THERMAL AND MOISTURE PROTECTION**

07 1113 – BITUMINOUSE DAMPPROOFING
07 2100 – THERMAL INSULATION
07 2500 – WEATHER BARRIERS
07 4113 – METAL ROOF PANELS
07 4213 – METAL WALL PANELS
07 4600 – SIDING
07 5323 – EPDM ROOFING
07 6200 – SHEET METAL FLASHING & TRIM

07 7100 – ROOF SPECIALTIES
07 8400 – FIRESTOPPING
07 9005 – JOINT SEALERS
07 9500 – EXPANSION CONTROL

**DIVISION 08 – OPENINGS**

08 1113 – HOLLOW METAL DOORS & FRAMES
08 1400 – WOOD DOORS
08 3100 – ACCESS DOORS & PANELS
08 3323 – OVERHEAD COILING DOORS
08 3463 – DETENTION DOORS & FRAMES
08 4313 – ALUMINUM-FRAMED STOREFRONTS
08 4523 – WOOD WINDOWS
08 5113 – ALUMINUM WINDOWS
08 7100 – FINISH HARDWARE
08 8100 – EXTERIOR GLAZING

**DIVISION 09 – FINISHES**

09 2116 – GYPSUM BOARD ASSEMBLIES
09 2216 – NON-STRUCTURAL METAL FRAMING
09 3000 – TILING
09 5100 – SUSPENDED ACOUSTICAL CEILINGS
09 5610 – FLOORING PREPARATION
09 6500 – RESILIENT FLOORING
09 6513 – RESILIENT BASE & ACCESSORIES
09 6813 – CARPET TILE
09 9000 – PAINTING & COATING

**DIVISION 10 – SPECIALTIES**

10 2113 – TOILET COMPARTMENTS
10 2800 – TOILET, BATH & LAUNDRY ACCESSORIES
10 4400 – FIRE PROTECTION SPECIALTIES

**DIVISION 12 – FURNISHINGS**

12 2400 – WINDOW SHADES
12 3661 – SOLID SURFACE COUNTERTOP

12 4813 – ENTRANCE FLOOR MATS AND FRAMES

**DIVISION 14 – ELEVATORS**

14 2400 – MRL HYDRAULIC ELEVATORS

**DIVISION 21 – FIRE PROTECTION**

21 0000 – FIRE PROTECTION

**DIVISION 22 – PLUMBING**

22 0000 – PLUMBING

**DIVISION 23 – HVAC**

23 0000 – HVAC

**DIVISION 26 – ELECTRICAL**

26 0000 – ELECTRICAL

**DIVISION 27 – COMMUNICATIONS**

27 1001 – GENERAL REQUIREMENTS
27 0526 – GROUNDING & BONDING FOR COMMUNICATIONS SYSTEMS
27 0528 – PATHWAYS FOR COMMUNICATIONS SYSTEMS
27 0536 – CABLE TRAYS FOR COMMUNICATIONS SYSTEMS
27 1323 – COMMUNICATIONS FOR OPTICAL FIBER BACKBONE CABLING
27 1513 – COMMUNICATIONS COPPER HORIZONTAL CABLING
27 1700 – TESTING, IDENTIFICATION, AND ADMINISTRATION OF FIBER INFRASTRUCTURE
27 1710 – TESTING ID & ADMINISTRATION OF BALANCED TWIST PAIR INFRASTRUCTURE

**DIVISION 28 – ELECTRONIC SAFETY & SECURITY**

28 1300 – INTEGRATED SECURITY SOFTWARE & HARDWARE
28 1500 – ACCESS CONTROL HARDWARE DEVICES
28 2000 – VIDEO SURVEILLANCE

**DIVISION 31 – EARTHWORK**

31 2500 – EROSION & SEDIMENTATION CONTROLS

**DIVISION 32 – EXTERIOR IMPROVEMENTS**

32 1123 – AGGREGATE BASE COURSES
32 1216 – ASPHALT PAVING
32 1313 – CONCRETE PAVING
32 1613 – PRECAST CONCRETE CURB
32 1723 – PAVEMENT MARKINS
32 3113 – CHAIN LINK FENCES
32 9119 – LANDSCAPE GRADING
32 9219 - SEEDING

**END OF SECTION**

**SECTION 00 0115**

**LIST OF DRAWINGS**

| DWG #: | TITLE: | DATE: |
|---|---|---|
| | COVER | 06/30/2025 |
| ***CIVIL*** | | |
| C1.1 | DEMO & EROSION CONTROL | 06/30/2025 |
| C1.2 | SITE PLAN | 06/30/2025 |
| C1.3 | DETAILS | 06/30/2025 |
| ***STRUCTURAL*** | | |
| S0.1 | GENERAL NOTES | 06/30/2025 |
| S0.2 | SCHEDULES | 06/30/2025 |
| S1.0 | FOUNDATION PLAN | 06/30/2025 |
| S1.1 | FIRST FLOOR FRAMING PLAN | 06/30/2025 |
| S1.2 | ROOF FRAMING PLAN | 06/30/2025 |
| S2.0 | FOUNDATION DETAILS | 06/30/2025 |
| S2.1 | FOUNDATION DETAILS | 06/30/2025 |
| S2.2 | FRAMING DETAILS | 06/30/2025 |
| S2.3 | FRAMING DETAILS | 06/30/2025 |
| ***ARCHITECURAL*** | | |
| A0.1 | ABBREVIATIONS, SYMBOLS & MATERIALS | 06/30/2025 |
| A0.2 | CODE INFORMATION & GENERAL NOTES | 06/30/2025 |
| A0.3 | CODE REVIEW PLANS | 06/30/2025 |
| AD1.0 | SITE DEMOLITION PLAN | 06/30/2025 |
| AD1.1 | LOWER-LEVEL DEMOLITION PLAN | 06/30/2025 |
| AD1.2 | UPPER-LEVEL DEMOLITION PLAN | 06/30/2025 |
| AD1.3 | ROOF DEMOLITION PLAN | 06/30/2025 |
| A1.0 | NEW WORK SITE PLAN | 06/30/2025 |
| A1.1 | LOWER-LEVEL NEW WORK PLAN | 06/30/2025 |

| | | |
|---|---|---|
| A1.2 | UPPER-LEVEL NEW WORK PLAN | 06/30/2025 |
| A1.3 | NEW WORK ROOF PLAN | 06/30/2025 |
| A1.4 | LOWER-LEVEL FINISHES PLAN | 06/30/2025 |
| A1.5 | UPPER-LEVEL FINISHES PLAN | 06/30/2025 |
| A1.6 | LOWER-LEVEL REFLECTED CEILING PLAN | 06/30/2025 |
| A1.7 | UPPER-LEVEL REFLECTED CEILING PLAN | 06/30/2025 |
| A2.1 | PROPOSED ELEVATIONS | 06/30/2025 |
| A2.2 | PROPOSED ELEVATIONS | 06/30/2025 |
| A2.3 | NEW GARAGE PLAN & ELEVATIONS | 06/30/2025 |
| A3.1 | ELEVATOR SECTIONS | 06/30/2025 |
| A3.2 | NEW SALLY PORT SECTIONS | 06/30/2025 |
| A3.3 | NEW GARAGE SECTIONS | 06/30/2025 |
| A4.0 | INTERIOR ELEVATIONS | 06/30/2025 |
| A4.1 | MEN'S LOCKER ROOM INTERIOR ELEVATIONS | 06/30/2025 |
| A4.2 | INTERIOR BATHROOM ELEVATIONS | 06/30/2025 |
| A4.3 | INTERIOR BATHROOM ELEVATIONS | 06/30/2025 |
| A4.4 | KITCHEN INTERIOR ELEVATIONS | 06/30/2025 |
| A4.5 | PRISONER PROCESSING INTERIOR ELEVATIONS | 06/30/2025 |
| A4.6 | EMERGENCY EXIT EXTERIOR ELEVATIONS | 06/30/2025 |
| A5.1 | ADDITION DETAILS | 06/30/2025 |
| A5.2 | MILLWORK DETAILS | 06/30/2025 |
| A6.1 | DOOR SCHEDULES | 06/30/2025 |
| A6.2 | WINDOW LEGEND & SCHEDULE | 06/30/2025 |
| A6.3 | FINISH SCHEDULE & WALL TYPES | 06/30/2025 |

***PLUMBING***

| | | |
|---|---|---|
| P0.1 | PLUMBING LEGEND, NOTES & SCHEDULES | 06/30/2025 |
| PD1.1 | DEMO LOWER-LEVEL PLAN – DOMESTIC WATER & GAS | 06/30/2025 |
| PD1.2 | DEMO UPPER-LEVEL PLAN – DOMESTIC WATER & GAS | 06/30/2025 |
| PD1.3 | DEMO ROOF PLAN | 06/30/2025 |

| | | |
|---|---|---|
| P1.1 | PROPOSED LOWER-LEVEL PLAN – DOMESTIC WATER & GAS | 06/30/2025 |
| P1.2 | PROPOSED UPPER-LEVEL PLAN – DOMESTIC WATER & GAS | 06/30/2025 |
| P1.3 | PROPOSED ROOF PLAN | 06/30/2025 |
| P2.1 | PLUMBING DETAILS | 06/30/2025 |
| P2.2 | PLUMBING DETAILS | 06/30/2025 |

***FIRE PROTECTION***

| | | |
|---|---|---|
| FP0.1 | FIRE PROTECTION LEGENDS, NOTES & ABBREVIATIONS | 06/30/2025 |
| FP1.1 | FIRE PROTECTION PROPOSED LOWER-LEVEL PLAN | 06/30/2025 |
| FP1.2 | FIRE PROTECTION UPPER-LEVEL PLAN | 06/30/2025 |
| FP2.1 | FIRE PROTECTION DETAILS | 06/30/2025 |
| FP2.2 | FIRE PROTECTION DETAILS | 06/30/2025 |

***MECHANICAL***

| | | |
|---|---|---|
| M0.1 | MECHANICAL LEGEND, NOTES & ABBREVIATIONS | 06/30/2025 |
| M0.2 | MECHANICAL SCHEDULES | 06/30/2025 |
| M0.3 | MECHANICAL SCHEDULES | 06/30/2025 |
| MD1.1 | MECHANICAL DEMOLITION LOWER-LEVEL PLAN - DUCTWORK | 06/30/2025 |
| MD1.2 | MECHANICAL DEMOLITION UPPER-LEVEL PLAN – DUCTWORK | 06/30/2025 |
| MD1.3 | MECHANICAL DEMOLITION ROOF PLAN | 06/30/2025 |
| M1.1 | MECHANICAL PROPOSED LOWER-LEVEL PLAN - DUCTWORK | 06/30/2025 |
| M1.2 | MECHANICAL PROPOSED UPPER-LEVEL PLAN – DUCTWORK | 06/30/2025 |
| M1.3 | PROPOSED ATTIC DUCTWORK PLAN | 06/30/2025 |
| M1.4 | MECHANICAL PROPOSED ROOF PLAN | 06/30/2025 |
| M2.1 | MECHANICAL PROPOSED LOWER-LEVEL PLAN – PIPING | 06/30/2025 |
| M2.2 | MECHANICAL PROPOSED UPPER-LEVEL PLAN – PIPING | 06/30/2025 |
| M3.1 | MECHANICAL DETAILS | 06/30/2025 |

| | | |
|---|---|---|
| M3.2 | MECHANICAL DETAILS | 06/30/2025 |

***ELECTRICAL***

| | | |
|---|---|---|
| E0.1 | ELECTRICAL LEGEND, NOTES & ABBREVIATIONS | 06/30/2025 |
| ES1.1 | ELECTRICAL SITE PLAN | 06/30/2025 |
| ED1.1 | LOWER-LEVEL DEMOLITION PLAN | 06/30/2025 |
| ED1.2 | UPPER-LEVEL DEMOLITION PLAN | 06/30/2025 |
| E1.1 | LOWER-LEVEL LIGHTING PLAN | 06/30/2025 |
| E1.2 | UPPER-LEVEL LIGHTING PLAN | 06/30/2025 |
| E2.1 | LOWER-LEVEL POWER & SYSTEMS PLAN | 06/30/2025 |
| E2.2 | UPPER-LEVEL POWER & SYSTEMS PLAN | 06/30/2025 |
| E2.3 | ROOF LIGHTING & POWER PLAN | 06/30/2025 |
| E3.1 | ELECTRICAL POWER DISTRIBUTION DETAILS | 06/30/2025 |
| E4.1 | ELECTRICAL SCHEDULES AND DETAILS | 06/30/2025 |
| FA0.1 | FIRE ALARM LEGEND & RISER DIAGRAM | 06/30/2025 |
| FA1.1 | LOWER-LEVEL FIRE ALARM PLAN | 06/30/2025 |
| FA1.2 | UPPER-LEVEL FIRE ALARM PLAN | 06/30/2025 |

**LOW-VOLTAGE**

| | | |
|---|---|---|
| LV0.1 | LEGEND AND NOTES | 06/30/2025 |
| LV0.2 | LEGEND AND NOTES | 06/30/2025 |
| LVD1.1 | LOWER-LEVEL DEMOLITION PLAN | 06/30/2025 |
| LVD1.2 | UPPER-LEVEL DEMOLTION PLAN | 06/30/2025 |
| LV1.1 | LOWER-LEVEL TELECOM PLAN | 06/30/2025 |
| LV1.2 | UPPER-LEVEL TELECOM PLAN | 06/30/2025 |
| LV1.3 | ENLARGED AUDIOVISUAL PLAN | 06/30/2025 |
| LV2.1 | LOWER-LEVEL SECURITY PLAN | 06/30/2025 |
| LV2.2 | UPPER-LEVEL SECURITY PLAN | 06/30/2025 |
| LV6.1 | SCHEDULES AND DETAILS | 06/30/2025 |

| | | |
|---|---|---|
| LV6.2 | SCHEDULES AND DETAILS | 06/30/2025 |
| LV6.3 | SCHEDULES AND DETAILS | 06/30/2025 |
| LV6.4 | SCHEDULES AND DETAILS | 06/30/2025 |
| LV6.5 | SCHEDULES AND DETAILS | 06/30/2025 |
| LV6.6 | AUDIOVISUAL ONE-LINE | 06/30/2025 |

**END OF SECTION**

**SECTION 01 1000**
**SUMMARY**

## PART 1 GENERAL

### 1.1 SUMMARY

A. Project Identification: North Smithfield PSC

B. Project Summary: The base scope of the project is focused on renovating the interior.

C. Particular Project Requirements:
1. Requirements for sequencing, scheduling and completion date: By Construction Manager in Coordination w/ Owner's Project Manager
2. Separate contracts to be awarded for FF&E and Signage, if applicable
3. Prior hazardous waste or asbestos work: Abatement to plan provided by Owner.
4. Contractor's use of new and existing facilities: To be advised

D. Permits and Fees: Apply for, obtain, and pay for permits, fees, and utility company back-charges required to perform the work. Submit copies to Architect.

E. Codes: Comply with applicable codes and regulations of authorities having jurisdiction. Submit copies of inspection reports, notices and similar communications to Architect.

F. Dimensions: Verify dimensions indicated on drawings with field dimensions before fabrication or ordering of materials. Do not scale drawings.

G. Existing Conditions: Notify Architect of existing conditions differing from those indicated on the drawings. Do not remove or alter structural components without prior written approval.

H. Coordination:
1. Coordinate the work of all trades.
2. Prepare coordination drawings for areas above ceilings where close tolerances are required between building elements and mechanical and electrical work.
3. Verify location of utilities and existing conditions.

I. Installation Requirements, General:
1. Inspect substrates and report unsatisfactory conditions in writing.
2. Do not proceed until unsatisfactory conditions have been corrected.
3. Take field measurements prior to fabrication where practical. Form to required shapes and sizes with true edges, lines and angles. Provide inserts and templates as needed for work of other trades.
4. Install materials in exact accordance with manufacturer's instructions and approved submittals.
5. Install materials in proper relation with adjacent construction and with proper appearance.
6. Restore units damaged during installation. Replace units which cannot be restored at no additional expense to the Owner.
7. Refer to additional installation requirements and tolerances specified under individual specification sections.

J. Limit of Use: Limit use of work as indicated. Keep driveways and entrances clear.

K. Existing Construction: Maintain existing building in a weathertight condition. Repair damage caused by construction operations. Protect building and its occupants.

L. Definitions:
   1. Provide: Furnish and install, complete with all necessary accessories, ready for intended use. Pay for all related costs.
   2. Approved: Acceptance of item submitted for approval. Not a limitation or release for compliance with the Contract Documents or regulatory requirements. Refer to limitations of 'Approved' in General and Supplementary Conditions.
   3. Match Existing: Match existing as acceptable to the Owner.

M. Intent: Drawings and specifications are intended to provide the basis for proper completion of the work suitable for the intended use of the Owner. Anything not expressly set forth but which is reasonable implied or necessary for proper performance of the project shall be included.

N. Writing Style: Specifications are written in the imperative mode. Except where specifically intended otherwise, the subject of all imperative statements is the Contractor. For example, 'Provide tile' means 'Contractor shall provide tile.'

**PART 2 PRODUCTS** - Not Applicable to This Section

**PART 3 EXECUTION** - Not Applicable to This Section

**END OF SECTION**

# SECTION 01 1100

# VOLATILE ORGANICE COMPOUND (VOC) LIMITS FOR ADHESIVES, SEALANTS, AND PAINTS

## 1.0 GENERAL

### 1.1 Summary

A. The specification section includes requirements for volatile organic compound (VOC) content in adhesives, sealants, paints and coatings used for this project.

### 1.2 General Requirements

A. The Contractor is required to implement practices and procedures to meet the project's environmental goals, which include achieving NE-CHPS criteria. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in the related sections of the Contract Documents, are implemented to the fullest extent feasible.

### 1.3 References

A. Rule 1168 – "Adhesive and Sealant Applications," amended January 7, 2005: South Coast Air Quality Management District (SCAQMD), State of California, www.aqmd.gov

B. Rule 1113 – "Architectural Coatings," amended July 9, 2004: South Coast Air Quality Management District (SCAQMD), State of California, www.aqmd.gov

C. Green Seal Standard GS-11 – "Paints," of Green Seal, Inc., Washington, DC, www.greenseal.org

D. Green Seal Standard GC-03 – "Anti-Corrosive Paints," of Green Seal, Inc., Washington, DC, www.greenseal.org

### 1.4 VOC Requirements for Interior Adhesives

A. The volatile organic compound (VOC) content of adhesives, adhesive bonding primers or adhesive primers used in this project shall not exceed the limits defined in Rule 1168 – "Adhesive and Sealant Applications."

B. The VOC limits defined by SCAQMD are as follows. All VOC limits are defined in grams per liter, less water and less exempt compounds.

### 1.5 General

A. Unless otherwise specified below, the VOC content of all adhesive, adhesive bonding primers and adhesive primers are to be in excess of 250 grams per liter.

B. For specified building construction related applications, allowable VOC content is as follows:

1. Architectural Applications

| | | |
|---|---|---|
| a. | Indoor carpet adhesive | 50 |
| b. | Carpet pad adhesive | 50 |
| c. | Wood floor adhesive | 100 |
| d. | Rubber floor adhesive | 60 |
| e. | Subfloor adhesive | 50 |
| f. | Ceramic tile adhesive | 65 |
| g. | VCT and asphalt tile adhesive | 50 |
| h. | Drywall and panel adhesive | 50 |
| i. | Cove base adhesive | 50 |
| j. | Multipurpose construction adhesive | 70 |
| k. | Structural glazing adhesive | 100 |

## 1.6 VOC Requirements for Interior Sealants

A. The VOC content of sealants, or sealant primers used in this project shall not exceed the limits defined in Rule 1168 – “Adhesive and Sealant Applications.”

B. The VOC limits defined by SCAQMD are as follows. All VOC limits are defined in grams per liter, less water and less exempt compounds.

1. Sealants

| | | |
|---|---|---|
| a. | Architectural | 250 |
| b. | Other | 420 |

2. Sealant Primer

| | | |
|---|---|---|
| a. | Architectural – Nonporous | 250 |
| b. | Architectural – Porous | 775 |
| c. | Other | 750 |

## 1.7 VOC Requirements for Interior Paints

A. Paints and Primers: Paints and primers used in non-specialized interior applications (i.e., for wallboard, plaster, wood, metal doors and frames, etc.) shall meet the VOC limitations of the Green Seal Paint Standard GS-11, of Green Seal, Inc., Washington, DC. Product-specific environmental requirements are as follows:

1. Volatile Organic Compounds

a. The VOC concentrations (in grams per liter) of the product shall not exceed those listed below as determined by the U.S. Environmental Protection Agency (EPA) Reference Test Method 24.

1) Interior Paints and Primers (non-flat) – 150 g/l
2) Interior Paints and Primers (flat) – 50 g/l

B. Anti-Corrosive and Anti-Rust Paints

1. Anti-corrosive and anti-rust paints applied to interior ferrous metal substances shall meet the VOC limitations of the Green Seal Paint Standard GS-03 requirements as follows:

a. Volatile Organic Compounds

1) The VOC concentrations (in grams per liter) of the product shall not exceed those listed by the EPA Reference Test Method 24: Anti-Corrosive and Anti-Rust Paints – 250 g/l.

### 1.8 VOC Requirements for Interior Coatings

A. Clear wood finishes, floor coatings, stains, sealers and shellacs applied to the interior shall meet the VOC limitations defined in Rule 113. The VOC limits defined by SCAQMD, based on 07/09/04 amendments, are as follows. VOC limits are defined in grams per liter, less water and less exempt compounds.

| | | |
|---|---|---|
| 1. | Clear wood finishes - Varnish | 350 |
| 2. | Clear wood finishes – Sanding Sealers | 350 |
| 3. | Clear wood finishes – Lacquer | 550 |
| 4. | Shellac – Clear | 730 |
| 5. | Shellac – Pigmented | 550 |
| 6. | Stains | 250 |
| 7. | Floor Coatings | 100 |
| 8. | Waterproofing Sealants | 250 |
| 9. | Sanding Sealers | 275 |
| 10. | Other Sealers | 200 |

## 2.0 PRODUCTS

Not Applicable

## 3.0 EXECUTION

Not Applicable

END OF DOCUMENT

# SECTION 01 2000
# PRICE AND PAYMENT PROCEDURES

## PART 1 GENERAL

### 1.1 SUMMARY

A. Price and Payment Procedures:
   1. Alternates
   2. Allowances

### 1.2 ALTERNATES

A. Total Price: Provide total price for each alternate in Bid Form. Include cost of modifications to other work to accommodate alternate. Include related costs such as overhead and profit.

B. Acceptance of Alternates: Owner will determine which alternates are selected for inclusion in the Contract.

C. Coordination of Alternates: Modify or adjust affected adjacent work as necessary to integrate work of the alternate into Project. Coordinate alternates with related work to ensure that work affected by each selected alternate is properly accomplished.

D. List of Alternates:
   1. Deduct-Alternate #01: Refer to alternate layout as shown on the drawings.

### 1.3 ALLOWANCES

A. Allowances: Lump sum allowances and unit cost allowances are listed below and as indicated on the Drawings. Amounts shall include all costs including overhead and profit except as specifically noted. Coordinate allowances with requirements for related and adjacent work.

B. Notification of Owner: Notify Owner of date when final decision on allowance items is required to avoid delays in the work.

C. Certification of Quantities: Furnish certification that quantities of products purchased are the actual quantities needed with reasonable allowance for cutting or installation losses, tolerances, mixing, waste, and similar margins.

D. Lump Sum Allowances: Include the following amounts in the base bid for materials, installation, overhead, profit and all costs for the following items.
   1. Not Applicable – Refer to Spec Section 01 2200 – Unit Prices

**PART 2 PRODUCTS** - Not Applicable to This Section

**PART 3 EXECUTION** - Not Applicable to This Section

**END OF SECTION**

# SECTION 01 2300
# ALTERNATES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

### 1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
   1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

### 1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
   1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

## PART 2 - PRODUCTS - Not Applicable to This Section

## PART 3 - EXECUTION

### 3.1 SCHEDULE OF ALTERNATES

A. Refer to Accompanying Narrative for Breakdown of Add-Alternate Packages

**END OF SECTION**

**SECTION 01 3000**
**ADMINISTRATIVE REQUIREMENTS**

## PART 1 GENERAL

### 1.1 SUMMARY

A. Administration of Contract: Provide administrative requirements for the proper coordination and completion of work including the following:
   1. Supervisory personnel.
   2. Preconstruction conference.
   3. Project meetings, minimum of two per month; prepare and distribute minutes.

B. Work Schedule: Submit progress schedule, updated monthly.

C. Submittal Schedule: Prepare submittal schedule; coordinate with progress schedule.

D. Schedule of Tests: Submit schedule of required tests including payment and responsibility.

E. Perform Surveys: Lay out the work and verifying locations during construction.

F. Emergency Contacts: Submit and post a list of emergency telephone numbers and address for individuals to be contacted in case of emergency.

G. Record Documents: Submit record drawings and specifications; to be maintained and annotated by Contractor as work progresses.

### 1.2 SUBMITTALS

A. Types of Submittals: Provide types of submittals listed in individual sections and number of copies required below. All submittals are to be submitted digitally via email
   1. Shop drawings, reviewed and annotated by the Contractor – pdf format.
   2. Product data – pdf format.
   3. Samples - as required to indicate range of color, finish, and texture to be expected.
   4. Inspection and test reports – pdf format.
   5. Warranties – Sample Warranty with Product Data, Executed Warranty with Closeout Documents.
   6. Survey Data – As applicable
   7. Closeout submittals – Physical Thumb drive, 2 copies.

B. Submittal Procedures: Comply with project format for submittals. Comply with submittal procedures established by Architect including Architect's submittal and shop drawing stamp. Provide required resubmittals if original submittals are not approved. Provide distribution of approved copies including modifications after submittals have been approved.
   1. Submittals to be titled per the 32-Divisions of CSI,
      a. Example: 08 4313-001-00 – Aluminum Storefront PD
      b. Example: 08 4313-002-00 – Aluminum Storefront Shop Drawings

C. Samples and Shop Drawings: Samples and shop drawings shall be prepared specifically for this project. Shop drawings shall include dimensions and details, including adjacent construction and related work. Note special coordination required. Note any deviations from requirements of the Contract Documents.

D. Requests for Information (RFIs): RFIs are to be submitted with detailed descriptions of the issue(s) and include potential solutions from the contractor for remedying the issue for the Architect’s evaluation and response. RFIs not containing detailed information may be

rejected in part or in whole until the responsible contractor provides the necessary information. The responsible contractor will not dictate the method of response from the Architect, it is at the Architect and/or Design Team's discretion as to the formality of their response. RFIs are to begin at "001"

E. Warranties: Provide warranties as specified; warranties shall not limit length of time for remedy of damages Owner may have by legal statute. The contractor, supplier, or installer responsible for performance of warranty shall sign warranties.

F. Review Periods: Architect and engineers have **10-business days to review submittals**, and **5-business days to review and respond to Requests for Information (RFIs)**. It is the contractor's responsibility to manage the schedule of construction to avoid critical-path issues.

### 1.3 LEED REQUIREMENTS AND SCORECARD

A. Not Applicable

**PART 2 PRODUCTS** - Not Applicable to This Section

**PART 3 EXECUTION** - Not Applicable to This Section

**END OF SECTION**

# SECTION 01 3300
# SUBMITTAL PROCEDURES

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Provide types of submittals listed in individual sections and number of copies required below.

1. Shop drawings, reviewed and annotated by the Contractor – pdf format.
2. Product data – pdf format.
3. Samples - as required to indicate range of color, finish, and texture to be expected.
4. Inspection and test reports - 2 copies.
5. Warranties - 2 copies.
6. Survey data - 2 copies.
7. Closeout submittals - 2 copies.

B. Comply with project format for submittals.

C. Comply with submittal procedures established by Architect including Architect's submittal and shop drawing stamp. Provide required resubmittals if original submittals are not approved. Provide distribution of approved copies including modifications after submittals have been approved.

D. Samples and shop drawings shall be prepared specifically for this project. Shop drawings shall include dimensions and details, including adjacent construction and related work. Note special coordination required. Note any deviations from requirements of the Contract Documents.

E. Provide warranties as specified; warranties shall not limit length of time for remedy of damages Owner may have by legal statute. Warranties shall be signed by contractor, supplier, or installer responsible for performance of warranty.

F. Architect and engineers have 10-business days to review submittals, and 5-business days to review and respond to Requests for Information (RFIs).

**PART 2** - **PRODUCTS** - Not Applicable to This Section

**PART 3** - **EXECUTION** - Not Applicable to This Section

**END OF SECTION**

# SECTION 01 3516

# ALTERATIONS PROJECT PROCEDURES

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Summary: The procedures and administrative requirements of this Section apply to all of the following Sections of the Specification which are involved in alterations to the existing building.

B. Extent Notes: Cut into or partially remove portions of the existing building as necessary to make way for new construction. Include such work as:

1. Cutting, moving or removal of items shown to be cut, moved, or removed.

2. Cutting, moving or removal of items not shown to be cut, moved, or removed, but which must be cut, moved, or removed to allow the new work to proceed. Work or items which are to remain in the finished work shall be patched or reinstalled after their cutting, moving, or removal, and their joints and finishes made to match adjacent or similar work.

3. Removal of existing surface finishes as needed to install new work and finishes.

4. Removal of abandoned items and removal of items serving no useful purpose, such as abandoned piping.

5. Repair or removal of dangerous or unsanitary conditions resulting from alterations work.

C. Patch, match, repair, refinish or reinstall existing items to remain in finished work, to specified condition for each material, with joints and finishes made to match adjacent or similar work.

D. Relocate and reinstall designated existing salvaged materials.

### 1.02 SCHEDULING AND ACCESS

A. Work Scheduling / Sequence:

1. Any work to be performed during hours other than normal business hours (8:00 A.M. to 5:00 P.M. Monday through Friday unless noted otherwise) must have prior approval of the Project Owner / Manager.

B. Maintenance of Access and Operations:

1. During period of construction, the Owner will continue to perform normal activities in existing building. Maintain proper and safe access to the Owner-occupied areas at all times.

2. Schedule demolition and remodeling operations with Owner in such a manner as to allow Owner operations to continue with minimum interruption.

3. During period of construction, do not obstruct in any manner existing exit ways of Owner-occupied areas. Prior to removal of existing exit ways (stairs, corridors, doors) as part of new Work, provide and maintain new exit ways so as to maintain same number of exit ways. Maintain existing fire doors in an operable condition.

C. Maintenance of Existing Services:

1. Maintain environmental control in existing building, especially temperature,

humidity and dust control.

2. Provide temporary lines and connections as required to maintain existing mechanical and electrical services in building.

3. Notify the Property Owner / Manager a minimum of three (3) days prior to each required interruption of mechanical or electrical services in building. Such interruptions shall be only at such times and for lengths of time as approved by the Property Manager. In no event shall interruption occur without prior approval of the Property Manager.

D. Building Access:

1. Contractor shall access building at time designated by Property Owner / Manager.

2. Access to construction areas within building shall be as designated by the Property Manager.

3. Restrict construction traffic to areas specifically designated by Property Manager.

**1.03 ALTERATIONS, CUTTING AND PROTECTION:**

A. Do not start any cutting or alterations work until dust protection is in place.

B. Extent:

1. Cutting and removal work shall be performed so as not to cut or remove more than is necessary and so as not to damage adjacent work.

2. Conduct work in such a manner as to minimize noise and to minimize accumulation and spread of dirt and dust.

3. Perform cutting for ductwork and other rectangular openings with carborundum saw with approved dust arrestor.

4. Drill holes for conduit and piping using core drills.

C. Shoring, Bracing and Capping: Provide shores, needling and bracing as needed to keep building structurally secure and free of deflection in all its parts, and as needed for installation of new structural members. In telephone equipment areas, all shoring shall be wood or other approved nonconductive material, and shall not be secured to, braced from, or supported by telephone equipment or cable racks.

D. Responsibility and Assignment to Trades:

1. Contractor shall assign the work of moving, removal, cutting, patching and repair to trades under his supervision so as to cause the least damage to each type of work encountered, and so as to return the building as much as possible to the appearance of new work.

2. Patching of finish materials shall be assigned to mechanics skilled in the work of the finish trade involved.

E. Protection:

1. Protect remaining finishes, equipment, and adjacent work from damage caused by cutting, moving, removal and patching operations. Protect surfaces which will remain a part of the finished work.

2. Protect existing facilities and features, within designated construction limits and along corridor access route to construction area.

3. Cover existing wall and floor finishes in work areas, in adjacent areas and along corridor access route to prevent damage from product delivery and construction operations. Use same UL listed sheeting material as specified for temporary partitions below.

4. Material to be stored on floor must be placed on 1/4 in. tempered hardboard (Masonite) sheeting or other approved substrate. Do not lean material against walls or equipment.

5. During demolition, cutting and construction, provide positive dust control by wetting dust debris and by completely sealing openings to Owner occupied areas with temporary partitions, so as to prevent spread of dust and dirt to adjacent areas.

6. After materials, equipment and machinery are installed, properly protect Work until final acceptance.

7. Any damage resulting from construction operations shall be repaired by the Contractor without cost to the Owner.

8. All access points to the building shall remain secure. Doors remaining open for a period of time for material delivery or removal shall be protected against unauthorized entry.

F. Salvage:

1. Salvage sufficient quantities of cut or removed material to replace damaged work or patch new work where required. Protect and provide dry, secure storage for items to be reused.

2. Salvage items specifically indicated for salvage and reuse, including:

   a. Existing doors and frames.

   b. Existing access flooring system.

3. Do not incorporate salvaged or used material in new construction, except where small quantities of finish material which are difficult to match or duplicate are approved for patching or extending purposes by Architect or except as specifically indicated.

4. Salvaged items left over after completion of Work shall be disposed of by Contractor, unless scheduled to be turned over to Owner.

**G. Temporary Barricades/Partitions**: Provide and maintain temporary and dust partitions to seal openings to Owner-occupied areas. Provide partitions as required to maintain dust control. Partition locations may or may not be indicated on the Drawings.

1. Type 1 Partitions: (Maintained in place for 30 days or less) Framing: Commercial softwood species, fire-retardant treated in accordance with AWPA C20, and bearing UL Label FR-S. Provide continuous 2 x 4 top and bottom plates, 2 x 4 studs at 24 in. o.c., and continuous 2 x 4 bridging 4 ft. studs may be used. At Contractor's option, drywall metal studs may be used. Provide 3-5/8 in. wide metal studs at 24 in. o.c., with continuous head and floor channels.

   Covering: Central Offices - Griffolyn type 55 FR or Durashield 8000FR reinforced sheeting, listed by Underwriters' Laboratories, Inc., as having a flame spread rating of less than 25 and smoke developed rating of less than 50. Apply double thickness of sheeting, fastened to one side with no-tear fasteners. Tape joints continuously.

   Note: In situations where Type 1 Partitioning will be installed within 2 ft. of existing or proposed telecommunications equipment, the sheeting shall be Griffolyn type 55 ASFR or Durashield 8000ASFR, anti-static, fire retardant sheeting.

2. Type II Partitions: (Maintained in place 18 months or less)

   Framing: (same as Type I above)

   Covering: 1/4 in. thick tempered hardboard or 1/2 in. thick plywood, listed by Underwriters' Laboratories, Inc., as having a flame spread rating of less than 25 and smoke developed rating of less than 50. Apply to one side and fasten to studs with drywall screws at 12 in. o.c., countersunk. Fire-retardant paint or fireproof coating is not required.

3. Type III Partitions: (Maintained in place longer than 18 months)

   Type: One hour fire rated gypsum drywall partition.

Framing: 3-5/8 in. wide metal drywall studs. Provide continuous head and floor runners. Space studs at 24 in. o.c.

Covering: One layer of 5/8 in. thick Type "X" gypsum board each side, fastened to studs and runners with drywall screws at 12 in. o.c. Tape and bed panel joints.

4. Doors: Type I and II Partitions: Single acting doors, opening out, with sturdy closer, closing against gasketed stops on frame to reduce passage of dust. Cover one side of each door with same material as used to cover partitions. Provide ample wood push bars and bump plates.

   Type III Partitions: Fire-resistive door and frame assembly bearing UL "C" Labels, complete, including metal frame, door and hardware.

5. Sealing: Seal perimeter of partitions and doors to prevent passage of dust. At Type I and II partitions, tape fastener depressions, joints between panels and joints between panels and floors, ceilings and columns with 2 in. wide pressure sensitive tape.

6. Mats: Provide mats at doors to reduce tracking of dust. Replace or clean daily.

H. Debris:

1. Remove debris promptly from the site each day.

2. Do not let piled material endanger structure.

3. During cutting and coring operations, use metal lined wood box secured tight against surface, to catch falling debris and water.

**1.04 PATCHING, EXTENDING AND MATCHING:**

A. Skill:

1. Patch and extend existing work using skilled mechanics who are capable of matching the existing quality of workmanship. The quality of patched or extended work shall not be less than that specified in the Sections of the product and execution Specifications which follow these General Requirements.

B. Patching:

1. In areas where any portion of an existing finished surface is damaged, lifted, stained, or otherwise made or found to be imperfect, patch or replace the imperfect portion of the surface with matching material.

2. Provide adequate support or substrate for patching of finishes.

3. If the imperfect surface was a painted or coated one, repaint or recoat the patched portion in such a way that uniform color and texture over the entire surface results.

4. If the surrounding surface cannot be matched, repaint or recoat the entire surface.

C. Quality:

1. In the Sections of the product and execution of Specifications which follow these General Requirements, no concerted attempt has been made to describe each of the various existing products that must be used to patch, match, extend or replace existing work. Obtain all such products in time to complete the Work on schedule. Such products shall be provided in quality which is in no way inferior to the existing products.

2. The quality of the products that exist in the building, as apparent during pre-quotation site visits, shall serve as the Specification requirement of strength, appearance, and other characteristics.

D. Transitions:

1. Where new work abuts or finishes flush with existing work, make the transition as smooth and workmanlike as possible. Patched work shall match existing adjacent work in texture and appearance so as to make the patch or transition invisible to the eye at a distance of no closer than three (3) feet.

2. Where masonry or other finished surface is cut in such a way that a smooth transition with new work is not possible, terminate the existing surface in a neat fashion along a straight line at a natural line of division and provide trim appropriate to the finished surface.

3. Where two or more spaces are indicated to become one space, rework floors and ceilings so that horizontal planes, without breaks, steps or bulkheads result.

4. In cases of extreme change of level (3 in. or more), obtain instructions from Project Manager as to method of making transition. Either stepping, bulkheading, encasement, ramping, sloping or change of transition line shall be employed, or a combination of these, as directed in each case by the Project Manager.

E. Matching:

1. Restore existing work that is damaged during construction to a condition equal to its condition at the time of the start of the Work.

2. At locations in existing areas where partitions are removed, patch the floors, walls and ceilings with finish materials to match adjacent finishes.

F. Overall Requirement that the Work Be Complete:

1. Where a product or type of construction occurs in the existing building, and it is not specified as a part of the new work, provide such products or types of construction as needed to patch, extend or match the existing work.

2. These Specifications will generally not describe existing products or standards of execution, nor will they enumerate products which are not a part of the new construction. The existing product is its own specification.

3. The presence of any product or type of construction in the old work shall cause its patching, extending, or matching to be performed, as necessary to make the work complete and consistent, to identical standards of quality.

**1.05 REPAIR:**

A. Replace work damaged in the course of alterations, except at areas approved by the Project Manager for repair.

B. Where full removal of extensive amounts of almost-suitable work would be needed to replace damaged portions, then filling, spackling, straightening, and similar repair techniques, followed by full painting of other finishing, will be permitted.

C. If the repaired work is not brought up to the standard for new work, the Project Manager will direct that it be cut out and replaced with new work.

**1.06 FIRESTOPPING:**

A. Where existing fire-rated partitions, walls or floors are penetrated by new work, each trade providing such new work shall seal around penetrating conduit, pipe, duct or sleeve in accordance with manufacturer's printed instructions and specifications.

B. Refer to Section 07840 – Firestopping (if applicable)

**1.07 CLEANING:**

A. Each Successive Trade:

1. As each trade finishes its work on each part of the alterations work and related new work, it shall clean up its work areas and make work surfaces ready for the work of the succeeding trades.

2. Spillage, overspray, collections of dust or debris, and damage to Owner-occupied spaces shall be cleaned or remedied immediately by the responsible trade.

B. Each Area as it is Completed:

1. As soon as work in each area of the alterations is complete, clean up all surfaces, remove equipment, salvage and debris, and return in condition suitable for use by the Owner as quickly as possible.

**PART 2 – PRODUCTS –** Not Applicable to this Section

**PART 3 – EXECUTION –** Not Applicable to this Section

**END OF SECTION**

# SECTION 01 4000
# QUALITY REQUIREMENTS

## PART 1 GENERAL

### 1.1 SUMMARY

A. Quality Monitoring: Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality. Perform quality control procedures and inspections during installation.

B. Standards: Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

C. Tolerances: Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate. Comply with manufacturers' tolerances.

D. Reference Standards: For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

E. Manufacturer's Field Services: When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to perform the following as applicable, and to initiate instructions when necessary.
1. Observe site conditions.
2. Conditions of surfaces and installation.
3. Quality of workmanship.
4. Start-up of equipment.
5. Test, adjust and balance of equipment.

**PART 2 PRODUCTS** - Not Applicable to This Section

**PART 3 EXECUTION** - Not Applicable to This Section

**END OF SECTION**

# SECTION 01 45 00
# QUALITY CONTROL

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Examine the Contract Documents and become thoroughly acquainted with the detailed material and workmanship requirements.

C. Comply with requirements of the Building Code of the State of Rhode Island for quality, workmanship and requirements for all materials.

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality-control and testing services.

B. Quality-control services include inspections, tests, reports and related actions performed by Contractor, independent agencies, governing authorities, engineers hired by the Owner and engineers employed by the Contractor.

C. Inspection and testing services are mandated by the laws and Building Code of the State of Rhode Island and are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with regulatory or Contract Document requirements.

D. Statement of Special Inspections and Contractor’s Statement of Responsibility follow this Section.

### 1.3 RESPONSIBILITIES

A. Special Inspection: The Owner shall select a Special Inspection Firm and pay for all Special Inspection Services, except as noted herein. The Contractor shall provide, be responsible for, and pay for the services for testing for
   1. As Determined in Specification Sections Herein.

B. The Contractor shall provide a Site Safety Program or Plan during all phases of construction.

C. Inspection and Testing Responsibilities other than those mandated by the State of Rhode Island as Special Inspections: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services are included in the Contract Sum.

   1. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Contractor's responsibility, the Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are included in the Contract Sum.
   2. Where individual Sections specifically indicate that certain inspections, tests, and other

quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.

a. Where the Owner has engaged a testing agency for testing and inspecting part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless agreed to in writing by the Owner.

3. The costs of the following tests and inspections shall be accounted for separately and reported to the Owner.
   a. Tests and inspection of materials and workmanship not conforming to contract requirements.
   b. Tests and inspection necessitated by any other noncompliance with contract requirements.
   c. Acceptance tests for materials because of changes in properties or changed sources.
   d. Costs of inspector's time and expenses wasted because of cancellations or delays of the work.
   e. Tests and services of inspectors required by a public authority.
   f. Energy performance inspections and test required to demonstrate compliance with Enterprise Green Communities certification Mandatory Building Performance Standard criteria.

B. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.

1. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.
2. No part of the time lost to retesting shall be made the subject of a claim for extension of time or for excess cost or damages by the Contractor

C. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:

1. Provide access to the Work.
2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
4. Provide facilities for storage and curing of test samples.
5. Deliver samples to testing laboratories.
6. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
7. Provide security and protection of samples and test equipment at the Project Site.

D. Duties of the Testing Agency: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the agency's duties.

1. The Testing Laboratory shall make all necessary arrangements with the General Contractor to ensure the presence of the required inspectors at all contract operations specified to be included under the Testing and Inspection Agreement. The General Contractor shall notify the Testing Laboratory a reasonable time in advance (not less than

24 hours) of the time when operations requiring inspection or testing are scheduled to start.
2. Provide necessary personnel, equipment and facilities for tests and inspection. Personnel shall be experienced and competent in their particular specialties.
3. The Testing Laboratory shall conduct its work so as not to cause a delay in the progress of construction. Any non-compliance with the Contract Documents shall be immediately reported to the General Contractor and the Architect.
4. The agency shall notify the Architect and the Contractor promptly of irregularities or deficiencies observed in the Work during the performance of its services.
5. Nothing herein specified permits the Testing Laboratory to allow the General Contractor to deviate from the requirements of the Contract Documents.
6. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
7. The agency shall not perform any duties of the Contractor.

E. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.
2. A complete set of Drawings and Specifications for the project work will be made available by the Owner at the project site. The Testing Laboratory personnel shall become thoroughly familiar with all provisions of these documents which apply for the testing and inspection services.

## 1.4 SUBMITTALS

A. Qualifications: Submit qualifications of testing laboratories proposed for use for approval.

B. Schedule: Submit a schedule of required tests and inspections for review.

C. Reports: Unless the Contractor is responsible for this service, the independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
    a. Date of issue, Project Title, and Project Number
    b. Name, address, and telephone number of testing agency.
    d. Dates and locations of samples and tests or inspections.
    e. Names of individuals making the inspection or test.
    f. Designation of the Work and test method.
    g. Identification of product and Specification Section.
    h. Complete inspection or test data.
    i. Test results and an interpretation of test results.
    j. Ambient conditions at the time of sample taking and testing.
    k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
    l. Name and signature of laboratory inspector.

m. Recommendations on retesting.

## 1.5 QUALITY ASSURANCE

A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

## 1.6 REFERENCE

A. American Society for Testing and Materials: ASTM E. 329-77: Inspection and Testing Agencies for Concrete Steel and Bituminous Materials as used in Construction.

B. Wherever the source or characteristics of materials change, or the quality of materials provided indicates lack of compliance with contract requirements, full or partial acceptance tests shall be performed as directed by the Structural Engineer of Record through the Architect.

**PART 2 - PRODUCTS** – Not Applicable to this Section

**PART 3 - EXECUTION**

## 3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:
1. Date of test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to applicable Engineer and Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Engineer’s, Architect’s and Construction Manager’s (if applicable) reference during normal working hours.

## 3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
2. Comply with the Contract Documents requirements for Division 01 Section “Cutting and Patching”.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are the Contractor’s responsibility, regardless of the assignment of responsibility for quality-control services.

**END OF SECTION**

# SECTION 01 5000
# TEMPORARY FACILITIES AND CONTROLS

## PART 1 GENERAL

### 1.1 SUMMARY

A. Temporary Services: Provide temporary services and utilities, including payment of utility costs including the following, as applicable to the project.
   1. Water (potable and non-potable).
   2. Lighting and power.
   3. Metering.
   4. Telephone.
   5. Toilet facilities.
   6. Materials storage.

B. Construction Facilities: Provide construction facilities, including payment of utility costs including the following, as applicable to the project.
   1. Construction equipment.
   2. Dewatering and pumping.
   3. Enclosures.
   4. Heating.
   5. Lighting.
   6. Elevator.
   7. Access.
   8. Roads.

C. Security and Protection: Provide security and protection requirements including the following, as applicable to the project.
   1. Fire extinguishers.
   2. Site enclosure fence, barricades, warning signs, and lights.
   3. Building enclosure and lock-up.
   4. Temporary jobsite protection.
   5. Environmental protection.
   6. Pest control during and at the end of construction.
   7. Snow and ice removal if applicable.

D. Personnel Support: Provide personnel support facilities including the following, as applicable to the project.
   1. Architect's field office with telephone, fax and data connection.
   2. Contractor's field office.
   3. Sanitary facilities.
   4. Drinking water.
   5. Project identification sign.
   6. Cleaning.

**PART 2 PRODUCTS** - Not Applicable to this Section

**PART 3 EXECUTION** – Not Applicable to this Section

**END OF SECTION**

# SECTION 01 6000
# PRODUCT REQUIREMENTS

## PART 1 GENERAL

### 1.1 SUMMARY

A. Manufacturers: Provide products from one manufacturer for each type or kind as applicable. Provide secondary materials as acceptable to manufacturers of primary materials.

B. Product Selection: Provide products selected or “equal” approved by Architect. Products submitted for substitution shall be submitted with complete documentation and include construction costs of substitution including related work. It is the responsibility of the contractor to “prove” the product substitution can be considered “an equal”

C. Substitutions: Request for substitution must be in writing. Conditions for substitution include:
1. An 'or equal' phrase in the specifications.
2. Specified material cannot be coordinated with other work.
3. Specified material is acceptable to authorities having jurisdiction.
4. Substantial advantage is offered to the Owner in terms of cost, time, or other valuable consideration.

D. Substitution Requests: Substitutions shall be submitted prior to award of contract, unless otherwise acceptable. Approval of shop drawings, product data, or samples containing substitutions is not an approval of a substitution unless an item is clearly presented as a substitution at the time of submittal.

**PART 2 PRODUCTS** - Not Applicable to this Section

**PART 3 EXECUTION** - Not Applicable to this Section

**END OF SECTION**

# SUBSTITUTION REQUEST
**(After the Bidding/Negotiating Phase)**

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Installer: _____ Address: _____ Phone: _____

History: ☐ New product ☐ 1-4 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

_____

_____

☐ Point-by-point comparative data attached — REQUIRED BY A/E

Reason for not providing specified item: _____

_____

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

_____

Savings to Owner for accepting substitution: _____ ($ _____).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

© Copyright 2013, CSI,
110 S. Union St., Suite 100, Alexandria, VA 22314



Form Version: September 2013
CSI Form 13.1A

# SECTION 01 6350

# SUBSTITUTION PROCEDURES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Sections:

1. Division 01 Section "Allowances" for products selected under an allowance.
2. Division 01 Section "Alternates" for products selected under an alternate.
3. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
4. Divisions 02 through 32 Sections for specific requirements and limitations for substitutions.

### 1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer an advantage to Contractor or Owner (IE. Schedule Improvements and/or Cost Savings).

### 1.4 SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use **CSI Form 13.1A** (included following this section)
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
   a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
   b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
   c. Detailed comparison of ALL qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Qualities may include, but are not limited to attributes such as performance, weight, size, durability, visual effect, aesthetic characteristics, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
   d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
   e. Samples, where applicable or requested.
   f. Certificates and qualification data, where applicable or requested.

g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from **manufacturer, on manufacturer's letterhead**, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within fourteen days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within **15** days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
   a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
   b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

## 1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

## 1.6 PROCEDURES

A. Coordination: Modify or adjust affected work as necessary to integrate the work of the approved substitutions.

# PART 2 - PRODUCTS

## 2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
   1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
      b. Substitution request is fully documented and properly submitted.
      c. Requested substitution will not adversely affect Contractor's construction schedule.
      d. Requested substitution has received necessary approvals of authorities having jurisdiction.
      e. Requested substitution is compatible with other portions of the Work.

f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within **60 days after the Notice of Award**. Requests received after that time may be considered or rejected at the sole discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
   a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
   b. Requested substitution does not require extensive revisions to the Contract Documents.
   c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
   d. Substitution request is fully documented and properly submitted.
   e. Requested substitution will not adversely affect Contractor's construction schedule.
   f. Requested substitution has received necessary approvals of authorities having jurisdiction.
   g. Requested substitution is compatible with other portions of the Work.
   h. Requested substitution has been coordinated with other portions of the Work.
   i. Requested substitution provides specified warranty.
   j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

**PART 3 - EXECUTION – Not Applicable to this Section**

**END OF SECTION**

# SECTION 01 7000
# EXECUTION & CLOSEOUT REQUIREMENTS

## PART 1 GENERAL

### 1.1 SUMMARY

A. Substantial Completion: The following are prerequisites to substantial completion. Provide the following.
   1. Punch list prepared by Contractor and subcontractors as applicable.
   2. Supporting documentation.
   3. Warranties.
   4. Certifications.
   5. Occupancy permit.
   6. Start-up and testing of building systems.
   7. Change over of locks.
   8. Meter readings.
   9. Commissioning documentation.

B. Final Acceptance: Provide the following prerequisites to final acceptance.
   1. Final payment request with supporting affidavits.
   2. Completed punch list.

C. As-Built Drawings: Provide a marked-up set of drawings including changes, which occurred during construction.

D. Project Closeout: Provide the following during project closeout.
   1. Submission of record documents.
   2. Submission of maintenance manuals.
   3. Training and turnover to Owner's personnel.
   4. Final cleaning and touch-up.
   5. Removal of temporary facilities.

## PART 2 PRODUCTS - Not Applicable to This Section

## PART 3 EXECUTION

### 3.1 CUTTING AND PATCHING

A. Cutting and Patching: Provide cutting and patching work to properly complete the work of the project, complying with project requirements for:
   1. Structural work.
   2. Mechanical/electrical systems.
   3. Visual requirements, including detailing and tolerances.
   4. Operational and safety limitations.
   5. Fire resistance ratings.
   6. Inspection, preparation, and performance.
   7. Cleaning.

B. Means and Methods: Do not cut and patch in a manner that would result in a failure of the work to perform as intended, decrease energy performance, increase maintenance, decrease operational life, or decrease safety performance.

C. Inspection: Inspect conditions prior to work to identify scope and type of work required. Protect adjacent work. Notify Owner of work requiring interruption to building services or Owner's operations.

D. Performance of Operations: Perform work with workmen skilled in the trades involved. Prepare sample area of each type of work for approval.

E. Cutting: Use cutting tools, not chopping tools. Make neat holes. Minimize damage to adjacent work. Inspect for concealed utilities and structure before cutting.

F. Patching: Make patches, seams, and joints durable and inconspicuous. Comply with tolerances for new work.

G. Cleaning: Clean work area and areas affected by cutting and patching operations.

**END OF SECTION**

# SECTION 01 9000
# LIFE CYCLE ACTIVITIES

## PART 1 GENERAL

### 1.1 SUMMARY

A. Commissioning: Provide commissioning of building systems, subsystems and equipment including:
   1. HVAC components and equipment.
   2. Building automation systems.
   3. Lighting control systems.

B. Commissioning Agent: The Owner will engage a commissioning agent to prepare a commissioning plan and report, and to perform functional tests and inspections of building systems.

C. Cooperation: Cooperate with the Owner's commissioning agent, including attendance at commissioning meetings and activities, coordinating scheduling, access to the work and utility services for commissioning activities.

D. Access: Provide access to project documentation, shop drawings, wiring diagrams, operations and maintenance manuals and similar items when requested by the Owner's commissioning agent.

E. Remedial Work: Modify, adjust, balance, repair or replace systems, subsystems and equipment which does perform to code requirements or to requirements specified in the Contract Documents at no additional expense to the Owner. Pay for retesting and additional modifications until satisfactory results are obtained.

**PART 2 PRODUCTS** - Not Applicable to This Section

**PART 3 EXECUTION** - Not Applicable to This Section

**END OF SECTION**

**SECTION 01 91 13**

**GENERAL COMMISSIONING REQUIREMENTS**

PART 1 Commissioning is a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meet defined objectives and criteria. The Commissioning process begins at project inception (during the pre-design phase) and continues through the life of the facility. The commissioning process includes specific tasks to be conducted during each phase in order to verify that design, construction, and training meet the Owner's Project Requirements.

PART 2 The Goals of the Commissioning Process are to:

2.1 Verify that applicable equipment and systems are installed according to the contract documents, manufacturer's recommendations, and industry accepted minimum standards, and that they receive adequate operational checkout by installing contractors.

2.2 Verify and document proper performance of equipment and systems.

2.3 Verify that O&M documentation left on site is complete.

2.4 Verify that the owner's operating personnel are adequately trained.

2.5 Comply with the requirements for Commissioning services by the Rhode Island Department of Education (RIDE) and the Northeast Collaborative for High Performance Schools (NE-CHPS)

PART 3 The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions, Division 1, and other trade specific specification sections shall apply to this section.

B. Owner's Project Requirements and Basis of Design documents are included by reference for information only.

C. ASHRAE Guideline 0-2005, The Commissioning Process

1.3 SUMMARY

A. This section includes general requirements that apply to the implementation of the commissioning process without regard to specific systems, assemblies, and components.

B. Related sections include the following:1. Section 01 33 00 Submittal Procedures 2. Section 01 78 23 Operation and Maintenance Data 3. Section 01 79 00 Demonstration and Training 4. Section 22 08 00 Commissioning of Plumbing Systems 5. Section 23 08 00 Commissioning of HVAC Systems 6. Section 26 08 00 Commissioning of Electrical Systems 7. Division 22 Plumbing 8. Division 23 Heating Ventilating and Air Conditioning 9. Division 26 Electrical 10. Division 28 Electronic Safety and Security

1.4 DEFINITIONS

A. Acceptance - A formal action, taken by a person with appropriate provider (which may or may not be contractually defined) to declare that some aspect of the project meets defined requirements, thus permitting subsequent activities to proceed.

B. Approval - Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the contract documents.

C. Basis of Design - A document that records the concepts, calculations, decisions, and product selections used to meet the Owner’s Project Requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

D. Checklists, Construction Checklists, Installation Checklists, or Pre-Functional Checklists - Checklists that are developed by the CxA and completed by the Construction Team during all phases of the construction process to verify that materials, equipment, assemblies, and systems are installed in accordance with the Contract Documents.

E. Commissioning Authority or Agent (CxA) - The entity identified by the owner who leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process.

F. Commissioning Plan (CxP) - A document developed by the CxA that outlines the organization, schedule, roles and responsibilities, and documentation requirements of the Commissioning Process. The CxP is initially developed in the design phase and updated throughout the construction and closeout process.

G. Commissioning Process - A quality-focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner's Project Requirements.

H. Commissioning Team - The individuals who through coordinated actions are responsible for implementing the commissioning process.

I. Data logging -The monitoring and recording of flows, currents, status, pressures, etc., of equipment using stand-alone data recorders separate from the control system or the trending capabilities of control systems.

J. Deferred Performance Tests (DPTs) - Performance tests that are performed, at the discretion of the CxA, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design, or other site conditions that disallow the test from being performed.

K. Deficiency, Non-Compliance, Non-Conformance - A condition in the installation or function of a component, piece of equipment, or system that is not in compliance with the contract documents.

L. Factory Testing - Testing of equipment on-site or at the factory, by factory personnel, with or without an owner's representative present.

M. Issues Log - A formal and ongoing record of problems or concerns – and their resolution – that have been raised by members of the commissioning team during the course of the commissioning process.

N. Owner's Project Requirements - A written document that details the functional requirements of a project and the expectations of how it will be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. This is also referred to as the Project Intent or Design Intent.

Pre-Functional Testing – testing performed by the contractors to verify complete system operation and system readiness.

Quality Based Sampling - A process for evaluating a sub-set (sample) of the total population. The sample is based upon a known or estimated probability distribution of expected values; an assumed statistical distribution based upon data from a similar product, assembly, or system; or a random sampling that has scientific statistical basis.

Seasonal Performance Tests - Performance tests that are deferred until the system(s) will experience conditions closer to their design conditions based on weather conditions.

Startup - The initial starting or activating of dynamic equipment, including completing construction checklists.

Systems Manual - A system-focused composite document that includes the operation manual, maintenance manual, and additional information of use to the owner during the occupancy and operations phase.

Functional Performance Test (FPT) - A protocol written by the CxA that defines methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems. Performance testing includes the dynamic functions and operations of equipment and systems using manual or monitoring methods under various levels of operation. Systems are tested under various modes, such as during low cooling loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to respond as the sequences state.

Training Plan or Instruction Program - A written document that details the expectations, schedule, and deliverables related to the training of project operating and maintenance personnel, users, and occupants.

Verification - The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the Owner's Project Requirements.

Trending – The monitoring, by a building management system or other electronic data gathering equipment, and analyzing of the data gathered over a period of time.

1.5 COORDINATION

A. Coordination of the Cx process is the responsibility of all Cx Team members.

B. The CxA coordinates the commissioning activities through the construction manager or general contractor. All members shall work together to fulfill their contracted responsibilities and meet the objectives of the contract documents.

C. The CxA, through the Owner or CM, will provide sufficient notice to the contractor for scheduling commissioning activities with respect to the Owner's participation. The CM will integrate all commissioning activities into the overall project schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

1.6 REMOBILIZATION AND RETESTING FEES

A. In general, CxA testing will include one test of each system or equipment. The cost of any additional testing will be submitted to the Owner for review and direction. Following Owner review, the cost for additional testing to verify that performance is in accordance with the design intent may be deducted from the Contractor's final payment by the Owner.

B. In the event that a CxA site visit is scheduled in advance with the Contractor and testing is unable to be performed through no fault of the Owner and the CxA is not notified within 48 hours, the cost of the travel and time will be deducted from the contractor's final payment by the Owner.

1.7 COMMISSIONING PLAN

A. Commissioning during construction begins with an initial commissioning meeting conducted by the CxA where the commissioning process is reviewed with the project commissioning team members. This meeting shall be scheduled by the CM. Generally, the initial Cx Meeting will be scheduled within 60 days of the award of contracts related to commissioned systems and equipment.

B. Additional meetings will be required throughout construction, scheduled by the CxA, through the owner or CM, with necessary parties attending to plan, scope, coordinate, schedule future activities, and resolve problems. In general these meetings will be monthly with the frequency increasing towards substantial completion to accommodate start-ups, balancing, scheduling testing, and training.

C. The CxA reviews submittals for commissioned equipment and systems parallel with the Design Team for compliance with the OPR.

D. The construction checklists, developed by the CxA, are to be completed by the contractor (or its subcontractors), before and during the startup process and verified by the CxA.

E. The CxA witnesses selected assembly mock-ups, equipment, and system start-ups.

F. The CxA develops equipment and system functional performance test (FPT) procedures. The FPT's are executed by the contractor and witnessed and documented by the CxA.

G. The CxA reviews the O&M documentation for completeness.

H. The CxA coordinates the training plan provided by the contractor.

I. Deferred performance testing will be conducted as required.

1.8 COMMISSIONING TEAM

A. Members appointed by Contractor(s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of each contractor, including project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members appointed by Owner:

1. CxA - An entity identified by the owner who leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.

2. Representatives of the facility Users and Operation and Maintenance personnel.

3. Architect and engineering design professionals.

1.9 RESPONSIBILITIES

Understanding and defining the roles of each participant are vital to the success of the Commissioning Process. This provides an outline of the responsibilities of each participant in the Commissioning Process. These responsibilities are typically formalized in the contracts between the Owner and the various parties and this section is not intended to supersede or negate any contracted relationships.

A. Owner (or Designated Representative)

1. Include the design professionals' Commissioning related responsibilities and scope of work in the design request for proposal and contract.

2. Oversee the development of the Owner's Project Requirements and approve any changes.

3. Designate a representative, ideally from the building's operations and maintenance team, to participate in the Commissioning Process including: a. Design Phase coordination meetings b. Construction Phase coordination meetings c. Informal owner-training as equipment is installed and started d. Maintenance orientation and inspections e. System

testing and verification meetings f. Functional procedure review meetings before testing of systems g. Training sessions h. Verification demonstrations i. Systems and assemblies tests j. Final review at acceptance meeting

4. Review and approve any changes made to the Owner's Project Requirements.

5. Review, comment on, and accept the Commissioning Authority's progress and final reports.

B. Commissioning Authority (CxA)

C. The Commissioning Authority is responsible to verify that the Owner's Project Requirements for the project are satisfactorily achieved. The CxA leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process. Specific tasks performed by the CxA include: Design Phase 1. Assemble a commissioning team, hold a scoping meeting and identify responsibilities. 2. Attend commissioning meetings as needed with project coordinator and design team. 3. Review the Owner's Project Requirements for clarity and completeness. 4. Develop and update the design phase commissioning plan. 5. Perform focused review of the design, drawings and specifications at various stages of development (during design development and contract document phases) as required. 6. Review the development and maintenance of the Basis of Design documentation by design team members. 7. Develop a draft construction phase commissioning plan using an Owner-approved outline. 8. Develop full commissioning specifications for all commissioned equipment. Coordinate with and integrate into the specifications of the architect and engineers. The specifications will be consistent in content, rigor and format to the referenced standards. a. A detailed description of the responsibilities of all parties. b. Details of the commissioning process. c. Reporting and documentation requirements, including formats; alerts to coordination issues, deficiency resolution; construction checklist and start up requirement.

10.

Coordinate control integration meetings where the owner, electrical engineers, mechanical engineers and CxA discuss integration issues between equipment, systems and disciplines to ensure that integration issues and responsibilities are clearly described in the specifications.

Review documents and responses from A/E to ensure that all previous comments have been addressed by the appropriate party.

The functional testing process. Specific functional test requirements, including testing conditions and acceptance criteria for each piece of equipment being commissioned.

Bid Phase 1. Answer commissioning related questions throughout the bid process.

Construction Phase

1. Perform the tasks and functions to be incorporated in the specifications ascribed to the CxA.

2. Coordinate and direct the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties.

3. Coordinate the commissioning work, with the Construction Manager, Contractor, Architect and Owner's representatives to ensure that commissioning activities are being scheduled into the master schedule.

4. Revise the construction phase commissioning plan developed during the design phase as required to include refined scope and schedule.

5. Plan and conduct commissioning meetings and distribute minutes.

6. Request and review information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures. Before startup, gather and review current control sequence and interlocks. Work with the architect so that the CxA/A/E comments are combined into one review submitted to the contractor.

7. Review coordination drawings to ensure that trades are making a reasonable effort to coordinate work. Coordinate submittal review with the architect so that the CxA/A/E comments are combined into one review submitted to the contractor.

8. Write and distribute construction checklists for commissioned equipment.

9. Develop an enhanced start-up and initial systems checkout plan with contractors for selected equipment.

10. Perform site visits to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.

11. Witness initial HVAC piping pressure test and flushing efforts to be confident that proper procedures were followed in accordance with specifications.

12. Witness select ductwork testing and cleaning sufficient to be confident that proper procedures were followed in accordance with specifications. Include documentation in the Commissioning Record.

13. Provide construction checklists for equipment/systems within the scope of work to the contractors.

14. Document construction checklist completion by reviewing completed checklists and by site observation.

15. Document system startup by reviewing start-up reports and by selected site observations.

16. Approve air and water systems balancing by spot testing and by reviewing completed reports and by selected site observation. Coordinate submittal review with the architect so that the CxA/A/E comments are combined into one review submitted to the contractor.

17. With assistance and review from the installing contractor, CxA will write functional performance test procedures for equipment and systems.

Analyze functional performance trend logs and monitoring data to verify performance. Coordinate, witness and document manual functional performance tests performed by installing contractors. Maintain a master issues log and report all issues as they occur directly to the Owner's representative and the architect.

Review equipment warranties to ensure that the Owner's responsibilities are clearly defined. Oversee and approve the training of the Owner's operating personnel. Review and approve the preparation of the O&M manuals for commissioned equipment. Coordinate submittal review with the architect so that the CxA/A/E comments are combined into one review submitted to the contractor.

Compile a final commissioning Report, which shall include:

a. A brief summary report that includes a list of participants and roles, brief building description, overview of commissioning and testing scope, and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the CxA regarding the adequacy of the equipment, documentation and training meeting the contract documents in the following areas: 1) Equipment meeting the equipment specifications 2) Equipment installation 3) Functional performance and efficiency 4) Equipment documentation 5) Operator training

b. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non- compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented.

c. Also included in the Commissioning Record shall be the issues log, commissioning plan, progress reports, submittal and O&M manual reviews, training record, test schedules, construction checklists, start-up reports, functional tests, and trend log analysis.

Comply with the requirements of any applicable green-building rating systems (i.e. LEED, High Performance Buildings, Green Guide for Healthcare, etc.).

Period Coordinate and supervise required opposite season or deferred testing as needed. Return to the site at 10 months warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interview facility staff and identify problems or concerns they have with operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports and documents and requests for services to remedy outstanding problems. The CxA is not responsible for correcting deficiencies.

D. Design Team

The primary role of the Design Team is to translate the Owner's Project Requirements into a complete design. Relative to commissioning, the design team's responsibilities vary depending on the specific project and contract, but may include:

1. Participate in the development and documentation of the initial Owner's Project Requirements.
2. Document revisions to the Owner's Project Requirements as approved by the Owner.
3. Document the Basis of Design.
4. Integrate the Commissioning Process requirements provided by CxA in the Contract Documents.
5. Respond to Commissioning Team design review comments.
6. Adequately detail the Operations and Maintenance of the systems and assemblies in Contract Documents.
7. Review and incorporate the CxA's comments from submittal reviews.
8. Participate in the initial Operation and Maintenance personnel training sessions. Include a presentation of the project's Basis of Design and descriptions of the associated systems.
9. Review functional test procedures.
10. Review the CxA's reports and logs and comment as appropriate.
11. Review and comment on the final Cx Report.

Construction Manager

The Construction Manager provides management, technical, and administrative expertise during the Construction phase to ensure the building Owner's goals relating to schedule and quality are met. The Construction Manager's responsibilities related to the Commissioning Process typically include:

1. Include any costs for Commissioning Process activities in the contract price. 2. Include Commissioning Process requirements and activities in all contractors'

contracts. 3. Include Cx-related milestones in the construction schedule. 4. Ensure necessary accessibility to all equipment to allow for proper operation and

maintenance of the building. 5. Provide individuals with the required background and authority to implement the

Commissioning Process activities as outlined in the Contract Documents. 6. Issue a statement at the end of the project certifying that all work has been completed

in accordance with the Contract Documents and the facility is operational. 7. Respond to Commissioning Process reports and correct deficiencies identified during

installation verification or functional testing. 8. Review and comment on the final Cx Report.

Contractors

Many different contractors will be involved in the Commissioning Process. The various contractors may include the building contractors (general, mechanical and electrical), the testing, adjusting, and balancing contractor, the building automation system contractor and others as required by the contract documents. As a member of the Commissioning Team, the responsibilities of the various building contractors include:

1. Include any costs for Commissioning Process activities in the contract price. 2. Include Commissioning Process requirements and activities in all subcontracts or

equipment purchases. 3. Ensure the cooperation and participation of all subcontractors and manufacturers of

equipment or systems to be commissioned. 4. Attend Commissioning Team meetings. 5. Include Cx-related milestones in the construction schedule. 6. Implement the training program as described in the Contract Documents. Coordinate

related activities with the CxA. 7. Provide submittals to the Owner, Design Team, and CxA as detailed in the Contract

Documents. 8. Respond to and resolve issues identified in the Cx Issues Log. 9. Notify the CxA when systems and assemblies are ready for installation verification

and testing. For repetitive assemblies, notify the CxA upon the completion of the prototype for a First Piece or Mock-Up review.

10. Complete system and equipment checklists developed by the CxA. Complete the Checklists as the work is completed. Provide completed copies to the CxA at regular intervals for verification.

11. Complete Pre-Functional test procedures. Functional testing will not take place until all Pre-Functional Tests have been fully executed.

12. Functional testing. Once pre-functional tests are complete, functional test verification will be scheduled and demonstrated in the presence of the CxA.

13. Maintain the Project Record Documents in accordance with the requirements of the Contract Documents.

Manufacturers

The suppliers of major equipment are required to support the Commissioning Team in the following manner:

1. Provide all information required for the proper Start-up and Operation and Maintenance of the system or assembly in the initial submittal, as detailed in the Contract Documents.

2. A qualified technician fluent in the programming and system operation (not a salesman) shall attend and participate in controls integration meetings to discuss how equipment with unitary or packaged controls will be integrated into the facility's central Building Management Control System (BMCS). All aspects of equipment controls will be discussed and defined to ensure

compliance with the overall design intent. At a minimum the following will be discussed: communication protocols, integration with the BMCS, monitoring points, controllability, sequence of operations, alarming, etc...

3. Provide the requirements to maintain the warranty in the initial submittal, as detailed in the Contract Documents.

4. Coordinate and provide results of all factory tests required in the Contract Documents.

5. Participate in the training process as detailed in the Contract Documents.

6. Demonstrate operation and performance of equipment and assemblies as detailed in the Contract Documents.

7. A qualified technician will be on site as needed to support testing and balancing, controls integration with the BMCS, and functional testing of their equipment.

Operations and Maintenance Staff

The Operations and Maintenance staff will participate in the Commissioning Process in the following areas: 1. Define Operations and Maintenance related requirements of the building. 2. Participate in design review for O&M impacts.

3. Review maintenance manual, record drawing and documentation requirements developed by the Design Team.

4. Define training program requirements. 5. Participate/witness functional performance testing. 6. Attend contractor and vendor training sessions.

1.10 EQUIPMENT/SYSTEMS TO BE COMMISSIONED A. The following equipment/systems will be commissioned in this project:

HVAC Systems: Heating, ventilation, air conditioning and refrigeration systems and associated controls Plumbing: Domestic hot water system

Electrical: Lighting and daylighting controls Building Automation and Controls: Interface of these systems with HVAC systems

PART 2 PRODUCTS 2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required performance testing shall be provided by the contractor for the equipment being tested. This includes, but is not limited to, two-way radios, meters, and data recorders. Data recorders may be provided by the CxA at the option of the CxA.

B. Special equipment, tools, and instruments required for testing equipment according to these contract documents shall be included in the contractor’s base bid price and shall be turned over to the owner at Project close-out.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance within the tolerances specified in the specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration to NIST traceable standards within the past year to an accuracy of 0.5 degree F and a resolution of + or - 0.1 degree F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 EXECUTION

. 3.1 OVERVIEW Through the Construction Phase of the project, it is the responsibility of the CxA to coordinate and direct the Commissioning Process activities in a logical, sequential, and efficient manner using protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties.

. 3.2 CONDUCT PRE-CONSTRUCTION MEETING The Pre-Construction Meeting is an opportunity for the CxA to meet with the Construction Team and discuss the general Commissioning Process. It is the ideal time to identify Commissioning Team members, discuss the integration of the Commissioning Process Schedule with the Construction Schedule, review the submittal review requirements, review the inspection and testing process, and develop the formal lines of communication between all parties.

. 3.3 CONDUCT REGULAR COMMISSIONING MEETINGS Once the Commissioning Team (Cx Team) has been formed, regular Commissioning Meetings are held. These meetings vary in frequency based upon the activity level at the time, but will generally be held monthly and will be coordinated to coincide with Construction Meeting days for convenience. At the Commissioning Meetings, past Commissioning Process activities are reviewed, future Commissioning Process activities are planned and coordinated, Commissioning documentation is requested and exchanged, and the Commissioning Schedule is updated and integrated into the Construction Schedule. The CxA will request all documentation necessary to develop the installation checklists, requirements for equipment start-ups, pre-functional and

functional performance tests at these meetings and review the draft versions of these documents with the contractors that are responsible for implementing them. The CxA leads these meetings, records the minutes, and distributes the minutes with action items to all Cx Team members.

. 3.4 CONTRACTOR SUBMITTAL REVIEW The CxA will review the Contractor submittals coincident with the Design Team and provide comments to the Design Team for inclusion with their review so a single set of review comments can be provided to the Contractors. The reviewed submittals will include commissioned equipment and coordination drawings that include commissioned equipment and systems, control drawings and sequences, and interfaces and interlocks between systems. In addition, the CxA will periodically review the final Design Team comments to ensure a quality review process. The review will focus on operations, maintenance, and commissioning related issues with the goal of ensuring the submitted equipment complies with the Owner's Project Requirements. The CxA review will NOT include a detailed review of system capacities, sizes, and other technical data that are the responsibility of the Engineer of Record. CxA submittal reviews will frequently request additional information from the Contractors,

including specific operations and maintenance data, performance curves, and targeted coordination drawings for areas of concern.

. 3.5 MAINTAIN ISSUES LOGS Throughout the Construction Process, the CxA will maintain a Commissioning Issues Log. This log will document all Construction Phase issues through a sortable database that identifies the following fields.

A. The responsible party, either Construction Team member, Design Team member, or Owner

B. The exact location of the issue (floor and room)

C. The applicable system component, i.e. lighting, ductwork, pump, etc.

D. The project impact

E. A severity

F. A deficiency code, i.e. craftsmanship, non-compliance, etc.

G. A reference to the Contract Documents (if applicable)

H. A detailed description of the issue

I. A status, i.e. complete, incomplete, accepted, unverifiable

. The issues log will be distributed and reviewed at each Commissioning Meeting and each issue will be tracked by the CxA until it is resolved.

. 3.6 CONSTRUCTION CHECKLISTS The Contractors will be responsible for completing documentation related to the installation, start- up, and testing of all commissioned equipment and systems. This documentation will be kept on- site and be completed through the use of paper forms. The CxA will develop the installation checklists and provide them in Adobe's portable document format (pdf) to the Construction Team. The Construction Team will be responsible for completing the installation checklists for 100% of the commissioned systems and equipment. The checklists will include best practices related to the specific equipment or system, highlights of required

installation details from the drawings and specifications, and equipment manufacturer, model number, serial number, and capacity verification information.

The construction manager or general contractor will be responsible for maintaining an up-to-date book of printed checklists. These checklists will be reviewed at every commissioning meeting with the expectation that checklists will be completed as the work progresses.

The CxA will use sampling strategies to field verify the proper completion of the checklists with sampling rates determined based upon the success of the verification process, the quantity of each type of equipment, and the relative importance of the equipment's operation related to the overall building operation.

The Functional Testing of the equipment and systems will not be scheduled until all relevant Installation Checklists are submitted to the Commissioning Agent.

. 3.7 PRE-FUNCTIONAL CHECKLISTS In order to verify that the systems and equipment are ready for final Functional Testing witnessed by the CxA, the Contractor will perform Pre-Functional Testing independent of the CxA. Pre- Functional Testing shall consist of performing the complete Functional Testing (described below) with tests provided by the CxA. Through this process, the Contractor will validate the test procedure and provide a marked-up version of the test complete with results. Once a completed test is provided indicating successful operation of the system, the CxA will schedule the Functional Testing as described below.

. 3.8 SITE OBSERVATIONS Periodically throughout the Construction process, the CxA will perform site visits to observe component and systems installations. These visits will be planned to coincide with selected planning and job-site meetings, installation milestones, component and assembly mock-ups, and equipment and system start-ups. The CxA will use these site visits to verify the proper completion of installation and start-up checklists, witness HVAC pipe and duct cleaning and testing, review the air and water systems balancing by selective testing, and generally track the progress of the construction. A field report will be provided at the conclusion of each visit documenting the tasks accomplished during the visit.

. 3.9 FUNCTIONAL TESTING The performance of the testing of all commissioned equipment and systems is the responsibility of the Contractors. The CxA will develop the functional performance tests with the assistance of the installing contractors, and upon the successful completion of Pre-Functional Testing as described above, will coordinate the testing process, and witness the tests that are performed by the Contractors. In addition, the CxA will prepare plans for, assist with execution of, and document tests of commissioned equipment overseen by regulatory authorities and ensure that such tests meet the rigor desired by the Owner. The CxA will coordinate the retesting of equipment until satisfactory performance is achieved. The functional performance testing will include operating the systems and components through each of the written sequences of operation, other significant modes and miscellaneous alarms, power failure, and security alarm when impacted by and interlocked with commissioned equipment. Sensors and actuators shall be calibrated during construction check listing by the installing contractors and spot checked by the CxA during functional testing. Tests on HVAC equipment shall be done, if possible, in their proper operating season (cooling in summer, heating in winter). Any equipment that operates in both seasons, such as the heat pumps, should ideally be tested in both seasons. However, if this is not possible, some manipulation of setpoints and control points will be done to simulate the necessary conditions. Functional testing will be done using conventional manual methods, control system trend logs, and stand-alone data loggers as required

to provide a high level of confidence in proper system function, as deemed appropriate by the CxA and the Owner. A report will be provided that includes all of the issues identified during the testing process.

As a component of the test procedures, the CxA will identify specific system trends to be set up and then analyze the trend and monitoring data as a method of verifying performance.

3.10 TRAINING AND O&M REVIEW

Planning for the training of the Owner's operations and maintenance staff begins in the design phase with the development of training requirements.

The Owner's operations and maintenance staff will commence training sessions during the construction phase through a combination of formal and informal training activities. Although the informal training sessions, such a project walkthroughs or submittal reviews, will take place throughout the construction process, the formal training program should not be initiated until the successful completion of functional testing to ensure that the operations and maintenance personnel receive accurate training and are able to witness the systems operating properly during the training.

The CxA will oversee and approve the Contractor-provided training of the Owner's operating personnel. The training agendas, attendance logs, and materials will be documented by the CxA and any additional or supplemental training required for the Owner's operating personnel to properly and efficiently operate the building will be highlighted to the Owner by the CxA.

The CxA will attend select training sessions to participate, document, monitor, and provide quality control. The sessions will be video recorded by the Contractors or Owner without CxA involvement or coordination of the recording.

The CxA will review and approve the commissioned systems and equipment sections of the Operations and Maintenance (O&M) manuals prepared by the Contractors. Comments will be provided to the Design Team to allow one submittal review to be sent to the Contractor. The Contractor is to have the O&M manuals ready and available for use in the training process.

PART 4 OCCUPANCY AND OPERATIONS PHASE

. 4.1 FINAL COMMISSIONING PROCESS REPORT At the completion of the Commissioning Process, the CxA will provide a final report based on the framework of the Commissioning Plan. An Executive Summary will be included that provides a summary of the participants and their roles, a brief building description, an overview of the commissioning and testing scope, and a general description of testing and verification methods. Included with the summary will be a matrix that provides the disposition of the CxA regarding the adequacy of the commissioned equipment and system in the following five areas: equipment meeting the equipment specifications, equipment installation, functional performance and efficiency, equipment documentation, and operator training. The final report will specifically identify all outstanding non-compliance issues, recommendations for improvement to equipment or operations, future actions required, and recommended changes to the Commissioning Process. In addition, the Report shall include a final issues log with all issues identified through the Commissioning Process, progress and field reports, submittal and O&M manual reviews, training record, test schedules, construction checklists, start-up reports, functional tests, and trend log analysis.

. 4.2 SEASONAL TESTING

Any equipment or system that cannot be adequately tested at the time of the initial testing due to seasonal operating issues will be retested in their primary operating season. Whenever possible, systems will be tested under load to verify system capacity and function.

. 4.3 WARRANTY REVIEW The CxA will return to the site 10 months into the 12 month warranty period and review with facility staff the current building operation and condition of outstanding issues related to the original and seasonal commissioning. Any issues that may come under

warranty or under the original construction contract will be identified and the CxA will assist the facility staff in developing reports, documents, and requests for services to remedy outstanding problems. The CxA is not responsible for correcting deficiencies.

. 4.4 HIGH PERFORMANCE BUILDING RATING SYSTEMS In addition to the reports described above, all paperwork required to satisfy the RIDE Regulations will be provided.

END OF SECTION

# SECTION 02 4100
# DEMOLITION

## PART 1 GENERAL

### 1.1 SUMMARY

A. Provide demolition activities.

### 1.2 SUBMITTALS

A. Schedule: Submit for approval selective demolition schedule, including schedule and methods for capping utilities to be abandoned and maintaining existing utility service.

### 1.3 QUALITY ASSURANCE

A. Codes and Regulations: Comply with governing codes and regulations. Use experienced workers.

### 1.4 PROJECT CONDITIONS

A. Occupancy: Immediate areas of work will not be occupied during selective demolition. The public, including children, may occupy adjacent areas.

B. Existing Conditions: No responsibility for buildings and structures to be demolished will be assumed by the Owner

## PART 2 PRODUCTS

### 2.1 DEMOLITION APPLICATIONS

A. Structure Demolition:
1. Application: Demolition of designated building structures.
2. Application: Demolition of designated site improvements including paving, curbing, site walls, and utility structures.
3. Application: Demolition of below-grade foundations and site improvements to depth to avoid conflict with new construction or site work.
4. Application: Removal of hollow items or items which could collapse.
5. Application: Salvage of designated items.
6. Application: Protection of site work and adjacent structures.
7. Application: Disconnection, capping, and removal of utilities.
8. Application: Pollution control during building demolition, including noise control.
9. Application: Removal and legal disposal of materials.
10. Protection: Designated site improvements and adjacent construction.
11. Salvage: Designated items.
12. Utilities: Interruption, capping or removal as applicable.
13. Hazardous Materials: Not present.
14. Hazardous Materials: Removed under separate prior contract.
15. Hazardous Materials: Removed as a part of this contract.

## PART 3 EXECUTION

### 3.1 SELECTIVE DEMOLITION

A. Demolition Operations: Do not damage building elements and improvements indicated to remain. Items of salvage value, not included on schedule of salvage items to be returned to

Owner, shall be removed from structure. Storage or sale of items at project site is prohibited.

B. Utilities: Locate, identify, disconnect, and seal or cap off utilities in buildings to be demolished.

C. Shoring and Bracing: Provide and maintain interior and exterior shoring and bracing.

D. Occupied Spaces: Do not close or obstruct streets, walks, drives or other occupied or used spaces or facilities without the written permission of the Owner and the authorities having jurisdiction. Do not interrupt utilities serving occupied or used facilities without the written permission of the Owner and authorities having jurisdiction. If necessary, provide temporary utilities.

E. Operations: Cease operations if public safety or remaining structures are endangered. Perform temporary corrective measures until operations can be continued properly.

F. Security: Provide adequate protection against accidental trespassing. Secure project after work hours.

G. Restoration: Restore finishes of patched areas.

**END OF SECTION**

# SECTION 02 4113
# SELECTIVE DEMOLITION

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

B. Removal and disposal of obsolete equipment.

C. Abandonment and removal of obsolete utilities and conduit.

### 1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

C. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of benchmarks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

### 1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

### 1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Accurately record actual locations of capped and active utilities.

**PART 2 PRODUCTS –** Not Applicable to this Section

## PART 3 EXECUTION

### 3.01 SCOPE

A. Remove portions of the existing construction as required to install new work.

B. Remove equipment being replaced.

C. Remove & Provide Safe Storage for Existing-to-Remain Equipment as Applicable

D. Remove MEP and other items being upgraded or replaced.

E. Remove items so noted on the drawings.

### 3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.

4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements that are not to be removed.
1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

D. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

E. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Dismantle existing construction and separate materials.
2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

## 3.03 EXISTING UTILITIES

A. Protect existing utilities to remain from damage.

B. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

C. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

D. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

E. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

## 3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Separate areas in which demolition is being conducted from other areas that are still occupied.
1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.

B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

C. Remove existing work as indicated and as required to accomplish new work.
1. Remove items indicated on drawings.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
3. Verify that abandoned services serve only abandoned facilities before removal.

4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

### 3.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

**END OF SECTION**

**e m e r y**
**Environmental Associates**

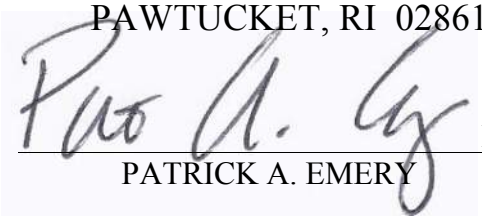
*PO Box – E * Pawtucket, RI * Office (401)-727-4941 *
Email: emeryenvironmental@verizon.net*

# *ASBESTOS ABATEMENT SPECIFICATION*

**PROJECT LOCATION**:
NORTH SMITHFIELD PUBLIC SAFETY COMPLEX
575 SMITHFIELD ROAD #1
NORTH SMITHFIELD, RI 02896

**CLIENT:**
MR. ERIC ARMY
STUDIO **MEJA** ARCHITECTS
460 HARRIS AVENUE; #301
PROVIDENCE, RI 02909
401-400-2724

**REPORT PREPARED BY**;
MR. PATRICK A. EMERY
EMERY ENVIRONMENTAL ASSOCIATES
P.O. BOX - E
PAWTUCKET, RI 02861



DATE: 9-18-2016
PATRICK A. EMERY

**EEA PROJECT #: 160801-A**

## TABLE OF CONTENTS

*APPENDIX – A: ASBESTOS ABATEMENT SPECIFICATION / RIDOH ASB-16, ASB-16A & ASB-16B ASBESTOS ABATEMENT APPLICATION FORMS*

*APPENDIX – B: ANALYTICAL SAMPLE RESULTS*

*APPENDIX – C: ASBESTOS CONSULTANT LICENSURE*

*APPENDIX – D: ASBESTOS TESTING LABORATORY LICENSURE*

*APPENDIX – E: ASBESTOS PROJECT DRAWING(S)*

# *APPENDIX – A:*

## *ASBESTOS ABATEMENT SPECIFICATION*

**RHODE ISLAND DEPARTMENT OF HEALTH**
**NOTARIZED CERTIFICATION OF ASBESTOS ABATEMENT PLAN**

Facility: _____

Address: ***575 SMITHFIELD ROAD #1***

City/Town: ***NORTH SMITHFIELD*** ZIP: ***02896*** Amendment/Phase No.: _____

Abatement Plan Written By: ***PATRICK A. EMERY*** Certification No.: AAC-***505-PD***

Summary of specific waivers/variances being requested: ***SEE ATTACHMENTS #4, #7, #8 & #9 - ENCLOSED***

Type of Asbestos Abatement **( X ) Removal** ( ) Enclosure ( ) Encapsulation ( ) Demolition

( ) Glovebag **( X ) Asphalt Roofing / Exterior Abatement**

**(X ) Other (Specify)** ***Alternate Work Procedure / Attachments #7, #8 & #9***

Is this plan being submitted in response to a Notice of Violation and/or a Notice of Requirement to Submit an Asbestos Abatement Plan?

( ) YES ( **X** ) NO

If Yes, Indicate Notice/Building Evaluation No(s): _____

Contractor: ***TO BE SELECTED*** License No: _____

Estimated Start Date: **1-1-2017**

Pre-Abatement Sampling Information:

Bulk Samples Collected By: ***PATRICK A. EMERY*** Certification No.: **AAC-505IS**

Bulk Samples Analyzed By: ***AEC LABORATORIES, LLC*** Certification No.: **AAL-112**

Air Samples to be Collected By: ***PATRICK A. EMERY*** Certification No.: **AAC-505IS**

Air Samples Analyzed By: ***AEC LABORATORIES, LLC*** Certification No.: **AAL-112**

In-Process / Clearance Air Sampling Information:

Air Samples to be Collected By: ***PATRICK A. EMERY*** Certification No.: **AAC-505IS**

Air Samples Analyzed By: ***AEC LABORATORIES, LLC*** Certification No.: **AAL-112**

## CERTIFICATION

I certify that this asbestos abatement plan is prepared and submitted under the provision s of Section 23-24.5-6 of the RI Asbestos Control Act and Parts A and C of the Rhode Island Rules and Regulations for Asbestos Control; all abatement/management activities performed in conjunction with this plan must be incompliance with the specifications prescribed in this plan (when approved) and the most current revision of all applicable federal and state regulations; and the asbestos abatement/ management activities described in this plan must be performed by a RI licensed asbestos abatement contractor.

Certified by: _____ Title: _____
(Signature of Building Owner or Agent)

Certified by: _____ Date: _____
(Typed/Printed Name of Certified)

Subscribed and sworn before me this _____ day of _____ , 20 _____

_____ My Commission Expires: _____
(Notary Public)

**AFFIX NOTARY SEAL HERE**

FORM ASB-16B (11/2003) REPLACES FORM ASB-16B (3/92)

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Health

Division of Occupational & Radiological Health

**APPLICATION FOR APPROVAL OF AN ASBESTOS ABATEMENT PLAN**

1. Building Owner's Name:

***TOWN OF NORTH SMITHFIELD***

2. Application Prepared By:

***PATRICK A. EMERY***

R.I. Certification No. AAC-***505 PD***

Telephone No.: ***(401)-727-4941***
(Area Code, No., Ext.)

3. Building Owner's Mailing Address and Telephone Number:

Street: ***ONE MAIN STREET***

City/Town: ***SLATERSVILLE, RI***

Zip: ***02876***

Telephone No: ***401-255-2053***
(Area Code, No., Ext.)

4. Person to be contacted regarding this application:

Name: ***PATRICK EMERY***

Telephone No.: ***401-641-0074***
(Area Code, No., Ext.)

5. Location where abatement work will be performed:

Name: (if applicable)

Street: ***575 SMITHFIELD ROAD #1***

City/Town: ***NORTH SMITHFIELD*** ZIP: ***02896***

6. Is this application being submitted in response to a "Notice of Requirement to Submit an Asbestos Abatement Plan"?

( ) YES ( ***X*** ) NO

If yes, what is the due date for submittal of Abatement Plan?
(Mo.) (Day) (Yr.)

Evaluation Number on the Notice:

7. Contractor who will be performing abatement work (if selected): ***TO BE DETERMINED***

Name: R.I. License No.: LAC -

8. Start Date of Abatement Work ***1*** (Month) ***1*** (Day) ***2017*** (Year)

9. Estimated Completion Date of Abatement Work: ***1*** (Month) ***1*** (Day) ***2018*** (Year)

10. Type of Asbestos Abatement: (Check all that apply)

**( X ) Removal** ( ) Enclosure

( ) Encapsulation ( ) Demolition

( ) Operations and Maintenance Only

**( X ) Other: (Specify) ALTERNATE WORK PROCEDURE**

11. Type of Building:
( ) School
( ) Privately Owned Building
***( X ) Publicly Owned Building***
( ) Residence
( ) Other: (Specify)

12. Building Access:
***( X ) Public Access (≥ 25% of Building Area)***
( ) Limited Public Access (< 25 % of Building Area)
( ) No Public Access

13. Bulk Sample Collection and Analysis:

A. Person collecting bulk samples:

Name: ***PATRICK A. EMERY*** R.I. Certification No.: AAC- ***505IS***

B. Sampling Methodology:

( **X** ) EPA AHERA Sampling Requirements (40 CFR 763.86).

( ) EPA's Asbestos Containing Material in School Buildings: A Guidance Document (EPA-450/2-78-014) or Guidance for Controlling Asbestos Containing Materials - 1985 Edition (EPA-560/5-85-024).

( ) Other (Specify)

C. Laboratory performing the analysis of the bulk samples:

Name: ***AEC LABORATORIES, LLC*** RI Certification No.: ***AAL-112***

D. Analytical Methodology:

(***X*** ) EPA Interim Method for the Determination of Asbestos in Bulk Insulation Samples (PLM method only).

( ) Other (Specify)

14. Pre-Abatement Air Sample Collection and Analysis:

A. Person collecting pre-abatement air samples:
Name: ***PATRICK A. EMERY*** Affiliation***: EMERY ENVIRONMENTAL ASSOCIATES***

B. Laboratory performing analysis of pre-abatement air samples:
Name: ***AEC LABORATORIES, LLC*** RI Certification No.: ***AAL-112***

C. Methodology used in the collection and analysis of pre-abatement samples:

***( X ) NIOSH Method 7400 (Most Current Revision)***
( ) OSHA 29 CFR 1926.58 - Appendix A & B
( ) Other (Specify) _____

15. A. Indicate how the regulated asbestos containing material (RACM) will be removed from the abatement site. If a hauler or broker will be used to transport the RACM to a disposal site, they must also be identified.

***TO BE PROVIDED BY CONTRACTOR***

B. Provide the name and location of the authorized asbestos waste facility to which the removed material will be transferred for disposal (if known).

***TO BE PROVIDED BY CONTRACTOR***

16. Person designated as compliance monitor for abatement work. **(NOT REQUIRED)**

Name***:*** ***PATRICK EMERY***
Affiliation: ***EMERY ENVIRONMENTAL ASSOCIATES***

17. In-Process & Clearance Air Sampling: ***(SEE ATTACHMENT NO. 1)***

A. Describe on an attachment the type, number and location of air samples that will be collected outside the work area during the abatement project.

B. Describe on an attachment the plan of action to be followed if the Indoor Non-Occupational Air Exposure Standard for Asbestos (0.01 fibers per cubic centimeter) is exceeded outside the work area during the abatement project.

C. Describe on an attachment the type, number and location of air samples that will be collected as part of the final clearance testing.

D. Describe on an attachment the plan of action to be followed if the Indoor Non-Occupational Air Exposure Standard for Asbestos (0.01 fibers per cubic centimeter) is exceeded during final clearance testing.

18. A separate and fully completed Form ASB-16A must be submitted for each area to be abated. List below the entry in Item 1 from each attached ASB-16A.

***ASBESTOS CONTROL AREA – A / BASEMENT AREA***
***ASBESTOS CONTROL AREA – B / FIRST FLOOR***
***ASBESTOS CONTROL AREA – C / EXTERIOR – WINDOW SASH, SOIL & CAULK REMOVAL / ALTERNATE WORK PROCEDURE (SEE ATTACHMENTS #8 & #9)***
***ASBESTOS CONTROL AREA – D / EXTERIOR ROOF AREA***
***ASBESTOS CONTROL AREA – E / EXTERIOR ROOF AREA / ALTERNATE BID WORK #1***
***ASBESTOS CONTROL AREA – F / EXTERIOR ROOF AREA / ALTERNATE BID WORK #2***
***ASBESTOS CONTROL AREA – G / EXTERIOR ENCLOSED WALL MASTIC ABATEMENT / ALTERNATE WORK PRACTICE (SEE ATTACHMENT #7) / ALTERNATE BID WORK #3***

**CONSULTANT CERTIFICATION**

19. I certify that this plan was prepared by me and I am responsible for its content.

Signature: _____ Date: **9** (Month) **18** (Day) **2016** (Year)

Affiliation: ***Emery Environmental Associates***

20. **ASBESTOS ABATEMENT PLAN APPLICATION FEE:**

| | |
|---|---|
| ( ) Operations & Maintenance Only | $ 75 |
| ( ) Up to One (1) NESHAP Unit | $ 75 |
| ( ) Between One (1) & Ten (10) NESHAP Units | $ 300 |
| ( ) Between Ten (10) & Fifty (50) NESHAP Units | $ 600 |
| **( X ) Over Fifty (50) NESHAP Units** | **$ 900** |
| ( ) AMENDMENT FEE | $ 150 |

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Health

Division of Occupational & Radiological Health

**APPLICATION FOR APPROVAL OF AN ASBESTOS ABATEMENT PLAN**

**SUPPLEMENTAL INFORMATION: AREA DESCRIPTION AND PROPOSED REMEDY**

**BUILDING LOCATION:** ***575 SMITHFIELD ROAD #1***
***NORTH SMITHFIELD, RI 02896***

**INSTRUCTIONS:** All items on this form must be addressed. All references to attachments must be clearly identified. All attachments must be marked with the specific item numbers on this form to which they pertain.

(1) Area Location/Identification (Room Name / No., Evaluation Number, etc.):

***CONTROL AREA – A / BASEMENT***
***(SEE ATTACHMENT-2 & ATTACHED DRAWING / APPENDIX - E FOR EXACT LOCATIONS )***

(2) Attach a description of each type (e.g. pipe, ceiling, etc.) of regulated asbestos containing material (RACM) in this area, including condition, location, quantity and asbestos content. Attach a copy of the laboratory report(s) for all samples. (**NOTE:** All laboratory reports must include the name of the building(s) and the location(s) of the sample(s)).

***SEE ATTACHMENT # - 2***

(3) Attach a current scale drawing of this area, showing direction of North and East, which has been clearly annotated to show the type, location and quantity of all RACM in this area. This drawing must include a legend, which acts as a guide to the scale, symbols and nomenclature used in the drawing. If a master plan or multiple drawings are provided, indicate the specific location(s) and drawing number(s), which depict this area. If the location of the decontamination chamber is known, it should be so indicated on the appropriate drawing(s).

***SEE ATTACHED DRAWING EEA-1 & STUDIO MEJA ARCHITECTS LTD. DWG #M1.1, M2.1, M2.4, E1.1, E2.1, E2.3, FA1.1, FA2.1, A1.1E, A1.1 / APPENDIX - E***

(4) **PROPOSED REMEDIES:**

A) Attach a description of the interim Operations and Maintenance Plan that will be implemented in accordance with C.1.2(b).

***SEE ATTACHMENT #-3***

(4) **PROPOSED REMEDIES: (Cont.)**

B) Will any portion of this area be abated by use of B.8 work procedures?
( ***X*** ) YES ( ) NO

If Yes, indicate below which RACM in this area will be abated by use of the following B.8 work procedures:

B.8.2 & B.8.3 (REMOVAL): ***THE ASBESTOS CONTRACTOR SHALL BE REQUIRED TO ABATE ALL ACM MATERIALS AS DEFINED WITHIN APPENDIX – 2 OF THE ATTACHED SPECIFICATION. ALL REMOVAL OPERATIONS MUST BE CONDUCTED IN ACCORDANCE WITH THE WORK REQUIREMENTS OF SECTION B.8.2 / B.8.3 OF THE CURRENT RIDOH ASBESTOS CONTROL REGULATION, IN ADDITION TO ALL WORK REQUIREMENTS AS DEFINED WITHIN ATTACHMENTS #1 - #5 (ATTACHED)***

B.8.2 & B.8.4 (ENCAPSULATION):

B.8.2 & B.8.5 (ENCLOSURE):

B.8.6 (DEMOLITION):

B.8.7 (GLOVEBAG):

B.8.8 (ASPHALT ROOFING):

C) Are you requesting any waivers to the above selected B.8 procedures for any of the abatement activities in this area?

**( X ) YES** ( ) NO

If Yes, attach a detailed description of the waivers requested you are proposing to utilize. All items must be keyed to the specific section(s) of the regulations for which waivers are requested.

***SEE ATTACHMENT # - 4***

D) Are you proposing alternative procedures under B.11 for any of the abatement activities in this area?

( ) YES **( X ) NO**

If Yes, attach a detailed description of the alternative procedures requested you are proposing to utilize. Alternate procedures must include a justification for not following specific section(s) of the regulations and be as protective of public health.

E) Will any a**ccessible** RACM remain in this area after abatement?

**( X ) YES** ( ) NO

If Yes, attach a description of the RACM that will remain and the details of the on-going Operations and Maintenance Plan that will be implemented in accordance with C.1.2(b).

***All remaining ACM within this area and the structure at the completion of the project shall be maintained by the building owner in accordance with a site specific O&M plan as developed by the building owner.***

**AGENCY USE ONLY**

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Health

Division of Occupational & Radiological Health

**APPLICATION FOR APPROVAL OF AN ASBESTOS ABATEMENT PLAN**

**SUPPLEMENTAL INFORMATION: AREA DESCRIPTION AND PROPOSED REMEDY**

**BUILDING LOCATION:** ***575 SMITHFIELD ROAD #1***
***NORTH SMITHFIELD, RI 02896***

**INSTRUCTIONS:** All items on this form must be addressed. All references to attachments must be clearly identified. All attachments must be marked with the specific item numbers on this form to which they pertain.

(1) Area Location/Identification (Room Name / No., Evaluation Number, etc.):

***CONTROL AREA – B / FIRST FLOOR & ATTIC AREA***
***(SEE ATTACHMENT-2 & ATTACHED DRAWING / APPENDIX - E FOR EXACT LOCATIONS )***

(2) Attach a description of each type (e.g. pipe, ceiling, etc.) of regulated asbestos containing material (RACM) in this area, including condition, location, quantity and asbestos content. Attach a copy of the laboratory report(s) for all samples. (**NOTE:** All laboratory reports must include the name of the building(s) and the location(s) of the sample(s)).

***SEE ATTACHMENT # - 2***

(3) Attach a current scale drawing of this area, showing direction of North and East, which has been clearly annotated to show the type, location and quantity of all RACM in this area. This drawing must include a legend which acts as a guide to the scale, symbols and nomenclature used in the drawing. If a master plan or multiple drawings are provided, indicate the specific location(s) and drawing number(s) which depict this area. If the location of the decontamination chamber is known, it should be so indicated on the appropriate drawing(s).

***SEE ATTACHED DRAWING EEA-2 & STUDIO MEJA ARCHITECTS LTD. DWG #M1.2, M2.2, M2.3, M2.5, M3.1,E1.2, E2.2, E2.4, E2.5, FA1.2, FA2.2, A1.2E, A1.2 / APPENDIX - E***

(4) **PROPOSED REMEDIES:**

A) Attach a description of the interim Operations and Maintenance Plan that will be implemented in accordance with C.1.2(b).

***SEE ATTACHMENT #-3***

(4) **PROPOSED REMEDIES: (Cont.)**

B) Will any portion of this area be abated by use of B.8 work procedures?
( ) YES ( X ) NO

If Yes, indicate below which RACM in this area will be abated by use of the following B.8 work procedures:

B.8.2 & B.8.3 (REMOVAL): ***THE ASBESTOS CONTRACTOR SHALL BE REQUIRED TO ABATE ALL ACM MATERIALS AS DEFINED WITHIN APPENDIX – 2 OF THE ATTACHED SPECIFICATION. ALL REMOVAL OPERATIONS MUST BE CONDUCTED IN ACCORDANCE WITH THE WORK REQUIREMENTS OF SECTION B.8.2 / B.8.3 OF THE CURRENT RIDOH ASBESTOS CONTROL REGULATION, IN ADDITION TO ALL WORK REQUIREMENTS AS DEFINED WITHIN ATTACHMENTS #1 - #5 (ATTACHED)***

B.8.2 & B.8.4 (ENCAPSULATION):

B.8.2 & B.8.5 (ENCLOSURE):

B.8.6 (DEMOLITION):

B.8.7 (GLOVEBAG):

B.8.8 (ASPHALT ROOFING):

C) Are you requesting any waivers to the above selected B.8 procedures for any of the abatement activities in this area?

( X ) YES ( ) NO

If Yes, attach a detailed description of the waivers requested you are proposing to utilize. All items must be keyed to the specific section(s) of the regulations for which waivers are requested.

***SEE ATTACHMENT # - 4***

D) Are you proposing alternative procedures under B.11 for any of the abatement activities in this area?

( ) YES **( X ) NO**

If Yes, attach a detailed description of the alternative procedures requested you are proposing to utilize. Alternate procedures must include a justification for not following specific section(s) of the regulations and be as protective of public health.

E) Will any a**ccessible** RACM remain in this area after abatement?

**( X ) YES** ( ) NO

If Yes, attach a description of the RACM that will remain and the details of the on-going Operations and Maintenance Plan that will be implemented in accordance with C.1.2(b).

***All remaining ACM within this area and the structure at the completion of the project shall be maintained by the building owner in accordance with a site specific O&M plan as developed by the building owner.***

**AGENCY USE ONLY**

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Health

Division of Occupational & Radiological Health

**APPLICATION FOR APPROVAL OF AN ASBESTOS ABATEMENT PLAN**

**SUPPLEMENTAL INFORMATION: AREA DESCRIPTION AND PROPOSED REMEDY**

**BUILDING LOCATION:** ***575 SMITHFIELD ROAD #1***
***NORTH SMITHFIELD, RI 02896***

**INSTRUCTIONS:** All items on this form must be addressed. All references to attachments must be clearly identified. All attachments must be marked with the specific item numbers on this form to which they pertain.

(1) Area Location/Identification (Room Name / No., Evaluation Number, etc.):

***CONTROL AREA – C / EXTERIOR – WINDOW SASH, CAULK & SOIL MITIGATION***
***(SEE ATTACHMENT-2 & ATTACHED DRAWINGS / APPENDIX - E FOR EXACT LOCATIONS )***

(2) Attach a description of each type (e.g. pipe, ceiling, etc.) of regulated asbestos containing material (RACM) in this area, including condition, location, quantity and asbestos content. Attach a copy of the laboratory report(s) for all samples. (**NOTE:** All laboratory reports must include the name of the building(s) and the location(s) of the sample(s)).

***SEE ATTACHMENT # - 2***

(3) Attach a current scale drawing of this area, showing direction of North and East, which has been clearly annotated to show the type, location and quantity of all RACM in this area. This drawing must include a legend which acts as a guide to the scale, symbols and nomenclature used in the drawing. If a master plan or multiple drawings are provided, indicate the specific location(s) and drawing number(s) which depict this area. If the location of the decontamination chamber is known, it should be so indicated on the appropriate drawing(s).

***SEE ATTACHED DWG'S EEA1 + EEA-2 & STUDIO MEJA ARCHITECT LTD. DWGS #A1.1E, #A1.1, #A1.2 & #A1.2E / APPENDIX - E***

(4) **PROPOSED REMEDIES:**

A) Attach a description of the interim Operations and Maintenance Plan that will be implemented in accordance with C.1.2(b).

***SEE ATTACHMENT #-3***

(4) **PROPOSED REMEDIES: (Cont.)**

B) Will any portion of this area be abated by use of B.8 work procedures?
( ) YES ( X ) NO

If Yes, indicate below which RACM in this area will be abated by use of the following B.8 work procedures:

B.8.2 & B.8.3 (REMOVAL):

B.8.2 & B.8.4 (ENCAPSULATION):

B.8.2 & B.8.5 (ENCLOSURE):

B.8.6 (DEMOLITION):

B.8.7 (GLOVEBAG):

B.8.8 (ASPHALT ROOFING):

C) Are you requesting any waivers to the above selected B.8 procedures for any of the abatement activities in this area?

**( X ) YES** ( ) NO

***SEE ATTACHMENT # - 4***

If Yes, attach a detailed description of the waivers requested you are proposing to utilize. All items must be keyed to the specific section(s) of the regulations for which waivers are requested.

D) Are you proposing alternative procedures under B.11 for any of the abatement activities in this area?

**( X) YES** ( ) NO

***SEE ATTACHMENTS #8 & #9***

If Yes, attach a detailed description of the alternative procedures requested you are proposing to utilize. Alternate procedures must include a justification for not following specific section(s) of the regulations and be as protective of public health.

E) Will any a**ccessible** RACM remain in this area after abatement?

**( X ) YES** ( ) NO

If Yes, attach a description of the RACM that will remain and the details of the on-going Operations and Maintenance Plan that will be implemented in accordance with C.1.2(b).

***All remaining ACM within this area and the structure at the completion of the project shall be maintained by the building owner in accordance with a site specific O&M plan as developed by the building owner.***

**AGENCY USE ONLY**

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Health

Division of Occupational & Radiological Health

**APPLICATION FOR APPROVAL OF AN ASBESTOS ABATEMENT PLAN**

**SUPPLEMENTAL INFORMATION: AREA DESCRIPTION AND PROPOSED REMEDY**

**BUILDING LOCATION:** ***575 SMITHFIELD ROAD #1***
***NORTH SMITHFIELD, RI 02896***

**INSTRUCTIONS:** All items on this form must be addressed. All references to attachments must be clearly identified. All attachments must be marked with the specific item numbers on this form to which they pertain.

(1) Area Location/Identification (Room Name / No., Evaluation Number, etc.):

***CONTROL AREA – D / EXTERIOR – ROOF AREA***
***(SEE ATTACHMENT-2 & ATTACHED DRAWINGS / APPENDIX - E FOR EXACT LOCATIONS )***

(2) Attach a description of each type (e.g. pipe, ceiling, etc.) of regulated asbestos containing material (RACM) in this area, including condition, location, quantity and asbestos content. Attach a copy of the laboratory report(s) for all samples. (**NOTE:** All laboratory reports must include the name of the building(s) and the location(s) of the sample(s)).

***SEE ATTACHMENT # - 2***

(3) Attach a current scale drawing of this area, showing direction of North and East, which has been clearly annotated to show the type, location and quantity of all RACM in this area. This drawing must include a legend which acts as a guide to the scale, symbols and nomenclature used in the drawing. If a master plan or multiple drawings are provided, indicate the specific location(s) and drawing number(s) which depict this area. If the location of the decontamination chamber is known, it should be so indicated on the appropriate drawing(s).

***SEE ATTACHED STUDIO MEJA ARCHITECT - DWG #A1.3E (NOTE #3) / APPENDIX - E***

(4) **PROPOSED REMEDIES:**

A) Attach a description of the interim Operations and Maintenance Plan that will be implemented in accordance with C.1.2(b).

***SEE ATTACHMENT #-3***

(4) **PROPOSED REMEDIES: (Cont.)**

B) Will any portion of this area be abated by use of B.8 work procedures?
( ***X*** ) YES ( ) NO

If Yes, indicate below which RACM in this area will be abated by use of the following B.8 work procedures:

B.8.2 & B.8.3 (REMOVAL):

B.8.2 & B.8.4 (ENCAPSULATION):

B.8.2 & B.8.5 (ENCLOSURE):

B.8.6 (DEMOLITION):

B.8.7 (GLOVEBAG):

B.8.8 (ASPHALT ROOFING): ***THE ASBESTOS CONTRACTOR SHALL BE REQUIRED TO ABATE ALL ASBESTOS CONTAINING MATERIALS AS DEFINED WITHIN APPENDIX – 2 OF THE ATTACHED SPECIFICATION. ALL ASBESTOS REMOVAL OPERATIONS MUST BE CONDUCTED IN ACCORDANCE WITH THE WORK REQUIREMENTS OF SECTION B.8.8 OF THE CURRENT RIDOH ASBESTOS CONTROL REGULATIONS, IN ADDITION TO ALL APPLICABLE WORK REQUIREMENTS AS DEFINED WITHIN APPENDIX'S #1 - #6 ( ATTACHED )***

C) Are you requesting any waivers to the above selected B.8 procedures for any of the abatement activities in this area?

**( X ) YES** ( ) NO

If Yes, attach a detailed description of the waivers requested you are proposing to utilize. All items must be keyed to the specific section(s) of the regulations for which waivers are requested.

***SEE ATTACHMENT # 4***

D) Are you proposing alternative procedures under B.11 for any of the abatement activities in this area?

( ) YES **( X ) NO**

If Yes, attach a detailed description of the alternative procedures requested you are proposing to utilize. Alternate procedures must include a justification for not following specific section(s) of the regulations and be as protective of public health.

E) Will any a**ccessible** RACM remain in this area after abatement?

**( X ) YES** ( ) NO

If Yes, attach a description of the RACM that will remain and the details of the on-going Operations and Maintenance Plan that will be implemented in accordance with C.1.2(b).

***All remaining ACM within this area and the structure at the completion of the project shall be maintained by the building owner in accordance with a site specific O&M plan as developed by the building owner.***

**AGENCY USE ONLY**

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Health

Division of Occupational & Radiological Health

**APPLICATION FOR APPROVAL OF AN ASBESTOS ABATEMENT PLAN**

**SUPPLEMENTAL INFORMATION: AREA DESCRIPTION AND PROPOSED REMEDY**

**BUILDING LOCATION:** ***575 SMITHFIELD ROAD #1***
***NORTH SMITHFIELD, RI 02896***

**INSTRUCTIONS:** All items on this form must be addressed. All references to attachments must be clearly identified. All attachments must be marked with the specific item numbers on this form to which they pertain.

(1) Area Location/Identification (Room Name / No., Evaluation Number, etc.):

***CONTROL AREA – E / EXTERIOR – ROOF AREA / BID ALTERNATE #1***
***(SEE ATTACHMENT-2 & ATTACHED DRAWINGS / APPENDIX - E FOR EXACT LOCATIONS )***

(2) Attach a description of each type (e.g. pipe, ceiling, etc.) of regulated asbestos containing material (RACM) in this area, including condition, location, quantity and asbestos content. Attach a copy of the laboratory report(s) for all samples. (**NOTE:** All laboratory reports must include the name of the building(s) and the location(s) of the sample(s)).

***SEE ATTACHMENT # - 2***

(3) Attach a current scale drawing of this area, showing direction of North and East, which has been clearly annotated to show the type, location and quantity of all RACM in this area. This drawing must include a legend which acts as a guide to the scale, symbols and nomenclature used in the drawing. If a master plan or multiple drawings are provided, indicate the specific location(s) and drawing number(s) which depict this area. If the location of the decontamination chamber is known, it should be so indicated on the appropriate drawing(s).

***SEE ATTACHED STUDIO MEJA ARCHITECT - DWG #A1.3E (NOTE #2) / APPENDIX - E***

(4) **PROPOSED REMEDIES:**

A) Attach a description of the interim Operations and Maintenance Plan that will be implemented in accordance with C.1.2(b).

***SEE ATTACHMENT #-3***

(4) **PROPOSED REMEDIES: (Cont.)**

B) Will any portion of this area be abated by use of B.8 work procedures?
( ***X*** ) YES ( ) NO

If Yes, indicate below which RACM in this area will be abated by use of the following B.8 work procedures:

B.8.2 & B.8.3 (REMOVAL):

B.8.2 & B.8.4 (ENCAPSULATION):

B.8.2 & B.8.5 (ENCLOSURE):

B.8.6 (DEMOLITION):

B.8.7 (GLOVEBAG):

B.8.8 (ASPHALT ROOFING): ***THE ASBESTOS CONTRACTOR SHALL BE REQUIRED TO ABATE ALL ASBESTOS CONTAINING MATERIALS AS DEFINED WITHIN APPENDIX – 2 OF THE ATTACHED SPECIFICATION. ALL ASBESTOS REMOVAL OPERATIONS MUST BE CONDUCTED IN ACCORDANCE WITH THE WORK REQUIREMENTS OF SECTION B.8.8 OF THE CURRENT RIDOH ASBESTOS CONTROL REGULATIONS, IN ADDITION TO ALL APPLICABLE WORK REQUIREMENTS AS DEFINED WITHIN APPENDIX'S #1 - #6 ( ATTACHED )***

C) Are you requesting any waivers to the above selected B.8 procedures for any of the abatement activities in this area?

**( X ) YES** ( ) NO

If Yes, attach a detailed description of the waivers requested you are proposing to utilize. All items must be keyed to the specific section(s) of the regulations for which waivers are requested.

***SEE ATTACHMENT # 4***

D) Are you proposing alternative procedures under B.11 for any of the abatement activities in this area?

( ) YES **( X ) NO**

If Yes, attach a detailed description of the alternative procedures requested you are proposing to utilize. Alternate procedures must include a justification for not following specific section(s) of the regulations and be as protective of public health.

E) Will any a**ccessible** RACM remain in this area after abatement?

( X ) YES ( ) NO

If Yes, attach a description of the RACM that will remain and the details of the on-going Operations and Maintenance Plan that will be implemented in accordance with C.1.2(b).

***All remaining ACM within this area and the structure at the completion of the project shall be maintained by the building owner in accordance with a site specific O&M plan as developed by the building owner.***

**AGENCY USE ONLY**

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Health

Division of Occupational & Radiological Health

**APPLICATION FOR APPROVAL OF AN ASBESTOS ABATEMENT PLAN**

**SUPPLEMENTAL INFORMATION: AREA DESCRIPTION AND PROPOSED REMEDY**

**BUILDING LOCATION:** ***575 SMITHFIELD ROAD #1***
***NORTH SMITHFIELD, RI 02896***

**INSTRUCTIONS:** All items on this form must be addressed. All references to attachments must be clearly identified. All attachments must be marked with the specific item numbers on this form to which they pertain.

(1) Area Location/Identification (Room Name / No., Evaluation Number, etc.):

***CONTROL AREA – F / EXTERIOR – ROOF AREA(S) / BID ALTERNATE #2***
***(SEE ATTACHMENT-2 & ATTACHED DRAWINGS / APPENDIX - E FOR EXACT LOCATIONS )***

(2) Attach a description of each type (e.g. pipe, ceiling, etc.) of regulated asbestos containing material (RACM) in this area, including condition, location, quantity and asbestos content. Attach a copy of the laboratory report(s) for all samples. (**NOTE:** All laboratory reports must include the name of the building(s) and the location(s) of the sample(s)).

***SEE ATTACHMENT # - 2***

(3) Attach a current scale drawing of this area, showing direction of North and East, which has been clearly annotated to show the type, location and quantity of all RACM in this area. This drawing must include a legend which acts as a guide to the scale, symbols and nomenclature used in the drawing. If a master plan or multiple drawings are provided, indicate the specific location(s) and drawing number(s) which depict this area. If the location of the decontamination chamber is known, it should be so indicated on the appropriate drawing(s).

***SEE ATTACHED STUDIO MEJA ARCHITECT - DWG #A1.3E (NOTE #1) / APPENDIX - E***

(4) **PROPOSED REMEDIES:**

A) Attach a description of the interim Operations and Maintenance Plan that will be implemented in accordance with C.1.2(b).

***SEE ATTACHMENT #-3***

(4) **PROPOSED REMEDIES: (Cont.)**

B) Will any portion of this area be abated by use of B.8 work procedures?
( ***X*** ) YES ( ) NO

If Yes, indicate below which RACM in this area will be abated by use of the following B.8 work procedures:

B.8.2 & B.8.3 (REMOVAL):

B.8.2 & B.8.4 (ENCAPSULATION):

B.8.2 & B.8.5 (ENCLOSURE):

B.8.6 (DEMOLITION):

B.8.7 (GLOVEBAG):

B.8.8 (ASPHALT ROOFING): ***THE ASBESTOS CONTRACTOR SHALL BE REQUIRED TO ABATE ALL ASBESTOS CONTAINING MATERIALS AS DEFINED WITHIN APPENDIX – 2 OF THE ATTACHED SPECIFICATION. ALL ASBESTOS REMOVAL OPERATIONS MUST BE CONDUCTED IN ACCORDANCE WITH THE WORK REQUIREMENTS OF SECTION B.8.8 OF THE CURRENT RIDOH ASBESTOS CONTROL REGULATIONS, IN ADDITION TO ALL APPLICABLE WORK REQUIREMENTS AS DEFINED WITHIN APPENDIX'S #1 - #6 ( ATTACHED )***

C) Are you requesting any waivers to the above selected B.8 procedures for any of the abatement activities in this area?

**( X ) YES** ( ) NO

If Yes, attach a detailed description of the waivers requested you are proposing to utilize. All items must be keyed to the specific section(s) of the regulations for which waivers are requested.

***SEE ATTACHMENT # 4***

D) Are you proposing alternative procedures under B.11 for any of the abatement activities in this area?

( ) YES **( X ) NO**

If Yes, attach a detailed description of the alternative procedures requested you are proposing to utilize. Alternate procedures must include a justification for not following specific section(s) of the regulations and be as protective of public health.

E) Will any a**ccessible** RACM remain in this area after abatement?

( ) YES **( X ) NO**

If Yes, attach a description of the RACM that will remain and the details of the on-going Operations and Maintenance Plan that will be implemented in accordance with C.1.2(b).

**AGENCY USE ONLY**

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Health

Division of Occupational & Radiological Health

**APPLICATION FOR APPROVAL OF AN ASBESTOS ABATEMENT PLAN**

**SUPPLEMENTAL INFORMATION: AREA DESCRIPTION AND PROPOSED REMEDY**

**BUILDING LOCATION:** ***575 SMITHFIELD ROAD #1***
***NORTH SMITHFIELD, RI 02896***

**INSTRUCTIONS:** All items on this form must be addressed. All references to attachments must be clearly identified. All attachments must be marked with the specific item numbers on this form to which they pertain.

(1) Area Location/Identification (Room Name / No., Evaluation Number, etc.):

***CONTROL AREA – G / EXT. – NORTH WEST ELEVATION (@ WEST ENTRY) / BID ALTERNATE #3***
***(SEE ATTACHMENT-2 & ATTACHED DRAWINGS / APPENDIX - E FOR EXACT LOCATIONS )***

(2) Attach a description of each type (e.g. pipe, ceiling, etc.) of regulated asbestos containing material (RACM) in this area, including condition, location, quantity and asbestos content. Attach a copy of the laboratory report(s) for all samples. (**NOTE:** All laboratory reports must include the name of the building(s) and the location(s) of the sample(s)).

***SEE ATTACHMENT # - 2***

(3) Attach a current scale drawing of this area, showing direction of North and East, which has been clearly annotated to show the type, location and quantity of all RACM in this area. This drawing must include a legend which acts as a guide to the scale, symbols and nomenclature used in the drawing. If a master plan or multiple drawings are provided, indicate the specific location(s) and drawing number(s) which depict this area. If the location of the decontamination chamber is known, it should be so indicated on the appropriate drawing(s).

***SEE ATTACHED STUDIO MEJA ARCHITECT - DWGS #A1.1E & #A1.2E (NOTE #3) / APPENDIX - E***

(4) **PROPOSED REMEDIES:**

A) Attach a description of the interim Operations and Maintenance Plan that will be implemented in accordance with C.1.2(b).

***SEE ATTACHMENT #-3***

(4) **PROPOSED REMEDIES: (Cont.)**

B) Will any portion of this area be abated by use of B.8 work procedures?
( ) YES **( X ) NO**

If Yes, indicate below which RACM in this area will be abated by use of the following B.8 work procedures:

B.8.2 & B.8.3 (REMOVAL):

B.8.2 & B.8.4 (ENCAPSULATION):

B.8.2 & B.8.5 (ENCLOSURE)

B.8.6 (DEMOLITION)

B.8.7 (GLOVEBAG)

B.8.8 (ASPHALT ROOFING):

C) Are you requesting any waivers to the above selected B.8 procedures for any of the abatement activities in this area?

**( X ) YES** ( ) NO

If Yes, attach a detailed description of the waivers requested you are proposing to utilize. All items must be keyed to the specific section(s) of the regulations for which waivers are requested.

***SEE ATTACHMENT # 4***

D) Are you proposing alternative procedures under B.11 for any of the abatement activities in this area?

**( X ) YES** ( ) NO

If Yes, attach a detailed description of the alternative procedures requested you are proposing to utilize. Alternate procedures must include a justification for not following specific section(s) of the regulations and be as protective of public health.

***SEE ATTACHMENT # 7***

E) Will any a**ccessible** RACM remain in this area after abatement?

**( X ) YES** ( ) NO

If Yes, attach a description of the RACM that will remain and the details of the on-going Operations and Maintenance Plan that will be implemented in accordance with C.1.2(b).

***All remaining ACM within this area and the entire envelope of the structure at the completion of the project shall be maintained by the building owner in accordance with the in-place AHERA Management Plan as developed and managed by the building owner / LEA.***

**AGENCY USE ONLY**

# *ATTACHMENT NO.- 1*

## IN-PROCESS AIR MONITORING / CONTROL AREAS: A – G (AS APPLICABLE):

During the scheduled abatement operations, the building owner's asbestos consultant will collect air sample(s) at the limits to each asbestos control area(s), periodically for the duration of the asbestos removal project. The compliance air samples shall be collected at random locations adjacent to the control areas (i.e., control area barriers or where the project representative determines, during the performance of the project).

If there is a deviation in proper procedures on the part of the asbestos abatement contractor during the set-up, the removal of the final cleanup, the selected project monitor shall be notified immediately. These deviations include inadequate on-site paperwork, deviations in outlined work procedures, or if compliance air sampling outside the work area indicate fiber concentrations in excess of 0.01 f/cc, the on-site project monitor shall determine the extent of the contamination, and the asbestos abatement contractor shall be responsible for extending containment / control area to include the containment and initiating the cleanup.

## CLEARANCE AIR MONITORING REQUIREMENTS / CONTROL AREAS: A & B:

A visual clearance inspection within the asbestos abatement work area(s) shall be performed prior to the performance of clearance air sampling. The visual inspection will include an inspection of all vertical and horizontal surfaces within the control area, (as applicable). The on-site project monitor shall determine the cleanliness of the work area. After the containment area has passed the on-site project monitors visual clearance inspection(s), the asbestos monitor shall collect the following air samples within the control area:

Upon the successful completion of the visual inspection, the on-site project monitor shall collect an appropriate number of PCM clearance air samples from within each separate containment / control area(s), as determined by the project monitor at the time of the clearance air testing. These samples shall be collected in accordance with the guidelines of the section B.8.2 (p), of the current RIDOH Asbestos Control Regulation [R 23-24.5-ASB].

NOTE: If clearance air monitoring results in fiber concentrations in excess of the criteria as specified within section B.8.2 (p) of the current RIDOH Asbestos Control Regulation [R 23-24.5-ASB], The asbestos abatement contractor shall be responsible for the re-cleaning (i.e., wet-wiping, HEPA vacuuming...etc.) and re-encapsulating of the work area. A period of no fewer 24 hours shall elapse prior to the collection of the next set of clearance samples. This process shall be repeated until the air sample fiber concentrations are equal to or less than 0.01 f/cc.

## OSHA PERSONAL AIR MONITORING ASBESTOS CONTROL AREA – C, D, E, F & G (AS APPLICABLE):

**OSHA Personal Air Testing Requirements:** In association with the design of the work practices for this project. During the scheduled asbestos abatement operations, the selected asbestos contractor will be required to collect and analyze personal air sample(s) in compliance with current OSHA requirements as defined by 29CFR1926.1101, **each day** for the duration of the asbestos removal project.

If there is a deviation in proper procedures on the part of the asbestos abatement contractor during the set-up, the removal of the final cleanup, the selected project monitor shall be notified immediately. These deviations include inadequate on-site paperwork, deviations in outlined work procedures, or if OSHA personal air samples are in excess of the current OSHA TWA / PEL, the on-site project monitor shall determine the extent of the contamination, and the asbestos abatement contractor shall be responsible for extending containment / control area to include the containment and initiating the cleanup.

In addition, the building owners asbestos consultant (Emery Environmental Associates) shall collect in-process ambient PCM air samples at the limits of the asbestos work operations ***periodically*** during the performance of the asbestos project to document the ambient air quality at the limits of the asbestos control area is within acceptable air quality levels as determined by current RIDOH – Indoor Non-Occupational Air Exposure Standard as defined by section A.3 of the current RIDOH asbestos control regulation [R-23-24.5-ASB] periodically during the asbestos mitigation work operations. If air quality samples are determined to be at or above the above referenced standard the asbestos contractor shall be required to stop work all work and initiate additional engineering control(s) to insure the asbestos mitigation work operations is not creating a hazard for unprotected individuals at or beyond the limits of the asbestos control area.

## FINAL VISUAL INSPECTION REQUIREMENTS / ASBESTOS CONTROL AREA – C, D, E, F & G (AS APPLICABLE):

In association with the design of the "Alternate Work Practices" as proposed for Asbestos Control Area – C (Attachments #8 & #9), Asbestos Control Area – G (Attachment #7) and standard B.8.8 work operations as defined for the exterior presumed asbestos roofing material removal at Asbestos Control Areas – D, E & F. A final visual inspection of each asbestos abatement work area(s) / elevation (as applicable) shall be performed prior to the removal of any work area demarcation (engineering controls) or critical barriers (as applicable). These area(s) shall include any/all horizontal and vertical surfaces within the area of asbestos abatement work area(s). In addition, the building owner's asbestos consultant shall review all personal air sample results collected during the performance of the project. Upon a review of the air sample results and visual inspection(s) - the building owner's asbestos consultant shall determine the following:

If the personal air sample results are below 0.1 f/cc (TWA) as determined by an eight hour time weighted average, and the ambient air samples are below 0.01f/cc (as applicable) **and the area has been cleaned of all ACM / PACM asbestos containing building materials and visually inspected and approved by a field representative of Emery Environmental**, the area will be considered a non-hazard and the control area barriers may be torn down and occupied by personnel without protective equipment as required by 29 CFR 1926.1101.

However, If the personal air samples are determined to be in excess of 0.1 f/cc (TWA), or the area is determined to contain asbestos debris by a RIDOH licensed asbestos inspector, the contractor shall be required to continue restricted access to the area, re-clean the area via. wet methods and HEPA vacuuming. This process shall be repeated until the air is visually clean of all ACM debris.

***NOTE: The asbestos contractor must submit personal air samples as collected during the performance of the project ( in compliance with OSHA 29CFR1926.1101 and analyzed by a RIDOH certified laboratory) to the building owner, prior to a request for final visual inspection(s).***

# *ATTACHMENT NO.-2*
# CHART OF ACM:

***NOTE: THE SELECTED ASBESTOS CONTRACTOR SHALL BE RESPONSIBLE FOR THE FIELD VERIFICATION OF ALL ASBESTOS QUANTITIES, AS REPORTED FOR THE ASBESTOS CONTROL AREA (S) - PRIOR TO SIGNING THE PROJECT CONTRACT AND START OF THE PROJECT. NO CHANGE ORDERS WILL BE APPROVED FOR DISCREPANICES ASSOCIATED WITH THE REPORTED QUANTITIES.***

❖ ***The asbestos contractor must refer to all applicable Studio MEJA project drawings as defined on each applicable ASB16 form - for each defined asbestos control area, for the exact location of any/all ACM/PACM materials scheduled for removal in association with this project specification. Materials scheduled for removal in this project specification (Attachment #2) are cross-referenced to room monikers as defined by the project architect (Studio MEJA) on project drawings. NOTE: The room identification monikers used for the initial inspection (i.e. material identification samples) as collected to date, are not consistent with the room identification monikers used by the architect on the above referenced Studio MEJA prints. PLEASE NOTE EEA IS USING THE ROOM IDENTIFICATION MONIKERS USED BY THE ARCHITECT ON THE MOST CURRENT STUDIO MEJA DRAWINGS (9/14/16), TO DOCUMENT AND FACILITATE THE LOCATION OF THE KNOWN PACM/ACM BUILDING MATERIALS SCHEDULED TO BE REMOVED BY THIS SPECIFICATION. Please refer to Attachment #10A & #10B of this specification for table(s) that cross-references the room identification monikers used by Emery Environmental Associates during the initial asbestos inspection and the room moniker identifications used by the project architect (on the above referenced prints).***

| *CONTROL AREA – A / BASEMENT* | | | |
|---|---|---|---|
| **Location** | **ACM Quantity** | **Type / Description** | **Asbestos Content** |
| ❖*Basement (Throughout)* | **4,432 Square Ft.* | ★ ☯ *Removal of wall / ceiling surfacing area. [Original Plaster and Gypsum wallboard / joint compounding building materials @ wall / ceiling areas].* | *2% Chrysotile* |
| ❖*Basement (Throughout)* | **500 Square Ft.* | # *Repair of wall / ceiling surfacing areas to remain. [Original Plaster and Gypsum wallboard / joint compounding building materials @ wall / ceiling areas].* | *2% Chrysotile* |
| ❖*Basement (Throughout)* | **6,454 Square Ft.* | ⛐ *Ceiling Tile / Ceiling Tile Glue (as applicable)* | *2% Chrysotile* |
| ❖*Basement (Throughout)* | **50 Linear Ft.* | ✪ *Thermal Pipe Insulation* | *PACM* |
| ❖*Basement (Throughout)* | **50 Linear Ft.* | ❋ *Thermal Pipe Insulation Repair* | *PACM* |

| *CONTROL AREA – B / FIRST FLOOR* | | | |
|---|---|---|---|
| **Location** | **ACM Quantity** | **Type / Description** | **Asbestos Content** |
| ❖*First Floor (Throughout)* | **4,106 Square Ft.* | ★ ☯ *Removal of wall / ceiling surfacing area. [Original Plaster and Gypsum wallboard / joint compounding building materials @ wall / ceiling areas].* | *2% Chrysotile* |
| ❖*First Floor (Throughout)* | **500 Square Ft.* | # *Repair of wall / ceiling surfacing areas to remain. [Original Plaster and Gypsum wallboard / joint compounding building materials @ wall / ceiling areas].* | *2% Chrysotile* |
| ❖*First Floor (Throughout)* | **7,152 Square Ft.* | ⛐*Ceiling Tile / Ceiling Tile Glue (as applicable)* | *2% Chrysotile* |
| ❖*First Floor (Throughout)* | **50 Linear Ft.* | ✪ *Thermal Pipe Insulation* | *PACM* |
| ❖*First Floor (Throughout)* | **50 Linear Ft.* | ❋ *Thermal Pipe Insulation Repair* | *PACM* |

| *CONTROL AREA – C / EXTERIOR – BASEMENT + FIRST FLOOR* | | | |
|---|---|---|---|
| **Location** | **ACM Quantity** | **Type / Description** | **Asbestos Content** |
| ***EXTERIOR: Basement / First Floor Area as defined by Note# on applicable Studio MEJA Prints A1.1E & A1.2E; Note #1*** | **** 100 Square Feet*** | ***Intact Removal of metal window sash of windows as scheduled for renovation.*** | ***5-8% Chrysotile*** |
| ***EXTERIOR: Basement / First Floor Area as defined by Note# on applicable Studio MEJA Prints A1.1E & A1.2E; Note #1 & #7*** | **** 50 Square Feet Caulk*** | ***Complete removal and disposal of all accessible caulk as applied to exterior window frames as installed within masonry rough openings as scheduled for renovation.*** | ***5-8% Chrysotile*** |
| ***EXTERIOR: Perimeter of Entire Structure (including exterior soil and asphalt surface areas).*** | **** 500 Square Feet / Surface Area*** | ***Complete removal of all visible frame caulk material & wood window sash glazing debris (as can be visually ascertained on asphalt surface area(s) and/or within existing soil).*** | ***5-8% Chrysotile*** |
| ***EXTERIOR SOIL @ Building Footprint / Foundation.*** | ****300 Square Ft.*** | ***Removal of Presumed Contaminated Soil (based on visual inspection)*** | ***PACM*** |

| *CONTROL AREA – D / EXTERIOR ROOFING MATERIAL REMOVAL* | | | |
|---|---|---|---|
| ***LOCATION*** | ***ACM QUANTITY*** | ***TYPE / DESCTIPTION OF ACM MATERIAL TO BE REMOVED.*** | ***ASBESTOS CONTENT*** |
| ***Exterior Roof Area:*** | **** 40 Square Feet*** | ***✣ - Removal of any/all roof fields (tar / tar paper), edge mastic, penetration mastic(s) & roof paints as applied to roof deck(s), roof walls & penetration(s). [Note: Please refer to Studio MEJA; Drawing #A1.3E – Note #3 and Attachment #6 of this specification for all applicable work requirements for the removal / replacement of the existing PACM roofing system for this asbestos control area .*** | ***Presumed Asbestos Containing***<br><br>***Roof Field & Mastics (Roof Penetration & Edge Mastics).*** |

| *CONTROL AREA – E / EXTERIOR ROOFING MATERIAL REMOVAL ALTERNATE BID PROPOSAL #1* | | | |
|---|---|---|---|
| ***LOCATION*** | ***ACM QUANTITY*** | ***TYPE / DESCTIPTION OF ACM MATERIAL TO BE REMOVED.*** | ***ASBESTOS CONTENT*** |
| ***Exterior Roof Area:*** | ****100 Square Feet*** | ***✣ - Removal of any/all roof fields (tar / tar paper), edge mastic, penetration mastic(s) & roof paints as applied to roof deck(s), roof walls & penetration(s). [Note: Please refer to Studio MEJA; Drawing #A1.3E – Note #2 and Attachment #6 of this specification for all applicable work requirements for the removal / replacement of the existing PACM roofing system for this asbestos control area .*** | ***Presumed Asbestos Containing***<br><br>***Roof Field & Mastics (Roof Penetration & Edge Mastics).*** |

| *CONTROL AREA – F / EXTERIOR ROOFING MATERIAL REMOVAL* | | | |
|---|---|---|---|
| ***LOCATION*** | ***ACM QUANTITY*** | ***TYPE / DESCTIPTION OF ACM MATERIAL TO BE REMOVED.*** | ***ASBESTOS CONTENT*** |
| ***Exterior Roof Area:*** | ****7,200 Square Feet*** | ***✣ - Removal of any/all roof fields (tar / tar paper), edge mastic, penetration mastic(s) & roof paints as applied to roof deck(s), roof walls & penetration(s). [Note: Please refer to Studio MEJA; Drawing #A1.3E – Note #1 and Attachment #6 of this specification for all applicable work requirements for the removal / replacement of the existing PACM roofing system for this asbestos control area .*** | ***Presumed Asbestos Containing***<br><br>***Roof Field & Mastics (Roof Penetration & Edge Mastics).*** |

| *CONTROL AREA – G / EXTERIOR OPENING AT MASONRY WALL ALTERNATE BID PROPOSAL #3* | | | |
|---|---|---|---|
| ***LOCATION*** | ***ACM QUANTITY*** | ***TYPE / DESCTIPTION OF ACM MATERIAL TO BE REMOVED.*** | ***ASBESTOS CONTENT*** |
| ***Exterior Elevation / Basement & First Floor North West Elevation as defined by Studio MEJA Drawings A1.1E & A1.2; Note #3.*** | ****75 Square Feet*** | ***ⓘ - Mastic Material as applied to interstitial space within masonry walls and waterproofing mastic as potentially applied to structural steel lintel above / below the existing window system scheduled to be impacted for new entry. [Note: Please refer to Studio MEJA; Drawing #A1.1E & A1.2E- Note#3 and Attachment #7 of this specification for all applicable work requirements for the creation of a new entry into the structure .*** | ***PACM*** |

✪ ***Asbestos contractor shall be responsible for the complete removal of all accessible and enclosed PACM thermal insulation materials as defined by Attachment #2 of this specification and Studio JAED mechanical system removal as defined by Studio MEJA prints M1.1, M1.2, M1.3, M2.1, M2.2, M2.3, M2.4 & M2.5; Dated 9/14/2016. The removal work operations must be conducted by the selected asbestos contractor using work practices as defined by section B.8.2 / B.8.3 of the current RIDOH Asbestos Control Regulation in addition to all additional work requirements as defined by Attachments #1 - #5 of this specification.***

❋ ***The selected RIDOH asbestos contractor shall be responsible for the repair of all damaged TSI as determined to be in poor condition by an asbestos inspector at the time of the renovation work operations. The repair shall be applicable to any/all TSI remaining within each asbestos control area at the Basement or First Floor area and not scheduled for removal Studio MEJA prints M1.1, M1.2, M1.3, M2.1, M2.2, M2.3, M2.4 & M2.5; Dated 9/14/2016. The work operations must be conducted by the selected asbestos contractor using work practices as defined by section B.8.2 / B.8.3 of the current RIDOH Asbestos Control Regulation in addition to all additional work requirements as defined by Attachments #1 - #5 of this specification.***

★ ***The selected asbestos contractor is responsible for the removal of all interior ACM / PACM wall and ceiling surfacing materials (gypsum and/or plaster) at each room / area of the structure as defined by Attachment #2 of this specification using work practices as defined by the corresponding ASB-16A form and Attachments #1 - #5 of this specification (as applicable). NOTE: The asbestos contractor shall be required to conduct only removal work operations as required to facilitate work requirements (i.e. impact to existing ceiling tiles, existing wall or ceiling surfaces areas) as defined on Studio MEJA drawings – M1.1, M1.2, M1.3, M2.1, M2.2, M2.3, M2.4, M2.5, M3.1, E1.1, E1.2, E2.1, E2.2, E2.3, E2.4, E2.5, FA1.1, FA1.2, FA2.1, FA2.2, A1.1E, A1.2E, A1.1 & A1.2.; Dated 9/14/16.***

# ***- The contracted asbestos contractor shall be responsible for the repair of any/all interior ACM / PACM wall and ceiling surfacing area (plaster or gypsum), at each room / area of the structure - using work practices as defined by the corresponding ASB-16A form and Attachments #1 - #5 of this specification.***

☯ ***Each area(s) of removal and quantity as reported within Attachment #2 of this specification, is inclusive of any/all plaster wall and/or ceiling surface areas previously removed and/or left partially remaining by the owner. It has been determined that surfacing materials (plaster, ceiling tile and gypsum) in minimal quantities is remaining in select areas of the defined asbestos control area which will require the asbestos contractor to complete the removal work operations using work practices as defined by Attachments - #1 - #5 of this project specification.***

♂ ***The contracted asbestos contractor shall be responsible for the complete removal of any/all interior ACM / PACM ceiling tiles and accessible glues either accessible or remaining above an accessible loose installed ceiling tile and remaining from a previous installation, at each room / area of the structure. All ceiling tiles and associated grid work shall be removed and disposed of as ACBM. The work operation must be done using work practices as defined by the corresponding ASB-16A form and Attachments #1 - #5 of this specification.***

✌ ***The intact removal of each operable metal window sash and disposal must be conducted in accordance with the RIDOH removal policy named: "Regulatory Interpretation Regarding Intact Removal of Non-Friable Asbestos Containing Materials" dated March 2, 2005, and all additional work requirements of Attachment #8 of this specification.***

🕶 ***Exterior ACM caulk material to be removed using work practices as defined by the corresponding ASB-16A forms and Attachments #1 & #9 of this specification (as applicable).***

✷ ***Exterior ACM caulk material debris and associated presumed contaminated soil to be removed using work practices as defined by the corresponding ASB-16A forms and Attachments #1 & #9 of this specification (as applicable).***

✜ ***- Exterior ACM / PACM roofing materials must be removed using work practices as defined by the corresponding ASB-16A forms and Attachments #1 - #6 of this specification (as applicable). The contracted asbestos contractor shall be required to conduct the removal of any/all - Exterior PACM roofing materials as required to facilitate the work requirements of Studio MEJA Drawing #A1.3E (Notes #1, 2 & 3 – as applicable to the corresponding ASB16A Forms and Attachments #2 & #6 of this specification).***

ⓘ ***- Exterior PACM wall mastic / waterproofing material to be removed using work practices as defined by the corresponding ASB-16A form and Attachments #1 - #7 of this specification (as applicable). (Refer to Studio MEJA Drawings A1.1E & A1.2E; Note #3).***

# *ATTACHMENT NO.-3*

**INTERIM AND ON-GOING OPERATIONS AND MAINTENANCE PROGRAM**:
The building owner representatives, maintenance personnel, building staff, outside contracting personnel, and other building occupants have been or will be made aware of the presence, amount, location, and condition, of the asbestos-containing building materials within this area of the building. These people have been or will be educated and advised not to disturb the asbestos-containing materials due to the potential health effects if asbestos fibers become airborne.

**EMPLOYEE NOTIFICATIONS**:
The building owner as well as outside contractors have been or will be notified as to the presence of ACM / PACM containing building materials within select Basement, First Floor, Attic & Exterior areas / 575 Smithfield Road #1; North Smithfield, RI. All outside contractor(s) will sign a document stating that the individual has been made aware of the presence and location of the asbestos-containing materials within these areas. Also, the building owner representative(s) are responsible for presenting information to the building occupants of any asbestos abatement activities being conducted. This will be accomplished by posting memo's and/or posting of caution / warning signs at all the entrances to the building during such activities.

**ACCIDENTAL DISTURBANCE OF ASBESTOS-CONTAINING MATERIALS:**
The building owner was, [at the time of the inspection],has been made aware of the presence of ACM / PACM containing building materials within select Basement, First Floor, Attic & Exterior areas / 575 Smithfield Road #1; North Smithfield, RI Due to the known presence of the asbestos-containing materials. The building owner will institute the following procedures in an event of an accidental asbestos fiber release within the building prior to the start of the asbestos abatement project.

If an asbestos-containing material becomes disturbed within the criteria of a minor fiber release (less than 10 linear feet or 25 square feet of ACBM), a trained " R.I. Competent Person" may perform the cleanup, removal, encapsulation, or enclosure abatement activities utilizing spot removal/repair techniques. During these spot abatement techniques, access to the area shall be restricted to only those trained individuals, signs shall be posted, and HVAC (if applicable) shall be shut down and locked out. If a major fiber release occurs (greater than 10 linear feet or 25 square feet of ACM), the clean up, removal, encapsulation, or enclosure abatement activities must be completed by a RI Department of Health (RIDOH) certified asbestos abatement contractor. Regardless of the amount of asbestos to be abated, the effected area must be isolated and entry to the area restricted to only those trained/ certified personnel.

**EMPLOYEE TRAINING:**
Any employee of the company, firm, agency, or other organization as well as any outside contractor employed by the building owner who, as a consequence of their work activities, disturbs asbestos-containing building materials must be properly trained and certified by the R.I. Department of Health as a "R.I. Competent Person" in accordance with the R.I. Rules and Regulations for Asbestos Control.

# *ATTACHMENT NO.- 4*

## *REQUESTED WAIVERS*

***WORK REQUIRMENTS: B.8.2(d)***
***LIMITED WALL COVERING /***
***INTERIOR - ASBESTOS CONTROL AREAS - A & B:***

Due to the planned removal and/or repair of multiple asbestos containing surfacing and miscellaneous building materials throughout the interior of the structure (Asbestos Control Areas A & B). The building owner requests a waiver for the limited use of wall covering as required by section B.8.2(d) of the current RIDOH asbestos control regulations (as applicable). Note: This request shall be limited to wall surfacing areas requiring asbestos mitigation, repair and/or renovation work operations associated with wall surface areas associated with the above referenced asbestos control areas. All remaining areas within the asbestos control area not requiring removal / repair of ACM wall surfacing or miscellaneous materials shall continue to be covered in accordance with the current requirements of the RIDOH regulation (section B.8.2(d); RIDOH asbestos control regulation [R-23-24.5-ASB]). All uncovered wall surface areas shall be wet cleaned and HEPA vacuumed to a dust free condition at the completion of the work to insure the area is clean, prior to clearance air sampling as defined by Attachment #1 of this specification.

***WORK REQUIRMENTS: B.8.2(d)***
***WAIVER OF WALL COVERING ABOVE AREA OF EXISTING CELING TILE /***
***INTERIOR - ASBESTOS CONTROL AREAS - A & B:***

Due to the potential for impact / release of dust associated with known ACM plaster debris to be present above the existing ceiling tiles throughout the Basement and First Floor areas of the structure. The asbestos contractor shall **not** be responsible for the covering of the limited wall surface area as exposed between the ceiling tile grid and the ceiling area above (area located above the existing ceiling tile), as to install wall covering at these areas, would require the asbestos contractor remove the ceiling tiles throughout the areas currently known to contain ACM plaster debris, prior to the start of the renovation work operations. Due to the impractical nature of this work operation, the asbestos contractor shall only be responsible for the covering of any/all accessible wall surface areas (up to the ceiling tile grid as required by section B.8.2(d) of the current RIDOH asbestos control regulation [R-23-24.5-ASB] and the wet cleaning and HEPA vacuuming of any/all exposed wall surface areas (painted plaster) located above the area of existing ceiling tiles - after the abatement work operation is completed but prior to clearance air sampling.

***CLEARANCE AIR TESTING /***
***EXTERIOR - ASBESTOS CONTROL AREAS – C, D, E, F & G (AS APPLICABLE):***

Based on the scheduled removal of non-friable ACM building materials from the exterior roof and exterior elevation area(s) of the structure the (as defined by Appendix – 2 of this specification) - in association with the scheduled open removal operations. The building owner requests a waiver of clearance air testing as required by section B.8.2(p) of the current RIDOH asbestos control regulations [R-23-24.5-ASB]. In lieu of clearance air testing, results of OSHA personnel air sampling as collected by the asbestos contractor during the asbestos mitigation work operations will be used in lieu of clearance area air sampling. Please refer to Attachment – 1, of this project specification for specific sampling criteria's and standards to be used for project completion.

# *ATTACHMENT NO.- 5*

## *SPECIFIC WORK REQUIREMENTS*

During the asbestos mitigation operations the selected asbestos contractor shall be responsible for the work to be conducted in accordance with **all** applicable asbestos control regulations: USEPA – NESHAP 40 CFR Part 61, US OSHA 29 CFR 1926.1101 & US OSHA 29 CFR 1910.1001 and the RIDOH Asbestos Control Regulation [R 23-24.5-ASB]. The building owner (Town of North Smithfield), project architect (Studio MEJA Architects) and/or the selected asbestos consultant (Emery Environmental Associates) will stop the work at any time violations of any asbestos control regulations are observed. In addition to the above referenced asbestos control regulations, the selected asbestos contractor shall be required to comply with the following additional work requirements.

### *ASBESTOS CONTROL AREAS: A - G*

**PROJECT SUBMITTALS:** Prior to the start of any asbestos work operations, the selected asbestos contractor shall be required to submit copies of the following items for review and approval. ***NOTE: Additional submittals not requested at this time may be required for submittal and approval in the future.*** No asbestos work operations may begin on site until the following items are submitted and approved in writing by the owner (Town of North Smithfield).

1. ***Copy of RIDOH 10 day written start work notification for this project,***
2. ***Copies of the Town of North Smithfield police and fire department written notification(s),***
3. ***Copy of contractors current insurance certificate,***
4. ***Copy of contractor's current written health and safety program,***
5. ***Copy of contractors current written asbestos respirator program,***
6. ***Copies of MSDS sheet for the polyethylene sheeting, proposed for use,***
7. ***Copies of MSDS sheet for 10-mil fire retardant polyethylene sheeting with reinforced scrim, proposed for use (with the exterior window abatement operations),***
8. ***Copies of MSDS sheet for the duct tape, proposed for use,***
9. ***Copies of MSDS sheet for the final spray encapsulant, proposed for use,***
10. ***Copies of MSDS sheet for duct tape, proposed for use,***
11. ***Copies of MSDS sheet for protective suits, proposed for use,***
12. ***Copy of manufactures efficiency report for each "HEPA vacuum system" proposed for use***
13. ***Copies of licensure for the waste landfill, proposed for use,***
14. ***Copies of RIDOH Asbestos licensure, training certification, medical information, fit test, First Aid / CPR card(s), for each worker proposed for use on the project site,***
15. ***Copies of RIDOH certification for laboratory used to analyze the contractors daily OSHA personal air samples.***

**LEAD PAINT / RIDEM:** The selected asbestos contractor shall be required to comply with all notification and work requirements of the current RIDEM lead control regulation(s) No – 24 & 5.

**LEAD PAINT /OSHA:** All workers coming into contact with the painted walls, ceilings, window frame(s) and door frames(s) shall be required to comply with all worker protection requirements of the current OSHA lead regulation 29 CFR 1926.62.

***ASBESTOS CONTROL AREAS: A & B:***

**MOVABALE OBJECTS:** It is the responsibility of the asbestos contractor to wet clean, HEPA vacuum and remove all moveable non-asbestos objects from the work area prior to the start of any asbestos mitigation operations.

**COVERING OF NON-ASBESTOS BUILDING MATERIALS:** The asbestos contractor shall be responsible for the covering of all floor, wall and ceiling surface areas, materials and objects within each work area that is not scheduled for asbestos abatement with two layers of polyethylene sheeting. All items scheduled to be covered within each work area must be first pre-cleaned using wet-methods and HEPA vacuumed to a dust free condition prior to covering. This shall include fiberglass pipe, ceiling tiles, non-asbestos doors, floors, walls, light fixtures, HVAC duct insulation, etc. All items not covered and not decontaminated at the completion of the work shall be considered asbestos contaminated and must be cleaned or disposed of as asbestos containing building material. NOTE: When covering painted wall surface areas or painted materials the asbestos contractor shall protect the painted surface areas with painters tape prior to the use of waterproof tape. Also, the contractor shall be prohibited from using spray adhesives during the installation of the containment system (i.e. wall covering).

**NEGATIVE PRESSURE CONTAINMENT REQUIREMENTS:** The Asbestos Abatement contractor shall set-up and maintain negative pressure ventilation units with HEPA filtration, in sufficient number, dependent upon the abatement areas, to provide one (1) work-place air change every fifteen minutes. These units shall operate continuously (24 hours per day) from the time of barrier construction through the time of successful final visual inspection by the building owners selected consultant.

Local exhaust filtered air will be evacuated to the outside of the building at all times away from public access areas and building ventilation intake vents. HEPA filters will be leak proof and the ventilation unit will maintain a minimum pressure differential of -0.02 inches of water column relative to the adjacent areas of the building. Documentation of negative pressure shall be monitored by a manometer with printed reading. A printed reading of the containment pressure reading / "log" documented on a daily basis. The reading shall be dated and referenced to the project location and control area. The manometer readings shall be printed signed by the project supervisor and forwarded to the owner **(Town of North Smithfield)** on a daily basis. If the printed readings indicate adequate negative pressure has not been maintained. The asbestos contractor shall increase the number of units until proper negative pressure can be established.

**LOCKOUT / TAG OUT:** The asbestos contractor shall be responsible for the lock-out / tag-out of any and all gas or electric equipment operating within the asbestos control area(s). (This shall include generators, boiler system equipment, hot water heaters, etc.) In addition, the asbestos contractor shall be responsible for the isolation and lock-out / tag-out of all electrical service(s) within the asbestos control area(s).

**SMOKE DETECTOR / FIRE DETECTOR PROTECTION DURING WORK OPERATIONS:** The selected asbestos contractor shall be responsible for the protection and covering of all fire system alarms, fire system detector(s) and smoke detectors during the performance of the project. Protection must be conducted using methods approved by current RI fire codes.

✪ **ACM THERMAL PIPE INSULATION REMOVAL:** During the performance of the renovation, the selected asbestos contractor is required to remove all "accessible" thermal pipe insulation materials within the limits of the asbestos control area as defined for impact (removal) by Studio MEJA drawings M1.1, M1.2, M2.1, M2.2, M2.3, A1.1E & A1.2E (refer to Attachment #2 of this specification). "Accessible" thermal pipe insulation (TSI) shall be defined as any pipe insulation material within a room / office / hallway or stairway that contains exposed TSI. **NOTE: "Accessible" TSI shall also include pipe insulation that was previously enclosed within a wall or ceiling surface area scheduled for removal and/or the area above a drop ceiling system (as scheduled to be removed as part of the Studio MEJA designed renovation work operations).** Any/all thermal pipe insulation that is determined "accessible" and scheduled for removal must only be impacted (removed) by a RIDOH asbestos contractor and only using work operations as defined by section B.8.2/B.8.3 of the current RIDOH asbestos control regulation [R-23-24.5-ASB]. At areas where the TSI is being removed and terminated at an area where it routes from "accessible" to "inaccessible" or to a area where removal is not being conducted, the selected asbestos contractor shall be required to "cap" and repair these areas to a intact condition using a re-wettable fiberglass cloth and in a manner that insures the TSI is covered and no asbestos is exposed for a potential fiber release in the future.

❋ **REPAIR OF "ACCESSIBLE" - ACM THERMAL PIPE INSULATION (AS APPLICABLE):** During the performance of the renovation, the selected asbestos contractor is required to repair any/all damaged (impact, torn insulation cover, exposed insulation cut ends, etc.) and "accessible" thermal pipe insulation materials within each asbestos control area, that is not scheduled for removal by Studio MEJA drawings M1.1, M1.2, M2.1, M2.2, M2.3, A1.1E & A1.2E (refer to Attachment #2 of this specification). "Accessible" thermal pipe insulation (TSI) shall be defined as any pipe insulation material within a classroom / hallway, stairway, storage room, office, etc. - that the exposed TSI (can be touched) with or without the use of a ladder. NOTE: "Accessible" TSI shall not be defined as pipe insulation that is enclosed behind an intact wood pipe chase box, enclosed behind a plaster wall or enclosed above a plaster ceiling. Repair to the damaged asbestos pipe insulation shall be made using work operations as defined by section B.8.2/B.8.3 of the current RIDOH asbestos control regulation [R-23-24.5-ASB], and shall be conducted using a re-wettable fiberglass cloth and applied by asbestos workers in a manner that repairs the damaged areas and renders the thermal pipe insulation into an intact / non-damaged condition.

➶**CEILING TILE REMOVAL / GENERAL WORK REQUIREMENTS:** The asbestos contractor shall be responsible for the complete removal of any/all interior ACM / PACM ceiling tiles, accessible glues and associated ceiling tile grid system(s) throughout each area (each room, hallway, closet, office, etc.) of the structure. Ceiling tile removal shall be defined as accessible 2'X2' & 2'X4' loose ceiling tiles in a grid system and 1'X1' ceiling tile adhered to the ceiling areas using both staples and/or glue. Multiple areas of the structure (Basement and First Floor) contains multiple types of ceiling tile in the same room / area and the asbestos contractor shall be responsible for the removal of all ceiling tile(s) in each room / area (of each asbestos control area) regardless of quantity or application. All removal must be done in accordance with all applicable work operations as defined by section B8.2/B.8.3 of the current RIDOH asbestos control regulation [R-23-24.5-ASB] in association with the all applicable waivers as defined by Attachment – 4 of this specification. All waste as generated by the ceiling tile removal shall be disposed of as an ACBM.

➶**CEILING TILE REMOVAL / SPECIFIC WORK REQUIREMENTS:**
The asbestos contractor shall not intentionally impact any wall / ceiling surfacing material or remove any ceiling tiles within each asbestos control area prior to the area being prepared in accordance with RIDOH work requirements as defined by section B.8.2 / B.8.3 of the current RIDOH asbestos control regulation [R-23-24.5-ASB], **and the area is approved to proceed (removal) in writing by the building owners asbestos consultant**.
When the contractor is approved to remove the ceiling tile it must be done in accordance with the following work operations:
(1). The removal of the ceiling tile must be done in a manner that renders the ceiling tile intact during the removal work operation and each tile must be sufficiently wetted with amended water and containerized at the point of removal. Dropping of waste (i.e. ceiling tile) and/or the intentional breakage of the ceiling tile for the purpose of removal (and any other work operation that creates a visible emission) are prohibited. Any/all accumulation of un-containerized ACM waste is prohibited.
(2). After the ceiling tiles are removed the asbestos contractor shall seal any openings within the containment area per work requirements of section B.8.2 (a) & (b) of the current RIDOH asbestos control regulation [R-23-24.5-ASB],
(3). After the ceiling tile are removed and all openings are sealed, the asbestos contractor may proceed with the mitigation and repair of the remaining ACM/PACM building materials within each separate asbestos control area.

★ **WALL / CEILING SURFACING MATERIAL REMOVAL**: The selected asbestos contractor is responsible for the removal of any/all interior ACM / PACM wall and ceiling surfacing materials (gypsum and/or plaster) at each room / area of the structure as defined by Attachment #2 of this specification using work practices as defined by the corresponding ASB-16A form of this specification (as applicable). NOTE: The asbestos contractor shall be required to conduct only work operations that will impact wall or ceiling surfaces areas as required to facilitate work requirements as defined on Studio MEJA drawings – M1.1, M1.2, M1.3, M2.1, M2.2, M2.3, M2.4, M2.5, M3.1, E1.1, E1.2, E2.1, E2.2, E2.3, E2.4, E2.5, FA1.1, FA1.2, FA2.1, FA2.2, A1.1E, A1.2E, A1.1 & A1.2.; Dated 9/14/16. During the removal work operations the contractor shall remove any/all wall and ceiling surface areas that will be impacted by the renovation work operation(s). This shall include but not limited to:

1) Removal of wall / ceiling surfaces (either due to damage or required to facilitate a new renovation work operation),
2) Removal of existing mechanical systems (pipe, duct, electrical, fire alarm),
3) Installation of new mechanical systems (pipe, duct, electrical, fire alarm),

The exact areas and limits of removal shall be directed by the owner (Town of North Smithfield) and the work requirements as defined by the previous referenced Studio MEJA drawings. The selected asbestos contractor shall be required to remove and dispose of ANY/ALL solid gypsum and/or plaster wall and ceiling surface areas (and associated framing) throughout the area(s) of renovation as ACBM. In addition, the asbestos contractor shall be responsible for the removal of any materials as adhered to these wall and ceiling surface areas if impact by any renovation work operation is defined on the previous referenced Studio MEJA drawings for this project.

When applicable. The selected asbestos contractor shall be responsible for the complete removal and disposal of the entire plaster / gypsum system at areas where new doorways, wall shoring or new wall configuration is required, (regardless of total quantity / layers of plaster) along with the applicable support materials (i.e. metal screen and/or wood lath). At areas where the removal / impact to the wall and ceiling systems is limited to holes (openings) for new utility penetrations or removal of old utilities, the asbestos contractor shall conduct the work as required / applicable for the planned work operations.

The exact limits of work (limits of demolition) shall be defined by the previous referenced Studio MEJA drawings. During and at the completion of the work operations, the asbestos contractor shall be responsible for the removal of plaster to be done in a manner that utilized straight cuts [i.e. right angles / 90°, 45° or level] with the final condition of the plaster to be in an intact and stable condition. At areas where a void is created (i.e. space where air can move) at areas where a floor, ceiling and/or wall surface area was removed but cannot be completely decontaminated or wet cleaned. The asbestos contractor shall be responsible for the isolation of the void **using a product as approved by the owner**. This may include but not limited to the installation of: (1). non-asbestos caulk, (2). non-asbestos mastic encapsulant, (3). fire rated foam (used with rock wool), (4). isolation using gypsum wallboard and sealed with caulk or (5). Installation of a non-asbestos gypsum based plaster repair material. The only requirement of this work requirement is that the isolation of opening (void) cannot impede or create a burden for other trades conducting contracted work for this project (i.e.: trades installing utility routing, wall / ceiling plaster repair, painting, etc.) or at an area where ACM/PACM materials can be readily accessed and/or removed.

Upon completion of the work operations, the asbestos contractor shall be required to wet clean and HEPA vacuum all surface areas within the entire work area prior to the collection of clearance air testing as defined within Attachment #1 of this specification.

All waste materials as generated during the work operations must be containerized and disposed of as asbestos containing building material in accordance with all applicable OSHA, USEPA, USEPA and DOT regulations.

**# - ACM PLASTER REPAIR @ WALL & CEILING SURFACE AREA(S) THROUGHOUT THE INTERIOR OF THE STRUCTURE:** The asbestos contractor shall be required to conduct the repair of any/all plaster or gypsum wall or ceiling surfacing materials throughout the entire interior of the structure.

Upon completion of the work operations, the asbestos contractor shall be responsible for the repair of any/all existing / remaining damaged gypsum or plaster wall or ceiling surface areas within the area(s) including but not limited to the following: areas of previous / existing damaged plaster, holes created by new utility pathways, holes created by wall or ceiling removal, holes created by removed utilities. The plaster repair shall be made to an intact condition using materials and workmanship as required by the project architect and to a condition suitable for new paint.

**FINAL CLEANING:** The selected contractor shall be responsible for the complete cleaning of all surface areas within the asbestos control area using wet methods and HEPA vacuuming prior to the completion of the project.

**POWER SUPPLY TO WORK AREA FOR CLEARANCE AIR TESTING:** Prior to request for final visual inspection and/or clearance air testing. The selected asbestos contractor is required to supply **each separate asbestos work area** with at least FIVE (5) independent electric cords for the purpose of clearance air testing. The cords must be clean (i.e. dust free), operational ("live") and directly attached to a GFI / GFCI.

**POST-ABATEMENT FINAL CLEANING:** Upon completion of the project the selected asbestos contractor shall be responsible for the removal of all asbestos contaminated polyethylene sheeting and any associated water proof tape used as part of the containment system. In addition, the contractor shall be responsible for the following:

- *Cleaning of all tape residue from light fixtures, wall / ceiling and floor surface areas,*
- *Removal of any/all tack staples used during the project,*
- *Cleaning of any/all residues left from mastic removal products on floor or wall surface area(s),*
- *Cleaning of any/all paint chips that has been dislodged during the containment removal operations,*

# *ATTACHMENT NO.- 6*

## *ADDITIONAL WORK REQUIREMENTS – EXTERIOR / ROOF AREA:*

During the asbestos mitigation operations the selected asbestos contractor shall be responsible for the work to be conducted in accordance with **all** applicable asbestos control regulations: USEPA – AHERA 40 CFR 763, USEPA – NESHAP 40 CFR Part 61, US OSHA 29 CFR 1926.1101 & US OSHA 29 CFR 1910.1001 and the RIDOH Asbestos Control Regulation [R 23-24.5-ASB]. The building owner (Town of North Smithfield), project architect (Studio MEJA Architects) and/or the selected asbestos consultant (Emery Environmental Associates) will stop the work at any time violations of any asbestos control regulations are observed. In addition to the above referenced asbestos control regulations, the selected asbestos contractor shall be required to comply with the following additional work requirements.

### *ASBESTOS CONTROL AREA – D, E & F / EXTERIOR ROOF AREA(S):*

**EXTERIOR - WORK OPERATION(S):** All roofing materials throughout the structure have been assumed to contain asbestos. The asbestos contractor shall be required to remove all exterior PACM containing building materials as defined by **Attachment - 2** of this project specification and is required by the project architect to complete the scheduled renovation work operations. All removal work operations at the exterior roof area must be conducted in accordance with section B.8.8 of the current RIDOH Asbestos Control Regulations [R-23-24.5-ASB], and in accordance with all requested waivers and work procedures as defined by Attachments – 4 of this specification. In addition to these requirements, the selected asbestos contractor shall be responsible for the following additional work requirements:

✜ **EXTERIOR BUILT-UP ROOF TAR / MASTIC MATERIAL REMOVAL AT ROOF SURFACE AREAS ( EEA REFERENCED ASBESTOS CONTROL AREA :**

During the roof removal operations, the asbestos contractor shall be responsible for the removal and disposal of **all** roofing materials as defined by Attachment – 2 of this specification as ACBM. The contractor must also conduct all work in accordance with the current work requirements as defined by section B.8.8 of the RIDOH asbestos control regulation [R-23-24.5-ASB] and all additional requirements of USEPA – NESHAP 40 CFR Part 61, US OSHA 29 CFR 1926.1101 & US OSHA 29 CFR 1910.1001. The selected asbestos contractor shall be responsible for the removal of all built up tar / tar paper roof system, ACM / Assumed ACM - roof mastic, roofing tar, roof tar papers and paints as applied to masonry roof walls, roof decking, roof cants, roof edge flashing(s), roof penetration flashings and any other surface roof mastics / roof tars that remain on the roof as may be impacted by the design and details of the current project [NOTE: Refer to Studio MEJAA1.3 / Demolition Notes #1, #2 & #3 for exact areas of roof replacement and limits to roofing and building materials as impacted for this project. All removed ACM / PACM roofing materials must be containerized at the roof area in two layers of six-mil polyethylene sheeting (i.e. disposal bags) and sealed to an airtight condition. No open or un-containerized ACM waste will be allowed to be transported through the interior of the school at any time. If waste is moved through the exterior of the school it must be transported to grade through a dust tight

Shute or lowered to grade in large scale pans that are covered with plywood or six-mil polyethylene sheeting to eliminate any visible emissions during transport via. a crane.



All ACBM roofing materials must be disposed of in a lined dumpster in compliance with current EPA asbestos disposal regulations. *[NOTE: All ACBM waste loaded in the lined dumpster(s) must be transported to the dumpster with the release of **NO** visible emissions. Based on this requirements the selected asbestos contractor will be required to submit a work plan that will explain what engineering controls will be used to prevent the release of **NO** visible emissions.]* In addition, All waste dumpster(s) must be covered at the end of the day and access to the dumpster must be prohibited with the erection of a fence (around the entire dumpster) and a locking gate. Access to the dumpster must be limited to the asbestos contractor, general contractor and asbestos project monitor. A copy of the key must be given to the building owner's (Town of North Smithfield) and Emery Environmental Assoc. at the start of work and for the duration of the project.

**NOTE - 1:** Safe access to roof area as required to conduct the asbestos control work operations is the responsibility of the asbestos contractor.

**NOTE - 2**: It shall be the responsibility of the asbestos contractor to comply with all OSHA work requirements as it pertains to fall protection.

**NOTE - 3:** It shall be the responsibility of the asbestos contractor to coordinate all roofing activities with the building owner and roofing contractor (as applicable) on a daily basis. No roof abatement work shall be started that is not scheduled to be made watertight at the completion of each days roof asbestos mitigation operations.

**NOTE - 4:** During the work operations, the asbestos contractor shall establish a watering system that can be directed at the area(s) of removal and must insure compliance with all requirements of the current USEPA / NESHAP regulation 49 CFR Part 61, regarding visible emissions. In addition, the selected asbestos contractor shall be responsible for compliance with RIDEM regulation #5 (fugitive dust) and RIDEM regulation #24 (Lead Paint). **Removal with the use of a 1 or 5 gallon watering can and/or spray bottle shall not be permitted or determined adequate water for the specified abatement operations.** The selected contractor shall use water from an operating hose that is connected to a city water service (attached to the structure) or a fire hydrant. NOTE: Use of fire hydrant shall only be permitted with permission from the Town of North Smithfield and/or the building owner.

**NOTE - 5:** The selected asbestos contractor shall be responsible for the work to be conducted in accordance with **all** applicable asbestos control regulations: USEPA – NESHAP 40 CFR Part 61, US OSHA 29 CFR 1926.1101, US OSHA 29 CFR 1910.1001 and the RIDOH Asbestos Control Regulation [R 23-24.5-ASB]. The building owner and/or the selected asbestos consultant (Emery Environmental Associates) will stop the work at any time violations of any asbestos control regulations are observed.

**ACM WASTE CONTAINERIZATION:** The selected asbestos contractor shall be responsible for the wetting and containerization of all ACM/PACM waste at the point of waste generation (i.e. point of removal). At no time shall the asbestos contractor be allowed to open remove and drop ACM waste from a height of 6 feet or greater before the waste is containerized (i.e. double bagged, barreled or wrapped in two layers of polyethylene sheeting and wrapped to an air tight condition). At no time shall any ACM/PACM waste be dropped through a dust tight shute that has not been bagged or barreled first. And at no time shall waste be allowed to be placed in an open dumpster without the waste being containerized first (i.e. double bagged, barreled or wrapped in two layers of polyethylene sheeting and wrapped to an air tight condition).

**LEAD PAINT / RIDEM:** The selected asbestos contractor shall be required to comply with all notification and work requirements of the current RIDEM lead control regulation No – 24.

**LEAD PAINT /OSHA:** All workers coming into contact with interior and exterior painted surfaces shall be required to comply with all worker protection requirements of the current OSHA lead regulation 29 CFR 1926.62.

**ELECTRICTY SUPPLY / SERVICE FOR SITE / WORK OPERATIONS:** During the performance of the asbestos abatement operations, the asbestos contractor shall be responsible for providing any/all electricity as required for the performance of the contracted asbestos abatement operations.

**CRIRTICAL BARRIERS / GENERAL NOTE:**
Prior to the start of any ACM roofing, the asbestos contractor shall be responsible for the installation of a critical barrier made of at least 2 layers of 6 mil polyethylene sheeting and installed to an air tight condition over any opening (HVAC vent, skylight, hole, roof hatch, etc.- within a fifteen foot radius of any asbestos roofing operations. The polyethylene sheeting shall be installed in a manner as to insure that no PACM / ACM dust or debris enters the interior area of the structure during the roof abatement operations.

# *ATTACHMENT NO.- 7*

# *ALTERNATE WORK PROCEDURE*

***ASBESTOS CONTROL AREA – G / EXTERIOR - BASEMENT AND FIRST FLOOR AREAS @ NORTH - WEST ELEVATION***

**REMOVAL OF ASSUMED MASTIC WITHIN INTERSISTIAL AREA OF EXTERIOR BRICK WALL:** The asbestos contractor shall be responsible for the complete removal of any/all presumed asbestos waterproofing mastic as may be applied to masonry brick (within the interstitial space of the exterior brick wall) or the steel window lintels as currently scheduled to impacted (removed) per the requirements of the Studio MEJA / North West Elevation (Drawings A1.1E & A1.2E / Note #3 ). If ACM mastic is determined to be present within the above referenced areas and as defined within Attachment #2 of this speciation. The selected asbestos contractor shall be required to abate these materials using the following AWP.

1). The selected asbestos contractor must establish a work decontamination system as defined by section B.8.8(d) of the current RIDOH asbestos control regulation [R-23-24.5-ASB], and all workers conducting removal, cleaning or material containerization work must be done using PPE for atmospheres at or above the OSHA PEL for asbestos.

2). The asbestos contractor must cover and isolate all operable windows, vents, doorways, ducts, drains, grills, grates, diffusers, skylights with two (2) layers of six mil polyethylene sheeting and seal these critical barriers to an air tight condition with waterproof tape. This requirement shall be conducted to restrict ambient asbestos fibers / dust from entering the interior of the structure,

3). The asbestos contractor must erect vinyl barricade tape marked with “DANGER ASBESTOS HAZARD” and used in association with printed “Danger Asbestos” OSHA warning signage posted along the area of demarcation. This barrier must be used to establish a regulated work area that prohibits non-asbestos trained workers and the general public who are not donning PPE for atmospheres at or above the OSHA PEL for asbestos exposures, (This requirement for vinyl barricade tape may be amended to use temporary construction fencing (if allowed by the owner),

5). The asbestos contractor must establish ground cover directly under and at least 10 additional feet contiguous on either side of the area of the planned area of removal work operation using a minimum of two (2) layers of six (6) mil polyethylene sheeting and installed in a manner that successfully collects any mishandled ACM materials generated by the ACM caulk removal work operation and also restricts contamination to the ground surface area,

6). The asbestos contractor must conduct the removal of the wall surface area in a manner that removes all ACM mastic materials (accessible and recessed behind the existing brick wall). Removal must be done using wet methods and tools directly connected to an operating HEPA vacuuming – and in a manner that does not create a visible emission. Mechanical methods (tools) that creates visible emissions or not attached to an operating HEPA vacuum is not allowed to be used at any time,

7). During the removal operation the asbestos contractor (i.e. work force) must containerize the ACM material at the point of generation. At no time shall open removal and allowing ACM to fall to the ground be allowed.

8). All waste materials generated during the work operation on a daily basis must be containerized in two layers of six-mil polyethylene sheeting, properly labeled and sealed to an airtight condition and disposed of as an ACBM and in compliance with all current USDOT, OSHA, NESHAP and EPA asbestos disposal regulations.

9). At the completion of asbestos removal work by the asbestos contractor - a final inspection to document all removal of ACM materials by the asbestos contractor has been completed,

10). Assuming no staging will be erected as part of the contract work by the owner or general contractor. The asbestos contractor shall be required to provide their own access to all areas requiring ACM removal work removal as defined by this “Alternate Work Practice” as part of the contract fee with no change order to the owner. In addition, the asbestos contractor shall be responsible for providing a man lift (worker boom lift) and a trained operator for any/all inspections as required by the owner to complete the work as defined by this “Alternate Work Practice”. The lift, operator and operation of the man lift / worker boom lift (by the asbestos contractor) shall be provided at no charge to the owner or the owners asbestos consultant.

# *ATTACHMENT NO.- 8*

# ALTERNATE WORK PRACTICE / INTACT WINDOW SASH REMOVAL:

## *ASBESTOS CONTROL AREA – C / BASEMENT & FIRST FLOOR AREAS:*

All window glazing within each wood window sash(s) throughout the structure has been determined to contain asbestos. Due to the design of the project, the building owner shall remove and dispose of **select** existing wood window sashes as designated by areas denoted with Notes #1 & #7 on the existing Studio MEJA drawings A1.1E and A1.2E (see APPENDIX – E attached).

Based on current project work requirements, The selected asbestos contractor shall be required to remove each designated window sash scheduled for removal and disposal - **intact** and in accordance with the RIDOH removal policy named: *"Regulatory Interpretation Regarding Intact Removal of Non-Friable Asbestos Containing Materials" dated March 2, 2005*. Upon completion of the window sash removal, the contractor shall be required to containerize and identify each sash for proper disposal (as ACBM) in accordance with all applicable requirements of RIDOH, OSHA, USEPA and USDOT asbestos control regulations.

All work must only be conducted while the room / area is unoccupied.

The asbestos contractors supervisor and workers shall be required to don PPE for atmospheres at or above the OSHA PEL for asbestos and collect OSHA personal air sampling on the work force during the work operations (as defined within Attachment #1 of this specification). Worker decontamination shall be done in accordance with all applicable work requirements as defined by OSHA 29CFR1926.1101.

EEA shall conduct visual inspection(s) of the work areas after the sash(s) have been removed to document no mishandled materials or debris is remaining within the area(s), post removal.

**NOTE: Any / all workers conducting the removal of the window glazing material should also assume the glazing material and any paint applied to glazing material contains Lead, and should conduct the work in compliance with all applicable requirements of OSHA; 29 CFR 1926.62.**

**NOTE: The asbestos contractor shall be responsible for the weather protection of the window rough openings immediately after the window sash has been removed for disposal and/or window glazing removal. The weather protection shall be accomplished using 10 mil fire retardant scrim reinforced polyethylene sheeting, installed and maintained in a manner that is weather tight for the duration of the project or as determined applicable by the owner / general contractor for this project.**

**LEAD PAINT / RIDEM:** The selected asbestos contractor shall be required to comply with all notification and work requirements of the current RIDEM lead control regulation(s) No – 24 & 5.

**LEAD PAINT /OSHA:** All workers coming into contact with the painted walls, ceilings, window frame(s) and door frames(s) shall be required to comply with all worker protection requirements of the current OSHA lead regulation 29 CFR 1926.62.

**FINAL CLEANING:** The selected contractor shall be responsible for the complete cleaning of all surface areas within the asbestos control area using wet methods and HEPA vacuuming prior to the completion of the project.

**POST-ABATEMENT FINAL CLEANING:** Upon completion of the project the selected asbestos contractor shall be responsible for the removal of all asbestos contaminated polyethylene sheeting and any associated water proof tape used as part of the containment system. In addition, the contractor shall be responsible for the following:

- *Cleaning of all tape residue from light fixtures, wall / ceiling and floor surface areas,*
- *Removal of any/all tack staples used during the project,*
- *Cleaning of any/all residues left from mastic removal products on floor or wall surface area(s),*
- *Cleaning of any/all paint chips that has been dislodged during the containment removal operations,*

# *ATTACHMENT NO.- 9*

# ALTERNATE WORK PRACTICE / ACM WINDOW FRAME CAULK & SOIL REMOVAL:

***ASBESTOS CONTROL AREA – C / EXTERIOR – BASEMENT & FIRST FLOOR***

✒ ✷ **EXTERIOR ACM CAULK REMOVAL AT PERIMETER OF WINDOW / DOOR FRAME SYSTEM (MASONRY ROUGH OPENING):** The asbestos contractor shall be responsible for the complete removal of all exterior caulking material(s) and/or associated backing (horse hair and/or backer rod) as installed around the perimeter of each existing window system masonry rough opening(s) as designated with Notes #1 & #7 on the existing Studio MEJA drawings A1.1E and A1.2E (see APPENDIX – E attached).

Note: All work to remove the ACM caulk must be conducted from the exterior of the structure, and in accordance with the following "Alternate Work Procedure" plan (Attachment #9 work procedures):

The asbestos contractor shall be responsible for the complete removal of all exterior caulking material(s) and associated backing (horse hair or backer rod) as installed around the perimeter of each existing window and door system within the masonry rough opening(s). Note: All work to remove the ACM caulk must be conducted from the exterior of the structure, and in accordance with the following "Alternate Work Procedure" plan (work procedures):

1). The selected asbestos contractor must establish a worker decontamination system as defined by section B.8.8(d) of the current RIDOH asbestos control regulation [R-23-24.5-ASB], and all workers conducting removal, cleaning or material containerization work must be done using PPE for atmospheres at or above the OSHA PEL for asbestos. This decontamination system must be installed at the exterior of the structure and must be attached to the work area,

2). The asbestos contractor must cover and isolate all operable windows, vents, doorways, ducts, drains, grills, grates, diffusers, skylights with access to the interior of the structure with two (2) layers of six mil polyethylene sheeting and seal these critical barriers to an air tight condition with waterproof tape. This requirement shall be conducted to restrict ambient asbestos fibers / dust from entering the interior of the structure but shall NOT be done in a manner that restricts the removal of the ACM caulking material if caulk is applied around one of the previously referenced critical opening(s) [Note: This work requirement may require the contractor to install the critical barrier at the interior of the structure if site conditions dictate],

**NOTE: Compliance with Attachment #9 / #2, shall not waive the selected asbestos contractors responsibility for protecting the interior of the structure from weather (i.e. rain, snow, etc.) [after the window sash(s) have been removed].**

3). The asbestos contractor must erect vinyl barricade tape marked with "DANGER ASBESTOS HAZARD" and used in association with printed "Danger Asbestos" OSHA warning signage posted along the area of demarcation. This barrier must be used to establish a regulated work area that prohibits non-asbestos trained workers and the general public who are not donning PPE for atmospheres at or above the OSHA PEL for asbestos exposures, (This requirement for vinyl barricade tape may be amended to use temporary construction fencing (if allowed by the owner),

4). The asbestos contractor must pre-clean all ledges and ground surface areas where existing ACM caulk and ACM window glazing may be existing due to pre-existing site conditions (i.e. material failure). Pre-cleaning must be done using wet methods / HEPA vacuuming prior to the start of any work operations on a daily basis.

5). The asbestos contractor must establish ground cover directly under the planned work operation and an additional ten (10) feet contiguous on either side of the planned area of removal. The ground cover shall consist of two (2) layers of six (6) mil polyethylene sheeting and installed in a manner that collects any/all mishandled ACM caulking materials generated during the removal work operation and to prevent contamination to the ground surface areas [NOTE: If shrubbery or plants are positioned within the work area (i.e. 10 feet from the structure) it is the contractors responsibility to cover and protect this vegetation from ACM debris as generated during the work. In addition, the contractor must remove the plastic covering of the plants, shrubs or trees - at the completion of work each day to prevent the killing of the plants, shrubs or trees],

6). The asbestos contractor must conduct the removal in a manner that removes all caulking (accessible and recessed behind the wood trim or window frame system). Caulk removal must include all backer materials (i.e. backer rod and/or hair). Removal must be done using hand tools and only while using wet methods / HEPA vacuuming – and in a manner that does not create a visible emission. Mechanical methods (tools) that creates visible emissions is not allowed at any time,

7). During the removal operation the asbestos contractor (i.e. work force) must containerize the ACM material at the point of generation. At no time shall the contractor conduct open removal and intentionally allow ACM to fall to the ground.

8). All waste materials generated during the work operation on a daily basis must be containerized in two layers of six-mil polyethylene sheeting, properly labeled and sealed to an airtight condition and disposed of as an ACBM and in compliance with all current USDOT, OSHA, NESHAP and EPA asbestos disposal regulations.

9). The exterior ground surface area at the perimeter of each elevation (side of building) contains both asphalt and exposed soil. As defined by this specification. The exterior ground surface areas **at the areas of planned** removal must be visually clean of any/all ACM debris as generated from dislodged paint chips, caulk from door / window frames and from the wood window sash(s) (as defined by Attachment #2 of this project specification) on a daily basis. Any/all cleaning or removal work must done by RIDOH accredited asbestos workers /supervisor using HEPA vacuuming and wet methods. To insure the exposed soil around the areas of planned removal / renovation (i.e. to insure the soil / asphalt area around the structure has been properly mitigated, **the asbestos contractor shall be required to remove at least 1-2" of exposed soil from the base of the foundation and extend from the foundation to a distance that insures no visible ACM caulk, ACM glazing or paint chips can be observed in the soil or on the asphalt / concrete at the time of the final visual inspection).**

10). At the completion of asbestos removal work by the asbestos contractor - a final inspection to document all removal of ACM materials by the asbestos contractor has been completed, this visual inspection must be documented by the building owners asbestos consultant prior to the installation of new caulk material (and /or the completion of the project).

11). NOTE: Assuming no staging will be erected as part of the contract work by the owner or general contractor. The asbestos contractor shall be required to provide their own access to all areas requiring ACM caulking removal as defined by this "Alternate Work Practice" as part of the contract fee with no change order to the owner. In addition, The asbestos contractor shall be responsible for providing a man lift (worker boom lift) and a trained operator for any/all inspections as required by the owner to complete the work as defined by this "Alternate Work Practice". The lift, operator and operation of the man lift / worker boom lift (by the asbestos contractor) shall be provided to the owners representative at no charge to the owner or the owners asbestos consultant.

# ATTACHMENT # 10A

## *ROOM I.D. IDENTIFICATION TABLE:*

| *Floor / Area* | *Studio MEJA Room I.D. A.1.1E (9/14/16)* | *EEA Room I.D.* |
|---|---|---|
| Basement | Assembly | Auditorium |
| Basement | EMA Office – 1 | EMA Office |
| Basement | EMA Office - 2 | EMA Office |
| Basement | | Men's Lavatory |
| Basement | Men's Locker Room | Room Outside Men's Lavatory |
| Basement | | Unisex Lavatory |
| Basement | Locker Room | Men's Locker Room |
| Basement | | Ballistic Storage Closet |
| Basement | | Single Prisoner Cell |
| Basement | | Women's Locker Room |
| Basement | Armory | Armory |
| Basement | Locker Room | Supervisor's Locker Room |
| Basement | Evidence | Evidence Room - 1 |
| Basement | Evidence | Evidence Room - 2 |
| Basement | Records | Records Room |
| Basement | Patrol | Patrol Room |
| Basement | Recording Room | Recording Room |
| Basement | Interview | Interview Room |
| Basement | Evidence Intake and Processing Rm. | Evidence Intake Room |
| Basement | Prisoner Processing Room | Prisoner Processing Room |
| Basement | Electrical | Electrical Room |
| Basement | | Cell |
| Basement | | Cell |
| Basement | Storage | Storage Room - 1 |
| Basement | Storage | Storage Room - 2 |
| Basement | Utility | Utility |
| Basement | | Prisoner Intake Entry (Hallway) |
| Basement | Entry | Hallway / Stairway @ Auditorium |

# ATTACHMENT # 10B

## *ROOM I.D. IDENTIFICATION TABLE:*

| *Floor / Area* | *Studio MEJA Room I.D. A.1.2E (9/14/16)* | *EEA Room I.D.* |
|---|---|---|
| First Floor | Conference Room | Police Conference Room |
| First Floor | Captain | Police Commander Office |
| First Floor | Captain | Police Captain Office |
| First Floor | | Police Lavatory |
| First Floor | Detectives | Police Investigative Office |
| First Floor | Administrator | Administrator Office |
| First Floor | Chief | Police Chief Office |
| First Floor | | Hallway @ Police Admin. Offices |
| First Floor | Dispatch | Police Dispatch Office – A |
| First Floor | | Police Dispatch Office - B |
| First Floor | | Server Room |
| First Floor | | Police Station Entry |
| First Floor | | Hallway @ Town Admin. Offices |
| First Floor | Municipal | Building & Zoning Office |
| First Floor | | Town Clerk Office |
| First Floor | Municipal | Town Clerk / Municipal Office |
| First Floor | | Town Offices Entry / Stairway |
| First Floor | Municipal | Tax Collector Office |
| First Floor | | Employee Lavatory |
| First Floor | | Visitor Lavatory |

# *APPENDIX – B:*

## *ANALYTICAL SAMPLE RESULTS*

AEC Laboratories, LLC

MA License: AA000197 RI License: AAL-112A1
CT License: PH-0124 ME License: LB-0074
VT License: AL877888

August 30, 2016 AEC Laboratory Number: **017874.00**

**Client Name and Address:**
Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Re:** Bulk Asbestos Results from 575 Smithfield Road # 1
North Smithfield, RI
Client Project Number: 160801-A

Dear Patrick Emery,

We at AEC Laboratories, LLC would like to thank you for your recent business. A total of 100 sample(s) were received on 08/26/2016 from a job located at North Smithfield, RI for 48 Hour Turn Around Time. The final report is enclosed for the aforementioned samples.

Please note that this report conforms to all applicable State and Federal requirements. AEC Laboratories, LLC follows prescribed procedures for the analysis of bulk materials to identify and quantify asbestos type and content.

These results only pertain to this job and should not be used in the interpretation of any other job. This report may be reproduced only in its entirety.

If you have any questions please do not hesitate to call me at the number below.

Regards,



Valerica Stanca
Laboratory Manager

Enclosures:
- Analytical results
- Chain of Custody
- Client Communications and/or Project Unconformities (If Applicable)

AEC Laboratories, LLC
*814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567*

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA1 -1 | **17874-01** | Basement / Hallway @ Prisoner Entry | Blue/Grey, Homogenous, 1' x 1' Floor Tile (Blue / Grey) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA1 -2 | **17874-02** | Basement / Hallway @ Cell | Blue/Grey, Homogenous, 1' x 1' Floor Tile (Blue / Grey) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA1 -3 | **17874-03** | Basement / Hallway @ Unisex Lav. | Blue/Grey, Homogenous, 1' x 1' Floor Tile (Blue / Grey) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA1 -4 | **17874-04** | Basement / Hall @ Men's Locker Room | Blue/Grey, Homogenous, 1' x 1' Floor Tile (Blue / Grey) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA1 -5 | **17874-05** | 1st Floor / Captain Office (Police) | Blue/Grey, Homogenous, 1' x 1' Floor Tile (Blue / Grey) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA1-6 | **17874-06** | 1st Floor / Hall @ Zoning Office / Town Clerk | Blue/Grey, Homogenous, 1' x 1' Floor Tile (Blue / Grey) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA1-7 | **17874-07** | 1st Floor / Stairway | Blue/Grey, Homogenous, 1' x 1' Floor Tile (Blue / Grey) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA2-1 | **17874-08** | Basement / Hall @ Prisoner Entry | Black, Homogenous, 1' x 1' Floor Tile Glue (Black) | | | Cellulose<br>Nonfibrous | 10<br>90 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA2-2 | **17874-09** | Basement / Hall @ Prisoner Cell | Black, Homogenous, 1' x 1' Floor Tile Glue (Black) | | | Cellulose<br>Nonfibrous | 10<br>90 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA2-3 | **17874-10** | Basement / Hall @ Unisex Lav. | Black, Homogenous, 1' x 1' Floor Tile Glue (Black) | | | Cellulose<br>Nonfibrous | 10<br>90 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
*814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567*

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA2-4 | **17874-11** | Basement / Hall @ Men's Locker Room | Black, Homogenous, 1' x 1' Floor Tile Glue (Black) | | | Cellulose<br>Nonfibrous | 10<br>90 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA2-5 | **17874-12** | 1st Floor / Captain Office (Police) | Black, Homogenous, 1' x 1' Floor Tile Glue (Black) | | | Cellulose<br>Nonfibrous | 10<br>90 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA2-6 | **17874-13** | 1st Floor / Hall @ Zoning Office | Black, Homogenous, 1' x 1' Floor Tile Glue (Black) | | | Cellulose<br>Nonfibrous | 10<br>90 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA2-7 | **17874-14** | 1st Floor / Stairway | Black, Homogenous, 1' x 1' Floor Tile Glue (Black) | | | Cellulose<br>Nonfibrous | 10<br>90 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA3-1 | **17874-15** | Basement / Hall @ Prisoner Entry | Black, Homogenous, 4" Vinyl Cove Molding Black | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
*814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567*

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA4-1 | **17874-16** | Basement / Hall @ Prisoner Entry | Brown, Homogenous, 4" Vinyl Cove Molding Glue Brown | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | <1<br><1<br>100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA5-1 | **17874-17** | Basement / Hall @ Prisoner Entry | Off-White/Grey, Heterogeneous, 2' x 2' Ceiling Tile | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | 35<br>35<br>30 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA5-2 | **17874-18** | Basement / Evidence Intake | Off-White/Grey, Heterogeneous, 2' x 2' Ceiling Tile | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | 35<br>35<br>30 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA5-3 | **17874-19** | Basement / Hall @ Women's Locker Rm | Off-White/Grey, Heterogeneous, 2' x 2' Ceiling Tile | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | 35<br>35<br>30 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA5-4 | **17874-20** | 1st Floor / Hall @ Patrol Commander | Off-White/Grey, Heterogeneous, 2' x 2' Ceiling Tile | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | 35<br>35<br>30 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| Client Sample/ HA ID | Laboratory Sample ID | Location | Description | Asbestos Type(s) | % | Other Materials | % | Asbestos Present | Total Asbestos % |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA5-5 | **17874-21** | 1st Floor / Hall @ Chief of Police | Off-White/Grey, Heterogeneous, 2' x 2' Ceiling Tile | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | 35<br>35<br>30 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA6-1 | **17874-22** | Basement / Hall @ Prisoner Entry | White/Tan, Homogenous, 1' x 1' Ceiling Tile (Remnant) | | | Cellulose<br>Nonfibrous | 98<br>2 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA6-2 | **17874-23** | Basement / Processing Room | White/Tan, Homogenous, 1' x 1' Ceiling Tile (Remnant) | | | Cellulose<br>Nonfibrous | 98<br>2 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA6-3 | **17874-24** | 1st Floor / Hall @ Women's Locker Room | White/Tan, Homogenous, 1' x 1' Ceiling Tile (Remnant) | | | Cellulose<br>Nonfibrous | 98<br>2 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA7-1 | **17874-25** | 1st Floor / Storage #1 | White, Homogenous, Plaster Skim Coat (White) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
*814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567*

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA7 -2 | **17874-26** | 1st Floor / Room Outside Men's Lav | White, Homogenous, Plaster Skim Coat (White) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA7 -3 | **17874-27** | 1st Floor / Hall @ Patrol Commander | White, Homogenous, Plaster Skim Coat (White) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA7 -4 | **17874-28** | 1st Floor / Captain's Office | White, Homogenous, Plaster Skim Coat (White) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA7 -5 | **17874-29** | 1st Floor / Dispatcher Office @ Ceil. | White, Homogenous, Plaster Skim Coat (White) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA7 -6 | **17874-30** | 1st Floor / Hall @ Tax Collector | White, Homogenous, Plaster Skim Coat (White) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
*814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567*

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA7-7 | **17874-31** | 1st Floor / Town Clerk @ Ceiling | White, Homogenous, Plaster Skim Coat (White) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA7-8 | **17874-32** | 1st Floor / Tax Collector | White, Homogenous, Plaster Skim Coat (White) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA8-1 | **17874-33** | Basement / Storage #1 | Grey, Heterogeneous, Plaster Base Coat (Grey) | | | Cellulose<br>Nonfibrous | 3<br>97 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA8-2 | **17874-34** | Basement / Room Outside Men's Lav. | White, Heterogeneous, Plaster Base Coat (Grey) | Chrysotile | 2 | Cellulose<br>Nonfibrous | 3<br>95 | **Yes** | **2** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA8-3 | **17874-35** | 1st Floor / Hall @ Patrol Commander | Plaster Base Coat (Grey) | | | | | | **PS** |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
*814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567*

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA8-4 | **17874-36** | 1st Floor / Captain's Office | Plaster Base Coat (Grey) | | | | | **PS** | |
| 160801-HA8-5 | **17874-37** | 1st Floor / Dispatch Office @ Ceiling | Plaster Base Coat (Grey) | | | | | **PS** | |
| 160801-HA8-6 | **17874-38** | 1st Floor / Hallway @ Tax Collector | Plaster Base Coat (Grey) | | | | | **PS** | |
| 160801-HA8-7 | **17874-39** | 1st Floor / Town Clerk @ Ceiling | Plaster Base Coat (Grey) | | | | | **PS** | |
| 160801-HA8-8 | **17874-40** | 1st Floor / Tax Collector | Plaster Base Coat (Grey) | | | | | **PS** | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
*814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567*

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA9-1 | **17874-41** | Basement / Evidence Intake | Grey/Brown, Heterogeneous, Drywall | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | 8<br>2<br>90 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA9-2 | **17874-42** | Basement / Record Room | Grey/Brown, Heterogeneous, Drywall | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | 8<br>2<br>90 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA9-3 | **17874-43** | Basement / Men's Locker Room | Grey/Brown, Heterogeneous, Drywall | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | 8<br>2<br>90 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA9-4 | **17874-44** | 1st Floor / Hallway @ Conf. Room | Grey/Brown, Heterogeneous, Drywall | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | 8<br>2<br>90 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA9-5 | **17874-45** | 1st Floor / Captain Office | Grey/Brown, Heterogeneous, Drywall | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | 8<br>2<br>90 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
*814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567*

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA9-6 | **17874-46** | 1st Floor / Stairway | Grey/Brown, Heterogeneous, Drywall | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | 8<br>2<br>90 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA9-7 | **17874-47** | 1st Floor / Visitor Lav. | Off-White/Brown, Heterogeneous, Drywall | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | 8<br>2<br>90 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA10-1 | **17874-48** | Basement / Evidence Intake | White, Homogenous, Joint Compound | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA10-2 | **17874-49** | Basement / Records Room | White, Homogenous, Joint Compound | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA10-3 | **17874-50** | Basement / Men's Locker Room | White, Homogenous, Joint Compound | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
*814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567*

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA1 0-4 | **17874-51** | 1st Floor / Hallway @ Conf. Room | White, Homogenous, Joint Compound | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA1 0-5 | **17874-52** | 1st Floor / Captain Office | White, Homogenous, Joint Compound | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA1 0-6 | **17874-53.1** | 1st Floor / Stairway | White, Homogenous, Joint Compound | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA1 0-6 | **17874-53.2** | 1st Floor / Stairway | White, Homogenous, Joint Compound | Chrysotile | 2 | Nonfibrous | 98 | **Yes** | **2** |

**Comments: Plaster-like layer associated with joint compound**

Analyzed by: VS Date Analyzed: 8/29/16

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA1 0-7 | **17874-54** | 1st Floor / Visitor Lav. | White, Homogenous, Joint Compound | | | Nonfibrous | 100 | **No** | **NAD** |

Analyzed by: VS Date Analyzed: 8/29/16

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
*814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567*

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA1 1-1 | **17874-55** | Basement / Evidence Intake | Tan, Homogenous, 1' x 1' Vinyl Floor Tile (Tan) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA1 1-2 | **17874-56** | Basement / Process Room | Tan, Homogenous, 1' x 1' Vinyl Floor Tile (Tan) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA1 1-3 | **17874-57** | Basement / Interview Room | Tan, Homogenous, 1' x 1' Vinyl Floor Tile (Tan) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA1 1-4 | **17874-58** | 1st Floor / Conf. Room | Tan, Homogenous, 1' x 1' Vinyl Floor Tile (Tan) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA1 1-5 | **17874-59** | 1st Floor / Tax Collector | Tan, Homogenous, 1' x 1' Vinyl Floor Tile (Tan) | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
*814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567*

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA1 2-1 | **17874-60** | Basement / Evidence Intake | Black, Homogenous, 1' x 1' Vinyl Floor Tile Glue - Black | | | Cellulose Nonfibrous | 8 92 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA1 2-2 | **17874-61** | Basement / Process Room | Black, Homogenous, 1' x 1' Vinyl Floor Tile Glue - Black | | | Cellulose Nonfibrous | 8 92 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA1 2-3 | **17874-62** | Basement / Interview Room | Black, Homogenous, 1' x 1' Vinyl Floor Tile Glue - Black | | | Cellulose Nonfibrous | 8 92 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA1 2-4 | **17874-63** | 1st Floor / Conf. Room | Black, Homogenous, 1' x 1' Vinyl Floor Tile Glue - Black | | | Cellulose Nonfibrous | 8 92 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA1 2-5 | **17874-64** | 1st Floor / Tax Collector | Black, Homogenous, 1' x 1' Vinyl Floor Tile Glue - Black | | | Cellulose Nonfibrous | 8 92 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA13-1 | **17874-65** | Basement / Process Room | Tan, Homogenous, Vinyl Cove Molding Tan | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/29/16 | | | | | | | | | |
| 160801-HA14-1 | **17874-66** | Basement / Process Room | Brown, Homogenous, Vinyl Cove Molding Glue Brown | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA15-1 | **17874-67** | Basement / Evidence Intake | Red, Homogenous, Vinyl Cove Molding Red | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA15-2 | **17874-68** | Basement / Interview Room | Red, Homogenous, Vinyl Cove Molding Red | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA15-3 | **17874-69** | Basement / Men's Locker Room | Red, Homogenous, Vinyl Cove Molding Red | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| Client Sample/ HA ID | Laboratory Sample ID | Location | Description | Asbestos Type(s) | % | Other Materials | % | Asbestos Present | Total Asbestos % |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA1 5-4 | **17874-70** | 1st Floor / Conf. Room | Red, Homogenous, Vinyl Cove Molding Red | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA1 6-1 | **17874-71** | Basement / Evidence Intake | Off-White/Brown, Heterogeneous, Vinyl Cove Molding Glue Brown | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA1 6-2 | **17874-72** | Basement / Interview Room | Off-White/Brown, Heterogeneous, Vinyl Cove Molding Glue Brown | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA1 6-3 | **17874-73** | Basement / Men's Locker Room | Off-White/Brown, Heterogeneous, Vinyl Cove Molding Glue Brown | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA1 6-4 | **17874-74** | 1st Floor / Conf. Room | Off-White/Brown, Heterogeneous, Vinyl Cove Molding Glue Brown | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
*814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567*

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA17-1 | **17874-75** | Basement / Hall @ Unisex Lav. | Red, Homogenous, Floor Tile Red | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | 2<br><1<br>98 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA17-2 | **17874-76** | 1st Floor Hall @ Bldg. Zoning | Red, Homogenous, Floor Tile Red | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | 2<br><1<br>98 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA18-1 | **17874-77** | Basement / Hall @ Unisex Lav. | Black, Homogenous, Floor Tile Glue Black | | | Cellulose<br>Nonfibrous | 3<br>97 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA18-2 | **17874-78** | 1st Floor / Hall @ Bldg. Zoning | Black, Homogenous, Floor Tile Glue Black | | | Cellulose<br>Nonfibrous | 3<br>97 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA19-1 | **17874-79** | Basement / Auditorium | Yellow, Homogenous, 1' x 1' Ceiling Tile (Fiberglass) | | | Fibrous Glass<br>Nonfibrous | 98<br>2 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
*814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567*

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA1 9-2 | **17874-80** | Basement / Auditorium | Yellow, Homogenous, 1' x 1' Ceiling Tile (Fiberglass) | | | Fibrous Glass<br>Nonfibrous | 98<br>2 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA1 9-3 | **17874-81** | Basement / Auditorium | Yellow, Homogenous, 1' x 1' Ceiling Tile (Fiberglass) | | | Fibrous Glass<br>Nonfibrous | 98<br>2 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA1 9-4 | **17874-82** | 1st Floor / Main Hall @ Conf. Room | Yellow, Homogenous, 1' x 1' Ceiling Tile (Fiberglass) | | | Fibrous Glass<br>Nonfibrous | 98<br>2 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA1 9-5 | **17874-83** | 1st Floor / Main Hall @ Chief Off. | Yellow, Homogenous, 1' x 1' Ceiling Tile (Fiberglass) | | | Fibrous Glass<br>Nonfibrous | 98<br>2 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA2 0-1 | **17874-84** | Basement / Auditorium | Brown, Homogenous, 1' x 1' Ceiling Tile Glue (Brown) | | | Fibrous Glass<br>Nonfibrous | <1<br>100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
*814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567*

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| Client Sample/ HA ID | Laboratory Sample ID | Location | Description | Asbestos Type(s) | % | Other Materials | % | Asbestos Present | Total Asbestos % |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA2 0-2 | **17874-85** | Basement / Auditorium | Brown, Homogenous, 1' x 1' Ceiling Tile Glue (Brown) | Anthophyllite | 2 | Fibrous Glass<br>Nonfibrous | <1<br>98 | **Yes** | **2** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA2 0-3 | **17874-86** | Basement / Auditorium | 1' x 1' Ceiling Tile Glue (Brown) | | | | | | **PS** |
| 160801-HA2 0-4 | **17874-87** | 1st Floor / Hall @ Chief Office | 1' x 1' Ceiling Tile Glue (Brown) | | | | | | **PS** |
| 160801-HA2 1-1 | **17874-88** | Basement / Auditorium | Grey, Homogenous, Pipe Insulation @ Elbow | | | Fibrous Glass<br>Nonfibrous | 25<br>75 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA2 1-2 | **17874-89** | Basement / Auditorium | Grey, Homogenous, Pipe Insulation @ Elbow | | | Fibrous Glass<br>Nonfibrous | 25<br>75 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| Client Sample/ HA ID | Laboratory Sample ID | Location | Description | Asbestos Type(s) | % | Other Materials | % | Asbestos Present | Total Asbestos % |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA2 1-3 | **17874-90** | Basement / Auditorium | Grey, Homogenous, Pipe Insulation @ Elbow | | | Fibrous Glass<br>Nonfibrous | 25<br>75 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA2 2-1 | **17874-91** | 1st Floor / Town Clerk | Off-White/Grey, Heterogeneous, 2' x 4' Ceiling Tile | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | 35<br>35<br>30 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA2 2-2 | **17874-92** | 1st Floor / Tax Collector | Off-White/Grey, Heterogeneous, 2' x 4' Ceiling Tile | | | Cellulose<br>Fibrous Glass<br>Nonfibrous | 35<br>35<br>30 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA2 3-1 | **17874-93** | 1st Floor / Visitor Lav. | Blue, Homogenous, Vinyl Cove - Sea Blue Green | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA2 4-1 | **17874-94** | 1st Floor / Visitor Lav. | Off-White/Brown, Homogenous, Glue @ Vinyl Cove Molding | | | Nonfibrous | 100 | **No** | **NAD** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
*814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567*

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA25-1 | **17874-95** | Exterior Window @ Stairway | Brown, Homogenous, Brown Caulk @ Alum. Window Frame | Chrysotile | 8 | Nonfibrous | 92 | **Yes** | **8** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA25-2 | **17874-96** | Exterior Window @ Bldg. & Zoning | Brown Caulk @ Alum. Window Frame | | | | | | **PS** |
| 160801-HA26-1 | **17874-97** | Exterior Window @ Auditorium | White, Homogenous, White Caulk @ Steel Window Frame | Chrysotile | 6 | Fibrous Talc<br>Nonfibrous | 5<br>89 | **Yes** | **6** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |
| 160801-HA26-2 | **17874-98** | Exterior Window @ Auditorium | White Caulk @ Steel Window Frame | | | | | | **PS** |
| 160801-HA27-1 | **17874-99** | Exterior Window @ Auditorium | White, Homogenous, White Glazing @ Steel Window Frame | Chrysotile | 5 | Nonfibrous | 95 | **Yes** | **5** |
| Analyzed by: VS Date Analyzed: 8/30/16 | | | | | | | | | |

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

AEC Laboratories, LLC
*814 Broad Street - Weymouth, MA 02189 - Ph. 781.337.0567*

**Client:** Emery Environmental
P.O. Box E
Pawtucket, RI 02861

**Attention:** Patrick Emery
**Phone:** 401-727-4941 **Fax:**

**Re:** 575 Smithfield Road # 1

North Smithfield, RI

**AEC Laboratories Project Number:** **017874.00**
**Client Project Number:** 160801-A

**Date Sampled:** 8/25/2016
**Date Received:** 8/26/2016
**Date Analyzed:** 8/29/16 - 8/30/16
**Date Reported:** 8/30/2016

**Analysis by EPA Method 600/R-93/116**

| *Client Sample/ HA ID* | *Laboratory Sample ID* | *Location* | *Description* | *Asbestos Type(s)* | *%* | *Other Materials* | *%* | *Asbestos Present* | *Total Asbestos %* |
|---|---|---|---|---|---|---|---|---|---|
| 160801-HA27-2 | **17874-100** | Exterior Window @ Auditorium | White Glazing @ Steel Window Frame | | | | | | **PS** |

Reviewed by: Valerica Stanca
Signature: Valerica Stanca

Analyzed by: Valerica Stanca
Signature: Valerica Stanca

**Reporting Notes:** NAD = "No Asbestos Detected" PS = "Positive Stop" PR = "Present" <1% = Trace Due to inherent Polarized Light Microscope limitations, fibers and/or bundles below the resolution of the light microscope (approximately <.25 microns in width) will not be detected. "NAD" and "Trace" samples should be confirmed by Transmission Electron Microscopy. AEC Laboratories, LLC (AEC) maintains liability limited to cost of analysis only. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by AEC. AEC is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client. AEC retains all samples for thirty (30) days after reporting. After this period AEC will dispose of all samples according to all local, state, and federal guidelines, unless requested in writing by the client. All results are expressed as a percentage based on Calibrated Visual Estimate (CVE), unless otherwise noted. Distinct layers are noted by .1, .2, etc. suffixes to lab ID.

Received by: Rec'd Date/Time: 8/16/16
Relinquished by: Date/Time:
Received by: Valerie Hawe Date/Time: 8/26/16 9:30

Client Name: EMERY ENVIRONMENTAL ASSOC. Phone: 401-641-0074
Client Address: PO BOX-E PAWTUCKET, RI 02861
Project:
Proj. Address: 575 SMITHFIELD ROAD #1 State (Required): RI
NORTH SMITHFIELD, RI 02896


810 Broad Street
Weymouth, MA 02189
Phone: 781-337-0567
Fax: 781-337-0986
labreports@americanenviron.com


Page 1 of 5

**BULK SAMPLE CHAIN OF CUSTODY**

Analysis: ☒ PLM ☒ Positive Stop ☐ Qualitative ☐ Point Count ☐ NOB Prep ☐ TEM Chat ☐ Lead ☐ PCB

Turnaround Time: ☐ RUSH ☐ 24 Hour ☒ 48 Hour ☐ 3 Day ☐ 5 Day

Sampled By: PATRICK EMERY
Date: 8/25/16
Results to (PM):

Verbal Results: Y / N
Cell #: 401-641 0074
Name: PATRICK EMERY

AEC Laboratories ID: 17874

Special Instructions: EEA PA160801-A

| LAB ID | FIELD ID | LOCATION | SAMPLE DESCRIPTION | Homogen-ous Area | Material Type |
|---|---|---|---|---|---|
| | 160801-HA1-1 | BASEMENT / HALLWAY @ PRISONER ENTRY | 1X1 FLOOR TILE (BLUE/GREY) | | |
| | 160801-HA1-2 | BASEMENT / HALLWAY @ CELL | | | |
| | 160801-HA1-3 | BASEMENT / HALLWAY @ UNISEX LAV | | | |
| | 160801-HA1-4 | BASEMENT / HALL @ MENS LOCKER ROOM | | | |
| | 160801-HA1-5 | 1ST FLOOR / CAPTAIN OFFICE (POLICE) | | | |
| | 160801-HA1-6 | 1ST FLOOR / HALL @ ZONING OFFICE / TOWN CLERK | | | |
| | 160801-HA1-7 | 1ST FLOOR / STAIRWAY | | | |
| | 160801-HA2-1 | BASEMENT / HALL @ PRISONER ENTRY | 1'X1' FLOOR TILE GLUE (BLACK) | | |
| | 160801-HA2-2 | BASEMENT / HALL @ PRISONER CELL | | | |
| | 160801-HA2-3 | BASEMENT / HALL @ UNISEX LAV. | | | |
| | 160801-HA2-4 | BASEMENT / HALL @ MENS LOCKER ROOM | | | |
| | 160801-HA2-5 | 1ST FLOOR / CAPTAIN OFFICE (POLICE) | | | |
| | 160801-HA2-6 | 1ST FLOOR / HALL @ ZONING OFFICE | | | |
| | 160801-HA2-7 | 1ST FLOOR / STAIRWAY | | | |
| | 160801-HA3-1 | BASEMENT / HALL @ PRISONER ENTRY | 4" VINYL COVE MOLDING - BLACK | | |
| | 160801-HA4-1 | BASEMENT / HALL @ PRISONER ENTRY | 4" VINYL COVE MOLDING GLUE - BROWN | | |
| | 160801-HA5-1 | BASEMENT / HALL @ PRISONER ENTRY | 2'X2' CEILING TILE | | |
| | 160801-HA6-2 | BASEMENT / EVIDENCE INTAKE | | | |
| | 160801-HA5-3 | BASEMENT / HALL @ WOMENS LOCKER RM. | | | |
| | 160801-HA5-4 | 1ST FLOOR / HALL @ PATROL COMMANDER | | | |
| | 160801-HA5-5 | 1ST FLOOR / HALL @ CHIEF OF POLICE | | | |

Received by: Pat G Date/Time: 8/16/16
Relinquished by: Date/Time:
Received by: VS Date/Time: 8/26/16


810 Broad Street
Weymouth, MA 02189
Phone: 781-337-0567
Fax: 781-337-0986
labreports@americanenviron.com


Client Name: EMERY ENVIRONMENTAL ASSOC. Phone: 401 641-0074
Client Address: PO BOX E PAWTUCKET, RI 02861
Project:
Proj. Address: 575 SMITHFIELD ROAD #1 State (Required): RI
NORTH SMITHFIELD, RI 02896



# BULK SAMPLE CHAIN OF CUSTODY

Analysis: [X] PLM [X] Positive Stop [ ] Qualitative [ ] Point Count [ ] NOB Prep [ ] TEM Chat [ ] Lead [ ] PCB

AEC Laboratories ID: 17874

Turnaround Time: [ ] RUSH [ ] 24 Hour [X] 48 Hour [ ] 3 Day [ ] 5 Day

Sampled By: PATRICK EMERY
Date: 8/25/16
Results to (PM):

Verbal Results: Y / N
Cell #: 401-641-0074
Name: PATRICK EMERY

Special Instructions:
ECA PA 160801-A

| LAB ID | FIELD ID | LOCATION | SAMPLE DESCRIPTION | Homogen-ous Area | Material Type |
|---|---|---|---|---|---|
| | 160801-MA6-1 | BASEMENT / HALL @ PRISONER ENTRY | 1'X1' CEIL TILE (REMNANT) | | |
| | 160801-MA6-2 | BASEMENT / PROCESSING ROOM | | | |
| | 160801-MA6-3 | 1ST FLOOR / HALL @ WOMENS LOCKER ROOM | ↓ | | |
| | 160801-MA7-1 | 1ST FLOOR / STORAGE #1 | PLASTER SKIM COAT (WHITE) | | |
| | 160801-MA7-2 | 1ST FLOOR / ROOM OUTSIDE MENS LAV. | | | |
| | 160801-MA7-3 | 1ST FLOOR / HALL @ PATROL COMMANDER | | | |
| | 160801-MA7-4 | 1ST FLOOR / CAPTAIN OFFICE | | | |
| | 160801-MA7-5 | 1ST FLOOR / DISPATCH OFFICE @ CEIL | | | |
| | 160801-MA7-6 | 1ST FLOOR / HALL @ TAX COLLECTOR | | | |
| | 160801-MA7-7 | 1ST FLOOR / TOWN CLERK @ CEIL | | | |
| | 160801-MA7-8 | 1ST FLOOR / TAX COLLECTOR | ↓ | | |
| | 160801-MA8-1 | BASEMENT / STORAGE #1 | BARRIER BASE COAT (GREY) | | |
| | 160801-MA8-2 | BASEMENT / ROOM OUTSIDE MENS LAV. | | | |
| | 160801-MA8-3 | 1ST FLOOR / HALL @ PATROL COMMANDER | | | |
| | 160801-MA8-4 | 1ST FLOOR / CAPTAIN OFFICE | | | |
| | 160801-MA8-5 | 1ST FLOOR / DISPATCH OFFICE @ CEIL | | | |
| | 160801-MA8-6 | 1ST FLOOR / HALLWAY @ TAX COLLECTOR | | | |
| | 160801-MA8-7 | 1ST FLOOR / TOWN CLERK @ CEIL | | | |
| | 160801-MA8-8 | 1ST FLOOR / TAX COLLECTOR | ↓ | | |

Received by: Pac-G Date/Time: 8/16/16
Relinquished by: _____ Date/Time: _____
Received by: US Date/Time: 8/26/16

810 Broad Street
Weymouth, MA 02189
Phone: 781-337-0567
Fax: 781-337-0986
labreports@americanenviron.com

Page 3 of 5

# BULK SAMPLE CHAIN OF CUSTODY

Client Name: EMERY ENVIRONMENTAL ASSOC. Phone: 401-641-0074
Client Address: PO BOX E PAWTUCKET, RI 02861
Project: _____
Proj. Address: 575 SMITHFIELD ROAD #1 State (Required): RI
NORTH SMITHFIELD, RI 02896

Analysis: ☒ PLM ☒ Positive Stop ☐ Qualitative ☐ Point Count ☐ NOB Prep ☐ TEM Chat ☐ Lead ☐ PCB

Turnaround Time: ☐ RUSH ☐ 24 Hour ☒ 48 Hour ☐ 3 Day ☐ 5 Day

Sampled By: PATRICK EMERY
Date: 8/25/16
Results to (PM):

Verbal Results: Y / N
Cell #: 401-641-0074
Name: PATRICK EMERY

AEC Laboratories ID: 17874

Special Instructions: EER PA 160801-A

| LAB ID | FIELD ID | LOCATION | SAMPLE DESCRIPTION | Homogen-ous Area | Material Type |
|---|---|---|---|---|---|
| | 160801-HA9-1 | BASEMENT / EVIDENCE INTAKE | DRYWALL | | |
| | 160801-HA9-2 | BASEMENT / RECORD ROOM | ↓ | | |
| | 160801-HA9-3 | BASEMENT / MENS LOCKER ROOM | ↓ | | |
| | 160801-HA9-4 | 1st FLOOR / HALLWAY & CONF. ROOM | ↓ | | |
| | 160801-HA9-5 | 1st FLOOR / CAPTAIN OFFICE | ↓ | | |
| | 160801-HA9-6 | 1st FLOOR / STAIRWAY | ↓ | | |
| | 160801-HA9-7 | 1st FLOOR / VISITOR LAV. | ↓ | | |
| | 160801-HA10-1 | BASEMENT / EVIDENCE INTAKE | JOINT COMPOUND | | |
| | 160801-HA10-2 | BASEMENT / RECORDS ROOM | ↓ | | |
| | 160801-HA10-3 | BASEMENT / MENS LOCKER ROOM | ↓ | | |
| | 160801-HA10-4 | 1st FLOOR / HALLWAY & CONF. ROOM | ↓ | | |
| | 160801-HA10-5 | 1st FLOOR / CAPTAIN OFFICE | ↓ | | |
| | 160801-HA10-6 | 1st FLOOR / STAIRWAY | ↓ | | |
| | 160801-HA10-7 | 1st FLOOR / VISITOR LAV. | ↓ | | |
| | 160801-HA11-1 | BASEMENT / EVIDENCE INTAKE | 1'X1' VINYL FLOORTILE (TAN) | | |
| | 160801-HA11-2 | BASEMENT / PROCESS ROOM | ↓ | | |
| | 160801-HA11-3 | BASEMENT / INTERVIEW ROOM | ↓ | | |
| | 160801-HA11-4 | 1st FLOOR / CONF. ROOM | ↓ | | |
| | 160801-HA11-5 | 1st FLOOR / TAX COLLECTOR | ↓ | | |
| | 160801-HA12-1 | BASEMENT / EVIDENCE INTAKE | 1'X1' VINYL FLOORTILE GLUE | BLACK | |
| | 160801-HA12-2 | BASEMENT / PROCESS ROOM | ↓ | | |

Received by: Plus 45 Date/Time: 8/16/16
Relinquished by: Date/Time:
Received by: VS 8/26/16 Date/Time:

810 Broad Street
Weymouth, MA 02189
Phone: 781-337-0567
Fax: 781-337-0986
labreports@americanenviron.com

Client Name: EMERY ENVIRONMENTAL ASSOC Phone: 401-641-0074
Client Address: PO BOX E PAWTUCKET, RI 02861
Project:
Proj. Address: 575 SMITHFIELD ROAD #1 State (Required): RI
NORTH SMITHFIELD, RI 02896



# BULK SAMPLE CHAIN OF CUSTODY

Analysis: ☒ PLM ☒ Positive Stop ☐ Qualitative ☐ Point Count ☐ NOB Prep ☐ TEM Chat ☐ Lead ☐ PCB

Turnaround Time: ☐ RUSH ☐ 24 Hour ☒ 48 Hour ☐ 3 Day ☐ 5 Day

Sampled By: PATRICK EMERY
Date: 8/25/16
Results to (PM):

Verbal Results: Y / N
Cell #: 401 641 0074
Name: PATRICK EMERY

AEC Laboratories ID: 17874

Special Instructions: EEA PA160801-A

| LAB ID | FIELD ID | LOCATION | SAMPLE DESCRIPTION | Homogen-ous Area | Material Type |
|---|---|---|---|---|---|
| | 160801-MA12-3 | BASEMENT / INTERVIEW ROOM | | | |
| | 160801-MA12-4 | 1ST FLOOR / CONF ROOM | | | |
| | 160801-MA12-5 | 1st FLOOR / TAX COLLECTOR | | | |
| | 160801-MA13-1 | BASEMENT / PROCESS ROOM | VINYL COVE MOLDING - TAN | | |
| | 160801-MA14-1 | BASEMENT / PROCESS ROOM | VINYL COVE MOLDING GLUE BROWN | | |
| | 160801-MA15-1 | BASEMENT / EVIDENCE INTAKE | VINYL COVE MOLDING - "RED" | | |
| | 160801-MA15-2 | BASEMENT / INTERVIEW ROOM | | | |
| | 160801-MA15-3 | BASEMENT / MENS LOCKER ROOM | | | |
| | 160801-MA15-4 | 1ST FLOOR / CONF ROOM | | | |
| | 160801-MA16-1 | BASEMENT / EVIDENCE INTAKE | VINYL COVE MOLDING GLUE "BROWN" | | |
| | 160801-MA16-2 | BASEMENT / INTERVIEW ROOM | | | |
| | 160801-MA16-3 | BASEMENT / MENS LOCKER ROOM | | | |
| | 160801-MA16-4 | 1ST FLOOR / CONF ROOM | | | |
| | 160801-MA17-1 | BASEMENT / MAIN & UNISEX LAV. | FLOORTILE - RED | | |
| | 160801-MA17-2 | 1ST FLOOR MAIN & BLDG. ZONING | | | |
| | 160801-MA18-1 | BASEMENT / MAIN & UNISEX LAV. | FLOORTILE GLUE - BLACK | | |
| | 160801-MA18-2 | 1st FLOOR / MAIN & BLDG. ZONING | | | |
| | 160801-MA19-1 | BASEMENT / AUDITORIUM | 1'X1' CEIL TILE (FIBERGLASS) | | |
| | 160801-MA19-2 | BASEMENT / AUDITORIUM | | | |
| | 160801-MA19-3 | BASEMENT / AUDITORIUM | | | |
| | 160801-MA19-4 | 1ST FLOOR / MAIN MAIN & CONF ROOM | | | |

Received by: Pat C 8/ /16 Date/Time:
Relinquished by: Date/Time:
Received by: VS 8/26/16 Date/Time:


810 Broad Street
Weymouth, MA 02189
Phone: 781-337-0567
Fax: 781-337-0986
labreports@americanenviron.com


Client Name: EMERY ENVIRONMENTAL ASSOC. Phone: 401 641-0074
Client Address: PO BOX E PAWTUCKET, RI 02861
Project:
Proj. Address: 575 SMITHFIELD ROAD #1 State (Required): RI
NORTH SMITHFIELD, RI 02896



# BULK SAMPLE CHAIN OF CUSTODY

Analysis: ☒ PLM ☒ Positive Stop ☐ Qualitative ☐ Point Count ☐ NOB Prep ☐ TEM Chat ☐ Lead ☐ PCB

AEC Laboratories ID: 17874

Turnaround Time: ☐ RUSH ☐ 24 Hour ☒ 48 Hour ☐ 3 Day ☐ 5 Day

Sampled By: PATRICK EMERY
Date: 8/25/16
Results to (PM):

Verbal Results: Y / N
Cell #: 401-641-0074
Name: PATRICK EMERY

Special Instructions:
EEA PA160101-A

| LAB ID | FIELD ID | LOCATION | SAMPLE DESCRIPTION | Homogen-ous Area | Material Type |
|---|---|---|---|---|---|
| | 160801-MA19-5 | 1st FLOOR / MAIN HALL @ CHIEF OFF | 12"x12" CEILING TILE (FIBERGLASS) | | |
| | 160801-MA20-1 | BASEMENT / AUDITORIUM | 12"x12" CEILING TILE GLUE (BROWN) | | |
| | 160801-MA20-2 | BASEMENT / AUDITORIUM | ↓ | | |
| | 160801-MA20-3 | BASEMENT / AUDITORIUM | ↓ | | |
| | 160801-MA20-4 | 1st FLOOR / HALL @ CHIEF OFFICE | ↓ | | |
| | 160801-MA21-1 | BASEMENT / AUDITORIUM | PIPE INSULATION @ ELBOW | | |
| | 160801-MA21-2 | BASEMENT / AUDITORIUM | ↓ | | |
| | 160801-MA21-3 | BASEMENT / AUDITORIUM | ↓ | | |
| | 160801-MA22-1 | 1st FLOOR / TOWN CLERK | 2'x4' CEILING TILE | | |
| | 160801-MA22-2 | 1st FLOOR / TAX COLLECTOR | ↓ | | |
| | 160801-MA23-1 | 1st FLOOR / VISITOR LAV | VINYL COVE - SEABLUE GREEN | | |
| | 160801-MA24-1 | 1st FLOOR / VISITOR LAV | GLUE @ VINYL COVE MOLDING | | |
| | 160801-MA25-1 | EXTERIOR WINDOW @ STAIRWAY | "BROWN" CAULK @ ALUM. WINDOW FRAME | | |
| | 160801-MA25-2 | EXTERIOR WINDOW @ BLDG & ZONING | ↓ | | |
| | 160801-MA26-1 | EXTERIOR WINDOW @ AUDITORIUM | "WHITE" CAULK @ STEEL WINDOW FRAME | | |
| | 160801-MA26-2 | EXTERIOR WINDOW @ AUDITORIUM | ↓ | | |
| | 160801-MA27-1 | EXTERIOR WINDOW @ AUDITORIUM | "WHITE" GLAZING @ STEEL WINDOW SASH | | |
| | 160801-MA27-2 | EXTERIOR WINDOW @ AUDITORIUM | ↓ | | |

# *APPENDIX – C:*

## *ASBESTOS PROJECT CONSULTANT LICENSURE*

*State of Rhode Island and Providence Plantations*
*DEPARTMENT OF HEALTH*
*HEALTHY ENVIRONMENT TEAM – ASBESTOS PROGRAM*
*CERTIFICATION*

**Pursuant to the Asbestos Abatement Act, Chapter 24.5 of Title 23 of the General Laws entitled "Health and Safety" as amended, and the Rules and Regulations for Asbestos Control, this Certificate is hereby issued as designated below. This Certificate is subject to all applicable rules, regulations, orders and notices of the Department of Health now or hereafter in effect and to any conditions specified below.**

**Certificate Holder:** PATRICK A EMERY
**Address:** EMERY ENVIRONMENTAL ASSOCIATES
PO BOX E
PAWTUCKET RI 02861

**Certification Number:** AAC-0505
**Type of Certification:** Asbestos Management Planner
**Expiration Date:** 04/30/2017

**Except as specifically provided otherwise in this Certificate, Certificate holders shall conduct their program in accordance with statements, procedures and representations contained in the documents, including any enclosures, listed below. The Rhode Island Rules and Regulations for Asbestos Control shall govern unless the statements, representations and procedures in the Certificate Holder's application and correspondence are more restrictive than the regulations.**

Raquel Barrera

Raquel Barrera
Sr. Community Program Liaison Worker
Healthy Homes and Environment

*State of Rhode Island and Providence Plantations*
*DEPARTMENT OF HEALTH*
*HEALTHY ENVIRONMENT TEAM – ASBESTOS PROGRAM*

# *CERTIFICATION*

**Pursuant to the Asbestos Abatement Act, Chapter 24.5 of Title 23 of the General Laws entitled "Health and Safety" as amended, and the Rules and Regulations for Asbestos Control, this Certificate is hereby issued as designated below. This Certificate is subject to all applicable rules, regulations, orders and notices of the Department of Health now or hereafter in effect and to any conditions specified below.**

**Certificate Holder:** PATRICK A EMERY
**Address:** EMERY ENVIRONMENTAL ASSOCIATES
PO BOX E
PAWTUCKET RI 02861

**Certification Number:** AAC-0505
**Type of Certification:** Asbestos Inspector
**Expiration Date:** 04/30/2017

**Except as specifically provided otherwise in this Certificate, Certificate holders shall conduct their program in accordance with statements, procedures and representations contained in the documents, including any enclosures, listed below. The Rhode Island Rules and Regulations for Asbestos Control shall govern unless the statements, representations and procedures in the Certificate Holder's application and correspondence are more restrictive than the regulations.**

Raquel Barrera

Raquel Barrera
Sr. Community Program Liaison Worker
Healthy Homes and Environment

*State of Rhode Island and Providence Plantations*
*DEPARTMENT OF HEALTH*
*HEALTHY ENVIRONMENT TEAM – ASBESTOS PROGRAM*
***CERTIFICATION***

**Pursuant to the Asbestos Abatement Act, Chapter 24.5 of Title 23 of the General Laws entitled "Health and Safety" as amended, and the Rules and Regulations for Asbestos Control, this Certificate is hereby issued as designated below. This Certificate is subject to all applicable rules, regulations, orders and notices of the Department of Health now or hereafter in effect and to any conditions specified below.**

**Certificate Holder:** PATRICK A EMERY
**Address:** EMERY ENVIRONMENTAL ASSOCIATES
PO BOX E
PAWTUCKET RI 02861

**Certification Number:** AAC-0505
**Type of Certification:** Asbestos Project Designer
**Expiration Date:** 04/30/2017

**Except as specifically provided otherwise in this Certificate, Certificate holders shall conduct their program in accordance with statements, procedures and representations contained in the documents, including any enclosures, listed below. The Rhode Island Rules and Regulations for Asbestos Control shall govern unless the statements, representations and procedures in the Certificate Holder's application and correspondence are more restrictive than the regulations.**

Raquel Barrera

Raquel Barrera
Sr. Community Program Liaison Worker
Healthy Homes and Environment

# *APPENDIX – D:*

## *ASBESTOS TESTING LABORATORY LICENSURE(S)*

State of Rhode Island
# Department of Health

AEC LABORATORIES LLC

Address Information

814 BROAD STREET

WEYMOUTH MA 02189

License Information

| | | | | | |
|---|---|---|---|---|---|
| **License No:** | AAL-112 | **Profession:** | Asbestos Program | **License Type:** | Analytical Serv-Bulk (PLM) & Air (PCM) |
| **License Status:** | Active | **Issue Date:** | 3/23/2009 | **Expiration Date:** | 3/23/2017 |
| **Secondary License Type:** | | | | | |

Specialty Information

No Specialty Information

Disciplinary Action

**Disclaimer:** The individual license information on the Licensee Lookup displays only the current license status (e.g., Active, Active Probation, Suspended, Revoked). For the disciplinary history of any individual licensee, please click on the link for the specific profession and then on the Disciplinary Actions link available on each professional board's webpage.

See Board Disciplinary Listings at http://www.health.ri.gov/lists/disciplinaryactions

**CLOSE THIS WINDOW TO RETURN TO THE SEARCH RESULTS.**

# *APPENDIX – E:*

## *ASBESTOS PROJECT DRAWING(S)*

# SECTION 02 82 00
# ASBESTOS REMEDIATION

## 1.0 GENERAL

### 1.1 Related Documents

A. All of the Contract Documents, including Drawings, General Conditions and other requirements apply to this project.

B. Known hazardous materials related to this project are limited to 2% chrysotile located in the baseboard mastic and the 9x9 floor tile in select areas of the building as indicated in the attached report.

### 1.2 Asbestos Procedures

A. There is known existing asbestos containing materials (ACM) in the existing building as identified in the attached report. The Contractor shall formally notify each sub-contractor that there are reports included for review.

B. Unknown and inaccessible ACM may be encountered during the project. Where the Contractor encounters discover or encounter ACM during the scope of work the Contractor shall notify the Owner immediately. Action should be taken immediately to reduce, control or eliminate the risk of exposure of contractors and the public to ACM.

C. Responsible Person: The Contractor is required to designate one (1) qualified on-site employee to be in charge of coordination with the project team and the Contractor with regards to the ACM.

D. Responsibility for Hazardous Materials Discovery: It is the sole responsibility of the Contractor and sub-contractors to undertake whatever measures and methods of procedures are necessary to appropriately safeguard the health and safety of all workers and members of the public with respect to any ACM discovery with the project work.

E. Indemnification: To the fullest extent permitted by law, the Contractor and sub-contractor shall indemnify and hold harmless by the Owner and project team and their agents and employees from and against any claims, damages, losses and expenses including, but not limited to, attorney's fees arising out of or relating to an such claim, damage, loss or expense if attributable to bodily injury, sickness, disease or death, or to damage to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom, and is caused in whole or part by any negligent act or omission of the Contractor and sub-contractor anyone directly or indirectly employed by any of them or anyone whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

### 1.3 Lead Containing Surface Coatings and Building Components

A. The Contractor and sub-contractor shall be made aware that Lead Based Paints, other surface coatings, and building components may exist throughout the building. OSHA's Lead Standard for the Construction Industry, Tile 29 Code of Federal Regulations 1926.62, covers lead in a variety of forms, including metallic lead, all inorganic lead components, and organic lead soaps. OSHA's lead in construction standard applies to all construction work where an employee may be exposed to lead. All work related to construction, alteration, or repair, including painting, is included. In construction, lead was used in many different types of building component, surfacing, coatings and applications including, but not limited to, roofs, sidings/surfaces, tank linings, and electrical conduits, plumbing fixtures, pipes and waste lines, soft solder, used chiefly for soldering tinplate

and copper pipe joints, is an alloy of lead and tin, paint, varnish, shellac and other surface coating materials. Construction projects vary in their scope and potential for exposing workers to lead and other hazards. Due to the age of the building, it is assumed that there may be lead-containing building materials and surface coatings located within the interior of the building. It is the Contractor's responsibility to protect their employees from lead exposures and to prevent the release of lead into the environment. Contractor will be responsible to follow all local, state and federal, RI Department of Environmental Management (RIDEM), Occupational and Safety and Health Administration (OSHA), and Environmental Protection Administration rules, regulations and laws concerning lead in construction activities.

B. The Contractor and respective sub-contractors are solely responsible for means and methods and techniques used for demolition.

C. The Contractor and sub-contractor shall at his own cost and expense comply with all laws, ordinance, rules and regulations or Federal, State, Regional and Local authorities during demolition, prepping, sanding, cutting, burning, scraping, paint over, grinding and regarding handling, storing and disposing of demolition/renovation debris.

### 1.4 Other

A. The Contractor shall be made aware that other hazardous materials may be found inside the building.

## 2.0 PRODUCTS

Not Applicable

## 3.0 EXECUTION

Not Applicable

**END OF SPECIFICATION**

**ATTACHMENT A: ASBESTOS MATERIAL REPORT**

**SECTION 03 3000**

**CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

B. Related Sections include the following:
1. Division 2 Section "Earthwork" for drainage fill under slabs-on-grade.
2. Division 2 Section "Cement Concrete Pavement" for concrete pavement and walks.
3. Division 3 Section "Concrete Toppings" for metallic and nonmetallic concrete floor toppings.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and silica fume.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
1. Indicate amounts of mix water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

D. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.

E. Welding Certificates: Copies of certificates for welding procedures and personnel.

F. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for formwork and shoring and reshoring installations that are similar to those indicated for this Project in material, design, and extent.

C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.

D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

E. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

F. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

G. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
1. ACI 301, "Specification for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."
1. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixes.
c. Concrete subcontractor.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.
   1. Avoid damaging coatings on steel reinforcement.
   2. Repair damaged epoxy coatings on steel reinforcement according to ASTM D 3963/D 3963M.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.
   2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
      a. High-density overlay, Class 1, or better.
      b. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed.
      c. Structural 1, B-B, or better, mill oiled and edge sealed.
      d. B-B (Concrete Form), Class 1, or better, mill oiled and edge sealed.

B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

D. Form Ties:
   1. Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   2. Furnish units that will leave no corrodible metal closer than 1-1/2" inch to the plane of the exposed concrete surface.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M, and as follows:
   1. Steel Reinforcement: ASTM A 615/A 615M, Grade 60, deformed.

C. Plain-Steel Wire: ASTM A 82, as drawn.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

B. Joint Dowel Bars: Stainless Steel Bars. Cut bars true to length with ends square and free of burrs.

2.4 CONCRETE MATERIALS

A. Portland Cement for foundation walls and footings: ASTM C 150, Type I.
   1. Fly Ash: ASTM C 618, Class F.

B. Portland Cement for slabs on grade: ASTM C 150, Type II or V.
   1. Fly Ash: ASTM C 618, Class F.

C. Blended Hydraulic Cement: ASTM C 595M, Type I (PM), pozzolan-modified portland cement.

D. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
   1. Class: Severe weathering region, but not less than 3S.
   2. Nominal Maximum Aggregate Size: 3/4 inch.

E. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

G. Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   2. Products: Subject to compliance with requirements, provide one of the following:
      a. Catexol 1000CL; Axim Concrete Technologies.
      b. MCI 2000 or MCI 2005; Cortec Corporation.
      c. DCI or DCI-S; W. R. Grace & Co., Construction Products Div.
      d. Rheocrete 222+; Master Builders, Inc.

e. FerroGard-901; Sika Corporation.

H. FIBER REINFORCEMENT

I. Synthetic Fiber: Fibrillated or monofilament polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches lo

2.6 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
1. Profile: As indicated.

B. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
1. Profile: As indicated.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Rubber Waterstops:
a. Greenstreak.
b. Progress Unlimited Inc.
c. Westec Barrier Technologies; Div. of Western Textile Products, Inc.
2. PVC Waterstops:
a. Greenstreak.
b. Meadows: W. R. Meadows, Inc.
c. Vinylex Corporation.

D. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophylic material for adhesive bonding to concrete.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Volclay Waterstop-RX; Colloid Environmental Technologies Co.
b. Hydrotite; Greenstreak.
c. Mirastop; Mirafi Moisture Protection, Div. of Royal Ten Cate (USA), Inc.

2.7 VAPOR RETARDERS

A. Vapor Retarder: ASTM E 1745, Class B, five-ply, nylon- or polyester-cord-reinforced, high-density polyethylene sheet; 15 mils thick.
1. Available Product: Subject to compliance with requirements, a product that may be incorporated into the Work includes, but is not limited to, "Griffolyn T-85" by Reef Industries Inc.

B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a No. 4 sieve and 10 to 30 percent passing a No. 100 sieve; meeting deleterious substance limits of ASTM C 33 for fine aggregates.

2.8 FLOOR AND SLAB TREATMENTS

A. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

2.9 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.10 RELATED MATERIALS

A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
   1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
   2. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Reglets: Fabricate reglets of not less than 0.0217-inch- thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

E. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
   1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Footings and Foundation Walls: Proportion normal-weight concrete mix as follows:
   1. Compressive Strength (28 Days): 3000 psi.

2. Maximum Water-Cementitious Materials Ratio: 0.48
3. Maximum Slump: 4 inches.
4. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 6 inches after admixture is added to concrete with 2- to 4-inch slump.

D. Slab-on-Grade: Proportion normal-weight concrete mix as follows:
1. Compressive Strength (28 Days): 4000 psi.
2. Maximum Water-Cementitious Materials Ratio: 0.42
3. Minimum Cementitious Materials Content: 560 lb/cu. yd..
4. Maximum Slump: 4 inches.

E. Suspended Slabs: Proportion normal-weight concrete mix as follows:
1. Compressive Strength (28 Days): 4000 psi.
2. Maximum Water-Cementitious Materials Ratio: 0.43
3. Minimum Cementitious Materials Content: 550 lb/cu. yd..
4. Maximum Slump: 4 inches.

F. Cementitious Materials: For concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.

G. Maximum Water-Cementitious Materials Ratio: 0.45 for concrete required to have low water permeability.

H. Maximum Water-Cementitious Materials Ratio: 0.42 for concrete exposed to deicers or subject to freezing and thawing while moist.

I. Maximum Water-Cementitious Materials Ratio: 0.42 for corrosion protection of steel reinforcement in concrete exposed to chlorides from deicing chemicals, salt, saltwater, brackish water, seawater, or spray from these sources.

J. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated:
1. Air Content: 6 percent for 3/4-inch- nominal maximum aggregate size.

K. Do not air entrain concrete to trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.

L. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixes where indicated.

2.12 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
1. Class B, 1/4 inch.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
1. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
1. Install anchor bolts, accurately located, to elevations required.
2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.

B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
1. At least 70 percent of 28-day design compressive strength.
2. Determine compressive strength of in-place concrete by testing representative field- or laboratory-cured test specimens according to ACI 301.

C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.

3.5 VAPOR RETARDERS

A. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions.

B. Fine-Graded Granular Material: Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.

3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain specified minimum concrete cover. Do not tack weld crossing reinforcing bars.
   1. Shop- or field-weld reinforcement according to AWS D1.4, where indicated.
   2. All welded wire-fabric on slabs shall be supported by concrete bricks or chair supports at not more than 4’-0” on center each way.
   3. All reinforcing shall be securely tied prior to casting of concrete so as to avoid displacement of reinforcing. Contractor is responsible for ensuring that necessary measures are taken, whether shown in contract documents or not, to ensure that reinforcing is adequately tied and/or supported.
   4. “Laying in” of reinforcing during casting of concrete is not permitted.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
   3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated on drawings or if not shown, so as to divide slab into areas not in excess of 800 square feet. Form contraction joints as shown on Construction Drawings. Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Joints should be cut prior to initial cracking of concrete; or within 4- 12 hours of casting, depending on project conditions. As an alternate, contraction joints may be formed used molded inserts set prior to hardening of slab.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
   2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
   3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
   1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

## 3.8 WATERSTOPS

A. Flexible Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, bonding or mechanically fastening and firmly pressing into place. Install in longest lengths practicable.

## 3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
   1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
   2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate. Do not vibrate forms or reinforcement.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Maintain reinforcement in position on chairs during concrete placement.
   3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   4. Slope surfaces uniformly to drains where required.
   5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
   1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
   3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.

C. Rubbed Finish: Apply the following to smooth-formed finished concrete:
   1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
   2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
   3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
   1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

2. Finish surfaces to the following tolerances according to ASTM E1155 for a randomly trafficked floor surface.

C. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:
   a. Specified overall values of flatness, F(F) 35; and levelness, F(L) 25, relative to specified slope; with minimum local values of flatness, F(F) 24; and levelness, F(L) 17, relative to specified slope; for slabs-on-grade.

D. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

## 3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

## 3.13 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

## 3.14 LIQUID FLOOR TREATMENTS

A. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
   3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

B. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

C. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

D. Repair materials and installation not specified above may be used, subject to Architect's approval.

## 3.15 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
6. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days, two at 28 days and hold the ffifth for possible future testing.
    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

C. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

**END OF SECTION 03 30 00**

# SECTION 03 5400
# FLOOR LEVELING LIGHTWEIGHT

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings, general provisions of the Contract, and other related construction documents such as Division 01 specifications apply to this Section

### 1.2 SUMMARY

A. This Section includes a self-drying, cement-based finish underlayment that provides a smooth surface prior to the installation of floor covering over a variety of substrates, including concrete with relative humidity up to 95%. Bases of design:

1. ARDEX FEATHER FINISH® XF™ Self-Drying, Cement-Based Finish Underlayment
2. ARDEX P 82™ Ultra Prime
3. ARDEX P 51™ Primer

B. Related Sections include the following:

1. Section 09 3000 Tiling

### 1.3 REFERENCES

A. ASTM F2170, Relative Humidity in Concrete Floor Slabs Using in situ Probes

B. ASTM F710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

## 1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used. Include manufacturer's Safety Data Sheets.

B. Qualification Data: For Installer

## 1.5 QUALITY ASSURANCE

A. Installation of the product must be completed by a factory-trained applicator, such as a Contractor or Substrate Prep Certified Installer, using mixing equipment and tools approved by the manufacturer.

B. Product must be cement-based having an inorganic binder content which includes a minimum 80% Portland cement per ASTM C150: Standard Specification for Portland cement and other specialty hydraulic cements. Gypsum products are not acceptable.

C. Manufacturer Experience: Provide products of this section by companies which have successfully specialized in production of this type of work for not less than 5 years. Contact Manufacturer Representative prior to installation.

1.6 Product installed as part of a floor system, shall be installed in conjunction with the recommended Tile & Stone Installation Materials or Flooring Adhesive, as appropriate, to provide the comprehensive warranty, depending on the system installed.

## 1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver products in original packaging, labeled with product identification, manufacturer, batch number and shelf life.

B. Store products in a dry area with temperature maintained between 50° and 85°F (10° and 29°C and protect from direct sunlight.

C. Handle products in accordance with manufacturer's printed recommendations.

## 1.8 PROJECT CONDITIONS

A. Do not install material below 50°F (10°C) surface and air temperatures. These temperatures must also be maintained during and for 48 hours after the installation of products included in this section. Install quickly if substrate is warm and follow warm weather instructions available.

## PART 2 - PRODUCTS

### 2.1 MAINTENANCE OF CAST-IN-PLACE CONCRETE

A. Self-Drying, Cement-Based Finish Underlayment
1. Provide one of the following products, or Architect approved equal, that meet or exceed specified requirements:

a. Bases of design: ARDEX FEATHER FINISH® XF™;
b. Henry 549 Feather Finish
c. Substitutions: See Section 01 6000 - Product Requirements.

2.2 **WATER:** Water shall be clean, potable, and sufficiently cool (not warmer than 70°F).

## PART 3 – EXECUTION

### 3.1 PREPARATION

A. General: Prepare substrate in accordance with manufacturer's instructions.

1. Concrete:

a. Prior to proceeding please refer to ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring. All concrete subfloors must be sound, solid, clean, and free of all oil, grease, dirt, curing compounds and any substance that might act as a bond breaker before priming. Mechanically clean if necessary using shot blasting or other. Acid etching and the use of sweeping compounds and solvents are not acceptable.

b. Substrates shall be inspected in accordance with ASTM F2170 and corrected for moisture or any other conditions that could affect the performance of the underlayment or the finished floor covering. For areas where moisture vapor emissions exceed the required limits refer to Section 09 05 61.13, Moisture Vapor Emission Control and install the appropriate Moisture Control System.

2. Crack and Joint Preparation

a. Moving Joints and Moving Cracks – honor all moving joints and moving cracks up through the installation. A flexible sealing compound may be installed.

b. Dormant Control Joints and Dormant Cracks – Fill all dormant control joints and dormant cracks with as recommended by the manufacturer.

3. Gypsum: All gypsum subfloors must be thoroughly clean and free of dirt, debris, sealers and contaminants that might act as a bond breaker. Mechanically clean if necessary using shot blasting or other. Please be advised, however, that the fact remains that the substrate is gypsum, and therefore has inherent weakness. Provide a solid surface to which new flooring can bond, but cannot change the fact that a weak substrate lies below.

4. Wood:

a. The wood subfloor must be constructed according to prevailing building codes and must be solid and securely fixed to provide a rigid base free of undue flex. Any boards exhibiting movement must be re-nailed. The surface of the wood must be clean and free of oil, grease, wax, dirt, varnish, shellac and any contaminant that might act as a bond breaker. If necessary, sand down to bare wood. A commercial drum sander can be used to sand large areas. Do not use solvents, strippers or cleaners. Vacuum all dust and debris. It is the responsibility of the installation contractor to verify that the wood subfloor is thoroughly clean and properly anchored.

b. Some flooring manufacturers recommend a finish-grade wood underlayment be installed over the existing wood subfloor. If necessary, smooth fasteners and/or joints in the wood underlayment. Please note that the wood underlayment must be suitable for the installation of the specific floor covering and must be installed in accordance with the wood underlayment manufacturer's recommendations.

5. Metal: Metal substrates must be rigid, well supported, properly anchored, and free of undue flex and vibration. They must also be clean, including the complete mechanical removal of rust, corrosion and any contaminant that may act as a bond breaker. It is the responsibility of the installation contractor to ensure that this is so. To prevent, rust from recurring, steel surfaces must be coated with an anticorrosive epoxy coating and allowed to dry thoroughly. The coating must be installed in strict accordance with the coating manufacturer’s written recommendations and allowed to cure fully. Lead, copper and aluminum do not need to be coated with an anticorrosive epoxy.

6. Adhesive residues on concrete must first be tested to make certain they are not water-soluble. Water-soluble adhesives must be completely mechanically removed down to clean concrete. Non-water-soluble adhesives should be prepared to a thin, well-bonded residue using the wet-scraping technique as recommended by the Resilient Floor Covering Institute (www.rfci.com). The prepared residue should appear as nothing more than a transparent stain on the concrete after scraping.

7. Other Non-Porous Substrates: The substrate must be clean, including complete removal of existing waxes and sealers, dust, dirt, debris and any other contamination that may act as a bond breaker. Substrate preparation must be by mechanical means, such as shot blasting.

3.2 **APPLICATION:**

A. Examine substrates and conditions under which materials will be installed. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas from contact due to mixing and handling of materials.

C. Priming:

1. Gypsum: Make an initial application of a Concentrated Water-Based Primer & Bonding Agent diluted with 3 parts water using a soft push broom. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry thoroughly (1 to 3 hours) before proceeding with the second application diluted 1:1 with water. Allow thorough drying to a clear, thin film (min. 3 hours, max. 24 hours).

2. Epoxy coating systems, concrete treated with silicate compounds and metal shall be primed with a Concentrated Water-Based Primer & Bonding Agent P 82 Ultra Prime. Do not leave any bare spots. Brush off puddles any excess primer. Allow primer to dry to a thin, slightly tacky film (min. 3 hours, max. 24 hours).

D. Mixing: Comply with manufacturer's printed instructions and the following.

1. Add 2 1/2 quarts (2.4 L) of clean potable water per 10-pound (4.5 kg) bag.

2. Mix using a ½" (12 mm, 650 rpm) low speed heavy-duty mixing drill with an a Concentrated Water-Based Primer & Bonding Agent T-2 ring mixing paddle. Do not overwater.

E. Application: Comply with manufacturer's printed instructions and the following.
1. Installed from a true featheredge up to ½" (12.7 mm) over large areas. It can also be installed up to any thickness in small, well-defined areas.

2. Apply to the substrate with the flat side of a trowel to obtain a solid mechanical bond before applying the desired thickness.

F. Curing

1. As soon as the floor leveling can be worked on without damaging the surface (15-20 minutes), standard floor coverings such as VCT, sheet vinyl and carpeting can be installed. If installing wood flooring, or, if high-performance adhesives will be used, such as epoxies or urethanes, floor leveling must first cure for 16 hours (70°F).

3.3 **FIELD QUALITY CONTROL**

A. Where specified, field sampling of the underlayment is to be done by taking an entire unopened bag of the product being installed to an independent testing facility to perform

compressive strength testing in accordance with ASTM C 109/modified: air-cure only. There are no in situ test procedures for the evaluation of compressive strength.

## 3.4 PROTECTION

A. Prior to the installation of the finish flooring, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, Masonite or other suitable protection course.

**END OF SECTION**

# SECTION 04 0100

# MASONRY MORTARING, GROUTING, AND MAINTENANCE OF MASONRY AND STONE

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Masonry mortaring and grouting.

B. Maintenance and restoration of masonry:

1. Repointing mortar joints.

### 1.2 SUMMARY

A. For repointing, resetting, relaying of historic masonry as shown on the Drawings and as specified in the Construction Documents and Preservation Briefs 1, 2 revised, and 6, U.S. Department of the Interior, National Park Service, Technical Preservation Services.

### 1.3 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry

B. Section 04 40 00 - Stone Assemblies

### 1.4 REFERENCES

A. American Concrete Institute (ACI):
1. ACI 530 - Building Code Requirements for Masonry Structures.
2. ACI 530.1 - Specifications for Masonry Structures.

B. ASTM International (ASTM):
1. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar
2. ASTM C5 - Standard Specification for Quicklime for Structural Purposes
3. ASTM C404 - Standard Specification for Aggregates for Masonry Grout
4. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
5. STM C979 - Standard Specification for Pigments for Integrally Colored Concrete
6. ASTM C1489 - Standard Specification for Lime Putty for Structural Purposes

C. Preservation Briefs:
1. No. 1 - The Cleaning and Waterproof Coating of Historic Buildings, Robert C. Mack, U.S. Department of the Interior, National Park Service, Preservation Assistance Division, Technical Preservation Services.
2. No. 2 - Repointing Mortar Joints in Historic Brick Buildings, Robert C. Mack, John P. Speweik, U.S. Department of the Interior, National Park Service, Preservation Assistance Division, Technical Preservation Services.
3. No. 6 - Dangers of Abrasive Cleaning to Historic Buildings, Anne E. Grimmer, U.S. Department of the Interior, National Park Service, Preservation Assistance Division, Technical Preservation Services.

## 1.5 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Shop Drawings: Indicate special supports for the work. Detail shoring, bracing, scaffolding, and temporary or permanent support. Contractor to supply scaffolding Drawings for permit.

C. Submit the following items in time to prevent delay of work and to allow adequate time for review of submittals, if needed. Do not order materials or start execution of the Work before receiving written approval:
   1. Written certificates from mortar manufacturer stating installers of the repointing mortars have successfully completed the training workshop for installation of the mortar or have met alternative workmanship qualifications acceptable to the manufacturer or provide written certification from Manufacturer that site training services have been contracted.
      a. On-site training is available from U.S. Heritage Group, Inc., at 3516 North Kostner Ave., Chicago, IL 60641 Phone: 773-286-2100; Fax 773-286-1852.
   2. Samples of specified materials and Material Safety Data Sheets (MSDS) as appropriate.
   3. Certificates, except where material labels provide such certification by the producers of the materials, that materials supplied comply with requirements of these specifications and appropriate standards.
   4. Color and aggregate match of repointing mortar samples to mortar identified as original or specified alternative.
   5. Written verification that specified items will be used. Provide purchase orders, shipping tickets, receipts, etc. to prove that specified materials were ordered and received.
   6. Restoration Program: Submit written program for each phase of restoration process including protection of surrounding material on building and site during operations. Describe in detail material, methods, and equipment to be used for each phase of restoration work.
      a. Contractors proposal/bid can serve this purpose.

D. Product Data: For cleaning compounds, cleaning solutions, and manufacturer's printed literature for each product.
   1. Material Safety Data Sheets (MSDS) as appropriate.

E. Manufacturer's Installation Instructions: Installation procedures for products selected for use, manufacturer's installation instructions, perimeter conditions requiring special attention, and test data indicating compliance with requirements, and installation instructions.

F. Samples: Submit four unit samples of masonry units to illustrate color, texture, and extremes of color range to match existing where replacements are necessary.

G. Samples: Submit two samples of each mortar, 6 total. in addition to the required mock-up, comparable in size to the mortar joint, illustrating mortar color and color range.
   1. Sample 1a: Limestone Mortar.

## 1.6 SUBSTITUTIONS

A. If alternative methods and materials to those indicated are proposed for any phase of restoration work, provide written description, and program of testing to demonstrate effectiveness for use on this project.
   1. Provide documentation showing compliance with the requirements for substitutions and the following information:
      a. Coordination information, including a list of changes needed to other work that will be necessary to accommodate the substitution.

B. A comparison of the substitution with specified products and methods, including performance, weight, size, durability, and visual effect.

C. Certification that substitution conforms to contract documents and is appropriate for applications indicated.
   1. Material Substitution Requests: Must be accompanied by independent laboratory test reports from a lab designated by the architect to establish equivalent performance levels and specification compliance. Submitting party must pay for testing.

## 1.7 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 Building Code Requirements for Masonry Structures, ACI 530.1 Specification for Masonry Structures, and local authorities having jurisdiction.

B. Masonry restoration to be performed by a craftsperson well-versed with historic lime mortar formulations, curing conditions and performance characteristics.
   1. Contractor must provide proof of such experience to the Architect by submitting sufficient proven project experience.
      a. Work must be performed by a firm having not less than 5 years successful experience in comparable masonry restoration projects and employing personnel skilled in the restoration process and operations indicated.

C. Only skilled journeymen masons who are familiar and experienced with the materials and methods specified and are familiar with the design requirements are to be used for masonry restoration. A skilled journeyman mason, trained and certified by the specified manufacturer, must be present at all times during masonry restoration and personally direct the work.

D. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

E. Source Limitations: Obtain materials for stone repair and mortar repointing from a single manufacturer source to ensure consistent performance and match quality, including color, aggregate, and detailing.

F. Mock-Up:
   1. See Section 01 40 00 - Quality Requirements.
   2. Benchmark Mock-Ups: Establish standards for execution of masonry work that has been installed, approved, and reviewed by bidders prior to bidding.
      a. Field Construction Mock-ups will be evaluated against Benchmark Mockups as basis for approval.
      b. Retain benchmark mockups in undisturbed condition, suitably marked,

during restoration as a standard for judging completed work.

3. Field Construction Mock-ups: Prior to start of general masonry restoration prepare sample panels and sample areas on the building where directed by the Architect.
   a. Obtain Architect's written approval before proceeding with Work.
   b. Document materials in mock-up conform to project specifications.
4. Cleaning: Testing must confirm the cleaning specification prior to wholesale execution on the building.
   a. Prepare 3 separate spot-cleaning sample areas for each type required. Determine extent of cleaning, cleaning methods, dwell time, and cleaning products.
   b. One test sample must consist of a hot water wash at low psi using a flat 25-50 degree wide spray stainless steel tip.
      1) Record and note all dwell times, surface, and air temperatures at the time of testing each possible solution.
   c. Architect to be present during mockup execution.
   d. Note cleaning detergent or chemical mixes, psi, nozzle orifice distance from wall face, manual manipulation of the surface (scrubbing), dwell times, and any other specific cleaning procedures.
   e. Repeat, using different cleaning methods as per specifications on up to 3 locations, until acceptable cleaning standard is reached without causing surface damage i.e. etching, scratching, etc.
5. Mortar Repointing:
   a. Prepare 4 separate sample areas of approximately 3 ft high by 3 ft wide for each type of repointing required.
      1) Sample 1a: Brick Mortar Joint Preparation.
      2) Sample 1b: Brick Mortar Joint Installation/Finishing.
      3) Sample 2a: Limestone Mortar Joint Preparation.
      4) Sample 2b: Limestone Mortar Joint Installation/Finishing.
   b. Joint Preparation: Demonstrate methods and quality of workmanship expected in removal of mortar from joints.
   c. Joint Mortar Installation: Demonstrate quality of materials and workmanship expected in pointing mortar joints.
   d. Prepare, install, and finish each sample according to specifications.
   e. Apply sample to the actual masonry.
   f. Cure samples a minimum of 14 days prior to Architect approval.
6. Locate mock-ups where directed by Architect.
7. Acceptable panel illustrating results of all masonry restoration techniques described above to become standard for work of this section. Retain acceptable panels in undisturbed condition, suitably marked, during restoration as a standard for judging completed work.

## 1.8 PRE-INSTALLATION CONFERENCE

A. Section 01 30 00 - Administrative Requirements.

B. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

## 1.9 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 60 00 - Product Requirements.

B. Deliver masonry, mortar, stone, and all other materials neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.

C. Store masonry restoration product ingredients in manufacturer's packaging, or when delivered loose, with adequate weatherproof covering.

D. Deliver materials to site in manufacturer's original unopened containers and packaging, bearing labels as to type and names of products and manufacturers.

E. Deliver and store masonry restoration material in manufacturer's original, unopened containers with the grade, batch, and production data shown on the container or packaging.

F. Protect restoration materials during storage and construction from wetting by rain, snow, or ground water, and from staining or intermixture with earth or other types of materials.

G. Protect mortar and other materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Keep containers tightly closed and away from open flames. Protect liquid components from freezing. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.

H. Comply with manufacturer's written specifications and recommendations for mixing, application, and curing of repointing mortars and patching materials.

I. Deliver products on time to avoid construction delays.

J. Deliver and store products in manufacturer's original packaging with identification labels intact.

K. Store products protected from weather and at temperature and humidity conditions recommended by manufacturer.

## 1.10 ENVIRONMENTAL REQUIREMENTS

A. See Section 01 60 00 - Product Requirements.

B. Cold Weather Requirements: In accordance with ACI 530.1 work shall cease when ambient temperature or temperature of masonry units is less than 40 degrees F (4 degrees C) will remain so for at least 48 hours after completion of work.

C. Do not use frozen materials or materials mixed or coated with ice or frost. Do not lower the freezing point of mortar using admixtures or anti-freeze agents, and do not use chlorides in the mortar.

D. Hot Weather Requirements: In accordance with ACI 530.1 work shall cease when ambient temperature is greater than 100 degrees F (38 degrees C) or surface and ambient air temperature is greater than 90 degrees F (32 degrees C) with wind velocity greater than 8 mph (13 km/h).
   1. Phase masonry restoration during hot weather by completing building segments on the shady side of the building and/or schedule installation of materials during cooler evening hours to prevent premature evaporation of moisture in the mortar and other products.

E. Do not apply products under conditions outside manufacturer's requirements, which

include:
1. Surfaces that are frozen; allow complete thawing prior to installation.
2. When surface or air temperature is not expected to remain above 40 degrees F (4 degrees C) for at least 48 hours after application.
3. Wind conditions that may blow materials onto surfaces not intended to be treated.
4. Less than 24 hours after a rain.
5. When rain is expected less than 6 hours after installation.

### 1.11 SEQUENCING

A. See Section 01 10 00 - Summary.

B. Perform repointing after cleaning masonry surfaces.

### 1.12 OTHER PROJECT CONDITIONS

A. Protect persons, motor vehicles, building site, vegetation, and surrounding buildings from injury resulting from masonry restoration work.
   1. Includes surface areas on adjacent wall surfaces or roofs not included in this scope of work.

B. Prevent repointing mortar from staining the face of masonry or other surfaces to be left exposed. Immediately remove all repointing mortar and other masonry restoration products that comes in contact with such surfaces.

C. Cover partially complete work when work is not in progress.

D. Protect sills, ledges, and projections from droppings.

E. Damage occurring to the building as a result of work of this section or Contractor's failure to protect against such damage will be the Contractor's responsibility. The Contractor will restore damaged areas to complete satisfaction of Architect at no expense to the Owner.

### 1.13 WARRANTY

A. See Section 01 78 23.19 - Preventative Maintenance Instructions.

B. Provide manufacturer's standard warranty for not less than one year, commencing on Date of Substantial Completion.

### 1.14 SCHEDULING

A. Section 01 30 00 - Administrative Requirements.

B. Perform cleaning, washing, stripping, repointing, etc. to exterior masonry and stone between hours of 7 AM to 9 PM.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

A. Acceptable Manufacturer: US Heritage Group, Inc., which is located at: 3516 N.

Kostner Ave.; Chicago, IL 60641; Tel: 773-286-2100; Fax: 773-286-1852; Email: request info (monika@usheritage.com); Web: http://www.usheritage.com

B. Substitutions: upon approval

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

## 2.2 MASONRY MORTARING AND GROUTING

A. Components:
1. Mortar Aggregate: Based on ASTM C144 to match existing historic mortar as per mortar analysis sand gradation chart.
2. Natural Hydraulic Lime: To meet standards of EN459 for composition and compressive strength.
3. Lime Putty: Slaked from high calcium quicklime to meet standards ASTM C5 and C1489, composed of minimum 90 percent calcium hydroxide, aged minimum of 3 months.
4. Pigments: Must meet ASTM C979.
5. Grout Aggregate: Meet ASTM C404, reference mortar lab analysis report.
6. Water: Clean and potable.
7. Admixes: Antifreeze, calcium chloride, air entrainers, etc. are not permitted.

B. Mortar Mixes:
1. Existing mortar is non-permeable in composition on existing limestone and face brick. The mortar mix in the common/back-up brick is unknown.
   a. Replacement mortar mixes must be more permeable than the remaining mortar and suitable for limestone, face brick, and common/back-up brick respectively.
   b. Mortar for Face Brick Masonry:
      1) US Heritage Group, Inc., Heritage Custom Blended Mortar.
         a) One (1) part slaked lime putty binder with pigment to match color of existing unweathered mortar
         b) 2.5 parts clean, well-graded sand composed of round to sub-angular particles to match existing mortar aggregate color by particle size distribution per mortar analysis sand gradation chart.
2. Mortar Mixing:
   a. Pre-mixed US Heritage Group Custom Blended Mortar will arrive on site in tamper-resistant waterproof sealed containers.
   b. Water component to be added as per manufacturer's recommendations and instructions.
   c. Re-temper as per manufacturer's recommendations only.
   d. Mixing of individual mortar ingredients on site will not be permitted.

## 2.3 MAINTENANCE AND RESTORATION OF STONE ASSEMBLIES

A. Masonry Repair Mortars, Anchors, Injection Grout, and Epoxy:
1. Limestone Patching Repair Mortar:
   a. A mineral-based, single component product mixed with water. Natural binders only; no synthetic polymers or additives used. Product to be vapor permeable. Submit color range of project limestone from the existing stone for custom color matching.
      1) Product: HL60 Heritage Limestone Repair Mortar, Manufactured by U.S. Heritage Group, Inc., 3516 N. Kostner Street, Chicago,

Illinois 60641, Phone: 773/ 286.2100, Fax: 773/ 286.1852.

b. Skilled masons can apply Heritage Restoration Mortars; no special certification is required.
c. Mortar can be ready for sculpting in 3 hours at room temperature.

2. Dispersed Hydrated Lime Injection Mortar:
   a. Injection mortar made of dispersed hydrated lime putty and filler. Designed to repair cavities and cracks no larger than 1/8 inch (3 mm) in width.
      1) Product: DHL-IM, Dispersed Hydrated Lime Injection Mortar: Manufactured by U.S. Heritage Group, Inc., 3516 N. Kostner Street, Chicago, Illinois 60641 Phone: 773/ 286.2100 Fax: 773/ 286.1852.

## 2.4 MAINTENANCE AND RESTORATION OF MASONRY

A. Repointing Mortar Materials:
   1. Prepared and placed in accordance with the Department of the Interior National Park Service Cultural Resources Preservation Briefs 2, "Repointing Mortar Joints in Historic Masonry Buildings," Revised edition, October 1998, and in compliance with the guidelines set forth by the Secretary of the Interior's Standards for Rehabilitation.
   2. Repointing Mortar: To match the original in color, composition, aggregate size, and aggregate appearance as determined by mortar analysis sand gradation chart.
      a. Compressive Strength: Equal or less than the compressive strength of the original mortar and surrounding masonry.
      b. To contain the same ingredient proportions of the original mortar.
   3. Replacement Mortar Ingredients and Mortar Formulations:
      a. To be established from mortar analysis findings and recommendations.
      b. Mortar Analysis: To be executed on samples collected from masonry elements of original mortar (meaning located at a minimum depth of 3 times the width of the mortar joint) unless otherwise specified in writing by Architect.
         1) To be ordered from laboratory by Architect; mortar analysis lab report to be released by Architect.
   4. Mortar Analysis Report: Include delivery of a sand gradation chart composed of actual physical samples of aggregate from analyzed mortar sample, in accurate relative proportion, to visually establish matched mortar aggregate requirements.
   5. Mortar Analysis Laboratory: Supply samples of pre-mixed mortar, to match mortar analysis report findings and recommendations, in sufficient volume for mock up installation at the site.
      a. Mortar Sample for Mock-Up: To include two (2) quality check samples of properly finished and cured mortar, made from the mock up material, installed in 1/2 x 3 inch (13 x 76 mm) plastic channels marked with mortar analysis code and mock up production date/batch code.
      b. Mortar Analysis Laboratory Contact: Tom Glab, Laboratory Manager, U.S. Heritage Group, Inc., 3516 North Kostner Ave. Chicago, IL 60641 Phone: 773-286-2100 Fax: 773-286-1852. Email: info@usheritage.com; www.usheritage.com.
   6. Mixing of individual mortar ingredients at the construction site is not permitted.
   7. Repointing Mortars: To be pre-blended in single containers in a factory-

controlled environment. Ingredients to be converted from volume measurements to weight measurements to ensure quality production of the mortar.

a. Containers to be marked including manufacturing date and batch number.
b. Manufacturer is required to maintain production-sampling procedures for each batch for quality control purposes.
    1) Provide samples of proposed materials for mock up panels at the site.
c. All pre-blended products are to meet applicable ASTM standards and project specification requirements.
d. Mortar Materials Contact: Sales, U.S. Heritage Group, Inc., 3516 North Kostner Ave., Chicago, IL 60641 Phone: 773-286-2100 Fax: 773-286-1852. Email: info@usheritage.com; www.usheritage.com.
    1) Mortar supplied from other suppliers is acceptable provided these sources meet the standards outlined in this document, match the historic mortar formulation and aesthetics, and meet or exceed the quality standards of USHG mortars.

B. Masonry Restoration Cleaning:
1. Masonry Cleaners to be in accordance with the Department of the Interior National Park Service Cultural Resources Preservation Brief 1, "The Cleaning and Waterproof Coating of Masonry Buildings," and Preservation Brief 6, "Dangers of Abrasive Cleaning to Historic Buildings," and in compliance with the guidelines set forth by the Secretary of the Interior's Standards for Rehabilitation.
2. Cleaning Baseline Procedure:
    a. Hot water wash at low psi. If hot water wash proves to be insufficient, see item "G" for acceptable manufacturers of alternate cleaning products.
    b. Pressure to be measured at the gun/nozzle or as closely to it as possible. 200-300 psi may be satisfactory; 400-800 psi (field test psi ranges) are more typical. A nylon bristle brush may be used to supplement the water wash if it does not remove or damage the masonry surface.
    c. Nozzle Size and Configuration: Stainless steel flat tip with 25-50 degree wide spray. Evaluate and test the distance of the wall surface from the nozzle orifice during the mock-up phase.
3. Algae Growth: Treat areas of algae/moss growth with an anti-fungal agent prior to masonry cleaning.
4. Sample Test Cleaning Area: Refer to Section 1.1 - Mock-Up, E - Cleaning for requirements.
5. All cleaning techniques should use the gentlest means possible to avoid etching, staining, bleaching, masonry damage, or increase of PH levels.
6. The goal of the masonry cleaning is not to remove 100 percent of surface soiling but to generally enhance the masonry appearance by maximizing removal of soiling caused by pollution, efflorescence, and biological growth while minimizing risk of damage to masonry. Architect will establish parameters on-site for acceptable levels of cleaning.
7. Heavily Soiled Areas (likely carbon and sulfates): The undersides of sills, ornament, belt courses, etc., may require alternate cleaning methods or additional applications of cleaner to achieve successful results.
    a. Black Encrustations: Diedrich Chemicals Restoration Technology, Model 808 Black Encrustation Remover (for spot treatment of carbon

encrusted black streaks).
b. Surface Grime:
1) Diedrich Technologies 101 or 101G Masonry Cleaner.
2) Pro So Co, Sure Klean, Enviro Klean EK Restoration Cleaner.
3) Pro So Co, Sure Klean, Masonry 766 Prewash and Afterwash.
4) Pro So Co, Sure Klean, Limestone Restorer.
5) Diedrich Technologies, Envirostore 100.
c. Substitutions: Approved equal or better.
8. Dwell Times: For cleaning methods, testing and implementation, dwell times to be be closely watched and adhered to in an effort to avoid damaging the masonry (etching the surface).
a. Dwell times will vary and should be monitored during the testing phase to determine the most effective time resulting in no damage.
9. Properly protect all adjacent wall surfaces, roofs, clock faces, windows, doors, glass, adjacent plant material, etc., from overspray.
10. Clean only the areas specified in the exterior elevation drawings.
a. Clean exposed surfaces of specified masonry using materials specified, so resulting surfaces have a uniform appearance.
11. Cleaning Stains and Tough Dirt: Select appropriate cleaner in accordance with manufacturer's instructions and recommendations; use cleaner and cleaning methods selected to minimize damage to surfaces and deterioration of appearance.
12. Install and clean up as per manufacturer's recommendations and standards.
a. Capture, store, and dispose of all cleaning products, overspray, wash, and after wash as per EPA and local government standards.
13. Manufacturers:
a. Mortar Materials Contact: Sales, U.S. Heritage Group, Inc., 3516 North Kostner Ave., Chicago, IL 60641 Phone: 773-286-2100 Fax: 773-286-1852. Email: info@usheritage.com; www.usheritage.com
b. Cleaning Materials:
1) PROSOCO, Inc., 3741 Greenway Circle, Lawrence, KS 66046. ASD. Tel: (800) 255-4255 or (785) 865-4200. Fax: (785) 830-9797. Email: marketing@prosoco.com; www.prosoco.com
2) Diedrich Technologies, Inc., 7373 South 6th Street, Oak Creek, WI 53154. Tel: (800) 283-3888; www.diedrichtechnologies.com
c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Components:
1. Cleaning Agent: Premixed solvent cleaner type.
2. Blasting Sand: Not permitted.
3. Mortar Materials: As specified in this specification.
4. Brick Type: Solid common brick

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements.

B. Verify surfaces to be cleaned and restored are ready for work of this section.

C. Examine conditions, with installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting

performance of unit masonry.

D. Do not proceed until unsatisfactory conditions have been corrected.

E. Verify that substrates are acceptable for product installation; do not begin until substrates meet manufacturer's requirements.

F. Do not begin work until test panels/mock-ups are approved by Architect and Owner.

G. Replacement of masonry units to be confirmed by Architect prior to execution.

## 3.2 PREPARATION

A. Protect elements surrounding work of this section from damage or disfiguration.

B. Immediately remove stains, efflorescence, or other excess resulting from work of this section.

C. Protect roof membrane and flashings from damage. Lay 1/2 inch (13 mm) plywood on roof surfaces over full extent of work area and traffic route.

D. Provide waterproof dams to divert flowing water to exterior drains and catch basins.

E. Carefully remove and store fixtures, fittings, finishing hardware, and accessories.

F. Close off, seal, mask, and/or board up areas, materials, and surfaces not receiving work of this section to protect from damage.

G. Construct dust proof and weatherproof partitions to close off occupied areas, if any.

## 3.3 INSTALLATION

A. Install Work in accordance with State and local Municipality standards.

B. Install mortar in accordance with specification and US Heritage Group Installation Guidelines and Procedures for Lime Putty and Hydraulic Lime Mortars for Repointing Applications.

C. Repointing:
   1. Leave initial mock-ups of stone and brick repointing in place throughout entire project to serve as control samples.
   2. Mortar for stone repointing and brick repointing will be two different compositions.
      a. This to be confirmed through mortar evaluation and laboratory testing.
   3. Leave one intact and serviceable example of each type of original mortar on the building; location and size to be determined with Architect.
   4. All joints (unless otherwise noted) to be raked back to sound, solid, back up material. All raking out should leave a clean, square face at back of joint to provide for maximum contact of pointing mortar with masonry back up mortar.
   5. Shallow or feather edging is not permitted.
   6. Existing mortar joints to be raked out the lesser of either a minimum depth of 2.5 times the width of the existing mortar joints or half the depth of the masonry unit so as not to compromise the structural stability of the wall.
   7. Examples:
      a. Mortar joint 1/16 inch (1.5 mm) Mortar joint needs to be cut out to a depth of 3/16 inch (5 mm) minimum.

b. Mortar joint 1/8 inch (3 mm) needs to be cut out to a depth of 5/16 inch (8 mm) minimum.
c. Mortar joint 1/4 inch (6 mm) needs to be cut out to a depth of 5/8 inch (16 mm) minimum.
d. Mortar joint 1/2 inch (13 mm) needs to be cut out to a depth of 1-1/4 inch (32 mm) minimum.
e. Mortar joint 3/4 inch (76 mm) needs to be cut out to a depth of 1-7/8 inch (48 mm) minimum.
f. Mortar joint 1 inch (25 mm) needs to be cut out to a depth of 2-1/2 inch ( mm) minimum.

8. Do not damage masonry units.
9. Do not widen existing masonry joints. The surrounding masonry edges are not to be spalled or chipped in the process of mortar removal. Damage to surrounding stone resulting from rotary blade over running is not permitted. Contractor must replace masonry damaged during mortar removal with replacement units that match the original exactly.
10. Utilize hand tools and power tools only after test cuts determine no damage to masonry units results.
11. Vertical Joints (Head Joints): Must not be raked out using rotary power saws. Vertical head joints less than 5 inches (127 mm) in height must be removed by hand in stonework unless a demonstration can be made that rotary use can be implemented without over cutting the joint, i.e. "over running." Vertical joints exceeding 5 inches (127 mm) in height may be approved for cutting with rotary power saws pending a successful demonstration to the Architect.
12. Horizontal Mortar Joints (Bed Joints) may be raked out using a diamond blade that is narrower than the joint width. The middle one-third of the mortar joint may be cut using a rotary power saw. The remaining mortar is to be removed from the masonry joints by hand using masonry chisels or pneumatic stone carving chisel. This technique is termed the Center Cut Approach.
13. Skyward Facing Horizontal Joints: Finish skyward facing horizontal joints and seams between dissimilar masonry materials with Sonnolastic NP-1 elastomeric polyurethane sealant colored to match the project mortar.
14. Brush, vacuum, blow out, or flush joints with water to remove dirt and loose debris, working from top to bottom of wall. Time the rinsing application so that at the time of pointing excess water has evaporated or run off. Joint surfaces should be damp but free from standing water.
15. Exposed surface of masonry adjacent to joint shall be surface saturated dry prior to mortar installation. Time the water mist application so that at the time of pointing excess water has evaporated or run off. Joint surfaces should be damp but free from standing water.
16. Maintain a water mister on site at all times during the repointing process.
17. Walls should be pre-soaked with water 10 minutes prior to pointing.
18. Mortar must be mixed according to manufacturer recommendations. Mortar material is to resemble the consistency of brown sugar during installation. This drier consistency enables the material to be tightly packed into the joint and allows for cleaner work and prevents shrinkage cracks as the mortar cures.
19. Joints should be pointed in layers or "lifts" where the joints are deeper than 1-1/4 inch (31 mm). Apply in layers not greater than 1/2 the depth but not more than 1-1/4 inch (31 mm) or until a uniform depth is formed. Compact each layer thoroughly and allow it to become thumbprint hard before applying the next layer.
20. Lift Examples:
    a. 3/16 inch (5 mm) joint depth (1/16 inch (1.5 mm) joint existing) point in

one lift.

b. 5/16 inch (8 mm) joint depth (1/8 inch (3 mm) joint existing) point in one lift.
c. 5/8 inch (16 mm) joint depth (1/4 inch (6 mm) joint existing) point in one lift.
d. 5/16 inch (8 mm) joint depth (3/8 inch (10 mm) joint existing) point in one lift.
e. 1-1/4 inch (31 mm) joint depth (1/2 inch (13 mm) joint existing) point in one lift.
f. 1-7/8 inch (48 mm) joint depth (3/4 inch (19 mm) joint existing) point in two lifts approximately 1 inch (25 mm) (each).
g. 2-1/2 inch (64 mm) joint depth (1 inch (25 mm) joint existing) point in three lifts approximately 3/4 inch (19 mm) (each).
h. Over 2-3/4 inch (70 mm) joint depth- point in lifts of no more than 1-1/4 inch (31 mm) (each).

21. When mortar is thumbprint hard the joints shall be finished to match the original historic joint profile.

D. Curing Methods:
1. Prevent finished mortar from drying out too quickly. Protect wall from direct sun and high winds during drying period.
   a. If mortar binder contains only lime putty (without hydraulic lime or Portland cement) then the wall must be misted to a surface saturated dry condition nine (9) separate times allowing the wall to dry out between applications.
      1) Completion of nine (9) wet-and-dry cycles may take two days to one week depending on the conditions of the wall and the environment. Cover the repointed wall with burlap sheeting as necessary to slow drying between misting applications.
   b. If mortar contains natural hydraulic lime or Portland cement, then maintain damp mortar condition for the first 72 hours after installation. Cover the repointed wall with plastic sheeting mist as necessary to prevent drying between misting applications.
2. Acceptable misting methods include, periodic hand misting, and periodic mist spraying using a system of pipes, mist heads, and timers. Adjust misting methods to ensure that the pointing mortar is damp without eroding the surface of the mortar.

**END OF SECTION**

# SECTION 04 21 00
# CLAY UNIT MASONRY

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Clay masonry units and accessories including:
   1. Brick units.
   2. Anchors and ties.
   3. Expansion joints.
   4. Flashing.
   5. Reinforcement.
   6. Mortar.
   7. Cleaning.

### 1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 04 20 00 - Unit Masonry.

C. Section 05 50 00 - Metal Fabrications.

D. Section 07 25 00 - WeatherBarriers.

E. Section 07 60 00 - Flashing and Sheet Metal.

### 1.3 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 03 45 13 - Faced Architectural Precast Concrete.

C. Section 04 20 00 - Unit Masonry.

D. Section 05 12 13 - Architecturally-Exposed Structural Steel Framing.

E. Section 05 40 00 - Cold-Formed Metal Framing.

F. Section 05 50 00 - Metal Fabrications.

G. Section 06 10 00 - Rough Carpentry.

H. Section 07 10 00 - Dampproofing and Waterproofing.

I. Section 07 25 00 - WeatherBarriers.

### 1.4 REFERENCES

A. ASTM International (ASTM):
   1. ASTM A 36 - Standard Specification for Carbon Structural Steel.
   2. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
   3. ASTM A 153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

4. ASTM A 615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
5. ASTM A 616 - Standard Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement.
6. ASTM A 617 - Standard Specification for Axle-Steel Deformed and Plain Bars for Concrete Reinforcement.
7. ASTM A 666 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
8. ASTM A 775 - Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
9. ASTM A996 - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.
10. ASTM B 370 - Standard Specification for Copper Sheet and Strip for Building Construction.
11. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
12. ASTM C 216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
13. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
14. ASTM C 652 - Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale).
15. ASTM D 1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
16. ASTM C 1088 - Standard Specification for Thin Veneer Brick Units Made from Clay or Shale.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Samples: Furnish not less than five individual brick as samples, showing extreme variations in color and texture.

D. Sample Panel: Mock-up or sample panels shall be used to review brick and mortar color and serve as the standard of workmanship for the Project.
   1. Approximately 4 feet (1.2 m) long by 3 feet (1 m) high, showing the proposed color range, texture, bond, mortar and workmanship. All brick shipped for the sample shall be included in the panel.
   2. When required, provide a separate panel for each type of brick or mortar.
   3. Do not start work until Architect/Engineer has accepted sample panel.
   4. Use panel as standard of comparison for all masonry work built of same material.
   5. Do not destroy or move panel until work is completed and accepted by Architect.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 years manufacturing similar products.

B. Installer Qualifications: Minimum 2 years installing similar products.

C. Brick Tests: Sample and test shall be in accordance with ASTM C 67.

D. Test Reports:
   1. Testing and reports shall be completed by an independent laboratory.

2. Test reports for each type of building and facing brick shall be submitted to the Architect/Engineer for review.
3. Test reports shall indicate:
    a. Compressive strength.
    b. 24 hour cold water absorption.
    c. 5-hour boil absorption.
    d. Saturation coefficient.
    e. Initial rate of absorption.
    f. Efflorescence.

E. Certificates: Prior to delivery, submit to Architect/Engineer certificates attesting compliance with the applicable specifications for grades, types or classes included in these specifications.

F. Costs of Tests: Cost of tests shall be borne by the purchaser, unless tests indicate that units do not conform to the requirements of the specifications, in which case cost shall be borne by the seller.

G. Prism Tests: Prism Tests shall be required when using engineered masonry (f 'm) =_____psi).

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store brick off the ground to prevent contamination by mud, dust or other materials likely to cause staining or other defects.

C. Cover all materials with a nonstaining waterproof membrane material when necessary to protect from elements.

D. Store different types of materials separately.

1.8 ALLOWANCES

A. Allowance includes purchase of brick, taxes, delivery and any special handling charges.

B. Special shaped brick units shall have a separate allowance.

1.9 PROJECT CONDITIONS

A. Protection of Work:
1. Wall Covering:
    a. During erection, cover top of wall with strong nonstaining waterproof membrane at end of each day or shutdown.
    b. Cover partially completed walls when work is not in progress.
    c. Extend cover minimum of 24 inches (610 mm) down both sides.
    d. Hold cover securely in place.
2. Load Applications:
    a. Do not apply uniform floor or roof loading for at least 12 hours after building masonry columns or wall.
    b. Do not apply concentrated loads for at least 3 days after building masonry columns or walls.
3. Stain Prevention:
    a. Prevent grout or mortar from staining the face of masonry.
    b. Remove immediately grout or mortar in contact with face of such masonry.
    c. Protect all sills, ledges and projections from droppings of mortar.

d. Protect base of wall from rain-splashed mud and mortar splatter.
e. Scaffold boards shall be turned on edge when work is not in progress.

B. Cold Weather Protection:
1. Preparation:
a. When ice or snow has formed on masonry bed, remove by carefully applying heat not to exceed 120 degrees F (49 degrees C) until surface is dry to the touch.
b. Remove all masonry deemed frozen or damaged.
2. Products:
a. When brick suction exceeds BIA reference standard, sprinkle with heated water:
1) When units are above 32 degrees F (0 degrees C), heat water above 70 degrees F (21 degrees C).
2) When units are below 32 degrees F (0 degrees C), heat water above 130 degrees F (54 degrees C).
b. Use dry masonry units.
c. Do not use wet or frozen units.
3. Construction Requirements While Work is Progressing:
a. Air temperature 40 degrees F (4 degrees C) to 32 degrees F (0 degrees C):
1) Heat sand or mixing water to produce mortar temperatures between 40 degrees F (4 degrees C) to 32 degrees F (0 degrees C).
b. Air temperature 32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C):
1) Heat sand and mixing water to produce temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C).
2) Maintain temperature of mortar on boards above freezing.
c. Air temperatures 25 degrees F (-4 degrees C) to 20 degrees F (-7 degrees C).
1) Heat sand and mixing water to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F. (49 degrees C).
2) Maintain mortar temperatures on boards above freezing.
3) Use salamanders or other heat sources on both sides of walls under construction.
4) Use windbreaks when wind is in excess of 15 mph (24 kms/h).
d. Air temperature 20 degrees F (-7 degrees C) and below:
1) Heat sand and mixing water to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C.).
2) Provide enclosures and auxiliary heat to maintain air temperature above 32 degrees F (0 degrees C).
3) Minimum temperature of units when laid: 20 degrees F (-7 degrees C).
4. Protection requirements for completed masonry and masonry not being worked on:
a. Mean daily air temperature 40 degrees F (4 degrees C) to 32 degrees F (0 degrees C):
1) Protect masonry from rain or snow for 24 hours by covering with weather-resistive membrane.
b. Mean daily air temperature 32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C):
1) Completely cover masonry with weather-resistive membrane for 24 hrs.
c. Mean daily temperature 25 degrees F (-4 degrees C) to 20 degrees F (-7 degrees C):
1) Completely cover masonry with insulating blankets or equal protection for 24 hours.
d. Mean daily air temperature 20 degrees F (-7 degrees C) and below:
1) Maintain masonry temperature above 32 degrees F (0 degrees C) for 24 hours by:
a) Method: Enclosure and supplementary heat.
b) Method: Electric heating blankets.

c) Method: Infrared lamps.
d) Method: Other approved methods.

C. Hot Weather Protection:
1. When temperature exceeds 100 degrees F or 90 degrees F with 8 mph wind (above 38 degrees C or 32 degrees C with 13 kms/h wind).
a. Maintain temperature of mortar and grout between 70 degrees F and 120 degrees F (21 degrees C and 49 degrees C).
1) Limit spread of mortar bed to 4 feet (1.2 m). Place units within 1 minute of spreading mortar.
b. Partially or recently completed walls may be fog sprayed and/or covered with opaque plastic or canvas or both to control moisture evaporation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Belden Brick Company or equal

B. Substitutions: upon review

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 CLAY MASONRY UNITS

A. All brick specified and shown on drawing shall be _____ as Manufactured by The Belden Brick Company.
1. Facing Brick: ASTM C 216, Grade SW,
a. Type FBS.
b. Type FBX.
c. Type FBA.
d. Size: _____ by _____ by _____ (t by h by l)
2. Hollow Brick: ASTM C 652, Grade SW.
a. Type HBS.
b. Type HBX.
c. Type HBA.
d. Size: _____ by _____ by _____(t by h by l)
3. Thin Veneer Brick: ASTM C 1088.
a. Grade Exterior.
b. Grade Interior.
c. Type TBS.
d. Type TBX.
e. Type TBA.
f. Size: _____ by _____ by _____ (t by h by l).

B. Minimum Compressive Strength: _____. (Not applicable to Thin Brick conforming with ASTM C1088.)

C. Maximum Initial Rate of Absorption (IRA): _____.

D. Provide brick similar in texture, color and physical properties to those available for inspection at the Architect/Engineer's office and/or as supplied on the approved sample panel.

E. Shapes: Special shapes are required to be used per architectural detail(s).

F. All brick supplied shall be pre-blended by the manufacturer.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars:
1. Billet Steel Deformed Bars: ASTM A 615.
2. Rail Steel Deformed Bars: ASTM A 616 or A996.
3. Axle Steel Deformed Bars: ASTM A 617 or A996.
4. Epoxy Coated Billet Steel: ASTM A 615 and ASTM A 775.

2.4 ANCHORS AND TIES

A. Corrugated Ties: ASTM A 1008, 20 Gage, Width: _____ inch, length: _____ inches, Galvanized: ASTM A 153, Class B-2.

B. Truss Joint Reinforcement: ASTM A 82 (ASTM A 666), Size_____, Galvanized: ASTM A 153, Class B-2.

C. Ladder Joint Reinforcement: ASTM A 82 (ASTM A 666), Size_____, Galvanized: ASTM A 153, Class B-2.

D. Wire Wall Ties: ASTM A 82, Wire Size: _____, Shape: _____, Length: _____ inches, Galvanized: ASTM A 153, Class B-2.

E. Dovetail Anchors: ASTM A 1008, Gage: _____, Length: _____ inches, Galvanized: ASTM A 153, Class B-2.

F. Anchors:
1. Plate Bent Bar Anchors: ASTM A 36, Diameter: _____inch, Length: _____ inches, Galvanized: ASTM A 153, Class B-2.
2. Plate Header Bar Anchors: ASTM A 36, Diameter: _____ inch, Length: _____ inches, Galvanized: ASTM A 153, Class B-2.

2.5 FLASHING

A. Copper: ASTM B 370, 5 oz.

B. Copper: ASTM B 370, 7 oz.

C. Stainless Steel: ASTM A 666, Grade_____, Type 304.

D. Plastic: PVC, 30 mil (0.75 mm) thick.

E. Copper/Fabric: 5 oz.

F. Plastic/Copper: 5 oz.

G. Asphalt-Coated Copper: 5 oz.

2.6 EXPANSION JOINTS

A. Premolded Foam: ASTM D 1056, Type 2, Class A, Grade 1.

B. Neoprene: ASTM D 1056, Type 2, Class A, Grade 1.

C. Backer Rod: Extruded, Closed Cell Polyethylene.

2.7 ACCESSORIES

A. Weepholes:

1. Rope Wicks: Cotton Sash Cord, 12 inches long with end laid in cavity.
2. Plastic Tubes: 1/4 inch (6 mm) minimum inside diameter by 4 inches (102 mm) long.
3. Aluminum Weep/Vents.
4. Plastic Weep/Vents.

2.8 MORTAR

A. Mortar shall conform to ASTM C 270 under the guidelines provided in BIA Technical Notes #8 Series.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Cleaning Reinforcement: Remove mud, loose rust, ice and other coatings from reinforcement which would interfere with bond.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.4 BONDING

A. Lay masonry in bond pattern as indicated on drawings or general notes. Reference BIA Technical Note #30 for additional requirements.

3.5 LAYING MASONRY

A. Lay masonry with full head and bed joints.

B. Lay all brick plumb and true to lines.

C. Where fresh mortar joins partially set mortar, remove loose brick and mortar, and lightly wet exposed surface of set masonry.

D. Toothing shall be subject to approval by the Architect/Engineer.

E. When adjustment is necessary to be made after mortar begins to harden, remove hardened mortar and replace with fresh mortar.

3.6 TOOLING AND POINTING

A. Joint Profile: Tool mortar joints to a concave appearance.

B. Joint Profile: Tool mortar joints to a concave V-shaped appearance.

C. Joint Profile: Tool mortar joints to a concave grapevine appearance.

D. Tool exposed joints when "thumb-print" hard.

E. Flush cut all joints not tooled.

F. When pointing, rake mortar joints to a depth of not less than 1/2 inch (12 mm). Fill solidly with pointing mortar. Tool joints.

3.7 FLASHING

A. Clean surface of masonry from projections which might puncture flashing.

B. Place through-wall flashing on bed of mortar. Cover flashing with mortar.

C. Lap flashing a minimum of 6 inches (152 mm).

D. Leave flashing project from face of wall approximately 1/4 inch (6 mm) to form a drip. Flashing shall be cut back to the face of the wall after inspection, if the drip is deemed objectionable by Architect.

3.8 WEEPHOLES

A. Provide weep holes in head joints of the first brick course immediately above flashing by placing weeps no more than 24 inches (610 mm) on center horizontally.

B. Keep cavity free from mortar.

3.9 EXPANSION JOINTS

A. Keep clean from all mortar and debris. Locate as shown on drawings. Install neoprene pre-molded foam pad. Install backer rod. Install sealant. Prime surfaces if necessary.

3.10 CLEANING

A. Cut out all defective mortar joints and holes in exposed masonry and provide new mortar.

B. Clean pre-selected sample wall area. Do not proceed with cleaning until approved by Architect.

C. Clean brick as outlined in BIA Technical Notes 20.

D. All cleaning practices and product used shall be in accordance with cleaning products manufacturer's printed instructions.

END OF SECTION

# SECTION 04 2200

# CONCRETE MASONRY UNIT

## PART 1 – GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Loadbearing split-face concrete masonry units (CMU)
2. Mortar and grout
3. Reinforcement and accessories
4. Flashings and weeps
5. Cleaning of finished masonry surfaces

B. Related Sections:

1. 03 30 00 – Cast-in-Place Concrete
2. 07 62 00 – Sheet Metal Flashing and Trim
3. 07 92 00 – Joint Sealants

### 1.2 REFERENCES

A. ASTM C90 – Loadbearing Concrete Masonry Units.

B. ASTM C140 – Sampling and Testing Concrete Masonry Units.

C. ASTM C270 – Mortar for Unit Masonry.

D. ASTM C476 – Grout for Masonry.

E. ASTM A615/A615M – Deformed and Plain Carbon-Steel Bars.

F. TMS 402/602 – Building Code Requirements and Specification for Masonry Structures.

### 1.3 SUBMITTALS

A. Product Data: Manufacturer’s specifications for units, mortar, grout, accessories.

B. Samples:

1. Split-face CMU units in full color range for Architect selection.

2. Mortar color samples, if colored mortar is specified

C. Shop Drawings: For reinforced masonry details if required.

D. Mix Designs: For mortar and grout.

E. Certifications: Complying with ASTM C90 and other standards.

**1.4 QUALITY ASSURANCE**

A. Manufacturer Qualifications: Minimum 5 years experience producing split-face CMU.

B. Installer Qualifications: Proven experience with loadbearing masonry construction.

C. Mock-Up:

1. Provide minimum 4 ft x 4 ft sample panel

2. Include selected split-face color and joint tooling

3. Approved mock-up may remain as part of finished work.

**1.5 DELIVERY, STORAGE, AND HANDLING**

A. Deliver units on pallets, banded or wrapped.

B. Store off ground, covered, and protected from weather and contamination.

C. Handle carefully to avoid chipping, breakage, soiling.

**1.6 WARRANTY**

A. Manufacturer's Warranty: Materials free of defects at delivery.

B. Installer's Warranty: Workmanship free of defects for 1 year after Substantial Completion.

**PART 2 – PRODUCTS**

**2.1 MANUFACTURERS**

A. Basis of Design: Consolidated Brick

1. Product: Split-face concrete masonry units as supplied by Consolidated Brick

B. Substitutions: Allowed only if equal in appearance, strength, and approved by Architect.

**2.2 CONCRETE MASONRY UNITS**

A. Type: Loadbearing, split-face finish.

B. Size: Nominal 8x8x16 inches, unless otherwise detailed.

C. Color: TBD – Selected by Architect from full manufacturer range.

D. Compressive Strength: Minimum 1900 psi average per ASTM C90.

E. Density: Normal-weight or medium-weight as scheduled on drawings.

F. Appearance: Uniform split-face texture, free of visible cracks and defects.

**2.3 MORTAR MATERIALS**

A. Portland Cement: ASTM C150, Type I or II.

B. Hydrated Lime: ASTM C207, Type S.

C. Masonry Cement: ASTM C91, Type N or S as scheduled.

D. Sand: ASTM C144, clean, well-graded.

E. Water: Clean, potable.

F. Color Pigments: UV-stable mineral oxide pigments (if colored mortar specified).

**2.4 MORTAR MIX**

A. Comply with ASTM C270.

B. Type: N or S as scheduled on drawings.

C. Mortar Color: TBD – Selected by Architect.

**2.5 GROUT**

A. Comply with ASTM C476.

B. Fine or coarse grout as detailed.

C. Minimum 2000 psi compressive strength.

**2.6 REINFORCEMENT**

A. Steel Bars: ASTM A615/A615M, Grade 60, deformed.

B. Joint Reinforcement: ASTM A951/A951M galvanized ladder or truss type as detailed.

### 2.7 ACCESSORIES

A. Flashings: Stainless steel, copper, or flexible membrane as detailed.

B. Weeps: Plastic or rope type at 24" o.c. max at flashing locations.

C. Control Joint Accessories: PVC or rubber profiles, as detailed.

D. Cleaning Agent: Non-acidic, non-abrasive, approved for split-face CMU.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

A. Verify foundations and supporting structure are level and prepared.

B. Confirm layout, openings, and embedded items.

C. Do not begin masonry work until unsatisfactory conditions are corrected.

### 3.2 INSTALLATION

A. Lay CMU in running bond unless otherwise detailed.

B. Place units level, plumb, true to line with uniform 3/8" joints.

C. Tool joints to a concave finish.

D. Install reinforcement, ties, and grout per structural drawings.

E. Provide flashing at base of walls, above openings, and at shelf angles.

F. Install weeps at 24" o.c. maximum at flashing locations.

G. Provide control joints as indicated on drawings or as needed to minimize cracking.

### 3.3 TOLERANCES

A. Vertical alignment: ±1/4" in 10 feet.

B. Horizontal alignment: ±1/4" in 10 feet.

C. Cross-joint alignment: ±1/8".

### 3.4 CLEANING

A. Remove excess mortar immediately.

B. Clean masonry with non-acidic, manufacturer-approved cleaning agents.

C. Avoid damage to split-face texture during cleaning.

**3.5 PROTECTION**

A. Protect completed work from damage and weather during construction.

B. Cover walls at end of workday to prevent moisture intrusion.

**END OF SECTION**

**SECTION 04 8100**

**REINFORCED MASONRY**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:
   1. Concrete masonry units.
   2. Decorative concrete masonry units.
   3. Mortar and grout.
   4. Reinforcing steel.
   5. Masonry joint reinforcement.
   6. Ties and anchors.
   7. Miscellaneous masonry accessories.

B. Related Sections include the following:
   1. Section 03300, Cast-in-Place Concrete
   2. Section 05120, Structural Steel
   3. Section 05210, Open Web Steel Joists
   4. Division 7, Bituminous Dampproofing
   5. Division 7, Water Repellents
   6. Division 7, Section Sheet Metal Flashing and Trim
   7. Division 7, Firestopping

C. Products furnished, but not installed, under this Section include the following:
   1. Dovetail slots for masonry anchors, Section 03300, Cast-In-Place Concrete
   2. Adjustable masonry anchors welded to structural steel frame, Section 05120, Structural Steel

D. Products installed, but not furnished, under this Section include the following:
   1. Steel lintels for unit masonry
   2. Flashing reglets in masonry joists, Division 7

1.03 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following net-area compressive strengths (f'm) at 28 days. Determine compressive strength of masonry by testing masonry prisms according to ASTM C 1314.
   1. For Concrete Unit Masonry: f'm = 1500 psi.

B. Masonry Grout: 3000 psi compressive strength at 28 days.

1.04 SUBMITTALS

A. Comply with provisions of Section 01330.

B. Product Data: For each different masonry unit, accessory, and other manufactured product specified.
C. Shop Drawings: Show fabrication and installation details for the following:
   1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
   2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
D. Samples for Verification: For the following:
   1. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
   2. Colored mortar Samples for each color required, showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
   3. Weep holes/vents in color to match mortar color.
   4. Accessories embedded in the masonry.
E. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
   1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents, unless such deviations are specifically brought to the attention of the Architect and approved in writing.
F. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
G. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
   1. Each type of masonry unit required.
      a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
      b. Include test results, measurements, and calculations establishing net-area compressive strength of masonry units.
   2. Mortar complying with property requirements of ASTM C 270.
   3. Grout mixes complying with compressive strength requirements of ASTM C 476. Include description of type and proportions of grout ingredients.
H. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
   1. Each type of masonry unit required.
      a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
      b. Include test data, measurements, and calculations establishing net-area compressive strength of masonry units.
   2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
   3. Each combination of masonry unit type and mortar type. Include statement of net-area compressive strength of masonry units, mortar type, and net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

4. Each material and grade indicated for reinforcing bars.
5. Each type and size of joint reinforcement.
6. Each type and size of anchor, tie, and metal accessory.

I. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

J. Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with hot-weather requirements.

1.05 QUALITY ASSURANCE

A. Comply with provisions of Section 01400.

B. Refer to architectural wall types and architectural drawings for additional information not provided in specifications.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.

D. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

E. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

F. Preconstruction Testing Service: Engage a qualified independent testing agency to perform the following preconstruction testing:
1. Concrete Masonry Unit Test: For each concrete masonry unit indicated, per ASTM C 140.
2. Prism Test: For each type of wall construction indicated, per ASTM C 1314. Three total for entire project.
3. Mortar Test: For mortar properties per ASTM C 270.
4. Grout Test: For compressive strength per ASTM C 1019.

G. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

H. Mockups: Before installing unit masonry, build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
1. Locate mockups in the locations indicated or, if not indicated, as directed by Architect.
2. Build mockup of typical wall area as shown on Drawings.
3. Build mockups for the following types of masonry in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup wythes and accessories. Include a sealant-filled joint at least 16 inches long in each mockup.
   a. Each type of exposed unit masonry construction.
   b. Typical exterior wall.
   c. Typical exterior wall with through-wall flashing installed for a 24-inch length in corner of mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).

d. Typical interior unit masonry wall.

4. Clean exposed faces of mockups with masonry cleaner as indicated.
5. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
6. Notify Architect seven days in advance of dates and times when mockups will be constructed.
7. Protect accepted mockups from the elements with weather-resistant membrane.
8. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
9. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
    a. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
10. Demolish and remove mockups when directed.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01600.
B. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
    1. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.
C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
E. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
F. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.07 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
    1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
    2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
   1. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

1.08 REFERENCE STANDARDS

A. ACI 530/ASCE 5/TMS 402: Building Code Requirements for Masonry Structures
B. ACI 530.1/ASCE 6/TMS 602: Specification for Masonry Structures
C. ASTM A82: Standard Specification for Steel Wire Pland for Concrete Reinforcement
D. ASTM C90: Standard Specification for Load bearing Concrete Masonry Units
E. ASTM C144: Standard Specification for Aggregate for Masonry Mortar
F. ASTM C150: Standard Specification for Portland Cement
G. ASTM C207: Standard Specification for Hydrated Lime for Masonry Purposes
H. ASTM C270: Standard Specification for Mortar for Unit Masonry
I. ASTM C404: Standard Specification for Aggregates for Masonry Grout
J. ASTM C476: Standard Specification for Grout for Masonry
K. ASTM C780: Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
L. ASTM C1019: Standard Test Method for Sampling and Testing Grout
M. ASTM C1314: Standard Test Method for Compressive Strength of Masonry Prisms
N. AWS D1.4: American Welding Society Structural Welding Code – Reinforcing Steel

PART 2 - PRODUCTS

2.01 See architectural wall types and architectural drawings for information not provided in specifications. Coordinate all requirements between drawings and specifications.

2.02 CONCRETE MASONRY UNITS

A. General: Provide shapes indicated and as follows:
   1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
   2. Provide bullnose units for outside corners, unless otherwise indicated.
B. Concrete Masonry Units (Decorative and Standard): ASTM C 90
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
   2. Weight Classification: Normal weight, unless otherwise indicated.
   3. Provide Type I, moisture-controlled units.
   4. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

2.03 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
B. Hydrated Lime: ASTM C 207, Type S.
C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
D. Mortar Cement: ASTM C 1329.
E. Masonry Cement: ASTM C 91.
   1. For pigmented mortar, use a colored cement formulation as required to produce the color indicated or, if not indicated, as selected from manufacturer's standard formulations.
   2. For colored-aggregate mortar, use natural color or white cement as necessary to produce required mortar color.
F. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
   1. White-Mortar Aggregates: Natural white sand or ground white stone.
   2. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
G. Aggregate for Grout: ASTM C 404.
H. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
I. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units (and approved for such use by manufacturer of the units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.
J. Water: Potable.

2.04 REINFORCING STEEL

A. Comply with reinforcing requirements in Section 03300, Cast-in-Place Concrete.
B. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; Grade 60.
C. Epoxy-Coated Reinforcing Steel: ASTM A 615/A 615M, Grade 60; epoxy coated to comply with ASTM A 775/A 775M.

2.05 MASONRY JOINT REINFORCEMENT

A. General: ASTM A 951 and as follows:
   1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
   2. Wire Size for Side Rods: W2.8 or 0.188-inch diameter.
   3. Wire Size for Cross Rods: W2.8 or 0.188-inch diameter.
   4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units where indicated.
B. For single-wythe masonry, provide either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches o.c.
C. For multiwythe masonry, provide types as follows:
   1. Ladder type with perpendicular cross rods spaced not more than 16 inches o.c. and 1 side rod for each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod for each wythe of masonry 4 inches or less in width.
   2. Adjustable (2-piece) type with single pair of side rods and cross ties spaced not more than 16 inches o.c. and with separate adjustable veneer ties engaging the cross ties. Cross ties are either U-shaped with eyes or rectangular. Space side rods for embedment within each face shell of backup wythe and size adjustable ties to extend at least halfway through outer wythe but with at least 5/8-inch cover on outside face.
      a. Use where indicated and where horizontal joints of facing wythe do not align with those of backup wythe.

2.06 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.
B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
C. Steel Sheet, Galvanized after Fabrication: ASTM A 366/A 366M cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153.
D. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.07 BENT WIRE TIES

A. General: Rectangular units with closed ends and not less than 4 inches wide. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.
   1. Where coursing between wythes does not align, use adjustable ties composed of 2 parts; 1 with pintles, the other with eyes; with maximum misalignment of 1-1/4 inches.
B. Wire: Fabricate from 3/16-inch- 1/4-inch- diameter, hot-dip galvanized steel wire.

2.08 ANCHORS FOR CONNECTING TO CONCRETE

A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Anchor Section: Dovetail anchor section formed from 0.0528-inch- thick, steel sheet, galvanized after fabrication .
   2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.1875-inch- diameter, hot-dip galvanized steel wire.

2.09 RIGID ANCHORS

A. General: Fabricate from steel bars as follows:
   1. 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins.

2. Finish: Hot-dip galvanized to comply with ASTM A 153.

2.10 ADJUSTABLE MASONRY-VENEER ANCHORS

A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
   1. Anchor Section: Zinc-alloy barrel section with flanged head with eye and corrosion-resistant, self-drilling screw. Eye designed to receive tie section and to serve as head for drilling fastener into framing. Barrel length to suit sheathing thickness, allowing screw to seat directly against framing with flanged head covering hole in sheathing.
   2. Wire Tie Section: Rectangular- shaped wire tie sized to extend at least halfway through veneer but with at least 5/8-inch cover on outside face.
   3. Fabricate sheet metal anchor sections and other sheet metal parts from 0.0677-inch-thick, steel sheet, galvanized after fabrication .
   4. Fabricate wire tie sections from 0.1875-inch- diameter, hot-dip galvanized steel wire.

2.11 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:
   1. Headed bolts.
   2. Nonheaded bolts, bent in manner indicated.

B. Postinstalled Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
   1. Type: Chemical anchors.
   2. Type: Expansion anchors only as noted on drawings.
   3. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.

2.12 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from PVC.

B. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Rectangular Plastic Weep/Vent Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches.

E. Wicking Material: Cotton or polyester rope, 1/4 to 3/8 inch in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity between wythes.

F. Plastic Weep Hole/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, designed to fill head joint with outside face held back 1/8 inch from exterior face of masonry, in color selected from manufacturer's standard.

G. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication.

2.13 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.
B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.14 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification.
    1. For masonry below grade, in contact with earth, and where indicated, use Type M.
    2. For reinforced masonry and where indicated, use Type S.
D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates combined with selected cementitious materials.
    1. Mix to match Architect's sample.
E. Grout for Unit Masonry: Comply with ASTM C 476.
    1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
    2. Provide grout with a slump of 9 inches (+/- one inch) as measured according to ASTM C 143.
F. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's directions.

2.15 SOURCE QUALITY CONTROL

A. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below:
    1. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
B. Brick Tests: For each type and grade of brick indicated, units will be tested according to ASTM C 67.
C. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
    1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
    2. Verify that foundations are within tolerances specified.
    3. Verify that reinforcing dowels are properly placed.

4. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.02 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

3.03 CONSTRUCTION TOLERANCES

A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:

B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.

C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, nor 1/2 inch maximum.

D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.

E. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

3.04 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

1. One-half running bond with vertical joint in each course centered on units in courses above and below.
2. As indicated on Drawings.

C. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean

exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

E. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

G. Fill cores in hollow concrete masonry units with grout 24 inches under anchor bolt locations unless otherwise indicated.

3.05 MORTAR BEDDING AND JOINTING

A. Lay hollow masonry units as follows:
   1. With full mortar coverage on horizontal and vertical face shells.
   2. Bed webs in mortar.
   3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
   4. At cavity walls, bevel beds away from cavity, to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against the cavity face of the brick.

3.06 CAVITIES

A. Keep cavities clean of mortar droppings, debris, and other materials during construction. Strike joints facing cavities flush.
   1. Use wood strips temporarily placed in cavity to collect mortar droppings. As work progresses, remove strips, clean off mortar droppings, and replace in cavity.

B. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
   1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.07 MASONRY JOINT REINFORCEMENT

A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches. Space reinforcing a maximum of 16” on center.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.08 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 16 inches o.c.

3.09 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to concrete and masonry backup with seismic masonry-veneer anchors to comply with the following requirements:
   1. Fasten each anchor section with two metal fasteners of type indicated.
   2. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around the perimeter.

3.10 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry where indicated or a maximum of 25 feet on center. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
B. Form control joints in concrete masonry as follows:
   1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake joints in exposed faces.
   2. Install preformed control-joint gaskets designed to fit standard sash block.
   3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake joint.

3.11 LINTELS

A. Install steel lintels where indicated or as required for masonry openings shown on drawings. Lintel sizes to be sufficient to support weight of masonry and deflection requirements.
B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
   1. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.
C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.12 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
   1. Cut flashing off flush with face of wall after masonry wall construction is completed.

C. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
   1. Use rectangular plastic tubing, plastic weep hole/vents, or vinyl weep hole/vents, to form weep holes.
   2. In cavities, place pea gravel to a height equal to height of first course, but not less than 2 inches, immediately above top of flashing embedded in the wall, as masonry construction progresses, to splatter mortar droppings and to maintain drainage.

3.13 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
   1. Construct formwork to conform to shape, line, and dimensions shown. Make it sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
B. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602.
C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
   1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.14 FIELD QUALITY CONTROL

A. Owner will engage a qualified independent testing agency to perform field quality-control testing indicated below.
   1. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
B. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof.
C. Mortar properties will be tested per ASTM C 780.
D. Grout will be sampled and tested for compressive strength per ASTM C 1019.
E. Brick Tests: For each type and grade of brick indicated, units will be tested according to ASTM C 67.
F. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.
G. Prism-Test Method: For each type of wall construction indicated, masonry prisms will be tested per ASTM C 1314, and as follows:
   1. Two prisms for the All-Purpose Room
   2. Two prisms for all other masonry.

3.15 REPAIRING, POINTING, AND CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.16 MASONRY WASTE DISPOSAL

A. Recycling: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
B. Disposal as Fill Material: Dispose of clean masonry waste, including broken masonry units, waste mortar, and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.
C. Excess Masonry Waste: Remove excess, clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 81 00

# SECTION 05 0100

# MAINTENANCE OF METALS

## PART 1 – GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Surface preparation of existing exterior metal stairs
2. Removal of rust, old coatings, and debris by sandblasting and scraping
3. Cleaning of prepared surfaces
4. Application of corrosion-inhibiting primer
5. Application of finish coat(s) of paint

B. Related Sections:

1. 09 91 00 – Painting and Coating (for general painting requirements)
2. 01 74 00 – Cleaning and Waste Management.

### 1.2 REFERENCES

A. SSPC-SP 6 – Commercial Blast Cleaning.

B. SSPC-SP 2 – Hand Tool Cleaning.

C. SSPC-SP 3 – Power Tool Cleaning.

D. SSPC-PA 1 – Shop, Field, and Maintenance Painting of Steel.

### 1.3 SUBMITTALS

A. Product Data: Manufacturer’s data for primers and paints.

B. Surface Preparation Plan: Description of methods for rust/paint removal.

C. Paint Schedule: Including manufacturer, product name, color, number of coats.

D. Certifications: For abrasive media if used for sandblasting.

### 1.4 QUALITY ASSURANCE

A. Contractor Qualifications:

1. Minimum 3 years of experience with surface preparation and metal repainting

2. Demonstrated history of successful comparable projects.

B. Regulatory Compliance:

1. Conform to local environmental regulations for abrasive blasting, waste disposal, VOC limits

2. OSHA standards for worker safety and containment.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver coatings in manufacturer's sealed, labeled containers.

B. Store materials in a dry, secure area, protected from temperature extremes.

C. Handle materials carefully to prevent contamination or damage.

### 1.6 PROJECT CONDITIONS

A. Perform work in dry weather with temperatures and humidity within manufacturer's recommended limits.

B. Protect surrounding surfaces, vegetation, and site features from damage by blasting or painting operations.

C. Provide containment and dust control during sandblasting.

### 1.7 WARRANTY

A. Contractor shall warrant repainting work to be free from peeling, cracking, or premature corrosion for 1 year after completion.

## PART 2 – PRODUCTS

### 2.1 PRIMER

A. High-performance corrosion-inhibiting metal primer, suitable for exterior use.

B. Basis of Design: Sherwin-Williams Macropoxy 646, Benjamin Moore Corotech V400, or approved equivalent.

C. VOC-compliant with local regulations.

### 2.2 FINISH COAT

A. Exterior-grade, industrial enamel or urethane topcoat suitable for metal substrates.

B. Basis of Design: Sherwin-Williams Industrial Enamel, Benjamin Moore Corotech V500, or approved equivalent.

C. Color: Black

D. Sheen: Semi-Gloss

### 2.3 CLEANING MATERIALS

A. Solvents, degreasers, detergents as recommended by coating manufacturer.

B. Clean water, lint-free cloths.

### 2.4 ABRASIVE MEDIA

A. If sandblasting: Clean, dry, suitable-grade media meeting SSPC requirements.

B. Contractor responsible for selecting appropriate grit to achieve specified surface profile.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

A. Inspect existing stairs to identify extent of corrosion, failing paint, damage.

B. Report conditions requiring repair beyond repainting to Architect before proceeding.

### 3.2 SURFACE PREPARATION

A. Remove rust, scale, loose paint, and debris:

1. Sandblasting to SSPC-SP 6 Commercial Blast Cleaning for most surfaces.

2. Hand or power tool cleaning (SSPC-SP 2 or 3) in areas where blasting is not practical.

B. Feather edges of sound existing paint for smooth transition.

C. Clean all surfaces of dust, dirt, oil, grease before priming.

D. Protect adjacent materials and areas from damage or contamination.

E. Collect and dispose of spent abrasive and paint debris in accordance with environmental regulations.

### 3.3 APPLICATION OF COATINGS

A. Primer:

1. Apply immediately after surface preparation to prevent flash rusting.

2. Apply at manufacturer's recommended DFT (dry film thickness).

B. Finish Coats:

1. Apply specified number of coats (minimum two finish coats unless otherwise approved)

2. Allow required drying and curing times between coats

3. Maintain uniform appearance and coverage.

C. Application Methods:

1. Brush, roller, or airless spray in accordance with manufacturer recommendations.

a. Avoid runs, sags, or holidays.

### 3.4 FIELD QUALITY CONTROL

A. Inspect surfaces after preparation and before coating.

B. Verify full coverage and adhesion of primer and finish coats.

C. Repair defects, holidays, or thin areas as required.

### 3.5 CLEANING

A. Remove masking and coverings carefully.

B. Clean adjacent surfaces of splatters or overspray.

C. Dispose of debris and cleaning materials legally.

### 3.6 PROTECTION

A. Protect finished surfaces from damage during remainder of construction.

B. Repair or refinish damaged areas to match.

**END OF SECTION**

**SECTION 05 0150**

**MAINTENANCE OF ARCHITECTURAL METALS**

## PART 1 – GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Cleaning and restoration of existing exterior architectural copper surfaces
2. Stabilization or preservation of existing patina
3. Optional clear protective sealant application if indicated

B. Related Sections:

1. 01 73 00 – Execution
2. 01 74 00 – Cleaning and Waste Management
3. 09 91 00 – Painting and Coating (for other metal finishes).

### 1.2 REFERENCES

A. ASTM D1653 – Water Vapor Transmission of Organic Coating Films.

B. Copper Development Association (CDA) – Copper in Architecture guidelines.

C. Preservation Brief 4 – Secretary of the Interior's Standards for Historic Properties.

### 1.3 SUBMITTALS

A. Product Data:

1. Manufacturer's data for proposed cleaners and sealers
2. Application instructions.

B. Cleaning Plan:

1. Describe cleaning methods, materials, sequence
2. Safety and environmental controls

C. Samples (if requested):

1. Test cleaning area on actual copper surface, minimum 2 ft x 2 ft.

2. Proposed finish appearance for Architect's review and acceptance

**1.4 QUALITY ASSURANCE**

A. Contractor Qualifications:

1. Minimum 3 years experience in architectural metal restoration

2. Documented history of comparable copper restoration projects.

B. Regulatory Compliance:

1. Conform to local environmental regulations for chemical use and waste disposal

2. OSHA standards for worker safety

**1.5 DELIVERY, STORAGE, AND HANDLING**

A. Deliver cleaning and sealing products in manufacturer's sealed, labeled containers.

B. Store in dry, secure location, protected from temperature extremes.

C. Handle chemicals and cleaning agents per manufacturer recommendations and safety data sheets (SDS).

**1.6 PROJECT CONDITIONS**

A. Perform work only when environmental conditions meet manufacturer's requirements.

B. Protect adjacent surfaces, vegetation, and site features from damage or contamination.

C. Coordinate sequencing with other exterior work to prevent damage to restored copper surfaces.

**1.7 WARRANTY**

A. Contractor shall warrant cleaning and sealing work to be free of visible defects or coating failure for 1 year after completion.

**PART 2 – PRODUCTS**

**2.1 CLEANING AGENTS**

A. Mild, non-abrasive, pH-neutral or slightly acidic copper cleaning solutions designed for architectural metals.

B. Basis of Design Products (examples):

1. Eaco Chem Copper Cleaning Gel

2. Custom Building Products Metal Restore

3. Approved equivalent.

C. Prohibited:

1. Strong acids (e.g., muriatic acid), harsh alkalis, abrasives that damage copper surface.

**2.2 SEALANTS (If Specified)**

A. Clear, breathable, UV-stable protective coating formulated for copper.

B. Low-gloss or matte finish unless otherwise specified.

C. Basis of Design Products (examples):

1. Everbrite Protective Coating

2. ProtectaClear

3. Approved equivalent

D. Performance Requirements:

1. UV and weather resistance suitable for exterior exposure

2. Water vapor permeability compliant with ASTM D1653

3. Non-yellowing, non-cracking

**2.3 MATERIALS FOR HAND CLEANING**

A. Soft natural bristle brushes.

B. Non-abrasive pads.

C. Clean water, lint-free cloths.

D. Personal protective equipment (PPE) per SDS requirements.

**PART 3 – EXECUTION**

**3.1 EXAMINATION**

A. Inspect existing copper surfaces to determine extent of oxidation, staining, corrosion, or damage.

B. Identify areas with desirable natural patina versus areas with corrosion or staining requiring removal.

C. Report conditions requiring repair beyond cleaning and sealing to Architect.

**3.2 PREPARATION**

A. Protect adjacent materials and surfaces with masking, sheeting, or temporary barriers.

B. Collect and contain all rinse water, cleaning solutions, and residues per environmental requirements.

C. Disconnect or protect nearby electrical fixtures.

**3.3 CLEANING**

A. Perform test cleaning on designated sample area for approval before proceeding.

B. Remove surface dirt, debris, and non-adherent oxidation with gentle washing.

C. Apply approved cleaning solution per manufacturer instructions.

D. Use non-abrasive hand tools or pads as needed; avoid scratching copper surface.

E. Rinse thoroughly with clean water.

F. Allow cleaned surfaces to dry completely before any sealing application.

**3.4 PRESERVING NATURAL PATINA**

A. Where patina is to remain:

1. Clean only to remove surface grime, bird droppings, pollutants

2. Avoid removal of stable, historic patina unless directed by Architect

B. Stabilize areas of active corrosion as specified

**3.5 APPLICATION OF SEALANT (IF SPECIFIED)**

A. Apply only on clean, dry copper surfaces.

B. Apply in thin, even coats per manufacturer instructions.

C. Allow full drying or curing between coats if multiple coats are specified.

D. Avoid drips, runs, and uneven sheen.

E. Maintain required minimum film thickness for exterior exposure.

### 3.6 FIELD QUALITY CONTROL

A. Inspect cleaned and/or sealed surfaces for uniform appearance.

B. Verify no damage to surrounding materials.

C. Correct unsatisfactory areas to Architect's satisfaction.

### 3.7 CLEANING

A. Remove masking and protective coverings carefully.

B. Clean adjacent surfaces of splatter or residue.

C. Collect and legally dispose of all waste materials, used rags, and cleaning chemicals.

### 3.8 PROTECTION

A. Protect restored copper surfaces from damage during remaining construction activities.

B. Repair or refinish damaged areas to match approved finish.

**END OF SECTION**

**SECTION 05 1200**

**STRUCTURAL STEEL**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Structural steel.
   2. Base, leveling, and bearing plates.
   3. Architecturally exposed structural steel.
   4. Grout.

B. Work Furnished but Installed by Others
   1. Anchorages cast into concrete and masonry.
   2. Lintels installed in masonry.

C. Related Sections include the following:
   1. Division 3, Cast-In-Place Concrete
   2. Division 4, Unit Masonry Assemblies
   3. Division 5, Open Web Steel Joists
   4. Division 5, Steel Deck
   5. Division 9, Painting

1.03 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

B. Architecturally Exposed Structural Steel: Structural steel designated as architecturally exposed structural steel in the Contract Documents or shown as exposed through the use of building sections, wall sections, and elevations.

1.04 REFERENCE STANDARDS

A. AISC – Manual of Steel Construction, Allowable Stress Edition, 9th Edition
B. AISC – Code of Standard Practice for Steel Buildings and Bridges

C. AISC – Specification for Structural Joints using ASTM A325 or A490 Bolts
D. ASTM A6 – General Requirements for Rolled Steel Plates, Shapes, Sheet Piling and Bars for structural use
E. ASTM A36 – Carbon Structural Steel
F. ASTM A53 – Welded and Seamless Steel Pipe
G. ASTM A108 – Steel Bars, Carbon, Cold Finished Standard Quality
H. ASTM A123 – Zinc Hot Galvanized Coatings on Iron and Steel Products
I. ASTM A242 – High-Strength Low-Alloy Structural Steel
J. ASTM A307 – Carbon Steel Bolts and Studs
K. ASTM A325 – High Strength Bolts for Structural Steel Joints, including Suitable Nuts and Plain Hardened Washers
L. ASTM A434 – Steel Bars, Alloy, Quenched and Tempered
M. ASTM A449 – Quenched and Tempered Steel Bolts and Studs
N. ASTM A490 – Heat Treated Structural Steel Bolts
O. ASTM A500 – Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
P. ASTM A501 – Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
Q. ASTM A992 – Standard Specification for Steel for Structural Shapes For Use in Building Framing
R. ASTM 1008 - Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
S. ASTM 1011 – Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
T. ASTM C1107 – Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
U. AWS – Standard Qualification Procedure
V. AWS A2.4 – Standard Symbols for Welding, Brazing, and Non-destructive Examination
W. AWS – D1.1 – Structural Welding Code
X. OSHA 1926 29 CFR – Safety and Health Regulations for Construction
Y. SSPC SP-2 – Hand Tool Cleaning
Z. SSPC SP-3 – Power Tool Cleaning

1.05 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear and moment resisting connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand ASD-service loads indicated and comply with other information and restrictions indicated.
   1. Select and complete connections using schematic details indicated and AISC's "Manual of Steel Construction, Allowable Stress Design," Part 4.
   2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer registered in the State of RI to prepare structural analysis data for moment resisting beam to column structural-steel connections. Analysis to be stamped and signed.

B. Construction: Type 1 and 2, simple span and fully rigid framing.

1.06 SUBMITTALS

A. Comply with provision in Division 1. Submit a maximum of four sets.

B. Product Data: For each type of product indicated.

C. Shop Drawings: Show fabrication of structural-steel components.
   1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   2. Include embedment drawings.
   3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
   4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
   5. Include moment resisting structural-steel connections to be in compliance with design loads. Provide complete structural analysis data, signed and sealed by the qualified professional engineer responsible for their preparation who is licensed in the State of Rhode Island. Both the moment and shear components of the connection are to be included in the analysis.

D. Welding certificates.

E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
   1. Structural steel including chemical and physical properties.
   2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   3. Direct-tension indicators.
   4. Tension-control, high-strength bolt-nut-washer assemblies.
   5. Shear stud connectors.
   6. Shop primers.
   7. Nonshrink grout.

F. Source quality-control test reports.

G. Submit data on shop primer indicating adhesion compatibility with spray on fireproofing.

1.07 QUALITY ASSURANCE

A. Comply with provisions in Division 1.
B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
C. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Cbd.
D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
E. Comply with applicable provisions of the following specifications and documents:
   1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
   2. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
   3. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
   4. AISC's "Specification for the Design of Steel Hollow Structural Sections."
   5. AISC's "Specification for Allowable Stress Design of Single-Angle Members."

6. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

F. Mockups: Build mockups of architecturally exposed structural steel to set quality standards for fabrication and installation.
   1. Coordinate finish painting requirements with Division 9 painting Sections.
   2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01310 - Project Management and Coordination.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with provisions in Division 1.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
   1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
   2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

C. Deliver materials to the site at such intervals to ensure uninterrupted progress of the work.

1.09 COORDINATION

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.01 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992 or ASTM A 572, Grade 50.
B. Channels, Angles, M, S-Shapes: ASTM A 36.
C. Plate and Bar: ASTM A 36.
D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
E. Steel Pipe: ASTM A 53, Type E or S, Grade B.
F. Medium-Strength Steel Castings: ASTM A 27, Grade 65-35, carbon steel.
G. High-Strength Steel Castings: ASTM A 148, Grade 80-50, carbon or alloy steel.
H. Welding Electrodes: E70xx, comply with AWS requirements.

2.02 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 or ASTM A 490, Type 1, heavy hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers, plain.
   1. Finish: Plain.
   2. Direct-Tension Indicators: ASTM F 959, compressible-washer type
   3. Tension-Control Assemblies: ASTM F 1852

B. Unheaded Anchor Rods: ASTM A 307, Grade A.
   1. Configuration: Hooked.
   2. Nuts: ASTM A 563 hex carbon steel.
   3. Plate Washers: ASTM A 36 carbon steel.
   4. Washers: ASTM F 436 hardened carbon steel.
   5. Finish: Mechanically deposited zinc coating, ASTM B 695, Class 50.

C. Threaded Rods: ASTM A 193.
   1. Nuts: ASTM A 563 hex carbon steel.
   2. Washers: ASTM A 36 carbon steel.
   3. Finish: Plain.

2.03 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer when used without fireproofing materials.

B. When intumescent is specified, primer paint is to be compatible.

C. Galvanizing Repair Paint: ASTM A 780, minimum 95% metallic zinc by weight.

D. Steel exposed to exterior weather is to have high performance coating system or be hot dipped galvanized.

2.04 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.05 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
   1. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
   2. Mark and match-mark materials for field assembly.
   3. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Architecturally Exposed Structural Steel: Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel identified as architecturally exposed structural steel.
   1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, seam marks, roller marks, rolled trade names, and roughness.
   2. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning and SSPC-SP 3, "Power Tool Cleaning."

F. Holes:
   1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
   2. Base-Plate Holes: Cut, drill, or punch holes perpendicular to steel surfaces.
   3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

G. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

I. Fabricate beams and girders with positive camber when composite with the concrete slab. Prescribe enough camber to counteract dead load of concrete slab and framing. Amount of camber is to be indicated on submitted shop drawings.

2.06 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

   1. Joint Type: Pretensioned.

B. Weld Connections: E70xx in compliance with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
   1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
   2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.

a. Grind butt welds flush.
b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.07 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.
1. Galvanize loose lintels and relieving angles attached to structural-steel frame and located in exterior walls.
2. Galvanize steel as noted on drawings.

2.08 SOURCE QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:
1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:
1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."

B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
   1. Set bearing and leveling plates for structural members on leveling grout as required.
   2. Pretension anchor rods after supported members have been positioned and plumbed.
   3. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Do not use thermal cutting during erection.

H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

I. Touch-up Painting: immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint. Apply paint to exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils. Use galvanizing repair paint to correct damaged or abraded areas of galvanized members and to cover and protect field welds in galvanized members

3.04 FIELD CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Pretensioned.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design " for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
a. Grind butt welds flush.
b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: All field welds will be visually inspected according to AWS D1.1.
1. In addition to visual inspection, 10% of all field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:
a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.06 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.
   1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
   2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 9 painting Sections.

D. Any field alterations are to be submitted as a drawing to the architect prior to implementation. Submitted drawing is to show field conditions and work to be performed including, but not limited to member sizes, tolerances, weld sizes and length, and connection information. Proposed field alteration is subject to approval by architect or engineer.

**END OF SECTION 05 12 00**

# SECTION 05 2100

# OPEN WEB STEEL BAR JOISTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:
   1. Open-web K-series and LH-series steel joists.
   2. KCS-type, open-web K-series steel joists.
   3. Joist accessories.

B. Related Sections include the following:
   1. Division 3 - Concrete
   2. 05120: Structural Steel
   3. 05310: Steel Deck
   4. Division 9 - Painting

### 1.3 DEFINITIONS

A. Special Joists: Joists requiring modification by the manufacturer to support nonuniform, unequal, or special loading conditions that invalidate SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders."

### 1.4 REFERENCE STANDARDS

A. AISC S329 – Allowable Stress Design Specification for Structural Joints Using A325 or A490 Bolts
B. ASTM A 36 – Standard Specification for Carbon Structural Steel
C. ASTM A108 – Standard Specification for Steel Bars, Carbon, Cold-finished, Standard Quality
D. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
E. ASTM A307 – Carbon Steel Bolts and Studs
F. ASTM A325 – Structural Bolts, Steel, Heat Treated
G. ASTM A490 – Heat Treated Steel Structural Bolts
H. AWS D1.1 – Structural Welding Code
I. OSHA 1926 29 CFR – Safety and Health Regulations for Construction
J. SJI – Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders
K. SJI Technical Digest No. 9 – Handling and Erection of Steel Joists and Joist Girders
L. SSPC-Paint 15 – Steel Joist Shop Primer
M. SSPC SP-2 – Hand Tool Cleaning
N. SSPC SP-3 – Power Tool Cleaning

1.5 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding the design gravity, wind, and seismic loads as indicated on the contract drawings and in compliance with the Rhode Island State Building Code.

B. Design joists to withstand design loads with live and total load deflections no greater than the following:
   1. Floor Joists: Vertical deflection of 1/360 (total load) of the span.
   2. Roof Joists: Vertical deflection of 1/360 (live load) and 1/240 (total load) of the span.

1.6 SUBMITTALS

A. Comply with provisions of Division 1. Submit a maximum of four sets.

B. Product Data: For each type of joist, accessory, and product indicated or used.

C. Shop Drawings: Show layout, mark, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, accessories; splice and connection locations and details; and attachments to other construction.

   1. Indicate locations and details of anchorage devices and bearing plates to be embedded in other construction.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Submit data on shop primer indicating adhesion compatibility with spray on fireproofing.

1.7 QUALITY ASSURANCE

A. Comply with provisions Division 1.

B. Manufacturer Qualifications: A firm experienced in manufacturing joists similar to those indicated for this Project and with a record of successful in-service performance.
   1. Manufacturer must be certified by SJI to manufacture joists complying with SJI standard specifications and load tables.
   2. Assumes responsibility for engineering special joists to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

C. SJI Specifications: Comply with SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders" (hereafter, "Specifications"), applicable to types of joists indicated.

D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.3 "Structural Welding Code--Sheet Steel."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with provisions of Division 1.

B. Deliver, store, and handle joists as recommended in SJI's "Specifications."

C. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.9 SEQUENCING

A. Deliver steel bearing plates and other devices to be built into concrete and masonry construction in a timely manner to not delay progression of work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel: Comply with SJI's "Specifications" for chord and web members.

B. Steel Bearing Plates: ASTM A 36.

C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers. Finish is plan and uncoated.

D. High-Strength Bolts and Nuts: ASTM A 325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers. Finish is plain and uncoated.

E. Welding Electrodes: E70xx, Comply with AWS standards.

F. Galvanizing Repair Paint: ASTM A 780.

2.2 PRIMERS

A. Primer: SSPC-Paint 15, Type I, red oxide; FS TT-P-636, red oxide; or manufacturer's standard shop primer complying with performance requirements of either of these red-oxide primers.

B. Primer selection is to be coordinated with spray on fireproofing and UL fire protection classifications. The primer is to pass bond tests to ensure adequate adhesion with the spray on fireproofing.

2.3 OPEN-WEB K-SERIES STEEL JOISTS

A. Manufacture steel joists according to "Standard Specifications for Open Web Steel Joists, LH-Series," in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord; of joist type indicated.

1. Joist Type: LH-series steel joists.

B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

C. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

D. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

E. Do not camber joists.

F. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes for joists in order to achieve slope created by the difference of steel bearing elevations.

2.4 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span.
1. Schematically indicated only.
2. Furnish additional erection bridging if required.
3. Coordinate clearance requirements of other trades with location of bridging.

B. Provide adequate anchorage for bridging with enough capacity to resist withdrawal forces specified in the S.J.I. Specifications.

C. Steel bearing plates with integral anchorages are specified in Division 5 Section "Metal Fabrications."

D. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface, unless otherwise indicated.

E. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.5 CLEANING AND SHOP PAINTING

A. Coordinate surface preparation, primer, and final cleaning with adhesion requirements of spray on fireproofing and UL fire protection classification.

B. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories to be primed by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

C. Apply one shop coat of primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

D. Painting of joists and joist accessories is specified in Division 9 Section "Painting."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.

C. Field weld joists to supporting steel bearing plates. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts, unless otherwise indicated.

E. Bolt joists to supporting steel framework using high-strength structural bolts, unless otherwise indicated. Comply with RCSC's "Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Field welds will be visually inspected according to AWS D1.1.

C. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following procedures, as applicable:
1. Radiographic Testing: ASTM E 94 and ASTM E 142.
2. Magnetic Particle Inspection: ASTM E 709.
3. Ultrasonic Testing: ASTM E 164.
4. Liquid Penetrant Inspection: ASTM E 165.

D. Bolted connections will be visually inspected.

1. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."

E. Correct deficiencies in Work that inspections and test reports have indicated are not in compliance with specified requirements.

F. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.4 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates and abutting structural steel.
1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
2. Apply a compatible primer of the same type as the shop primer used on adjacent surfaces.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 9 Section "Painting."

D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer,that ensure joists and accessories are without damage or deterioration at time of Substantial Completion.

E. Field alteration of steel joists is not permitted without written approval from the joist designer. The joist designer is to provide certification for the design of the field alteration. The contractor is to provide adequate testing by an independent agency to ensure the proper execution of the design in every respect. Testing is subject to approval by architect or engineer.

**END OF SECTION 05 21 00**

**SECTION 05 3100**

**METAL DECK**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Roof deck.
   2. Deck accessories, closures, fillers, fastening of deck.
   3. Roof frames
B. Related Sections include the following:
   1. Division 3, Cast-in-Place Concrete
   2. Division 4, Unit Masonry Assemblies
   3. Division 5, Structural Steel
   4. Division 5, Open Web Steel Joists
   5. Division 7, Roof Insulation

1.03 SUBMITTALS

A. Comply with provisions in Division 1.
B. Submit a maximum of four sets. Contractor to make sepias of reviewed sets as required for further distribution.
C. Product Data: For each type of deck, accessory, and product indicated.
D. Shop Drawings:
   1. Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction. Include dimensions of individual components and finishes.
   2. Type and location of welds.
   3. Details of accessories, showing sump pans, cant strips, closure strips and insulation supports.
E. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements. Include test reports for mechanical fasteners showing compliance with required loading.
F. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.04 QUALITY ASSURANCE

A. Comply with provisions in Division 1.
B. Manufacturer Qualifications: Member of the Steel Deck Institute.
C. Installer Qualifications: An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
E. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
F. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those steel deck units tested for fire resistance per ASTM E 119 by a testing and inspection agency acceptable to authorities having jurisdiction.
   1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
   2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.
   3. Finish of steel deck is to provide adequate adhesion for spray on fire resistant material.
G. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."

1.05 DELIVERY, STORAGE, AND HANDLING
A. Comply with provisions in Division 1.
B. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
C. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
D. Do not place bundles of deck on unstable structural members or in such a manner that will overstress the supporting beam, joist, or wall.

1.06 COORDINATION
A. Coordinate deck penetrations with other trades as required. Any opening to be shown on shop drawings.
B. Coordinate roof frame quantities, locations, and dimensions with other trades as required. Structural steel roof frames to be provided as noted in Article 3.

1.07 REFERENCE STANDARDS
A. AISI – Specificaion for the Design of Cold-Formed Steel Structural Members with Commentary
B. ASTM A36 – Carbon Structural Steel
C. ASTM A108 – Steel Bars, Carbon Cold-Finished Standard Quality
D. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
E. ASTM A446 – Steel Sheet, zinc coated by the Hot-Dip Process, Structural Quality
F. ASTM A525 – Steel Sheet, zinc coated by the Hot-Dip Process, General Requirements
G. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
H. ASTM A1008 – Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
I. AWS D1.1 – Structural Welding Code – Steel
J. AWS D1.3 – Structural Welding Code - Sheet Steel
K. MIL – MIL-P-21035, Galvanizing Repair
L. OSHA 1926 29 CFR – Safety and Health Regulations for Construction

M. SDI – Publication No. 29, Design Manual for Composite Decks, Form Decks, Roof Decks, and Cellular Floor Deck Systems with Electrical Distribution
N. SDI DDM02 – Diaphragm Design manual; Steel Deck Institute, Inc.; 2nd Edition.

PART 2 - PRODUCTS

2.01 NON-COMPOSITE FORM DECK

A. Non-composite Steel Form Deck: Fabricate ribbed-steel sheet noncomposite form deck panels to comply with "SDI Specifications and Commentary for Non-composite Steel Form Deck," in SDI Publication No. 29, the minimum section properties indicated, and the following:
1. Galvanized Steel Sheet: ASTM A 653, Structural Steel, Grade 33, G60 zinc coating.
2. Profile Depth: 1 1/2 inches.
3. Design Uncoated-Steel Thickness: 20 gauge.
4. Span Condition: Triple span or more.
5. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.02 COMPOSITE FLOOR DECK

A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 29, the minimum section properties indicated, and the following:
1. Galvanized Steel Sheet: ASTM A 653, Structural Steel, Grade 33, G60 zinc coating.
2. Profile Depth: 1 1/2 inches.
3. Design Uncoated-Steel Thickness: 20 gauge or as noted in plans
4. Span Condition: Triple span or more.

2.03 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 29, and the following:
1. Galvanized Steel Sheet: ASTM A 653, Structural Steel, Grade 33, G90 zinc coating.
2. Deck Profile: Type B wide rib.
3. Profile Depth: 1 1/2 inches or 1 inch.
4. Design Uncoated-Steel Thickness: 18 gage or 20 gage or as noted in plan
5. Span Condition: Triple span or more.
6. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.04 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

G. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile indicated unless noted otherwise on drawings.

H. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

J. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

K. Shear Connectors: ASTM A 108, Grades 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B, with arc shields

L. Galvanizing Repair Paint: ASTM A 780.

M. Repair Paint: Lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

### 3.02 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.
B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
C. Locate decking bundles to prevent overloading of supporting members.
D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.
H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.03 ROOF DECK INSTALLATION

A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 inches long, and as follows:
   1. Weld Diameter: 5/8 inch, nominal.
   2. Weld Spacing: Weld deck in place at all supports with a 36/4 pattern with additional welds spaced at 6 inches apart at the perimeter of the building and roof corners. Welding to be less than a minimum of two welds per deck unit at each support or 12 inches on-center in the field.
   3. Weld Washers: Install weld washers at each weld location as recommended by SDI.
B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/3 of the span or 36 inches, and as follows:
   1. Mechanically fasten with self-drilling No. 10 diameter or larger carbon-steel screws.
   2. Fasten with a minimum of 1-1/2-inch- long welds.
   3. Minimum of two fasteners for each deck span.
C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
   1. End Joints: Lapped 2 inches minimum.
D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 12 inches apart with at least 1 weld at each corner.
E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.
G. Reinforcement at Openings: Reinforce any opening penetrating metal deck shown on the contract documents as follows unless noted otherwise on drawings:
   1. Openings with any dimension 8” or less to have a flat steel plate welded to the top surface of the deck. Plate to extent 12” past the opening in each direction and to be minimum 18 gauge. Weld or screw plate to deck at 3 locations each side.
   2. Openings greater than 8” in any direction to be reinforced with a structural steel angle frame. Frame to support the entire perimeter of opening and to be supported on each end by adjacent framing or load bearing wall. Unless noted otherwise frame to be constructed of L3x3x1/4 angles.

3.04 FLOOR DECK INSTALLATION

A. Fasten floor deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch, nominal.
2. Weld Spacing: Weld edge ribs of panels at each support. Space welds 12 inches apart in the field of the floor and 6 inches apart at any perimeter edge.
3. Weld Washers: Install weld washers at each weld location as recommended by SDI.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/3 of the span or 36 inches, and as follows:

1. Mechanically fasten with self-drilling No. 10 diameter or larger carbon-steel screws.
2. Fasten with a minimum of 1 1/2 inch long welds

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
1. End Joints: Lapped.

D. Shear Connectors: Weld shear connectors through deck to supporting frame according to AWS D1.1 and manufacturer's written instructions. Butt end joints of deck panels; do not overlap. Remove and discard arc shields after welding shear connectors

E. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

F. Floor Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of decking. Weld cover plates at changes in direction of floor deck panels, unless otherwise indicated.

G. Install piercing hanger tabs not more than 14 inches apart in both directions, within 9 inches of walls at ends, and not more than 12 inches from walls at sides, unless otherwise indicated.

H. Reinforcement at Openings: Reinforce any opening penetrating floor deck shown on contract documents with structural steel angle frame. Frame is to support entire perimeter of openings and will bear on framing or load bearing wall on each side. Unless noted otherwise members of frame are to be built from L4x4x1/4 angles.

3.05 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.
B. Field welds will be subject to inspection.
C. Testing agency will report test results promptly and in writing to Contractor and Architect.
D. Remove and replace work that does not comply with specified requirements.
E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.06 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
   1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
   2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Division 9, Painting.

C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

**END OF SECTION 05 31 00**

# SECTION 05 5000

# METAL FABRICATIONS

## PART 1 – GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Steel stairs and landings
2. Steel railings and handrails
3. Wall-mounted and pipe railings
4. Metal ladders
5. Supports and brackets
6. Bollards and guards
7. Loose steel angles, plates, lintels, framing
8. Miscellaneous steel components shown on drawings.

B. Related Sections:

1. 03 30 00 – Cast-in-place Concrete (for embedded items)
2. 05 12 00 – Structural Steel Framing
3. 05 59 63 – Detention Enclosures
4. 08 34 63 – Detention Doors and Frames
5. 09 91 00 – Painting

### 1.2 REFERENCES

A. ASTM A36/A36M – Structural Steel.

B. ASTM A53/A53M – Steel Pipe.

C. ASTM A123/A123M – Hot-Dip Zinc Coating.

D. ASTM A500 – Cold-Formed Welded & Seamless Structural Tubing.

E. AWS D1.1 – Structural Welding Code – Steel.

**1.3 SUBMITTALS**

A. Product Data: Manufacturer data for standard components.

B. Shop Drawings:

1. Fabrication details

2. Connections and welds

3. Anchor details

4. Field joints and installation

C. Samples:

1. Finish sample if specified

D. Certificates: Welding procedures and welder qualifications if required.

**1.4 QUALITY ASSURANCE**

A. Fabricator Qualifications:

1. Minimum 5 years experience in metal fabrication of similar scope.

B. Welding Standards:

1. AWS D1.1 certified welders.

C. Pre-Installation Conference (optional):

1. Coordinate supports, embeds, and attachments with other trades.

**1.5 DELIVERY, STORAGE, AND HANDLING**

A. Protect materials from corrosion, deformation, and damage.

B. Store off ground in dry, ventilated area.

C. Provide temporary bracing for pre-assembled items.

**1.6 WARRANTY**

A. One-year warranty against defects in materials and workmanship.

**PART 2 – PRODUCTS**

**2.1 MATERIALS**

A. Steel Shapes and Plates: ASTM A36/A36M.

B. Steel Pipe: ASTM A53/A53M, standard weight, Schedule 40.

C. Steel Tubing: ASTM A500, Grade B, structural tubing.

D. Sheet Steel: ASTM A653/A653M, galvanized if indicated.

E. Anchors, Fasteners:

1. Hot-dip galvanized for exterior use

2. Stainless steel where indicated

3. Expansion anchors for masonry, type as scheduled

F. Welding Electrodes: Compatible with base metal, per AWS.

**2.2 FABRICATION**

A. General:

1. Shop-fabricate to greatest extent practical.

2. Form to required shapes, dimensions, and profiles

B. Workmanship:

1. Neat, square, true, and free of distortion

2. Grind exposed welds smooth.

C. Connections:

1. Welded or bolted unless noted otherwise

2. Minimize exposed bolts and fasteners where possible.

D. Welds:

1. Continuous where required for strength

2. Conform to AWS D1.1.

E. Cutouts and Fittings:

1. Provide for installation of adjacent materials

F. Provide anchoring and bracing as needed for rigidity and stability.

**2.3 STAIRS AND LANDINGS**

A. Stringers: Steel channels or tubes, size as shown.

B. Treads: Metal pans for concrete fill or steel plate with slip-resistant surface.

C. Landings: Framed steel with concrete fill or steel plate.

D. Supports, Brackets: As required for attachment.

E. Finish: Shop-primed or galvanized if exterior.

**2.4 RAILINGS AND HANDRAILS**

A. Pipe or Tube Steel Construction: Size as shown.

B. Connections: Welded or mechanically fastened.

C. Intermediate Rails or Pickets: As scheduled.

D. Wall Brackets: Welded steel.

E. Finish: Shop-primed or galvanized if exterior.

**2.5 LADDERS**

A. Stringers: Steel bar or tube.

B. Rungs: Solid steel bar with slip-resistant surface.

C. Wall Brackets: Welded steel.

D. Finish: Shop-primed or galvanized if exterior.

**2.6 MISCELLANEOUS ITEMS**

A. Bollards: Steel pipe filled with concrete.

1. Base plate or direct-buried

B. Loose Angles, Lintels: Sized per structural schedule.

C. Supports and Brackets: As shown or required.

D. Embed Plates and Anchors: With headed studs or holes for rebar welding.

1. Coordinate with concrete work.

### 2.7 FINISHES

A. Shop Primer: Rust-inhibitive, applied to cleaned surfaces.

B. Galvanized Finish: Hot-dip galvanized per ASTM A123/A123M where indicated or scheduled.

C. Field Painting: Specified in Section 09 91 00

1. Touch-up damaged primer or galvanizing before final painting.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

A. Verify site conditions, dimensions, and substrates.

B. Notify Architect of any conditions that prevent proper installation.

### 3.2 INSTALLATION

A. Install plumb, level, true, and rigid.

B. Provide temporary bracing to maintain alignment until permanently secured.

C. Secure to structure with anchors or welds as shown.

D. Coordinate with other trades for installation of embedded items.

E. Provide continuous welds unless noted otherwise.

F. Field welds to match shop fabrication quality.

### 3.3 FIELD FINISHING

A. Touch up shop primer damaged during handling or installation.

B. Touch up field welds.

C. Clean and prepare surfaces for field painting as specified in Section 09 91 00.

### 3.4 ADJUSTING AND CLEANING

A. Remove debris and scrap from site.

B. Clean installed metalwork of dirt and marks.

C. Repair or replace damaged components.

**3.5 PROTECTION**

A. Protect work from damage until acceptance.

B. Repair damage to match original finish.

**END OF SECTION**

# SECTION 05 5100
# METAL STAIRS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Stairs with concrete treads.

B. Structural steel stair framing and supports.

C. Handrails and guards.

### 1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete fill in stair pans; mesh reinforcement for landings.

B. Section 09 9000 - Painting and Coating: Paint finish.

### 1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2012.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

D. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010.

E. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2013.

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

G. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2007.

H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

J. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).

K. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

### 1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include the design engineer's stamp or seal on each sheet of shop drawings.

C. Delegated Design Data: As required by authorities having jurisdiction.

### 1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Fabricator Qualifications:

1. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

## PART 2 PRODUCTS

### 2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
   2. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code.
   3. Dimensions: As indicated on drawings.
   4. Shop assemble components into largest practical sections suitable for transport and access to site.
   5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   6. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. All joints as inconspicuous as possible, whether welded or mechanical.
      a. Welded Joints: Continuously welded and ground smooth and flush.
      b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
      c. Exposed Edges and Corners: Eased to small uniform radius.
      d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

### 2.02 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501 structural tubing, round and shapes as indicated.

C. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

D. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
   1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
   2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).

E. Steel Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

F. Welding Materials: AWS D1.1; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

### 2.03 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.

1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
2. Number of Coats: Two.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

### 3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

### 3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1.

D. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

E. Obtain approval prior to site cutting or creating adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

### 3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

**END OF SECTION**

# SECTION 05 5200
# METAL RAILINGS

## PART 1 GENERAL

### 1.1 SUMMARY

A. Provide pipe and tube handrails and railing systems.

### 1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

### 1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Handrail and Railing Structural Performance: In accordance with applicable Building Code.

## PART 2 PRODUCTS

### 2.1 MATERIALS

A. Metal Railings:
1. Manufacturers, Handrails and Railings:American Access, Inc.;BlueWater Mfg., Inc.;FabEnCo, Inc.;Feeney Inc. (CableRail, DesignRail);FIXFAST USA;Garlock Safety Systems;INKAN Ltd.;Leading Edge Safety, LLC;PRL Glass Systems, Inc.;Safety Rail Company.
2. Steel Finish: Baked enamel.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. Take field measurements prior to fabrication, where possible. Form to required shapes and sizes with true, straight edges, lines and angles. Provide light-tight, hairline joints.

B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with work of other sections.

C. Coordinate with work of other sections; provide inserts and templates as needed. Install work plumb and level with uniform appearance.

D. Restore damaged finishes and protect work.

**END OF SECTION**

# SECTION 05 5213
# PIPE AND TUBE RAILINGS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Free-standing railings at steps with color galvanizing.

B. Pipe & Tube Railings at ADA Ramps

### 1.02 RELATED REQUIREMENTS

A. Section 03 3300 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 05 5113 - Metal Pan Stairs: Handrails other than those specified in this section.

### 1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2013.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013.

E. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

F. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

### 1.04 SUBMITTALS

A. See Section 01 3300 - for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

## PART 2 PRODUCTS

### 2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.

B. Allow for expansion and contraction of members and building movement without damage to connections or members.

C. Dimensions: See drawings for configurations and heights.

D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

E. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

### 2.02 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M, Grade B cold-formed structural tubing.

B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

C. Galvanizing: In accordance with requirements of ASTM A123/A123M. Basis of Design – Duncan Glavanizing Color Galv. 616-389-8440.

1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I – Inorganic compatible with color galvanizing.
2. ColorGalv 15 finish in color to be selected by Design Agent from full range. 20 year warranty against rust and 15 year warranty on the finish.

D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction, matching ColorGalv.

**2.03 FABRICATION**

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Finish: Galvanize after assembly.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that field conditions are acceptable and are ready to receive work.

**3.02 PREPARATION**

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

C. Apply one coat of bituminous paint to concealed aluminum surfaces that will be in contact with cementitious or dissimilar materials.

**3.03 INSTALLATION**

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Install railings in compliance with ADA Standards for accessible design at applicable locations.

D. Anchor railings securely to structure.

E. Field weld anchors as indicated on drawings. Grind welds smooth. Touch-up to maintain finish color and warranty.

F. Conceal anchor bolts and screws whenever possible and in compliance with approved shop drawings. Where not concealed, use flush countersunk fastenings.

**3.04 TOLERANCES**

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

**END OF SECTION**

**SECTION 05 5963**

**DETENTION ENCLOSURES**

## PART 1 – GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Steel detention enclosures
2. Welded steel mesh partitions (walls)
3. Welded steel mesh ceilings with grid framing
4. Framing members, posts, doors, and hardware prep
5. Fasteners and anchorage
6. Factory-applied primer or galvanized finish

B. Related Sections:

1. 05 50 00 – Metal Fabrications
2. 08 34 63 – Detention Doors and Frames
3. 08 71 00 – Door Hardware
4. 09 91 00 – Painting.

### 1.2 REFERENCES

A. ASTM A36/A36M – Structural Steel.

B. ASTM A123/A123M – Zinc Coatings (Hot-Dip Galvanizing).

C. ASTM A653/A653M – Zinc-Coated Steel Sheet.

D. ANSI/NAAMM HMMA 863 – Detention Locking Systems Installation.

### 1.3 SUBMITTALS

A. Product Data: Manufacturer’s literature on mesh, framing, ceiling grid components, doors, finishes.

B. Shop Drawings:

1. Plan layouts with partition elevations
2. Framing and post locations
3. Ceiling grid layout and details
4. Door locations, swing, hardware preps
5. Anchorage details

C. Samples:

1. Mesh panel (6" x 6" minimum)
2. Finish color sample (if applicable)

D. Warranty Documentation.

**1.4 QUALITY ASSURANCE**

A. Manufacturer Qualifications:

1. Minimum 5 years experience producing detention-grade enclosures.

B. Installer Qualifications:

1. Minimum 3 years experience installing detention enclosures and ceilings

C. Pre-Installation Conference (optional):

1. Coordinate layout, ceiling grids, anchorage, and hardware integration.

**1.5 DELIVERY, STORAGE, AND HANDLING**

A. Deliver materials in protective packaging with clear identification.

B. Store elevated, dry, protected from corrosion or damage.

C. Handle to prevent distortion of mesh panels and grid components.

**1.6 WARRANTY**

A. Manufacturer’s standard warranty: Minimum 1 year, covering defects in materials and fabrication.

**PART 2 – PRODUCTS**

**2.1 MANUFACTURERS**

A. Basis of Design:

1. Trussbilt, Habersham Metal Products, RR Brink, Southern Folger, or approved equivalent.

B. Substitutions:

1. Permitted per Division 01 with prior approval.

**2.2 MATERIALS**

A. Steel Shapes/Plates: ASTM A36/A36M.

B. Steel Sheet: ASTM A653/A653M, galvanized or prime painted.

C. Mesh Panels:

1. Welded steel wire grid or flattened expanded metal

2. Typical grid: 2" x 2" openings with minimum 3/16" wire diameter

3. Fully welded intersections.

D. Posts:

1. Square steel tube, minimum 2" x 2" x 11 gauge

E. Ceiling Grid Framing:

1. Steel angle or tube framing minimum 1-1/2" x 1-1/2" x 3/16”

2. Designed to form secure, tamper-resistant grid.

F. Fasteners:

1. Tamper-resistant or concealed where accessible

G. Anchors:

1. Expansion bolts or masonry anchors suitable for substrate

2. Welded embedded anchors as required.

H. Primer: Rust-inhibitive shop-applied.

I. Optional Finish: Hot-dip galvanized per ASTM A123/A123M for high-humidity locations.

**2.3 FABRICATION – WALL PANELS**

A. Welded mesh infill framed with minimum 1-1/2" x 1-1/2" x 3/16" angle or tube.

B. Continuous welds, ground smooth.

C. Tight-fitting, plumb and square.

D. Hardware preps for locks and strikes where doors are included.

**2.4 FABRICATION – CEILING GRIDS**

A. Ceiling grid to be integral part of secure enclosure, fully framed and bolted or welded to walls and posts.

B. Grid Framing Members:

1. Minimum 1-1/2" x 1-1/2" x 3/16" steel angle or tube

2. Spacing not to exceed 48" o.c. in either direction, unless otherwise indicated on shop drawings

3. Continuous perimeter angle or tube welded to walls/posts.

C. Mesh Infill Panels:

1. Same construction as wall panels

2. Fully framed with welded corners

3. Factory-fabricated to fit grid layout.

D. Access Panels (if required):

1. Hinged and lockable

2. Reinforced to match strength of fixed grid.

E. Welded or bolted connections designed to resist tampering and forced entry.

**2.5 DOORS**

A. Matching enclosure construction.

B. Mesh or solid sheet steel infill.

C. Framed construction with minimum 1-1/2" x 1-1/2" x 3/16" tubing.

D. Heavy-duty continuous or butt hinges.

E. Hardware preps for detention-grade locks or padlock hasps as scheduled.

**2.6 FINISH**

A. Shop Primer: Rust-inhibitive, neutral gray.

B. Optional:

1. Hot-dip galvanized after fabrication per ASTM A123/A123M

2. Powder-coat finish if specified, color as selected.

**PART 3 – EXECUTION**

**3.1 EXAMINATION**

A. Verify openings and substrates are correct, plumb, level, and properly prepared.

B. Confirm layout per approved shop drawings.

C. Report unsuitable conditions.

**3.2 INSTALLATION**

A. Install per manufacturer's instructions and approved shop drawings.

B. Install posts plumb and secure to floor or walls with specified anchors.

C. Attach wall panels securely with tamper-resistant fasteners.

D. Install ceiling grid system:

1. Secure perimeter framing to walls and posts

2. Install cross-members at specified spacing

3. Fit and secure mesh infill panels with welded or bolted connections

4. Install access panels where indicated.

E. Install doors plumb, level, and functional with detention-grade hardware.

F. Coordinate with security systems for final hardware and locking system integration.

**3.3 FIELD FINISHING**

A. Clean and touch up abraded or field-welded areas with manufacturer-approved primer or finish.

B. Apply finish paint in accordance with Section 09 91 00 if required.

**3.4 ADJUSTING AND CLEANING**

A. Adjust doors to operate smoothly and lock securely.

B. Clean enclosure surfaces of dirt, debris, and labels.

C. Replace damaged components as directed.

**3.5 PROTECTION**

A. Protect installed enclosures from damage during construction.

B. Repair or replace damaged units prior to final acceptance.

**END OF SECTION**

# SECTION 05 7000

# DECORATIVE METAL

## PART 1 – GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Fabrication and installation of decorative architectural copper banding at exterior façade
2. Associated trim profiles, joints, fasteners, and anchorage for decorative installation
3. Supports and concealed attachments as required for system performance

B. Related Sections:

1. 04 22 00 – Concrete Unit Masonry
2. 06 10 00 – Rough Carpentry (blocking and supports)
3. 07 62 00 – Sheet Metal Flashing and Trim (if separate weatherproof copings exist)
4. 09 91 00 – Painting and Coating (for adjacent finishes)

### 1.2 REFERENCES

A. ASTM B370 – Copper Sheet and Strip for Building Construction.

B. CDA (Copper Development Association) – Architectural Guidelines.

C. SMACNA – Architectural Sheet Metal Manual (as reference for forming tolerances).

D. AAMA 611 – Voluntary Specification for Anodized Finishes on Architectural Metals (referenced where relevant).

### 1.3 SUBMITTALS

A. Product Data: For copper materials, fasteners, and accessories.

B. Shop Drawings:

1. Profile shapes, dimensions, and transitions
2. Attachment and anchoring methods
3. Thermal movement provisions and expansion joints

C. Samples:

1. 12" length of proposed copper profile, formed and finished

2. Proposed seam or joint types (if exposed)

D. Mock-Up (Optional):

1. Provide one installed banding segment (minimum 4 ft) for approval before proceeding

**1.4 QUALITY ASSURANCE**

A. Installer Qualifications:

1. Minimum 5 years of experience installing decorative architectural metalwork

2. Proven experience with exterior copper installations

B. Fabrication Standards:

1. Comply with approved shop drawings and good sheet metal practice.

C. Mock-Up Review: Architect may request modifications prior to approval.

**1.5 DELIVERY, STORAGE, AND HANDLING**

A. Deliver fabricated units in protective crates or wraps.

B. Store in a dry, protected area to avoid moisture or deformation.

C. Handle to prevent scratches, dents, or bending.

**1.6 WARRANTY**

A. Installer Warranty: Workmanship warranty for 2 years from date of Substantial Completion.

B. Manufacturer Warranty: Standard material warranty from copper supplier.

**PART 2 – PRODUCTS**

**2.1 MANUFACTURERS**

A. Basis of Design: Custom-formed copper profiles fabricated from:

1. Revere Copper, Aurubis, Zapp Copper, or approved equivalent.

**2.2 MATERIALS**

A. Copper Sheet:

1. ASTM B370, cold-rolled, 16 oz/sf minimum

2. Temper: H01 (cold-rolled)

3. Finish: Natural mill finish copper

4. No coating or treatment; allow for natural patina to develop

B. Fasteners:

1. Concealed where possible

2. Non-corrosive: copper, brass, or stainless steel

3. Sized for secure attachment into substrate

C. Sealants:

1. As required for joints – use neutral-cure silicone or butyl, compatible with copper

2. Color: Clear or color-matched as approved by Architect.

**2.3 FABRICATION**

A. Fabricate profiles to match Architect's design intent and shop drawings.

B. Form clean, true bends and seams.

C. Minimize visible fasteners; use blind or concealed fastening methods.

D. Provide expansion provisions at long runs or directional changes.

E. Factory-form segments to maximum lengths practical for handling and delivery.

**PART 3 – EXECUTION**

**3.1 EXAMINATION**

A. Verify substrates are level, clean, dry, and capable of supporting copper banding and associated attachments.

B. Notify Architect of any condition preventing proper installation. Do not proceed until corrected.

**3.2 INSTALLATION**

A. Install copper banding level, plumb, and true to profile.

B. Anchor securely using concealed fasteners unless otherwise detailed.

C. Allow for thermal expansion at joints or directional changes.

D. Coordinate installation with adjacent materials to avoid interference or damage.

E. Do not scratch or deform copper during installation; replace any damaged material.

F. Clean joints and apply sealant where required for water control or movement accommodation.

**3.3 CLEANING**

A. Clean completed surfaces with soft cloth and clean water.

B. Do not use acidic or abrasive cleaners.

C. Remove installation residue, adhesives, or markings.

**3.4 PROTECTION**

A. Protect installed banding from construction damage.

B. Cover with temporary protection as necessary until substantial completion.

C. Repair or replace damaged elements with matching copper as approved.

**END OF SECTION**

# SECTION 06 1000
# ROUGH CARPENTRY

## PART 1 GENERAL

### 1.1 SUMMARY

A. Provide rough carpentry.

### 1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

### 1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Lumber Standards and Grade Stamps: DOC PS 20, American Softwood Lumber Standard and inspection agency grade stamps.

C. Construction Panel Standards: DOC PS 1, U.S. Product Standard for Construction and Industrial Plywood; APA PRP-108.

D. Wood Framing Standards: NFPA House Framing Manual.
1. Exterior Wall Framing: 2 inch by 6-inch nominal (38 mm by 140 mm actual) studs, 24 inches (61 cm) on center.
2. Exterior Wall Framing: 2 inch by 4-inch nominal (38 mm by 89 mm actual) studs, 16 inches (40 cm) on center.
3. Interior Wall Framing: 2 inch by 4-inch (38 mm by 89 mm actual) studs, 16 inches (40 cm) on center.

E. Preservative Treatment: AWPA C2 for lumber and AWPA C9 for plywood; waterborne pressure treatment. Provide for wood in contact with soil, concrete, masonry, roofing, flashing, damp-proofing and waterproofing.

F. Fire-Retardant Treatment: AWPA C20 for lumber and AWPA C27 for plywood; noncorrosive type. Provide at building interior where required by code.

## PART 2 PRODUCTS

### 2.1 MATERIALS

A. Rough Carpentry Applications:
1. Manufacturers, Wood Sheathing: Refer towww.arcat.com/divs/sec/sec06100.html
2. Application: Rooftop equipment bases and support curbs.
3. Application: Wood grounds, nailers, and blocking.
4. Application: Wood furring.
5. Application: Backing panels.
6. Application: Wood sheathing.
7. Application: Subflooring.
8. Application: Building wrap.
9. Building Wrap:

a. Material: Air-retarder sheeting made from polyolefins; cross-laminated films, woven strands, or spun-bonded fibers; coated or uncoated; with or without perforations; ASTM E 1677, Type I.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.

B. Plywood: Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial"

C. Provide nailers, blocking and grounds where required. Set work plumb, level and accurately cut.

D. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with other work.

E. Comply with manufacturer's requirements for cutting, handling, fastening and working treated materials.

F. Restore damaged components. Protect work from damage.

**END OF SECTION**

# SECTION 06 1100
# WOOD FRAMING

## PART 1 GENERAL

### 1.1 SECTION INCLUDES
A. Wood Framing

### 1.2 RELATED SECTIONS
A. Section 06 1000 – Rough Carpentry.
B. Section 09 2116 – Gypsum Board Assemblies

### 1.3 REFERENCES
A. PS 20 - American Softwood Lumber Standard - US Department of Commerce, National Institute of Standards and Technology.
B. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.

### 1.4 SUBMITTALS
A. Submit under provisions of Section 01 3000 - Administrative Requirements.
B. Product Data: Manufacturer's data sheets on each product to be used, including:

### 1.5 DELIVERY, STORAGE, AND HANDLING
A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
B. Handle materials to avoid damage.
C. Store on a level surface with blocking to keep boards off the ground and provide uniform and adequate support.

### 1.6 PROJECT CONDITIONS
A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

### 1.7 SEQUENCING
A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

## PART 2 PRODUCTS

### 2.1 Sizes:
A. As shown on Drawings

### 2.2 Fasteners
A. Material: Stainless steel.
B. Material: Hot-dip galvanized steel.

## PART 3 EXECUTION

### 3.1 EXAMINATION
A. Do not begin installation until substrates have been properly prepared.
B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

**3.3 INSTALLATION**

A. Install in accordance with manufacturer's instructions.
B. Finish products in accordance with manufacturer's instructions.
C. Use only corrosion resistant fasteners. Acceptable are stainless steel or hot-dipped galvanized nails.
D. Joints shall fall over framing lumber and shall be double nailed. Do not nail any less than 1/2 inch from any edge and fasten at a minimum of every 24 inches on center.
E. Drive nails perpendicular to the framing lumber and the wood product; drive nails flush with the product's surface. Nails shall penetrate at least 1-1/4 inches into the structural framing.

**3.4 PROTECTION**

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION**

# SECTION 06 1600
# SHEATHING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:

1. Wall sheathing
2. Roof sheathing
3. Parapet sheathing
4. Composite nail base insulated roof sheathing
5. Subflooring
6. Underlayment
7. Sheathing joint and penetration treatment

B. Related Requirements:

1. Section 06 1000 "Rough Carpentry" for plywood backing panels
2. Section 07 2500 "Weather Barriers" for water-resistive barrier applied over wall sheathing

### 1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Sustainable Design Submittals:

1. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
2. Product Data: For installation adhesives, indicating VOC content.

3. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.

## 1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated plywood.
2. Fire-retardant-treated plywood.
3. Foam-plastic sheathing.

## 1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

## 2.2 WOOD PANEL PRODUCTS

A. Emissions: Products shall meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

C. Factory mark panels to indicate compliance with applicable standard.

## 2.3 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2[ **for interior construction not in contact with ground, use Category UC3b for exterior construction not in contact with ground, and use Category UC4a for items in contact with ground**].

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: [**Treat all plywood unless otherwise indicated**] [**Treat items indicated on Drawings**] [**and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing**].

## 2.4 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201/D 3201M at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: **Treat all plywood unless otherwise indicated.**

## 2.5 WALL SHEATHING

A. Plywood Sheathing: **Either DOC PS 1 or DOC PS 2**, E**xterior, Structural I, Exterior** sheathing.

1. Span Rating: Not less than **20/0**.
2. Nominal Thickness: Not less than **11/32 inch**

B. Paper-Surfaced Gypsum Sheathing: ASTM C 1396/C 1396M, gypsum sheathing; with water-resistant-treated core and with water-repellent paper bonded to core's face, back, and long edges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Gypsum.
    b. Georgia-Pacific Building Products.
    c. National Gypsum Company.
    d. Temple-Inland Building Products by Georgia-Pacific.
    e. USG Corporation.
    f. Or approved equal

2. Type and Thickness: **Regular, 1/2 inch or as noted on drawings, Type X, 5/8 inch**.
3. Edge and End Configuration: **Square**.
4. Size: **48 by 96 inches for vertical** installation.

C. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. CertainTeed Corporation.
    b. Continental Building Products, LLC.
    c. Georgia-Pacific Building Products.
    d. National Gypsum Company.
    e. Temple-Inland Building Products by Georgia-Pacific.
    f. USG Corporation.
    g. <**Insert manufacturer's name**>.

2. Type and Thickness: **Regular, 1/2 inch, Type X, 5/8 inch**.
3. Size: **48 by 96 inch** for vertical installation.

D. Cellulose Fiber-Reinforced Gypsum Sheathing: ASTM C 1278/C 1278M, gypsum sheathing.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. USG Corporation.
    b. Or approved equal

2. Product: Subject to compliance with requirements, provide "Fiberock Sheathing with Aqua-Tough" by United States Gypsum Co.
3. Type and Thickness: **Regular, 1/2 inch, Type X, 5/8 inch**.
4. Size: **48 by 96 inches**.

E. Cementitious Backer Units: ASTM C 1325, Type A.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. C-Cure.
    b. Custom Building Products.
    c. FinPan, Inc.
    d. USG Corporation.
    e. Or approved equal

2. Thickness: **As indicated**.

F. Fiberboard Sheathing: ASTM C 208, Type IV, **Grade 1 (Regular), Grade 2 (Structural)** cellulosic fiberboard sheathing with square edges, **1/2-inch** thick.

G. Extruded-Polystyrene-Foam Sheathing: ASTM C 578, Type IV, in manufacturer's standard lengths and widths with tongue-and-groove or shiplap long edges as standard with manufacturer.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. DiversiFoam Products.
    b. Dow Chemical Company (The).
    c. Kingspan Insulation Limited.
    d. Owens Corning.
    e. Or approved equal

2. Thickness: **As indicated**.
3. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

H. Foil-Faced, Polyisocyanurate-Foam Wall Sheathing: ASTM C 1289, Type I, Class 2, rigid, cellular, polyisocyanurate thermal insulation.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hunter Panels LLC; Xci Foil or a comparable product by one of the following:

    a. Atlas EPS; a Division of Atlas Roofing Corporation.
    b. Carlisle Coatings & Waterproofing Inc.
    c. <**Insert manufacturer's name**>.

2. Polyisocyanurate Core: **Grade 3, 25 psi.**
3. Thickness: **As indicated**.

I. Foil-Faced, Polyisocyanurate-Foam Wall Sheathing: ASTM C 1289, Type I, Class 1, Grade 3, rigid, cellular, polyisocyanurate thermal insulation with minimum 15-mil thick foil facers on both sides. Foam-plastic core shall have a flame-spread index of 25 or less.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hunter Panels LLC; Xci Class A or a comparable product by one of the following:

    a. Atlas EPS; a Division of Atlas Roofing Corporation.
    b. Carlisle Coatings & Waterproofing Inc.
    c. Or approved equal

2. Thickness: **As indicated**.
3. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

J. Foil-Faced, Polyisocyanurate-Foam Wall Sheathing: ASTM C 1289, Type I, Class 1, Grade 3, rigid, cellular, polyisocyanurate thermal insulation with 15-mil glass-fiber-reinforced foil facers. Foam-plastic core shall have a flame-spread index of 25 or less.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hunter Panels LLC; Xci 286 or comparable product by one of the following:

    a. Atlas EPS; a Division of Atlas Roofing Corporation.
    b. Carlisle Coatings & Waterproofing Inc.
    a. Or approved equal

2. Thickness: As indicated
3. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

K. Coated-Glass-Fiber-Mat-Faced Polyisocyanurate-Foam Wall Sheathing: ASTM C 1289, Type II, Class 2 rigid, cellular, polyisocyanurate thermal insulation with coated-glass-fiber-mat facers.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hunter Panels LLC; Xci CG or comparable product of one of the following:

    a. Atlas EPS; a Division of Atlas Roofing Corporation.
    b. Carlisle Coatings & Waterproofing Inc.
    c. Or approved equal.

2. Polyisocyanurate Board: **Grade 3, 25 psi**.
3. Thickness: **As indicated**.
4. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

L. Premium Level Glass-Reinforced Faced, Polyisocyanurate-Foam Board: ASTM C 1289, Type II, Class 2, rigid, cellular, polyisocyanurate-foam board with a Class A foam core with a flame-spread index of less than 25.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hunter Panels LLC; Xci CG Class A or comparable product of one of the following:

    a. Atlas EPS; a Division of Atlas Roofing Corporation.
    b. Carlisle Coatings & Waterproofing Inc.
    c. Rmax, Inc.
    d. Or approved equal.

2. Polyisocyanurate Board: Grade 3, 25 psi.
3. Thickness: **As indicated**.
4. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

M. Nail Base-Surfaced Polyisocyanurate-Foam Wall Sheathing: ASTM C 1289, Type V, with Type II Class 2 rigid, cellular, polyisocyanurate thermal insulation with fire-resistant-treated plywood nail base, surface bonded to one face and coated-glass-fiber-mat facer on opposite face.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hunter Panels LLC; Xci Ply or comparable product by one of the following:

    a. Atlas EPS; a Division of Atlas Roofing Corporation.
    b. Carlisle Coatings & Waterproofing Inc.
    c. Or approved equal.

2. Panel Thickness: **As indicated**.
3. Nail Base Surface: Fire-resistance-treated, DOC PS 2, Exposure 1, plywood sheathing, **5/8-inch** thick.
4. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

N. Premium Performance Coated Glass Reinforced and Fire Resistant-Treated Plywood-Faced Polyisocyanurate-Foam Board: ASTM C 1289, Type V, Utilizing Class 2, rigid, cellular, Class A, polyisocyanurate-foam insulation core.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hunter Panels LLC; Xci Ply Class A or comparable product by one of the following:

    a. Atlas EPS; a Division of Atlas Roofing Corporation;
    b. Carlisle Coatings & Waterproofing Inc;
    c. Rmax, Inc;
    d. Or approved equal.

2. Thickness: **As indicated**.
3. Sheathing Type: Fire-resistant-treated plywood.
4. Sheathing Thickness: **5/8 inch**

O. Nail Base-Surfaced Polyisocyanurate-Foam Wall Sheathing: ASTM C 1289, Type V, Class 2 rigid, cellular, polyisocyanurate thermal insulation with nail base surface bonded to one face and coated glass-mat facer on opposite face.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hunter Panels LLC; Xci NB or comparable product by one of the following:

    a. Atlas EPS; a Division of Atlas Roofing Corporation.
    b. Carlisle Coatings & Waterproofing Inc.
    c. Or approved equal.

2. Overall Panel Thickness: **As indicated**.
3. Polyisocyanurate Foam Core: **Grade 3, 25 psi**.
4. Foam-Panel Facing: Coated glass reinforced.
5. Plywood Nail Base Surface: DOC PS 2, Exposure 1, sheathing, **5/8-inch** thick.
6. Oriented Strand Board Nail Base Surface: DOC PS 2, Exposure 1, sheathing, 5**/8-inch** thick.

## 2.6 ROOF SHEATHING

A. Plywood Sheathing: **Exposure 1, Structural I**, **Exposure 1** sheathing.

1. Span Rating: Not less than **20/0**.
2. Nominal Thickness: Not less than **1/2 inch.**

B. Oriented-Strand-Board Sheathing: DOC PS 2, **Exposure 1, Structural I**, **Exposure 1** sheathing.

1. Span Rating: Not less than **20/0**.
2. Nominal Thickness: Not less than **5/8 inch**.

## 2.7 PARAPET SHEATHING

A. Plywood Sheathing: **Exposure 1, Structural I, Exposure 1** sheathing.

1. Span Rating: Not less than **20/0**.
2. Nominal Thickness: Not less than **15/32 inch**.

B. Oriented-Strand-Board Sheathing: DOC PS 2, **Exposure 1, Structural I, Exposure 1** sheathing.

1. Span Rating: Not less than **20/0**.
2. Nominal Thickness: Not less than **5/8 inch**.

C. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. CertainTeed Corporation.
    b. Georgia-Pacific Building Products.
    c. National Gypsum Company.
    d. Temple-Inland Building Products by Georgia-Pacific.
    e. USG Corporation.
    f. Or approved equal.

2. Type and Thickness: **Regular, 5/8 inch, Type X, 5/8 inch or as indicated**.
3. Size: **48 by 96 inch** for vertical installation.

D. Cementitious Backer Units: ASTM C 1325, Type A.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. C-Cure.
    b. Custom Building Products.
    c. FinPan, Inc.
    d. USG Corporation.
    e. Or approved equal.

2. Thickness: **5/8 inch or as indicated**.

## 2.8 COMPOSITE NAIL BASE INSULATED ROOF SHEATHING

A. Nail Base-Surfaced Polyisocyanurate-Foam Roof Sheathing: ASTM C 1289, Type V, Class 1 rigid, cellular, polyisocyanurate thermal insulation with nail base surface bonded to one face and fiber-reinforced facer on opposite face**, FM-approved**.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hunter Panels LLC; H Shield NB or comparable product by one of the following:

    a. Atlas EPS; a Division of Atlas Roofing Corporation.
    b. Cornell Corporation.
    c. Or approved equal

2. Polyisocyanurate Board: Grade 3, 25 psi.
3. Panel Thickness: As indicated.
4. Oriented-Strand-Board Nail Base: DOC PS 2 Exposure 1 sheathing **5/8 inch** with **non-**rabbeted edges.
5. Plywood Nail Base: DOC PS 2 Exposure 1 sheathing, **5/8 inch** with [**non-**]rabbeted edges; **fire-resistance treated** where applicable.

B. Vented, Nail-Base-Surfaced, Polyisocyanurate-Foam Roof Sheathing: ASTM C 1289, Type V, with nail base adhered to spacers on one face [**, FM-approved**].

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hunter Panels LLC; Cool Vent or comparable product by one of the following:

    a. Atlas EPS; a Division of Atlas Roofing Corporation.
    b. Cornell Corporation.
    c. Or approved equal.

2. Polyisocyanurate-Foam Insulation:Grade 3, 25 psi.
3. Foam-Panel Facing: [Fiber reinforced] [Glass reinforced].
4. Oriented-Strand-Board Nail Base: DOC PS 2 Exposure 1 sheathing, **5/8 inch** with **non-**rabbeted edges.
5. Plywood Nail Base: DOC PS 2 Exposure 1 sheathing, **5/8 inch** with **non-**rabbeted edges**; fire-resistance treated** where applicable.
6. Spacers: Wood blocks not less than **2-inch** thick and spaced not more than 12 inches o.c.
7. Overall Panel Thickness: **As indicated**.

## 2.9 SUBFLOORING AND UNDERLAYMENT

A. Plywood Subflooring: As indicated on drawings.

1. Span Rating: Not less than **24**.
2. Nominal Thickness: Not less than **5/8 inch**

B. Underlayment: Provide underlayment in nominal thicknesses indicated or, if not indicated, not less than 1/4 inch over smooth subfloors and not less than 3/8 inch over board or uneven subfloors.

1. Plywood Underlayment for Resilient Flooring: DOC PS 1, **Exterior, C-C Plugged** with fully sanded face.

2. Plywood Underlayment for Ceramic Tile: DOC PS 1, Exterior, C-C Plugged, not less than 5/8-inch nominal thickness.
3. Plywood Underlayment for Carpet: DOC PS 1, **Interior, Underlayment**
4. Hardboard Underlayment: ANSI A135.4, Class 4 (Service), Surface S1S; with back side sanded.

## 2.10 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For **roof and wall** sheathing, provide fasteners **with hot-dip zinc coating complying with ASTM A 153/A 153M**.
2. For **roof and wall** sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Sheathing to Wood Framing: ASTM C 1002.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.

1. For steel framing less than 0.0329-inch thick, use screws that comply with ASTM C 1002.
2. For steel framing from 0.033- to 0.112-inch thick, use screws that comply with ASTM C 954.

G. Screws for Fastening Composite Nail Base Insulated Roof Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117. Provide washers or plates if recommended by sheathing manufacturer.

## 2.11 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for **Paper-Surfaced** Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 079200 "Joint Sealants."

B. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and

sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

C. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

## 2.12 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with **ASTM D 3498** that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

1. Adhesive shall have a VOC content of **50** g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

# PART 3 - EXECUTION

## 3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate **wall and roof** sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

## 3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Combination Subfloor-Underlayment:

    a. **Nail** to wood framing.
    b. Screw to cold-formed metal framing.
    c. Space panels 1/8 inch apart at edges and ends.

2. Subflooring:

    a. **Nail** to wood framing.
    b. Screw to cold-formed metal framing.
    c. Space panels 1/8 inch apart at edges and ends.

3. Wall and Roof Sheathing:

    a. **Nail** to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
    b. Screw to cold-formed metal framing.
    c. Space panels 1/8 inch apart at edges and ends.

4. Underlayment:

    a. Nail to subflooring.
    b. Space panels 1/32 inch apart at edges and ends.
    c. Fill and sand edge joints of underlayment receiving resilient flooring immediately before installing flooring.

## 3.3 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to wood framing with **screws**.
2. Fasten gypsum sheathing to cold-formed metal framing with screws.
3. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
4. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

## 3.4 CEMENTITIOUS BACKER UNIT INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

## 3.5 FIBERBOARD SHEATHING INSTALLATION

A. Comply with ASTM C 846 and with manufacturer's written instructions.

B. Fasten fiberboard sheathing panels to intermediate supports and then at edges and ends. Use galvanized roofing nails; comply with manufacturer's recommended spacing and referenced fastening schedule. Drive fasteners flush with surface of sheathing and locate perimeter fasteners at least 3/8 inch from edges and ends.

C. Install sheathing vertically with long edges parallel to, and centered over, studs. Install solid wood blocking where end joints do not occur over framing. Allow 1/8-inch open space between edges and ends of adjacent units. Stagger horizontal joints if any.

D. Cover sheathing as soon as practical after installation to prevent deterioration from wetting.

## 3.6 FOAM-PLASTIC SHEATHING INSTALLATION

A. Comply with manufacturer's written instructions.

B. Foam-Plastic Wall Sheathing: Install vapor-relief strips or equivalent for permitting escape of moisture vapor that otherwise would be trapped in stud cavity behind sheathing.

C. Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

## 3.7 PARTICLEBOARD UNDERLAYMENT INSTALLATION

A. Comply with CPA's recommendations for type of subfloor indicated. Fill and sand gouges, gaps, and chipped edges. Sand uneven joints flush.

1. Fastening Method: **Nail** underlayment to subflooring.

## 3.8 HARDBOARD UNDERLAYMENT INSTALLATION

A. Comply with CPA's recommendations and hardboard manufacturer's written instructions for preparing and applying hardboard underlayment.

1. Fastening Method: **Nail** underlayment to subflooring.

**END OF SECTION**

# SECTION 06 4023
# INTERIOR ARCHITECTURAL WOODWORK

## PART 1 GENERAL

### 1.1 SUMMARY

A. Provide interior finish carpentry, architectural woodwork and countertops.

### 1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

C. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.

### 1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Standards: Architectural Woodwork Institute (AWI) 'Architectural Woodwork Standards.'

C. Preservative Treatment: Nonpressure method, exterior type, AWPA N1

D. Fire-Retardant Treatment:
1. Lumber: AWPA C20, non-corrosive type.
2. Plywood: AWPA C27, non-corrosive type.
3. Particleboard: ASTM E 84, flame spread 20 or less.

E. Wood Products: Comply with the following:
1. Hardboard: AHA A135.4.
2. Medium-Density Fiberboard: ANSI A208.2, Grade MD-Exterior Glue.
3. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
4. Softwood Plywood: DOC PS 1, Medium Density Overlay.
5. Hardwood Plywood and Face Veneers: HPVA HP-1.

F. Mock-Ups: Provide mock-up as required to demonstrate quality of workmanship of each type of finish carpentry.

## PART 2 PRODUCTS

### 2.1 MATERIALS

A. Interior Standing and Running Trim and Rails:
1. Species for Opaque Finish: White pine or sugar pine.
2. Grade: Custom.

B. Interior Wood Casework:
1. Species for Transparent Finish: Plain sawn/sliced natural birch.
2. Grade: Custom.

3. Face Style: Flush.
4. Frame Fabrication: Face frame.
5. Veneer Matching of Leaves: Slip.
6. Veneer Matching In Panel Face: Slip.

C. Interior Plastic Laminate Clad Casework:
1. Grade: Custom.
2. Face Style: Flush overlay.
3. Frame Fabrication: Face frame.

D. Interior Casework Hardware and Auxiliary Materials:
1. Hardware Finish and Base Metal: Satin stainless steel.
2. Glass: Clear tempered glass, ASTM C 1048.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. Provide work to sizes, shapes, and profiles indicated. Install work to comply with quality standards referenced. Back prime work and install plumb, level and straight with tight joints; scribe work to fit.

B. Quality Standard: Install woodwork to comply with AWI standards for the same grade specified for type of woodwork involved.

C. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with work of other sections.

D. Comply with manufacturer's requirements for cutting, handling, fastening and working treated materials.

E. Repair minor damage, clean and protect.

**END OF SECTION**

# SECTION 06 4100
# CASEWORK HARDWARE

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Provide: Hardware for Casework.

### 1.02 RELATED REQUIREMENTS

A. Section 06 4113 – Wood-Veneer-Faced Architectural Woodwork

B. Section 06 1000 - Rough Carpentry: Blocking and supports

### 1.03 SUBMITTALS

A. Comply with Section 013300 Submittal Procedures.

B. Product Data: Manufacturer's product data for each type of product required.
   1. Dimensions
   2. Load Carrying Capacity for Weight Bearing Hardware: Include, without limitation, hinges, pivots, shelf supports, and drawer slides.
   3. Installation and connection details. If manufacturer does not provide, provide custom drawn.

4. Use and application recommendations and limitations.

B. Samples: Full size, fully finished hardware for each item required.

C. Sample Quantities: As per Section 013300 Submittal Procedures

D. Incorporating Samples into Finished Work: Prohibited.

E. Submittal Grouping: Create separate submittal groups for each item. Combine Product data with corresponding Verification Sample into one uniquely numbered submittal package.

F. Continued Maintenance Service: Provide report indicating status of each hardware item serviced, inspected, adjusted, cleaned, or replaced, who performed service, name manufacturer's representative, forecast of anticipated hardware performance problems, and date of service. Clearly describe where hardware is located.

### 1.04 DELIVERY, STORAGE, AND HANDLING

A. Comply with Division 01 - General Requirements and manufacturer's instructions and recommendations.

## PART 2 PRODUCTS

### 2.01 HARDWARE

A. Hardware Size and Quantity: As shown, or if not shown, comply with manufacturer's recommendations & AWI Quality Standards.

B. Hardware Finishes: As shown, or if not shown:
   1. Exposed to View: As directed by Architect.
   2. Concealed, except when Doors and Drawers are Open: As directed by Architect
   3. Colors: Architect selection from manufacturer's full color range.
   4. Stainless Steel: Satin

C. Hardware Fasteners: Use hardware manufacturers provided or recommended
   1. Use appropriate fastener for each substrate.
   2. Use fiberboard compatible screws for fiberboard substrates.

3. Exposed to View Fasteners & Fastener Surface Finish: Match hardware finish it connects

D. Hinges, Pivots
   1. Concealed Hinge: Grass TEC series, self-closing, soft-close, 108-degree swing minimum
   2. Hinge Quantity: As per manufacturer's recommendations, but not less than the following:

| Hinge Quantity | Maximum Door Height | Maximum Door Width | Maximum Door Weight |
|---|---|---|---|
| Two Hinges | 35.5-inches | 24-inches | 11 pounds |
| Three Hinges | 63-inches | 24-inches | 20 pounds |
| Four Hinges | 79-inches | 24-inches | 33 pounds |
| Five Hinges | 98-inches | 24-inches | 48 pounds |

   Note: Above schedule is based on aforementioned Concealed Hinge Product Data

E. Pulls
   1. Mockett DP3B/AS - 4" Tab Drawer Pull - Finished On All Sides

F. Drawer Slides: Basis of Design: Blum Tandem Undermount
   1. Extension: Full Type. [entire drawer body extends out to face of cabinet]
   2. Load Capacity, Static, Up to 8-inches Deep: Regular Duty, 100 pounds
   3. Load Capacity, Static, Over 8-inches Deep: Heavy Duty, 125 pounds
   4. Load Capacity, Dynamic, Up to 8-inches Deep: Regular Duty, 75 pounds
   5. Load Capacity, Dynamic, Over 8-inches Deep: Heavy Duty, 110 pounds
   6. Close Type: Soft, self-closing

G. Shelf Hardware Inside Casework
   1. Basis of Design: Flat Top Shelf Support Pin 332, Knape & Vogt, Anochrome finish
   2. Built-In Shelving Metal Grommet: Knape & Vogt, match finish and size for Support Pin
   3. Coordinate location, hole size and hole spacing with hardware requirements.

H. Locks, Swinging Doors and Drawers: Best 5L series, keyed alike
   1. Locks, Sliding Doors: Best 3S series, keyed alike
   2. Locks, Locations: Each casework door and drawer
   3. Locks, Finish: As selected by Architect from any of manufacturer's available finishes

I. Closet Hardware: Tubular Specialties Manufacturing, www.calltsm.com
   1. Closet Rod Shelf Bracket: Model DB-1. Finish: Chrome plated steel.
   2. Closet Rod Tubing: 1-5/8-inch x 0.080-inch. Finish: Chrome plated steel. Length: Custom to fit.
   3. Closet Rod Flange: DF-Set [one closet rod flange and one closet rod saddle flange.
   4. Closet Rod Flange, Finish: Chrome plated brass
   5. Clothes Rod Deflection Limit: 0.25-inch maximum at 50 pounds per linear foot live load

J. Grommets, Cable Passage Through Countertops: Brava, by Doug Mockett & Company
   1. Size and Finish: As per Architect.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Comply with manufacturer's instructions and recommendations.

B. Shop Install Hardware: To greatest extent possible.
   1. Pulls can be field installed

B. Securely anchor hardware with fasteners at each fastener hole provided.
   1. Fastener Type: As appropriate for each substrate, different types required at particle and fiber board and hardwood.
   2. Fastener Stripping / Over Tightening: Prohibited
   3. Loose / Free Spinning / Un-tightened Fasteners: Prohibited.

C. Uniform Sightlines, Gaps, Reveals: Required. Adjust hardware, including hinges, accordingly.

D. Hardware Adjustment, All: Provide optimum operation
   1. Doors with Latches / Catches: Adjust correctly for optimum operation

**3.02 FINAL ADJUSTMENT**

A. Hardware Installation Made Before Certificate of Occupancy: Wherever installed more than 30 calendar days before Certificate of Occupancy, make final check and adjustment of all hardware items during the week the Certificate of Occupancy is made.

B. Clean Operating Items: As necessary to restore proper function and finish

C. Door Control Devices: Make adjustments to compensate to the final operation of heating and ventilating equipment.

**3.03 CONTINUED MAINTENANCE SERVICE**

A. Re-adjust every hardware item in this Section to proper function.

B. When to Return to Site to Readjust: Between month 6 and 7 after Certificate of Occupancy.

C. Who Returns to Site to Readjust: The installer and hardware manufacturer's representative.

D. Replacement Hardware: Replace failed hardware items due to:
   1. Fault design, materials or installation of hardware units.

E. Written Report: Submit as required in Part 1 of this section.

F. Payment Requisition: Include a separate line-item for this service.

**END OF SECTION**

# SECTION 06 4113

# WOOD-VENEER-FACED ARCHITECTURAL CABINETS

## PART 1 – GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Factory-fabricated, shop-finished wood-veneer-faced architectural cabinetry
2. Base cabinets, wall cabinets, tall cabinets, counters, and shelving as indicated
3. Veneer-faced doors, drawer fronts, end panels, and trim
4. Cabinet hardware and accessories
5. Solid surface countertops, integral backsplashes, and edge treatments
6. Shop-applied or field-applied finish as specified

B. Related Sections:

1. 06 20 00 – Finish Carpentry
2. 06 40 23 – Interior Architectural Woodwork
3. 09 91 00 – Painting (for field-applied finishes)
4. 22 42 00 – Plumbing Fixtures (for sink coordination)

### 1.2 REFERENCES

A. AWI – Architectural Woodwork Standards (latest edition).

B. HPVA – Hardwood Plywood and Veneer Association standards.

C. ANSI A208.1 / A208.2 – MDF and Particleboard Core Panels.

D. ISSFA – International Surface Fabricators Association guidelines for solid surface materials.

### 1.3 SUBMITTALS

A. Product Data: For cabinetry materials, veneers, adhesives, hardware, solid surface sheets.

B. Shop Drawings:

1. Plans, elevations, sections

2. Veneer matching and sequencing

3. Countertop layouts, sink cutouts, backsplash details

4. Attachment and support details

C. Samples:

1. Veneer panel, 8" x 8", showing species and finish

2. Solid surface material, minimum 4" x 4", showing color and finish

D. Warranty Documentation

**1.4 QUALITY ASSURANCE**

A. Fabricator Qualifications:

1. Minimum 5 years experience producing AWI Premium Grade casework and countertops

2. Certified by solid surface manufacturer if required

B. Installer Qualifications:

1. 3 years minimum experience in comparable cabinetry installations

C. Mock-Up (if required):

1. Provide one assembled cabinet section with solid surface top for approval

**1.5 DELIVERY, STORAGE, AND HANDLING**

A. Deliver in manufacturer’s protective packaging.

B. Store in conditioned, dry space.

C. Protect from moisture, sunlight, and damage.

**1.6 WARRANTY**

A. Cabinetry: Minimum 1-year installer warranty.

B. Solid Surface Countertops: Manufacturer’s standard warranty (minimum 10 years typical).

**PART 2 – PRODUCTS**

**2.1 MANUFACTURERS**

A. Basis of Design:

1. Custom architectural millwork shop meeting AWI Premium Grade

2. Solid Surface Countertops: Daltile, Corian®, LG HI-MACS®, Staron®, Formica Solid Surfacing, Wilsonart Solid Surface, or approved equal.

**2.2 CABINET MATERIALS**

A. Core Panels:

1. MDF or industrial-grade particleboard, ANSI A208.1 or A208.2 compliant

2. Low-emission cores meeting local regulations

B. Veneer Faces:

1. Select-grade natural wood veneer

2. Species and cut: To be Determined

3. Match: Book, slip, or random match as selected.

C. Cabinet Interiors:

1. Melamine-faced or clear-finished veneer

2. Color: To be Determined

D. Edge Banding:

1. Matching solid wood or veneer, 1.5 mm minimum.

E. Adhesives:

1. Low-VOC, compliant with local regulations.

**2.3 HARDWARE**

A. Refer to 06 4100 – Casework Hardware

**2.4 SOLID SURFACE COUNTERTOPS**

A. Material: Homogeneous, non-porous acrylic or acrylic/polyester blend.

B. Thickness: 1-1/2"

C. Color/Pattern: As selected from manufacturer’s full range.

D. Fabrication:

1. Factory-fabricated to shop drawings

2. Seamless construction at joints

3. Coved integral backsplashes where indicated

4. Sink cutouts as scheduled; integral solid surface sinks if specified

5. Edge profiles as detailed.

E. Performance:

1. Comply with manufacturer's fabrication and installation guidelines

2. Resistant to stains, impacts, and burns per manufacturer's published standards

F. Accessories: Integral backsplashes, end splashes, front edge treatments.

**2.5 ACCESSORIES**

A. Filler Strips: Matching veneer.

B. Scribe Moldings: Matching veneer.

C. Finished End Panels: Veneer-faced to match doors.

D. Toe Kicks: Moisture-resistant construction, color as indicated.

**2.6 FABRICATION**

A. AWI Premium Grade construction.

B. Frameless (European-style) or face-frame per drawings.

C. Doweled, screwed, glued construction with tight, flush joints.

D. Consistent veneer matching within units.

E. Shelving: 3/4" minimum, adjustable where indicated.

F. Backs: 1/4" minimum, fully captured or dadoed.

G. Toe Kicks: Fully enclosed, moisture-resistant base.

H. Shop Finishing:

1. Transparent catalyzed lacquer or polyurethane

2. Stain to be selected by Architect

3. Comply with AWI finish system requirements.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

A. Verify substrates are level, plumb, clean, and ready.

B. Confirm layout and dimensions.

C. Report conditions preventing proper installation.

### 3.2 INSTALLATION

A. Install per manufacturer's instructions and AWI Premium Grade.

B. Set cabinets level, plumb, and true to line.

C. Anchor securely to walls using concealed fasteners.

D. Scribe and fit to adjacent surfaces.

E. Install hardware level, aligned, fully functional.

F. Install solid surface countertops per manufacturer's fabrication and installation requirements:

1. Seam joints smoothly finished and inconspicuous

2. Secure countertops to cabinetry with recommended adhesives

3. Integrate backsplashes and end splashes per drawings

4. Seal penetrations and joints as required

5. Install sinks and accessories per manufacturer's instructions.

### 3.3 FIELD FINISHING (If Specified)

A. Sand, clean, and apply finish to match approved sample.

B. Comply with VOC regulations.

C. Protect adjacent surfaces during finishing.

### 3.4 CLEANING

A. Remove protective films.

B. Clean surfaces with approved cleaners.

C. Remove all construction debris.

**3.5 PROTECTION**

A. Protect installed cabinetry and countertops from damage until acceptance.

B. Repair or replace damaged work as directed.

**END OF SECTION**

# SECTION 07 1113
# BITUMINOUS DAMPPROOFING

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Bituminous dampproofing.

### 1.02 RELATED REQUIREMENTS

A. Section 31 2323 - Fill.

B. Section 33 4600 - Subdrainage.

C. Section 07 2100 - Thermal Insulation: Rigid insulation board used as protection board.

### 1.03 REFERENCE STANDARDS

A. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2011).

B. ASTM D1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; 2013.

### 1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide properties of primer, bitumen, and mastics.

### 1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years experience.

### 1.06 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application until dampproofing has cured.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. W.R. Meadows, Inc.; Sealmastic Emulsion Type I (spray-grade): www.wrmeadows.com..

B. Other Acceptable Manufacturers:
   1. Karnak Corporation: www.karnakcorp.com.
   2. Mar-Flex Systems, Inc: www.mar-flex.com.
   3. W.R. Meadows, Inc: www.wrmeadows.com.

### 2.02 DAMPPROOFING PRODUCTS

A. Bituminous Dampproofing: Cold-applied water-based emulsion; asphalt with mineral colloid or chemical emulsifying agent; with or without fiber reinforcement; asbestos-free; suitable for application on vertical and horizontal surfaces.
   1. Composition - Vertical Application: ASTM D1227 Type III or ASTM D1187 Type I.
   2. Composition - Horizontal and Low-Slope Application: ASTM D1227 Type II or III.
   3. VOC Content: Not more than permitted by local, State, and federal regulations.
   4. Applied Thickness: 1/16 inch (1.5 mm), minimum, wet film.

B. Primers, Mastics, and Related Materials: Type as recommended by dampproofing manufacturer.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.

C. Verify that items that penetrate surfaces to receive dampproofing are securely installed.

### 3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive dampproofing.

B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.

C. Do not apply dampproofing to surfaces unacceptable to manufacturer.

D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

### 3.03 APPLICATION

A. Foundation Walls: Apply two coats of asphalt dampproofing.

B. Prime surfaces in accordance with manufacturer's instructions.

C. Apply bitumen with roller.

D. Seal items projecting through dampproofing surface with mastic. Seal watertight.

**END OF SECTION**

# SECTION 07 2100
# THERMAL INSULATION

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Board insulation at perimeter foundation wall, foundation stem wall, and exterior wall where indicated.

B. Batt insulation in exterior wall construction where indicated.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

D. Acoustic Batt insulation for sound isolation.

### 1.02 RELATED REQUIREMENTS

A. Section 09 2116 – Gypsum Board Assemblies: Acoustic wall insulation.

### 1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2013.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.

### 1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

### 1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

## PART 2 PRODUCTS

### 2.01 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene board. Minimum R-Value per local codes or specified in drawings.

B. Insulation at Perimeter of Foundation: Expanded polystyrene board. Minimum R-Value per local codes or specified in drawings.

C. Batt and Rigid insulation used in exterior wall assembly. Minimum R-Value per local codes or specified in drawings.

### 2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene Board Insulation: ASTM C578, Type X; Extruded polystyrene board with foil facing; with the following characteristics:
   1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Board Size: 48 x 96 inch (1220 x 2440 mm).
   4. Board Edges: Shiplap.
   5. Manufacturers:
      a. Dow Chemical Co: www.dow.com.
      b. Owens Corning Corp: www.owenscorning.com.
      c. Pactiv Building Products: greenguard.pactiv.com.
   6. Substitutions: See Section 01 6000 - Product Requirements.

### 2.04 BATT INSULATION MATERIALS

A. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; Foil faced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
   1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
   2. Thickness: 3 1/2 inch.
   3. Manufacturers:
      a. Johns Manville International, Inc.: www.jm.com.
      b. Thermafiber, Inc: www.thermafiber.com.
      c. ROXUL, Inc; ComfortBatt: www.rspec.com.

### 2.05 ACCESSORIES

A. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
   1. Length as required for thickness of insulation material and penetration of deck substrate, with metal washers.

B. Adhesive: Type recommended by insulation manufacturer for application.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

### 3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Install boards horizontally on foundation perimeter.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

### 3.03 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install boards horizontally on walls.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

### 3.04 BOARD INSTALLATION AT CAVITY WALLS

A. Install boards to fit snugly between wall ties.

B. Install boards horizontally on walls.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

**3.05 BOARD INSTALLATION UNDER CONCRETE SLABS**

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

**3.06 BATT INSTALLATION**

A. Install insulation in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

**3.07 PROTECTION**

A. Do not permit installed insulation to be damaged prior to its concealment.

**END OF SECTION**

# SECTION 07 2500
# WEATHER BARRIERS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Air & Vapor Barriers (AVB)

B. Weather Resistive Barriers

C. Waterproofing protection at perimeter walls

D. Self-adhered flexible flashing for tie-ins and continuation of AVB

### 1.02 RELATED REQUIREMENTS

A. Section 03 3300 - Cast-in-Place Concrete: Vapor retarder under concrete slabs on grade.

B. Section 05 4000 - Cold-Formed Metal Framing: Installation of insulated sheathing to be coated with Fluid-applied Air & Vapor Barrier.

C. Section 06 1000 - Rough Carpentry: Installation of plywood and insulated sheathing to be coated with fluid-applied Air Barrier Coating.

D. Section 07 3129 – Wood Shingles: for installation of Weather Resistive Barrier.

E. Section 07 4647 – Fiber-Cement Siding (Exterior): for installation of Weather Resistive Barrier.

F. Section 07 1326 – Self-adhering Sheet Waterproofing: waterproofing at elevator pit and therapy pool.

G. Section 07 2400 - Exterior Insulation and Finish Systems: EIFS Air Barrier under exterior insulation.

H. Section 07 5300 - Elastomeric Membrane Roofing: Vapor retarders installed as part of roofing system.

I. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

J. Section 07 9005 - Joint Sealers: Sealant materials and installation techniques.

K. Section 09 2900 – Gypsum Board: Foil-backed gypsum board used as an air barrier.

### 1.03 DEFINITIONS

A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
   1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

### 1.04 REFERENCE STANDARDS

A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2013.

B. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.

C. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2006a (Reapproved 2013).

D. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.

F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

G. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

H. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; ICC Evaluation Service, Inc.; 2013.

I. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; ICC Evaluation Service, Inc.; 2011.

J. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; ICC Evaluation Service, Inc.; 2012.

**1.05 SUBMITTALS**

A. See Section 01 3300 - for submittal procedures.

B. Product Data: Provide data on material characteristics for each product.

C. Manufacturer's Installation Instructions for each product: Indicate preparation.

**1.06 QUALITY CONTROL**

A. Mock-up: Install air barrier, vapor retarder, and water-resistive barrier materials in mock-ups specified in 01 9115. Rework as necessary to obtain approvals.

B. Follow requirements for Air & Vapor Barrier coordination contained in Document 00 8000.

**1.07 FIELD CONDITIONS**

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

**PART 2 PRODUCTS**

**2.01 WEATHER BARRIER ASSEMBLIES**

A. Water-Resistive Barrier, also called Weather Resistive or Resistant Barrier: Provide on exterior walls under exterior cladding.
   1. Use HydroGap Drainable Housewrap by Benjamin Obdyke Roof and Wall Products as Basis of Design unless otherwise indicated.

B. Air & Vapor Barrier, AVB, or Air Barrier:
   1. On outside surface of sheathing on walls, sloped framing, and areas detailed, fluid-applied air barrier coating.

C. Fluid-Applied Waterproofing:
   1. On outside surface of foundation wall, shelf, top, and interior of concrete perimeter walls to below the bond breaker depth, apply WR Meadows Hydrolastic 836 as Basis of Design.

**2.02 WATER-RESISTIVE BARRIER MATERIALS (NEITHER AIR BARRIER NOR VAPOR RETARDER)**

A. Asphalt Felt: ASTM D226 Type I felt (No.15).

B. Building Paper: Asphalt-saturated Kraft building paper complying with requirements of ICC-ES AC38 Grade D.
   1. Water Penetration Resistance: Withstand a water head of 21 inches (55 cm), minimum, for minimum of 5 hours, when tested in accordance with AATCC 127.

C. Plastic Sheet: Polymeric-based sheet complying with requirements of ICC-ES AC38 Grade D with 60-minute water-resistance; do not use polyethylene sheet.

**2.03 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)**

A. Air Barrier Sheet, Mechanically Fastened:

1. Air Permeance: 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
2. Water Vapor Permeance: 5 perms (286 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant method).
3. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 6 months weather exposure.
4. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, when tested in accordance with ASTM E84.
5. Seam and Perimeter Tape: Polyethylene self-adhering type, mesh reinforced, 2 inches (50 mm) wide, compatible with sheet material; unless otherwise specified.
6. Products:
    a. DuPont Building Innovations; Tyvek Commercial Wrap with Tyvek Fluid Applied Flashing - Brush Formulation, Tyvek Fluid Applied Flashing and Joint Compound, FlexWrap NF, StraightFlash, StraightFlash VF, Tyvek Wrap Caps, and Tyvek Tape: www.dupont.com.
    b. Fiberweb, Inc; Typar MetroWrap: www.typar.com.
    c. National Shelter Products, Inc.; DRYLine RainDrain: www.drylinewrap.com.
    d. Kingspan Insulation LLC; GreenGuard RainDrop Building Wrap: www.trustgreenguard.com.

B. Air Barrier Sheet or, Self-Adhered Flashing:
1. Air Permeance: 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
2. Water Vapor Permeance: 10 perms (572 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant method).
3. Water Penetration Resistance Around Nails: Pass, when tested in accordance with ASTM D1970/D1970M (modified).
4. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for maximum of 150 days weather exposure.
5. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.
6. Water Resistance: Comply with applicable water-resistive requirements of ICC-ES Acceptance Criteria AC38.
7. Seam and Perimeter Tape: As recommended by sheet manufacturer.
8. Products:
    a. Perma-Barrier Low Temperature by WR Grace as Basis of Design.
    b. Substitutions: See Section 01 2500.

C. Air Barrier Coating, Fluid Applied: Vapor permeable, elastomeric waterproofing:
1. Material: Acrylic.
2. Acceptable Substrates: Stated by manufacturer as suitable for installation on visibly damp surfaces and concrete that has hardened but is not fully cured ("green" concrete) without requiring a primer.
3. Adhesion to Paper and Glass Mat Faced Sheathing: Sufficient to ensure failure due to delamination of sheathing before separation of coating from sheathing.
4. Dry Film Thickness (DFT): 10 mils (0.010 inch) (0.254 mm), minimum.
5. Air Permeance: 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
6. Water Vapor Permeance: 5 perms (287 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M.
7. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 6 months weather exposure.
8. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.
9. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

10. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
11. VOC Content: 100 g per L or less.
12. Code Acceptance: Comply with applicable requirements of ICC-ES Acceptance Criteria AC212.
13. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
14. Products:
    a. Carlisle Coatings and Waterproofing, Inc.; Barritech-VP: www.carlisle-ccw.com.
    b. Grace Construction Products; Perm-A-Barrier VP: www.graceconstruction.com.
    c. Henry Company; Air-Bloc 33MR: www.henry.com.

D. Air Barrier Membrane:
1. Material: Water-based acrylic.
2. Acceptable Substrates: Stated by manufacturer as suitable for installation on visibly damp surfaces and concrete that has hardened but is not fully cured ("green" concrete) without requiring a primer.
3. Adhesion to Paper and Glass Mat Faced Sheathing: Sufficient to ensure failure due to delamination of sheathing.
4. Dry Film Thickness: 30 mils (0.030 inch) (0.76 mm), minimum.
5. Air Permeance: 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
6. Water Vapor Permeance: 5 perms (287 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M.
7. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
8. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
9. Products:
    a. Epro Services, Inc.; ECOFLEX-PS: www.eproserv.com.
    b. Henry Company; Air-Bloc 33MR: www.henry.com.
    c. W.R. Meadows, Inc.; Air-Shield LMP: www.wrmeadows.com.

## 2.04 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Flexible Flashing: Sheathing fabric saturated with air barrier coating and complying with the applicable requirements of ICC-ES AC148.

C. Liquid Flashing: One part, fast curing, non-sag elastomeric STPU (Silyl-Terminated Polyurethane) gun grade, trowelable liquid flashing.

D. Vapor Retarder Tape: Coated polyester film with acrylic adhesive backing; pressure sensitive.

E. Liquid Flashing: One part, fast curing, non-sag, silicone, gun grade, trowelable liquid flashing.

F. Thinners and Cleaners: As recommended by material manufacturer.

# PART 3 EXECUTION

## 3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

## 3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

## 3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.

C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

D. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

E. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.

F. Mechanically Fastened Sheets - On Exterior:
   1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
   2. Overlap seams as recommended by manufacturer but at least 6 inches.
   3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches (305 mm).
   4. Attach to framed construction with fasteners extending through sheathing into framing. Space fasteners at 12 to 18 inches (305 to 460 mm) on center along each framing member supporting sheathing.
   5. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
   6. Where stud framing rests on concrete or masonry, extend lower edge of sheet at least 4 inches (100 mm) below bottom of framing and seal to foundation with sealant.
   7. Install water-resistive barrier over jamb flashings.
   8. Install air barrier and vapor retarder UNDER jamb flashings.
   9. Install head flashings under weather barrier.
   10. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.

G. Self-Adhesive Sheets:
   1. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.
   2. Lap sheets shingle-fashion to shed water and seal laps air tight.
   3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that all laps are firmly adhered with no gaps or fishmouths.
   4. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.
   5. At wide joints, provide extra flexible membrane allowing joint movement.

H. Coatings:
   1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
   2. Where exterior masonry veneer is to be installed, install masonry anchors before installing weather barrier over masonry; seal around anchors air tight.
   3. Mastic Coating: Install by trowel or roller to minimum thickness of 1/4 inch (6 mm); use sheet seal to join to adjacent construction, seal air tight with sealant.
   4. Use flashing to seal to adjacent construction and to bridge joints.

I. Openings and Penetrations in Exterior Weather Barriers:
   1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto weather barrier and at least 6 inches (150 mm) up jambs; mechanically fasten stretched edges.
   2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with at least 4 inches (100 mm) wide; do not seal sill flange.

3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches (230 mm) wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches (50 mm) beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

**3.04 FIELD QUALITY CONTROL**

A. Do not cover installed weather barriers until required inspections have been completed.

B. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

C. Take digital photographs of each portion of the installation prior to covering up.

**3.05 PROTECTION**

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

**END OF SECTION**

# SECTION 07 4113

# METAL ROOF PANELS

## PART 1 – GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Preformed corrugated metal roof panels
2. Fasteners, sealants, closures, and related flashings.
3. Underlayment (if specified)
4. Accessories required for complete installation.

B. Related Sections:

1. 05 40 00 – Cold-Formed Metal Framing
2. 06 16 00 – Sheathing
3. 07 62 00 – Sheet Metal Flashing and Trim
4. 07 72 00 – Roof Accessories
5. 07 92 00 – Joint Sealants.

### 1.2 REFERENCES

A. ASTM A653/A653M – Steel Sheet, Zinc-Coated or Zinc-Iron Alloy-Coated.

B. ASTM A755/A755M – Prepainted Metallic-Coated Steel Sheet.

C. ASTM E1646 – Water Penetration Testing.

D. ASTM E1680 – Air Leakage Testing.

E. AAMA 2605 – High-Performance Organic Coatings.

### 1.3 SUBMITTALS

A. Product Data: Manufacturer’s specifications, installation instructions, maintenance data.

B. Shop Drawings:

1. Panel profiles and dimensions

2. Layout, fastener locations, and flashing details

C. Samples:

1. Panel profile

2. Color finish samples in selected range.

D. Warranty documentation.

**1.4 QUALITY ASSURANCE**

A. Manufacturer Qualifications: Minimum 5 years experience producing corrugated roof panels.

B. Installer Qualifications: Minimum 3 years documented experience installing metal roof panels.

C. Mock-Up:

1. Minimum 4 ft x 4 ft installed sample

2. Demonstrate panel profile, finish, fastener system, flashing

3. Approved mock-up may remain as part of Work

**1.5 DELIVERY, STORAGE, AND HANDLING**

A. Deliver in manufacturer’s packaging, labeled.

B. Store materials off ground, protected from moisture and damage.

C. Handle to prevent damage to finishes and edges.

**1.6 WARRANTY**

A. Manufacturer’s Finish Warranty: Minimum 20 years against fade and chalk.

B. Substrate Corrosion Warranty: Minimum 20 years.

C. Installer Workmanship Warranty: Minimum 2 years.

**PART 2 – PRODUCTS**

**2.1 BASIS OF DESIGN**

A. Basis of Design Manufacturer: Western States Metal Roofing

1. Acceptable Profile: Corrugated metal roofing, e.g., “7/8” Corrugated” or similar profile from Western States Metal Roofing.

B. Equivalent products: Subject to Architect’s approval if fully meeting performance and appearance requirements.

**2.2 MATERIALS**

A. Base Metal:

1. Minimum 24-gauge steel sheet

2. Hot-dip galvanized to G90 or AZ50 Galvalume coating

B. Panel Profile:

1. Corrugated with symmetrical wave pattern

2. Approximate rib height: 7/8 inch

3. Panel coverage: As per selected profile (typically ~36 inches)

4. Exposed fastener attachment

C. Finish System:

1. Factory-applied PVDF (Kynar 500®/Hylar 5000®)

2. Color: Full range of “Copper Color” finishes, as selected by Architect

3. Complies with AAMA 2605.

D. Accessories:

1. Trim, ridge caps, closures, eave flashings of same material and finish as panels

2. Fasteners compatible with roofing panels

3. Sealants and closures as recommended by manufacturer

**2.3 FABRICATION**

A. Factory-formed to profiles and lengths to minimize field splices.

B. Hem exposed edges for stiffness and appearance.

C. Pre-punched holes if specified to ensure alignment.

**2.4 FASTENERS**

A. Type: Self-drilling hex-head screws with integral EPDM sealing washers.

B. Material: Corrosion-resistant coated carbon steel or stainless steel.

C. Color: Factory-painted to match panels where exposed.

**2.5 ACCESSORIES**

A. Trim and Flashings:

1. Formed metal, same gauge and finish as panels

2. Ridge caps, rake trim, eave trim, valley flashing as required

B. Closures:

1. Pre-molded or field-cut to match corrugation profile

2. Weather-resistant foam or metal as appropriate

C. Sealants:

1. Manufacturer’s recommended products compatible with substrates and finishes.

**PART 3 – EXECUTION**

**3.1 EXAMINATION**

A. Verify substrate is smooth, clean, dry, and properly aligned.

B. Confirm underlayment or air barrier installation as required.

C. Do not proceed until unsatisfactory conditions are corrected.

**3.2 PREPARATION**

A. Coordinate delivery to minimize storage time on site.

B. Protect adjacent surfaces from damage.

**3.3 INSTALLATION**

A. Install panels in accordance with manufacturer’s installation instructions and approved shop drawings.

B. Begin installation at eave and proceed toward ridge.

C. Overlap panels in direction of prevailing winds.

D. Secure panels with exposed fasteners through crests of corrugation per manufacturer's spacing.

E. Install trim, closures, and flashings to provide a complete weather-tight system.

F. Provide for thermal movement in accordance with manufacturer's recommendations.

**3.4 CLEANING**

A. Remove protective film immediately after installation.

B. Clean surfaces with manufacturer-approved methods.

**3.5 PROTECTION**

A. Protect finished installation from damage until Substantial Completion.

B. Replace damaged panels or accessories.

**3.6 DEMONSTRATION**

A. Demonstrate to Owner's representative proper maintenance procedures.

**END OF SECTION**

# SECTION 07 4213

# METAL WALL PANELS

## PART 1 – GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Preformed flat seam metal wall panels with concealed fastener attachment

2. Trim, flashings, closures, and accessories

3. Sub-framing, clips, and fasteners as required for complete system.

B. Related Sections:

05 40 00 – Cold-Formed Metal Framing.

06 16 00 – Sheathing.

07 62 00 – Sheet Metal Flashing and Trim.

07 92 00 – Joint Sealants

### 1.2 REFERENCES

A. ASTM A653/A653M – Zinc-Coated Steel Sheet.

B. ASTM A755/A755M – Prepainted Metallic-Coated Steel Sheet.

C. ASTM E283 – Air Leakage Testing.

D. ASTM E331 – Water Penetration Testing.

E. AAMA 2605 – High-Performance Organic Coatings.

### 1.3 SUBMITTALS

A. Product Data: Manufacturer’s specifications, installation instructions.

B. Shop Drawings:

1. Panel profiles and dimensions

2. Layout, seam conditions, attachment systems

3. Trim and flashing details.

C. Samples:

1. Panel profile

2. Full range of copper-color finish selections

D. Warranty documentation.

**1.4 QUALITY ASSURANCE**

A. Manufacturer Qualifications: Minimum 5 years producing flat-seam metal wall panels.

B. Installer Qualifications: Experienced with concealed-fastener metal panel systems.

C. Mock-Up:

1. Minimum 4 ft x 4 ft sample installation

2. Include panel seams, finish, trim conditions

3. Approved mock-up may remain as part of Work

**1.5 DELIVERY, STORAGE, AND HANDLING**

A. Deliver in manufacturer’s packaging, labeled.

B. Store off ground, protected from moisture and damage.

C. Handle carefully to avoid scratching finished surfaces.

**1.6 WARRANTY**

A. Manufacturer’s Finish Warranty: Minimum 20 years against fade and chalk.

B. Substrate Corrosion Warranty: Minimum 20 years.

C. Installer Workmanship Warranty: Minimum 2 years.

**PART 2 – PRODUCTS**

**2.1 BASIS OF DESIGN**

A. Basis of Design Manufacturer: Western States Metal Roofing

1. Acceptable profiles: T-Groove, Flush Wall Panel 0 12” Face Size

B. Substitutions: Permitted only if equivalent in performance, appearance, and finish, and approved by Architect.

**2.2 MATERIALS**

A. Base Metal:

1. 22-gauge steel sheet

2. Hot-dipped galvanized to G90 or equivalent AZ50 Galvalume coating.

B. Panel Profile:

1. Flat seam interlocking design

2. Concealed fastener attachment system

3. Factory-fabricated panels with consistent seam dimensions.

C. Finish System:

1. Factory-applied PVDF (Kynar 500®/Hylar 5000®) coating

2. Color: Full range of manufacturer's "Copper Color" finish selections, as selected by Architect

3. Complies with AAMA 2605.

D. Accessories:

1. Trim, flashings, closures of same material, gauge, and finish as panels

2. Compatible sealants

3. Thermal breaks if indicated

**2.3 FABRICATION**

A. Factory-formed to profiles, dimensions, and seam design indicated.

B. Panels hemmed and interlocked for watertight seams.

C. Minimize field cutting and fabrication.

D. Coordinate panel lengths to minimize joints.

**2.4 FASTENERS AND ATTACHMENTS**

A. Concealed panel clips: Manufacturer's recommended system for thermal movement and secure attachment.

B. Fasteners:

1. Self-drilling, corrosion-resistant screws

2. Compatible with panel material

3. Concealed from view in final installation

C. Exposed fasteners (for trim only): Color-matched to panel finish.

**2.5 ACCESSORIES**

A. Trim and Flashings: Formed from same material and finish as panels.

B. Closures: Preformed, weather-resistant, matching panel profile.

C. Sealants: Manufacturer-recommended, compatible with finishes.

**PART 3 – EXECUTION**

**3.1 EXAMINATION**

A. Verify substrate alignment and condition.

B. Confirm weather barrier installation if required.

C. Do not install until unsatisfactory conditions are corrected.

**3.2 PREPARATION**

A. Ensure surfaces are clean, dry, and free of contaminants.

B. Coordinate with adjacent construction for weather-tight transitions.

**3.3 INSTALLATION**

A. Install in strict accordance with manufacturer's instructions and approved shop drawings.

B. Align and level panels for consistent seam reveal.

C. Attach using concealed clips and fasteners as specified.

D. Install trim, flashings, closures for a complete, weather-tight system.

E. Provide for thermal movement per manufacturer's recommendations.

### 3.4 CLEANING

A. Remove protective film immediately after installation.

B. Clean panels with manufacturer-recommended methods.

### 3.5 PROTECTION

A. Protect installed work from damage until Substantial Completion.

B. Replace damaged panels and components.

### 3.6 DEMONSTRATION

A. Demonstrate to Owner’s representative the correct cleaning and maintenance procedures.

**END OF SECTION**

# SECTION 07 4600

# SIDING

## 1.1 SUMMARY

A. Section Includes:

1. Factory-formed vinyl siding panels
2. Trim accessories, corners, starter strips, J-channels, soffit panels as required
3. Flashing and sealants integral to siding system
4. Fasteners and installation accessories

B. Related Sections:

1. 06 10 00 – Rough Carpentry (wall framing and sheathing)
2. 07 27 00 – Air Barriers
3. 07 62 00 – Sheet Metal Flashing and Trim
4. 07 92 00 – Joint Sealants

## 1.2 REFERENCES

A. ASTM D3679 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding.

B. ASTM D4756 – Installation of Rigid PVC Siding and Soffit.

C. Vinyl Siding Institute (VSI) – Recommended Installation Practices.

## 1.3 SUBMITTALS

A. Product Data: Manufacturer’s data sheets for siding, accessories, and trim.

B. Samples:

1. 12-inch piece of siding panel, showing color and finish
2. Trim profiles as applicable.

C. Shop Drawings (if project-specific details required):

1. Layout of siding courses and accessories
2. Flashing details at windows, doors, corners

D. Warranty Documentation.

### 1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Minimum 3 years of experience with vinyl siding installation

2. Compliance with Vinyl Siding Institute (VSI) standards.

B. Mock-Up (Optional):

1. Provide minimum 4 ft x 4 ft siding panel with full trim detailing for Architect approval.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened packaging with labels intact.

B. Store flat, under cover, and elevated off ground.

C. Protect from direct sunlight, impact, or bending before installation.

### 1.6 WARRANTY

A. Manufacturer's standard warranty: Minimum 25 years or as offered.

B. Installer workmanship warranty: 1 year minimum.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

A. Basis of Design:

1.CertainTeed, Ply Gem, Royal Building Products, or approved equivalent

2. Color and profile to be selected from manufacturer's full range.

B. Substitutions: Allowed only with prior written approval.

### 2.2 VINYL SIDING PANELS

A. Material:

1. PVC compound complying with ASTM D3679

2. UV-stabilized finish, color-through formulation

B. Profile:

1. Horizontal lap, vertical board-and-batten, or shingle-style as indicated on drawings

2. Exposure width per design intent.

C. Thickness: Minimum 0.044" or as approved.

D. Color: To be selected by Architect from manufacturer’s standard range.

E. Performance:

1. Weather-resistant, fade-resistant, impact-resistant.

2. Wind load performance meeting local code requirements.

**2.3 ACCESSORIES**

A. Trim and Corners:

1. Matching vinyl or manufacturer’s coordinated profiles.

B. Starter Strips and J-Channels:

1. Manufacturer’s standard components compatible with siding

C. Soffit Panels (if required):

1. Solid or vented vinyl soffit as scheduled or indicated.

D. Fasteners:

1. Corrosion-resistant nails or screws per manufacturer’s recommendations.

**2.4 FLASHING AND SEALANTS**

A. Flashing:

1. Butyl or rubberized asphalt tape as recommended for openings and penetrations.

2. Sheet metal where indicated.

B. Sealants:

1. UV-resistant, paintable, compatible with vinyl siding

## PART 3 – EXECUTION

### 3.1 EXAMINATION

A. Verify substrate is smooth, dry, and properly prepared.

B. Confirm installation of weather barrier is complete.

C. Report conditions that would prevent proper installation.

### 3.2 PREPARATION

A. Ensure wall assemblies are fully flashed and sealed at openings before starting siding.

B. Install starter strips level at base of walls.

C. Coordinate with installation of soffit, fascia, and other trims.

### 3.3 INSTALLATION

A. Install siding and accessories in accordance with:

1. Manufacturer’s instructions
2. ASTM D4756
3. VSI Best Practices.

B. Maintain expansion clearance per manufacturer’s instructions.

C. Fasten siding securely, but do not overdrive to allow for movement.

D. Align courses level and straight.

E. Integrate flashing at all penetrations, openings, and transitions.

F. Install soffit panels, trim, and accessories for complete watertight system.

### 3.4 FIELD QUALITY CONTROL

A. Inspect installed siding for alignment, secure fastening, and uniform appearance.

B. Correct deficiencies before Substantial Completion.

### 3.5 CLEANING

A. Remove protective film or labels.

B. Clean siding surfaces with mild detergent and water.

C. Remove construction debris from site.

**3.6 PROTECTION**

A. Protect installed siding from damage until acceptance.

B. Replace damaged components with new matching material.

**END OF SECTION**

# SECTION 07 5323
# EPDM ROOFING

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. EPDM membrane roofing system, including all components specified.

B. Thermal Barriers and air and vapor barriers installed beneath roofing insulation.

### 1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood nailers associated with roofing and roof insulation.

B. Section 07 2500 – Weather Barriers: Air & Vapor Barrier at wall line. Required tie-in.

C. Section 07 6200 - Sheet Metal Flashing and Trim: Formed metal flashing and trim items associated with roofing.

D. Section 07 7100 - Roof Specialties: Manufactured copings, fascias, gravel stops, and other flashing-related items.

E. Section 07 7200 - Roof Accessories: Roof hatches, vents, and manufactured curbs.

F. Section 08 6300 - Metal Framed Skylights.

### 1.03 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 for definition of terms related to roofing work not otherwise defined in the section.

### 1.04 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.

B. ASTM C209 - Standard Test Methods for Cellulosic Fiber Insulating Board; 2012.

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

D. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2014.

E. ASTM D1079 - Standard Terminology Relating to Roofing, Waterproofing, and Bituminous Materials; 2013.

F. ASTM D1621 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics; 2010.

G. ASTM D1622/D1622M - Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2014.

H. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.

I. Factory Mutual Global Data Sheet 1-29, Roof Deck Securement and Above Deck Roof Components.

### 1.05 SUBMITTALS

A. See Section 01 3300 - for submittal procedures.

B. Product Data:

1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.

C. Samples: Submit samples of each product to be used.

D. Letter acknowledging compliance with FM enhanced fastening patterns for this site noting wind speed requirements and 1.15 importance factor.

E. Sample Warranty at product submittal, and Executed Warranty for substantial completion.

F. Shop Drawings: for tapered insulation. See sample layout following this section.

G. Details: Submit any manufacturer's details proposed for use that differ from details shown on the Drawings.

**1.06 DELIVERY, STORAGE AND HANDLING**

A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.

B. Store materials clear of ground and moisture with weather protective covering.

C. Keep combustible materials away from ignition sources.

**1.07 WARRANTY**

A. See Section 01 7700 - Closeout Procedures, for additional warranty requirements.

B. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

C. Warranty: Roofing Manufacturer's Limited Warranty covering membrane, roof insulation, and other indicated components of the system, for the term indicated.
   1. Limit of Liability: No dollar limitation.
   2. Scope of Coverage: Repair leaks in the roofing system caused by:
      a. Ordinary wear and tear of the elements.
      b. Unintentional damage due to normal rooftop inspections, maintenance, or service.
      c. Manufacturing defect in Firestone brand materials.
      d. Defective workmanship used to install these materials.
      e. Damage due to winds up to 100 mph (160 km/h).
      f. Hail up to 2 inches (50 mm) in diameter.
   3. Not Covered:
      a. Damage due to winds in excess of 100 mph (160 km/h).
      b. Damage due hurricanes or tornadoes.
      c. Intentional damage.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. Acceptable Manufacturer - Roofing System Basis of Design: Firestone Building Products LLC, Carmel, IN: www.firestonebpco.com.

B. Manufacturer of Insulation and Cover Boards: Same manufacturer as roof membrane.

C. Substitutions: See Section 01 2500.

**2.02 ROOFING SYSTEM DESCRIPTION**

A. Roofing System: **Basis of Design – Firestone Rubbergard Max. .060 Reinforced.** Ethylene-propylene-diene-monomer (EPDM) single-ply membrane.
   1. Membrane Attachment: Fully adhered.
   2. Warranty: Full system warranty; Firestone 15 year Red Shield Limited Warranty covering membrane, roof insulation, and membrane accessories.
   3. Comply with applicable local building code requirements, AIG insurer requirements, and FM Global data sheet 1-29. Assume 3-second wind speed gusts of 115-mph, Surface Roughness C. Importance factor 1.15 and a safety factor of 2.

B. Roofing System Components: Listed in order from the top of the roof down:

1. Membrane: 60 mil reinforced.
2. Insulation Cover Board: High density polyisocyanurate; mechanically attached
3. Insulation:
   a. Total R Value: 27.5, minimum.
   b. Top Layer: Polyisocyanurate foam board, tapered where necessary, non-composite; mechanically fastened.
   c. Bottom Layer: Polyisocyanurate foam board, non-composite; mechanically fastened.
4. In areas of thermal barrier at rated roof: Air & Vapor Barrier: 6 mil polyethylene over ½" fire-rated gypsum coverboard. May be noted as "SecureRock", "½" GYP" or "DensDeck" on drawings. Basis of Design – DensDeck.roof board by Georgia Pacific
5. At areas of steel deck without thermal barrier, use Firestone V-Force Vapor Barrier Membrane, self-adhering direct to steel.

**2.03 EPDM MEMBRANE MATERIALS**

A. Roofing and Flashing Membrane: Black, cured synthetic single-ply membrane composed of ethylene propylene diene terpolymer (EPDM) with the following properties:
   1. Nominal Thickness: 60 mill, reinforced.

B. Membrane Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.

C. Flashing Membrane: Self-curing, non-reinforced membrane composed of nonvulcanized EPDM rubber, complying with ASTM D4811 Type II, and with the following properties:
   1. Thickness: 0.055 inch (1.4 mm).
   2. Acceptable Product: RubberGard EPDM FormFlash by Firestone.

D. Self-Adhesive Flashing Membrane: Semi-cured 45 mil EPDM membrane laminated to 35 mil (0.9 mm) EPDM tape adhesive; QuickSeam Flashing by Firestone.

E. Pre-Molded Pipe Flashings: EPDM, molded for quick adaptation to different sized pipes; Firestone EPDM Pipe Flashing.

F. Self-Adhesive Lap Splice Tape: 35 mil (0.9 mm) EPDM-based, formulated for compatibility with EPDM membrane and high-solids primer; QuickSeam Splice Tape by Firestone.

G. Splice Adhesive: Synthetic polymer-based, formulated for compatibility with EPDM membrane and metal surfaces; SA-1065 Splice Adhesive by Firestone.

H. Adhesive Primer: Synthetic rubber based primer formulated for compatibility with EPDM membrane and tape adhesive; QuickPrime Plus by Firestone.

I. Seam Edge Treatment: EPDM rubber-based sealant, formulated for sealing exposed edges of membrane at seams; Lap Sealant HS by Firestone.

J. Pourable Sealer: Two-part polyurethane, two-color for reliable mixing; Pourable Sealer by Firestone.

K. Water Block Seal: Butyl rubber sealant for use between two surfaces, not exposed; Water Block Seal by Firestone.

L. Metal Plates and Strips Used for Fastening Membrane and Insulation: Steel with Galvalume coating; corrosion-resistance meeting FM 4470 criteria.

M. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches (33 mm) wide by 0.10 inch (2.5 mm) thick; Firestone Termination Bar by Firestone.

N. Walk-way Pads: QuickSeam Walkway Pad by Firestone, Item Number W56RAC1860.

**2.04 ROOF INSULATION AND COVER BOARDS**

A. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam in both tapered and flat sheets complying with ASTM C1289 Type II Class 1, with the following additional characteristics:

1. Thickness: As indicated on drawings.
2. Size: 48 inches (1220 mm) by 96 inches (2440 mm), nominal.
3. R-Value (LTTR):
   a. 1.0 inch (25 mm) Thickness: 6.0, minimum.
   b. 1.25 inch (32 mm) Thickness: 7.5, minimum.
   c. 1.5 inch (38 mm) Thickness: 9.0, minimum.
   d. 1.75 inch (44 mm) Thickness: 10.5, minimum.
   e. 2.0 inch (51 mm) Thickness: 12.1, minimum.
   f. 3.0 inch (76 mm) Thickness: 18.5, minimum.
   g. 4.0 inch (102 mm) Thickness: 25.0, minimum.
4. Compressive Strength: 20 psi (138 kPa) when tested in accordance with ASTM C1289.
5. UL-Classified and FM-approved for direct to steel deck applications.
6. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
7. Recycled Content: 19 percent post-consumer and 15 percent post-industrial, average.
8. Acceptable Product: ISO 95+ GL Polyisocyanurate Insulation by Firestone.

B. High Density Polyisocyanurate Cover Board: Non-combustible, water resistant, high density closed cell polyisocyanurate core with coated glass mat facers, with the following characteristics:
1. Size: 48 inches (1220 mm) by 96 inches (2440 mm), nominal.
2. Thickness: 1/2 inch (12 mm).
3. Thermal Value: R-value of 2.5, when tested in accordance with ASTM C518 and ASTM C177.
4. Surface Water Absorption: 3 percent, maximum, when tested in accordance with ASTM C209.
5. Compressive Strength: 120 psi (830 kPa), when tested in accordance with ASTM D1621.
6. Density: 5 pcf (80 kg/cu m), when tested in accordance with ASTM D1622/D1622M.
7. Factory Mutual approved for use with FM 1-120 rated roofing assemblies.
8. Mold Growth Resistance: Passing ASTM D3273.
9. Acceptable Product: ISOGARD HD Cover Board by Firestone.

C. Insulation Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.

## PART 3 INSTALLATION

### 3.01 GENERAL

A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.

B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.

C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.

D. Perform work using competent and properly equipped personnel.

E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.

F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do

not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F (15 to 25 degrees C).

G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
   1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
   2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
   3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.

H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.

I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

**3.02 EXAMINATION**

A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.

B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.

C. Examine roof substrate to verify that it is properly sloped to drains.

D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

**3.03 PREPARATION**

A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.

B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.

C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch (6 mm) wide with fill material acceptable insulation to membrane manufacturer.

D. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

E. Wood Nailers: Provide wood nailers at all perimeters and other locations where indicated on the drawings, of total height matching the total thickness of insulation being used.

**3.04 INSULATION AND COVER BOARD INSTALLATION**

A. Install thermal barrier, air & vapor barrier, and insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.

B. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.

C. Lay roof insulation in courses parallel to roof edges.

D. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch (6 mm). Fill gaps greater than 1/4 inch (6 mm) with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch (6 mm).

E. Comply with FM-approved fastener patterns, type of fasteners, and number of fasteners required per Roof Nav sheets included after this section.

### 3.05 SINGLE-PLY MEMBRANE INSTALLATION

A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.

B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.

C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.

D. Install membrane adhered to the substrate, with edge securement as specified.

E. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.

F. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 2 in 12 inches (1:6 ) using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.
   1. Exceptions: Round pipe penetrations less than 18 inches (460 mm) in diameter and square penetrations less than 4 inches (200 mm) square.
   2. Metal edging is not merely decorative; ensure anchorage of membrane as intended by roofing manufacturer.

### 3.06 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
   1. Follow roofing manufacturer's instructions.
   2. Remove protective plastic surface film immediately before installation.
   3. Install water block sealant under the membrane anchorage leg.
   4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
   5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
   6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.
   7. When the roof slope is greater than 1:12, apply seam edge treatment along the back edge of the flashing.

### 3.07 FINISHING AND WALKWAY INSTALLATION

A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.

### 3.08 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).

C. Perform all corrections necessary for issuance of warranty.

### 3.09 CLEANING

A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.

B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.

C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

## 3.10 PROTECTION

A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

## 3.11 ROOF NAV SHEETS

A. See FM Global “Roof Nav” sheets following this section for fastener and other installation requirements in different roof areas of the project.

**END OF SECTION**

**SECTION 07 6200**
**SHEET METAL FLASHING AND TRIM**

PART 1 GENERAL

1.1 SUMMARY

A. Provide flashing and sheet metal.

PART 2 PRODUCTS

2.1 MATERIALS

A. Flashing and Sheet Metal:
   1. Manufacturers:Architectural Metal Specialties Inc.;Petersen Aluminum Corp.;TYPAR or equal.
   2. Application: Metal counterflashing and base flashing.
   3. Application: Exposed metal trim and fascia units.
   4. Metal: Extruded aluminum.
      a. Standard: 6063-T52, prefinished 2-coat 70% Fluoropolymer, 0.080 inches for primary legs of extrusion.
   5. Flexible Sheet Membrane Flashing: Nonreinforced flexible black elastic sheet, 50 to 65 mils thick, synthetic rubber.
   6. Auxiliary Materials:
      a. Solder compatible with metal.

**END OF SECTION**

# SECTION 07 7100
# ROOF SPECIALTIES

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Manufactured roof specialties, including copings, fascias, gravel stops, and vents.

B. Roof control and expansion joint covers.

### 1.02 RELATED REQUIREMENTS

A. Section 07 77123 – Manufactured Gutters & Downspouts

### 1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.

B. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association; Fifth Edition, with interim updates.

C. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012.

D. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; Single Ply Roofing Industry; 2011. (ANSI/SPRI/FM 4435/ES-1)

E. Factory Mutual wind load and uplift requirements for perimeter fastening.

### 1.04 SUBMITTALS

A. See Section 01 3300 - for submittal procedures.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations. Include FM and UL ratings obtained and applicable to this site.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

D. Samples: Submit two illustrating component shape, finish, and color.

E. Samples: Submit two appropriately sized samples of coping and gravel stop.

F. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

### 1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) details.

B. Provide wind warranty as component of full roof warranty.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Roof Edge Flashings and Copings:
   1. W.P. Hickman Company; PermaSnap 2 Coping, Safeguard Fascia and Gravel Stop System: www.wph.com. As basis of design.
   2. Metal-Era Inc; www.metalera.com.
   3. Firestone Building Products: www.firestonebpco.com

B. Control and Expansion Joint Covers:
   1. GAF; www.gaf.com.
   2. Johns Manville Corporation; www.jm.com.
   3. MM Systems Corp; www.mmsystemscorp.com.
   4. Construction Specialties, Inc.

**2.02 COMPONENTS**

A. Roof Edge Flashings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners. See details for configurations.
   1. Configuration: Fascia, cant, formed fascia extender, and edge securement for roof membrane.
   2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable code.
   3. Material: Formed aluminum sheet, 0.050 inch (1.3 mm) thick, minimum, as required for wind calculations. Welded corners.
   4. Finish: 70 percent polyvinylidene fluoride.
   5. Color: To be selected by Design Agent from manufacturer's standard range.

B. Copings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
   1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness and finish as cap; concealed stainless steel fasteners.
   2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 RE-3 to positive and negative design wind pressure as defined by applicable code.

C. Control and Expansion Joint Covers: Composite construction of flexible flashing of white color with closed cell urethane foam backing, each edge seamed to aluminum sheet metal flanges, designed for nominal joint width of 1 inch (25 mm). Include special formed corners, tees, intersections, and wall flashings, each sealed watertight. Provide UL-rated joint assemblies matching rating of roof/ceiling assembly.

**2.03 ACCESSORIES**

A. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

B. Metal Penetration Pocket – adjustable pitch pan by edge flashing manufacturer for pitch pocket use. Pourable Sealer equal to Firestone FillGard M, 2 part, compatible with other roof components.

**2.04 FINISHES**

A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as scheduled.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

**3.02 INSTALLATION**

A. Install components in accordance with manufacturer's instructions to comply with Factory Mutual standards.

B. Seal joints within components when required by component manufacturer.

C. Anchor components securely.

D. Conform to SMACNA Architectural Sheet Metal Manual (ASMM) drawing details as noted:

E. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

F. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

G. Coordinate installation of flashing flanges into reglets.

**END OF SECTION**

# SECTION 07 8400
# FIRESTOPPING

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

### 1.02 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a.

B. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

### 1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

### 1.04 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Trained by the manufacturer.
   2. Licensed by authority having jurisdiction.

### 1.05 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

## PART 2 PRODUCTS

### 2.01 FIRESTOPPING - GENERAL REQUIREMENTS

A. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

### 2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Through Penetration Firestopping: Use any system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

### 2.03 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
   1. Fire Ratings: Use any system listed by UL or tested in accordance with ASTM E814 that has F Rating equal to fire rating of penetrated assembly and T Rating Equal to F Rating and that meets all other specified requirements.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

### 3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

### 3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authority having jurisdiction.

### 3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

### 3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

**END OF SECTION**

# SECTION 07 9005
# JOINT SEALERS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Sealants and joint backing.

### 1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping: Firestopping sealants.

B. Section 09 9000 - Painting

### 1.03 REFERENCE STANDARDS

A. ASTM C834 - Standard Specification for Latex Sealants; 2010.

B. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.

C. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2005 (Reapproved 2010).

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with other sections referencing this section.

### 1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating sealant chemical characteristics.

### 1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

## PART 2 PRODUCTS

### 2.01 SEALANTS

A. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
   1. Applications: Use for:
      a. Interior wall and ceiling control joints.
      b. Joints between door and window frames and wall surfaces.
      c. Other interior joints for which no other type of sealant is indicated.

B. Epoxy Concrete Floor Joint Filler: Self-leveling, pourable, semi-rigid sealant intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
   1. Composition: Single or multi-part,100 percent solids by weight.
   2. Hardness: 85, minimum, after 7 days, when tested in accordance with ASTM D2240, Shore A.
   3. Color: Concrete gray.
   4. Joint Width, Minimum: 1/8 inch.
   5. Joint Width, Maximum: 3/4 inch.
   6. Joint Depth: Provide product suitable for joints from 1/8 inch to 2 inches in depth including space for backer rod.

### 2.02 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

### 3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Protect elements surrounding the work of this section from damage or disfigurement.

### 3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

D. Install bond breaker where joint backing is not used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Tool joints concave.

H. Concrete Floor Joint Filler: Install concrete floor joint filler per manufacturer's written instructions. After floor joint filler is fully cured, shave joint filler flush with top of concrete slab.

### 3.04 CLEANING

A. Clean adjacent soiled surfaces.

### 3.05 PROTECTION

A. Protect sealants until cured.

**END OF SECTION**

# SECTION 07 9500
# EXPANSION CONTROL

## PART 1 GENERAL

### 1.1 SUMMARY

A. Provide expansion joint cover assemblies.

### 1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

C. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.

### 1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Fire Performance: ANSI/UL 263, NFPA 251, UBC 43-1, ASTM E 119, and ASTM E 814 as applicable.

## PART 2 PRODUCTS

### 2.1 MATERIALS

A. Expansion Control Assemblies:
1. Manufacturers: Balco, Inc..
2. Application: Floor expansion joint cover assemblies.
3. Application: Wall expansion joint cover assemblies.
4. Application: Ceiling expansion joint cover assemblies.
5. Type: Metal assembly with flat cover plates.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. Take field measurements prior to fabrication, where possible. Form to required shapes and sizes with true, straight edges, lines and angles. Provide light-tight, hairline joints.

B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with work of other sections.

C. Coordinate with work of other sections; provide inserts and templates as needed. Install work plumb and level with uniform appearance.

D. Restore damaged finishes and protect work.

**END OF SECTION**

# SECTION 08 1113
# HOLLOW METAL DOORS AND FRAMES

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Steel doors and frames
B. Thermally insulated steel doors
C. Steel glazing frames
D. Accessories

### 1.02 RELATED REQUIREMENTS

A. Section 08710 - Door Hardware.
B. ~~Section 08800 - Glazing: Glass for doors and borrowed lites.~~
C. Section 09900 - Paints and Coatings: Field painting.

### 1.03 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.
B. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.
C. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2011).
D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.
E. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.
F. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2007.
G. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2013.
H. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.
I. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

### 1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.
C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with NAAMM HMMA 840.
B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Steel Doors and Frames:
   1. Assa Abloy Ceco, Curries, or Fleming: www.assaabloydss.com.
   2. Republic Doors; www.republicdoor.com.
   3. Steelcraft, an Ingersoll Rand brand; www.steelcraft.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

### 2.02 DOORS AND FRAMES

A. Requirements for All Doors and Frames:
   1. Accessibility: Comply with ANSI/ICC A117.1.
   2. Door Top Closures: Flush with top of faces and edges.
   3. Door Edge Profile: Beveled on both edges.
   4. Door Texture: Smooth faces.
   5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
   6. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
   7. Galvanizing for Units in Wet Areas: All components hot-dipped zinc-iron alloy-coated (galvannealed), manufacturer's standard coating thickness.
   8. Finish: Factory primed, for field finishing.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

### 2.03 STEEL DOORS

A. Exterior Doors:
   1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
   2. Core: Polystyrene foam.
   3. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
   4. Weatherstripping: Separate, see Section 08 7100.

B. Interior Doors:
   1. Grade: ANSI A250.8 Level 1, physical performance Level C, Model 1, full flush.
   2. Core: Mineral fiberboard.
   3. Thickness: 1-3/4 inches (44 mm).

### 2.04 STEEL FRAMES

A. General:
   1. Comply with the requirements of grade specified for corresponding door.
      a. ANSI A250.8 Level 1 Doors: 16 gage frames.
   2. Finish: Same as for door.
   3. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches (100 mm) high to fill opening without cutting masonry units.
   4. Frames Wider than 48 Inches (1200 mm): Reinforce with steel channel fitted tightly into frame head, flush with top.

B. Exterior Door Frames: Face welded, seamless with joints filled.
   1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
   2. Weatherstripping: Separate, see Section 08 7100.

C. Interior Door Frames: Knock-down type.

E. Frames for Interior Glazing or Borrowed Lights: Construction and face dimensions to match door frames, and as indicated on drawings.

**2.05 ACCESSORY MATERIALS**

A. Glazing: As specified in Section 08 8000, factory installed.

B. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

C. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

**2.06 FINISH MATERIALS**

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

## PART 3 EXECUTION

**3.01 EXAMINATION**

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

**3.02 PREPARATION**

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

**3.03 INSTALLATION**

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. In addition, install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Coordinate installation of hardware.

E. Coordinate installation of glazing.

**3.04 TOLERANCES**

A. Maximum Diagonal Distortion: 1/16 in (1.5 mm) measured with straight edge, corner to corner.

**3.05 ADJUSTING**

A. Adjust for smooth and balanced door movement.

**END OF SECTION**

# SECTION 08 1400
# WOOD DOORS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with Veneer
2. Factory fitting flush wood doors to frames and factory machining for hardware.
3. ~~Factory installed glazing~~

B. Related Requirements:
1. Section 08 7100 – Door Hardware

### 1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, vision kits for openings and factory finishing**.**

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Use same unit designations used in Contract Documents.
2. Hardware preparation.
3. ~~Glazed openings~~
4. Blocking dimensions and locations
5. ~~Fire-protection ratings for fire-rated doors.~~

~~C. Samples for Initial Selection: Available standard Stain color~~

D. Samples for Verification:

1. Factory finish applied to actual door face material, approximately 8 x 10 inches, for each material and finish.

2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.

3. Plastic Laminate, 5” square, for each color, texture and pattern selected.

4. Frames for light openings, 6 inches long, for each material, type, and finish when required.

### 1.4 QUALITY ASSURANCE

A. Quality Standard: WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors".

~~B. Security Standard: Filti Testing and Development (FTD), "Shooter Attack Test Method (SA)"~~

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags and wrap bundles of doors in plastic sheeting.

C. Mark each door on top rail with opening number used on Shop Drawings.

### 1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

### 1.7 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
    b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

## PART 2 - PRODUCTS

A. Basis-of-Design: Masonite Architectural
    1. Or Approved Equal

B. Source Limitations: Obtain wood doors from single manufacturer.

### 2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: Provide WDMA I.S.1-A

1. Performance Grade: Extra Heavy Duty.
2. Aesthetic Grade: **A grade faces.**

B. Security Standard: FTD-SA
1. Performance Class:
   a. Non-rated-Class 6
   b. 20-Minute rated – Class 3
   c. 45- Minute rated –Class 6

C. Fire-Rated Wood Doors: Conforming to NFPA 80; listed and labeled for required ratings based on testing at pressure NFPA 252 OR UL 10C by UL or other testing agency acceptable to authorities having jurisdiction.

1. Ratings**; Refer to Door Schedule in Drawings**
2. Cores:
   a. 20-minute fire-rated: Extra heavy-duty particle board
   b. 45-minute fire-rated: Fire-resistant wood-based particleboard
3. Vertical Edges:
   a. Category A Positive Pressure: Integral intumescent seals concealed by outer stile where required.
   b. Category B Positive Pressure: Intumescent seals applied to door frame per requirements of section 08 71 00 where required.
4. Blocking: Provide blocking with improved screw holding capability approved for use in doors of fire protection ratings indicated as follows:
   a. 5-inch in doors indicated to have closers and overhead stops
   b. Blocking is not required in structural composite lumber core doors

D. Smoke and Draft Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784 for I occupancy projects.

## 2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Aesthetic Grade: Custom, with Grade A faces
2. Species**: Veneer**
3. Cut: **Rotary cut**
4. Match between Veneer Leaves: **Slip** match.
5. Assembly of Veneer Leaves on Door Faces: Center balanced match.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Vertical Edges: Matching / Compatible Veneer edge band over structural composite lumber
8. Core: Extra Heavy-Duty Particle Board
9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.

## 2.4 LIGHT FRAMES

~~A. Metal Vision Frames for Light Openings:~~
~~1. 18 gauge cold-rolled steel~~

~~2. Through-bolted through the door~~
~~3. Bite: Minimum 3/8" overlap~~
~~4. Finish: **Powder-coated** finish; and approved for use in doors of fire-protection rating indicated.~~
~~5. All Metal Stamping-118D or 118~~

## 2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

~~C. Openings:~~

~~1. Light Openings: Factory cut and install with vision kits indicated above.~~
~~1. Glass: Factory install glass in doors per manufacturer's instructions.~~
~~a. Non-rated glass to be Armoured One AOTSG516~~
~~b. 20-minute glass to be Armoured One AOSTG1016FR-45~~
~~c. 45-minute glass to be Armoured One AOSTG1016FR-45~~

## 2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

B. Finish:

1. Grade: Premium
2. Finish: Primed & Painted
3. Staining / Painting Color: White
4. Sheen: Satin

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 Door Hardware.

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

1. Install fire-rated doors according to NFPA 80.
2. Install smoke- and draft-control doors according to NFPA 105.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide1/4 inch from bottom of door to top of threshold unless otherwise indicated.

    a. Comply with NFPA 80 for fire-rated doors.
    b. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.

2. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

## 3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

**END OF SECTION**

# SECTION 08 3100
# ACCESS DOORS AND PANELS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Wall access door and frame units.

B. Ceiling access door and frame units.

### 1.02 RELATED REQUIREMENTS

A. Section 09 9000 - Painting and Coating: Field paint finish.

### 1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate installation with work of other trades.

### 1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

## PART 2 PRODUCTS

### 2.01 ACCESS DOOR AND PANEL APPLICATIONS

A. Walls, Unless Otherwise Indicated:
   1. Material: Steel.
   2. Size: 12 x 12 inches (300 x 300 mm), unless otherwise indicated.
   3. Standard duty, hinged door.
   4. Tool-operated spring or cam lock; no handle.
   5. In All Wall Types: Surface mounted face frame and door surface flush with frame surface.

B. Walls in Wet Areas:
   1. Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.
   2. Size: 12 x 12 inches (300 x 300 mm), unless otherwise indicated.
   3. Standard duty, hinged door.
   4. Tool-operated spring or cam lock; no handle.
   5. In All Wall Types: Surface mounted face frame and door surface flush with frame surface.

C. Ceilings, Unless Otherwise Indicated: Same type as for walls.
   1. Size in Lay-in Grid Ceilings: To match grid module.
   2. Size in Other Ceilings: 12 x 12 inches (300 x 300 mm), unless otherwise indicated.

### 2.02 WALL AND CEILING UNITS

A. Manufacturers:
   1. Acudor Products Inc: www.acudor.com.
      a. Units in Walls, Unless Otherwise Indicated: ACUDOR ADWT.
   2. Cendrex, Inc: www.cendrex.com.
      a. Units in Walls, Unless Otherwise Indicated: Cendrex CTA, contoured cover concealing frame, hingeless with magnetic cover attachments, adjustable frame size.
   3. Karp Associates, Inc: www.karpinc.com.
   4. Milcor by Commercial Products Group of Hart & Cooley, Inc: www.milcorinc.com.

B. Access Doors: Factory fabricated door and frame units, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.

1. Door Style: Single thickness with rolled or turned in edges.
2. Steel Finish: Primed.
3. Primed Finish: Polyester powder coat; manufacturer's standard color.
4. Hardware:
    a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

### 3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings. Secure rigidly in place.

C. Position units to provide convenient access to the concealed work requiring access.

**END OF SECTION**

# SECTION 08 3323
# OVERHEAD COILING DOORS

## PART 1 – GENERAL

### 1.01 SECTION INCLUDES

A. Electrically operated overhead coiling doors

B. Guides, brackets, barrel assemblies, slat curtain, hood, bottom bar

C. Electric operators and controls

D. Accessories and related components

### 1.02 RELATED REQUIREMENTS:

A. 05 50 00 – Metal Fabrications
B. 09 90 00 – Painting and Coating
C. 26 05 00 – Common Work Results for Electrical

### 1.03 REFERENCE STANDARDS

A. ASTM A653/A653M – Steel Sheet, Zinc-Coated (Galvanized)

B. ASTM A36/A36M – Structural Steel

C. NFPA 70 – National Electrical Code

D. UL 325 – Door, Drapery, Gate, Louver, and Window Operators and Systems

### 1.04 SUBMITTALS

A. Product Data: Manufacturer’s specifications and installation instructions.

B. Shop Drawings:

1. Door elevations
2. Mounting details and connection requirements
3. Rough opening dimensions

C. Samples: Manufacturer’s full range of standard finish colors

D. Operation and Maintenance Data

E. Manufacturer’s Warranty

### 1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 years’ experience in overhead coiling door production

B. Installer Qualifications: Approved by manufacturer

C. Regulatory Requirements:

1. Comply with UL 325 for motorized operators
2. Conform to NFPA 70 for electrical installations

### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors in manufacturer's labeled packaging.

B. Store to prevent damage or distortion.

C. Protect finished surfaces from damage and weather exposure.

### 1.07 WARRANTY

A. Manufacturer's Standard Warranty: Minimum 1 year on materials and workmanship.

B. Operator Warranty: Minimum 10 years.

## PART 2 – PRODUCTS

### 2.01 MANUFACTURERS

A. Basis of Design: Overhead Door Corporation

B. Cornell-Cookson

C. Raynor

D. Wayne Dalton

E. Or Approved Equal

### 2.02 OVERHEAD COILING DOORS

A. Curtain Slats:

1. Interlocking flat or curved galvanized steel slats
2. Minimum 22-gauge steel
3. Finish: Factory-applied baked enamel or powder coat, color as selected.

B. Bottom Bar:

1. Two-angle steel or extruded aluminum
2. Continuous resilient astragal for tight sill seal

C. Guides:

1. Formed steel channels with wear strips
2. Sized to resist specified wind loads.

D. Barrel/Drum:

1. Steel pipe designed to minimize deflection
2. Accommodates counterbalance system integral with operator

E. Hood:

1. Formed galvanized steel, minimum 24 gauge
2. Fully encloses coiled curtain

### 2.03 ELECTRIC OPERATORS

A. Duty Rating: Heavy-duty, UL 325-listed.

B. Motor: 115/230V single-phase or 208/230/460V three-phase (as scheduled).

C. Controls:

1. Three-button constant-pressure wall station (open/close/stop)
2. Key switch or security override as indicated
3. Remote Control Operation and integration with building security system

D. Safety Devices:

1. Photoelectric sensors
2. Electric sensing edge
3. Automatic reversing capability upon obstruction detection.

### 2.04 ACCESSORIES

A. Weather Seals:

1. Bottom, guides, and head as standard.

B. Vision Panels: Not required unless scheduled.

C. Wind Load Design: Manufacturer’s standard wind load rating to suit project location.

### 2.05 FINISHES

A. Curtain and Exposed Metal:

1. Galvanized steel with factory-applied baked enamel or powder-coat finish
2. Color: To be selected from manufacturer’s full standard color range.

## PART 3 – EXECUTION

### 3.01 EXAMINATION

A. Verify opening dimensions and conditions.

B. Confirm that substrates are plumb, level, and capable of supporting loads.

### 3.02 INSTALLATION

A. Install in strict accordance with manufacturer’s instructions and approved shop drawings.

B. Secure assemblies to structure to resist operational and wind loads.

C. Coordinate electrical connections and ensure compliance with NEC.

D. Ensure safe, smooth, and quiet operation.

### 3.03 ADJUSTING AND CLEANING

A. Adjust for balanced, smooth operation.

B. Lubricate all moving parts according to the manufacturer's recommendations.

C. Clean all exposed surfaces.

### 3.04 DEMONSTRATION

A. Demonstrate operation to Owner's personnel.

B. Provide complete maintenance and operation instructions.

**END OF SECTION**

**SECTION 08 3463**

**DETENTION DOORS AND FRAMES**

## PART 1 – GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Steel detention doors:

a. Solid flush or panel-type

b. Bar/grille-type.

2. Welded steel detention frames

3. Hardware reinforcement and preparations

4. Shop prime painting

B. Related Sections:

1. 05 50 00 – Metal Fabrications (security screens, grilles)

2. 08 71 00 – Door Hardware (including detention-grade hardware)

3. 09 91 00 – Painting (field finishing)

### 1.2 REFERENCES

A. ASTM A653/A653M – Zinc-coated steel sheet.

B. ASTM A36/A36M – Structural Steel.

C. ANSI/NAAMM HMMA 861 – Guide for Detention Steel Doors.

D. ANSI/NAAMM HMMA 862 – Guide for Detention Steel Door Frames.

E. HMMA 863 – Installation of Detention Locking Systems.

### 1.3 SUBMITTALS

A. Product Data: Manufacturer’s data for doors, frames, bar/grille options, hardware preps.

B. Shop Drawings:

1. Elevations of all doors (solid and grille types)

2. Details of bar/grille construction if selected

3. Hardware locations and reinforcements

4. Anchorage details.

C. Samples (if requested):

1. Cut sections of door or frame

2. Primer finish sample

D. Warranty Documentation

**1.4 QUALITY ASSURANCE**

A. Manufacturer Qualifications:

1. 5+ years experience in detention-grade fabrication

2. Conformance with HMMA standards

B. Installer Qualifications:

1. 3+ years experience installing detention doors and frames

2. Familiar with detention-grade hardware

C. Pre-Installation Conference (optional):

1. Coordinate door/frame types and hardware with Owner and Architect.

**1.5 DELIVERY, STORAGE, AND HANDLING**

A. Deliver doors and frames with protective packaging and blocking.

B. Store in secure, dry location off ground.

C. Protect from corrosion and damage.

**1.6 WARRANTY**

A. Manufacturer’s standard 1-year warranty covering defects in materials and workmanship.

**PART 2 – PRODUCTS**

**2.1 MANUFACTURERS**

A. Basis of Design:

1. RR Brink, Trussbilt, Southern Folger, U.S. Security Systems, or approved equivalent

B. Substitutions:

1. Allowed per Division 01 requirements with prior approval

**2.2 MATERIALS**

A. Steel Sheet: ASTM A653/A653M, commercial-quality, galvanized.

B. Structural Steel: ASTM A36/A36M where required.

C. Hardware Reinforcements: 7 gauge minimum.

D. Stiffeners/Infill for Solid Doors: Continuous vertical steel stiffeners, mineral wool or sound-deadening fill.

E. Bars/Grilles (if selected): Solid steel bars, minimum 3/4" diameter or flat bar profiles per manufacturer's standards.

**2.3 DOOR TYPES**

A. General:

1. Door types (solid flush/panel or bar/grille) to be determined by Owner

2. All doors factory-assembled, welded, and shop primed.

B. Solid Doors:

1. Thickness: 1-3/4" nominal

2. Minimum 12 gauge face sheets

3. Fully welded perimeter, continuous internal stiffeners

4. Hardware preps for detention locks, hinges, closers.

C. Bar/Grille Doors (If Selected):

1. Fully welded steel bar construction per manufacturer's detention design

2. Vertical bars spaced per security requirement (typ. 5" max clear spacing)

3. Perimeter frame: 2" x 2" minimum welded steel tubing

4. Integrated hinge and lock reinforcement

5. Factory-applied primer finish.

**2.4 FRAME CONSTRUCTION**

A. Material: Minimum 12 gauge galvanized steel.

B. Profile: Single or double rabbet as shown.

C. Welded corners, ground smooth.

D. Hardware reinforcements:

1. 7 gauge hinge and strike preps

2. Additional reinforcements for detention locks

E. Anchors:

1. Welded or adjustable anchors for CMU or stud walls

2. Floor anchors as required

F. Grout Guards: Welded in place for masonry installations.

G. Finish: Factory-applied rust-inhibitive primer.

**2.5 ACCESSORIES**

A. Silencers: 3 per strike jamb (for solid doors).

B. Temporary spreaders.

C. Anchors compatible with wall substrate.

**2.6 FABRICATION**

A. Fully welded construction, no visible seams on exposed faces.

B. Hardware preps per schedule and shop drawings.

C. Doors and frames square, true, and reinforced for security hardware.

D. Factory primer applied to all surfaces after fabrication.

**PART 3 – EXECUTION**

**3.1 EXAMINATION**

A. Verify openings are correct size, plumb, level, and properly prepared.

B. Confirm backing and blocking is installed as needed.

C. Report any conditions preventing proper installation.

**3.2 INSTALLATION**

A. Install per manufacturer's instructions and HMMA 863.

B. Plumb and level frames, securely anchored to structure.

C. Grout fill masonry frames as required.

D. Coordinate door installation with hardware integrators.

E. Protect frame interiors from grout or plaster.

**3.3 FIELD FINISHING**

A. Prepare and finish per Section 09 91 00.

B. Touch up any field welding or damaged primer.

**3.4 ADJUSTING AND CLEANING**

A. Clean surfaces of dirt, oil, and debris.

B. Adjust doors to swing freely and latch securely with detention hardware.

C. Replace any damaged components.

**3.5 PROTECTION**

A. Protect installed doors and frames from construction damage.

B. Replace or repair damaged units as directed.

**END OF SECTION**

# SECTION 08 4313
# ALUMINUM-FRAMED STOREFRONTS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

### 1.02 RELATED REQUIREMENTS

A. Section 07 9005 - Joint Sealers: Perimeter sealant and back-up materials.

B. Section 08 8000 - Glazing: Glass and glazing accessories.

### 1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; American Architectural Manufacturers Association; 2012.

B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 2012.

C. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels; 2013.

D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

E. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2013.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

### 1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, dimensional limitations.

E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

### 1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the State in which the Project is located.

B. Manufacturer and Installer Qualifications: Company specializing in manufacturing aluminum glazing systems with minimum three years of documented experience.

### 1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

### 1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

### 1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

C. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

## PART 2 PRODUCTS

### 2.01 FRAMING FOR INSULATING GLAZING

A. Front-Set Style, Thermally-Broken:
   1. Basis of Design: Basis of Design Efco, 526 or YKK, YHS 50 FS.
   2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. C.R. Laurence Co., Inc; U.S. Aluminum: www.crl-arch.com.
   2. EFCO, a Pella Company: www.efcocorp.com.
   3. YKK AP America Inc: www.ykkap.com.

### 2.02 CONCEALED FRAME WINDOWS

A. Concealed vent, Thermally-Broken:
   1. Basis of Design:
   2. Mullion Dimensions: 1-13/16” wide by 2-3/4 inches deep.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. C.R. Laurence Co., Inc; U.S. Aluminum: www.crl-arch.com.
   2. EFCO, a Pella Company: www.efcocorp.com.
   3. YKK AP America Inc: www.ykkap.com.

### 2.03 SWINGING DOORS

A. Narrow Stile, Insulating Glazing, Thermally-Broken:
   1. Basis of Design: Kawneer Company, Inc., 350 Standard Entrances.
   2. Thickness: 2-1/4 inches (57.1 mm).

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. C.R. Laurence Co., Inc; U.S. Aluminum: www.crl-arch.com.
   2. EFCO, a Pella Company: www.efcocorp.com.
   3. YKK AP America Inc: www.ykkap.com.

### 2.04 STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Finish: Class I natural anodized.

a. Factory finish all surfaces that will be exposed in completed assemblies.
b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
3. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
4. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
5. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
6. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
7. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

## 2.05 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.
   2. Glazing stops: Flush.

B. Glazing: As specified in Section 08 8000 - Glazing.
   1. For Exterior Framing: Type G-8 or G-9.

C. Swing Doors: Glazed aluminum.
   1. Finish: Same as storefront.

D. Operable Sash: Aluminum project-out awning; structural silicone glazed concealed frame, finished to match storefront; pivot shoe roto-operator, insect screen with full wicket.

## 2.06 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209 (ASTM B209M).

C. Fasteners: Stainless steel.

D. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

## 2.07 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating or AAMA 612 clear anodic coating with electrolytically deposited organic seal; not less than 0.7 mils (0.018 mm) thick.

B. Pigmented Organic Coating System: AAMA 2603; polyester or acrylic baked enamel finish.

## 2.08 HARDWARE

A. Other Door Hardware: Storefront manufacturer's standard type to suit application.
   1. Finish on Hand-Contacted Items: Polished chrome.
   2. For each door, include butt hinges, pivots, push handle, pull handle, exit device, narrow stile handle latch, and closer.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

### 3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Coordinate attachment and seal of perimeter air and vapor barrier materials.

I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

J. Install operating sash.

K. Set thresholds in bed of mastic and secure.

L. Install hardware using templates provided.

M. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

### 3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft (1.5 mm/m) non-cumulative or 1/16 inches per 10 ft (1.5 mm/3 m), whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

### 3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for independent testing and inspection requirements. Inspection will monitor quality of installation and glazing.

### 3.05 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

### 3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

### 3.07 PROTECTION

A. Protect installed products from damage during subsequent construction.

**END OF SECTION**

**SECTION 08 4523**

**FIBERGLASS SANDWICH PANEL WALL SYSTEM**

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes the insulated, translucent sandwich panel system and accessories as shown and specified. Work includes providing and installing:

1. **Flat** insulated, translucent sandwich panels
2. Aluminum clamptite installation system
3. Aluminum sill flashing

B. Related Sections:

1. **<Insert Related Sections>**

### 1.2 SUBMITTALS

A. Submit manufacturer's product data. Include construction details, material descriptions, profiles, and finishes of components.

B. Submit shop drawings. Include plans, elevations, and details.

C. Submit manufacturer's color charts showing the full range of colors available for factory finished exposed aluminum.

1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below.
   a. Sandwich panels: 7" x 12" units
   b. Factory finished aluminum: 3" long sections.

D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.

E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.

1. Reports required (if applicable) are:
   a. Flame Spread and Smoke Developed (UL 723) – Submit UL Card
   b. Burn Extent (ASTM D 635)
   c. Color Difference (ASTM D 2244)
   d. Impact Strength (UL 972)
   e. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
   f. Bond Shear Strength (ASTM D 1002)

g. Beam Bending Strength (ASTM E 72)
h. Insulation U-Factor (NFRC 100)
i. NFRC System U-Factor Certification (NFRC 700)
j. NFRC Visible Light Transmittance (NFRC 202)
k. Solar Heat Gain Coefficient (NFRC or Calculations)
l. Condensation Resistance Factor (AAMA 1503) (Thermally Broken, insulated panels only)
m. Air Leakage (ASTM E 283)
n. Structural Performance (ASTM E 330)
o. Water Penetration (ASTM E 331)
p. Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure (ASTM E2707)

## 1.3 CLOSEOUT SUBMITTALS

A. Provide field maintenance manual to include in project maintenance manuals.

## 1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope, and location. At least three of the projects shall have been in successful use for ten years or longer.
2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural, and water infiltration testing of sandwich panel systems by an accredited agency.
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components, and production sandwich panels for conformance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES.

B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing Kalwall panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope, and type.

## 1.5 PERFORMANCE REQUIREMENTS

A. The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.

1. When requested, include span analysis data.
2. Standard panel system shall have less than 0.01 cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
3. Structural Loads. Provide system capable of handling the following loads:

a. Positive Wind Load (PSF): **<40> PSF Ultimate.**

B. Deflection Limits:

1. Walls: Limited to **L/60** of clear span for each assembly component.

C. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 110 deg F (43 deg C), ambient; 150 deg F (66 deg C), material surfaces.

## 1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver panel system, components, and materials in manufacturer's standard protective packaging.

B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

## 1.7 WARRANTY

A. Material and Workmanship: 5 Years
1. Panel Warranties:
    1) 10 Year Limited Warranty covering separation of faces from grid core affecting structural strength, noticeable surface fiber exposure of the exterior panel face, and /or abnormal color change in the exterior face sheet.
    2) 20 Year Limited Warranty against FIBERBLOOM, external exposure of the reinforcing glass fibers.
2. Finish Warranty: **10** years from date of delivery.
3. Provide manufacturer's and installer's written warranties agreeing to repair or replace panel system work, which fails in material or workmanship, within one year from the date of delivery. Failure of material or workmanship shall include deterioration of finish on metal in excess of normal weathering; and defects in accessories; insulated, translucent sandwich panels; and other components of the work.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURER

A. The basis for this specification is for products manufactured by Kalwall Corporation. Other manufacturers may bid this project subject to compliance with the performance requirements of this specification and submission of evidence thereof. Listing other manufacturers' names in this specification does not constitute approval of their products or relieve them of compliance with all the performance requirements contained herein.

B. Kalwall Corporation, Mark Zaremba Tel: (860) 604-9781– Email: mzaremba@kalwall.com

C. Apollo Industries, Stafford, TX

D. Enduro Composites, Houston, TX

## 2.2 PANEL COMPONENTS

A. Face Sheets:

1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
   a. **Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.**
   b. Face sheets shall not deform, deflect, or drip when subjected to fire or flame.
2. Interior face sheets:
   a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than **50** and smoke developed no greater than 450 when tested in accordance with UL 723.
   b. Burn extent by ASTM D 635 shall be no greater than 1”.
3. Exterior face sheets:
   a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after **5** years outdoor South Florida weathering at 5° facing south as measured on a white sample, with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
   Strength: Exterior face sheet shall be uniform in strength, impenetrable by handheld pencil and repel an impact minimum of **70 ft. lbs.** without fracture or tear when impacted by a 3-1/4” diameter, 5 lb. free-falling ball per UL 972.
   b. Erosion Protection: Integral, embedded-glass erosion barrier.
4. Appearance:
   a. Exterior face sheet: Smooth, **.070 thick and Chrystal SW** in color.
   b. Interior face sheet: Smooth, .**045” thick and White S-171** in color.
   c. Face sheets shall not vary more than ± 10% in thickness and be uniform in color.

B. Grid Core:

1. **Thermally Broken Composite** I-beam grid core shall be of alloy and temper recommended by manufacturer with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16”.
2. I-beam Thermal break: Minimum 1”, thermoset fiberglass composite. **Poured and de-bridged thermal break is not acceptable.**

C. Laminate Adhesive:

1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council “Acceptance Criteria for Sandwich Panel Adhesives".
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
   a. 50% Relative Humidity at 68° F: 540 PSI

b. 182° F: 100 PSI
c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

## 2.3 PANEL CONSTRUCTION

A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.

1. **Thickness: 2-3/4 inches**
2. Grid Core Insulation: Fill panel cores with **fiberglass batt.**
3. Panel U-factor by NFRC certified laboratory:
   a. **2-3/4" thermally broken grid 0.23 U-Factor**
4. Complete insulated panel system shall have NFRC certified U-factor of 0.29.
5. Visible Light Transmittance (VLT):
   a. Visible LT (NFRC 202) by NFRC certified laboratory: 26%.
6. Solar heat gain coefficient 0.30
7. Grid pattern as viewed: **Nominal size 24"x12"; pattern Shoji**

B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10'-0" span without a supporting frame by ASTM E 72.

C. Panels shall meet the conditions of acceptance according to ASTM E2707 Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure:
1. Absence of flame penetration through the wall assembly at any time.
2. Absence of evidence of glowing combustion on the interior surface of the assembly at the end of the 60-min observation period.
3. Absence of evidence of flame, glow, and smoke if the test is terminated prior to the completion of the 60-min observation period.

D. Thermally broken, insulated panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.

## 2.4 ALUMINUM CLAMPTITE INSTALLATION SYSTEM

A. Aluminum clamptite installation system:
1. **2¾" Thermal Strut System-Flat** Thermally Broken closure system: Thermal barrier shall consist of polyamide thermal strut construction with multi-directional glass fiber reinforcing. Aluminum components shall be mechanically crimped into cross knurled cavities. Poured and de-bridged thermal break is not acceptable**.**

B. Sealing tape: Manufacturer's standard, pre-applied to aluminum clamptite installation system at the factory under controlled conditions.

C. Fasteners: 300 series stainless steel screws for aluminum clamptite installation system, excluding final fasteners to the building.

D. Finish:

1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be **selected from manufacturer's standards.**

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Installer shall examine substrates, supporting structure, and installation conditions.

B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by sealant manufacturer for this purpose.
2. Where aluminum will contact concrete, masonry, or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by sealant manufacturer.

### 3.3 INSTALLATION

A. Install the panel system in accordance with the manufacturer's fabrication drawings and suggested installation instructions.

1. Anchor component parts securely in place by permanent mechanical attachment system.
2. Accommodate thermal and mechanical movements.
3. Seal aluminum clamptite installation system as shown on the manufacturer’s fabrication drawings and suggested installation instructions.

B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturers fabrication drawings and suggested installation instructions.

### 3.4 FIELD QUALITY CONTROL

A. Water Test: Installer to test a representative section of installed materials according to procedures in AAMA 501.2.

B. Repair or replace work that does not pass testing or that is damaged by testing and retest work.

### 3.5 CLEANING

A. Clean the panel system, interior and exterior, immediately after installation.

B. Refer to manufacturer's written recommendations.

**END OF SECTION**

SECTION 08 51 13 - ALUMINUM WINDOWS

PART 1 GENERAL

1.2 DESCRIPTION OF WORK

A. The work of this section includes, but is not limited to, the following:

1. Aluminum windows, fixed and dual-swing type.
2. Oversize aluminum glazing assemblies.

1.3 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

| | | |
|---|---|---|
| 1. | Section 04 20 00 | Unit Masonry |
| 2. | Section 05 40 00 | Cold-Formed Metal Framing |
| 3. | Section 06 10 00 | Rough Carpentry |
| 4. | Section 07 27 16 | Sheet Membrane Air Barriers |
| 5. | Section 07 92 00 | Joint Sealants |
| 6. | Section 08 81 00 | Glass and Glazing |

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that windows comply with specified requirements. Product data for each type of window required, shall include:

1. Construction details and fabrication methods.
2. Profiles and dimensions of individual components.
3. Data on hardware, accessories, and finishes.
4. Recommendations for maintenance and cleaning of exterior surfaces.

B. Shop Drawings: Provide large scale shop drawings for fabrication, installation and erection of all parts of the work. Provide plans, elevations, and details of anchorages, connections and accessory items. Provide installation templates for work installed by others. Show all interfaces and relationships to work of other trades. Include information not fully detailed in manufacturer's standard product data and the following:

1. Layout and installation details, including anchors.

2. Elevations of continuous work at 1/4 inch scale and typical window unit elevations at 3/4 inch scale.
3. Full-size section details of typical composite members, including reinforcement.
4. Glazing details.
5. Accessories.

C. Certification: Provide certification by a recognized independent testing laboratory or agency showing that each type, grade, and size of window unit complies with performance requirements indicated.

D. Initial Selection Samples: Submit samples showing complete range of colors, textures, and finishes available for each material used.

E. Verification Samples: Submit representative samples of each material that is to be exposed in the completed work. Show full color ranges and finish variations expected. Provide samples having minimum size of 144 sq. in.

1.5 QUALITY ASSURANCE

A. Source: For each material type required for the work of this section, provide primary materials which are the product of one manufacturer. Provide secondary or accessory materials which are acceptable to the manufacturers of the primary materials.

B. Installer: A firm with a minimum of five years experience in type of work required by this section and which is acceptable to the manufacturers of the primary materials.

C. Design Requirements: Comply with structural performance, air infiltration, and water penetration requirements indicated in AAMA GS-001 for type, grade, and performance class of window units required.

D. Indications of section sizes and reinforcement on the Drawings are for design intent only. Manufacturer shall provide proper structural design and anchorage.

E. Mock-Up: Mock-up of exterior wall is required. Comply with requirements of Section 01 43 39, Mock-Ups.

1.6 TESTS AND PERFORMANCE REQUIREMENTS

A. Manufacturer's Standard Tests: Provide manufacturer's standard test data showing compliance with specified requirements.
1. Glazing is affected by an alternate. If the alternate is accepted, glass shall be double glazed insulated glass in accordance with requirements of Section 08 81 00 and thermal conductance (U-value) requirements revised accordingly. All other performance requirements will remain unchanged.

B. Test products to AAMA/WDMA/CSA 101/I.S.2/A440-17 North American Fenestration Standard. Performance to meet or exceed AW-PG70-DAW Dual Action Tilt/Turn and Fixed Windows.

C. Test Sequence: Test sequence is optional, except that air infiltration tests shall precede water resistance tests.

D. Air Infiltration Test: With window sash and ventilators closed and locked, test unit in accordance with ASTM E 283, as follows:

1. Static Air Pressure Difference: 5% of specified Design Wind Pressure, but never less than 6.24 pounds per square foot.
2. Air Infiltration: Air infiltration shall not exceed 0.02 cfm/sq.ft. for fixed units or 0.10 cfm/sq.ft. for operable units when tested in accordance with ASTM E 283.

E. Water Leakage Test: Test unit in accordance with ASTM E 547, with four test cycles, each cycle consisting of five minutes with pressure applied, and one minute of pressure released, during which time the water spray will be continuously applied.

1. Test Pressure: Not less than 15 pounds per square foot.
2. Performance: No leakage as defined in the test method at the specified test pressure.
3. Water Infiltration: Window shall allow no water penetration when tested in accordance with ASTM E 331.

F. Uniform Load Deflection Test: Test units in accordance with ASTM E 330, at the following static air pressure difference (100 psf positive and negative Design Wind Pressure), or the loads prescribed by code for this project site, whichever is greater. Apply pressure first to the exterior side (positive) and then the interior side (negative).

1. Test Procedure: Procedure A at 150% of Design Wind Pressure as specified in ASTM E 330.
2. Performance: Deflection in each member measured at locations of greatest deflection shall not exceed L/175 of member span at the specified Design Wind Pressure.
3. All intermediates, vertical, and horizontal members, including meeting rails must handle Design Wind Pressure at L/175 deflection with no change in sightline or system depth to that which is detailed.

F. Uniform Load Structural Test: Test units in accordance with ASTM E 330, at the following static air pressure difference (100 psf positive and negative Design Wind Pressure for Windows, 50 psf positive and negative Design Wind Pressure for oversized CW assemblies), or the loads prescribed by code for this project site, whichever is greater. Apply pressure first to the exterior side (positive) and then the interior side (negative).

1. Test Procedure: Procedure A at 150% of Design Wind Pressure as specified in ASTM E

330.

2. Performance: No failure or permanent deformation.

G. Condensation Resistant Factor: Per AAMA 1503.1, value not less than 55.

H. Thermal Movement: Provide window systems that allow for expansion and contraction of members throughout an ambient temperature range of 120$^{O}$F.

I. Thermal Transmittance:
1. Provide window units that have a U-value maximum 0.19 rated in BTU/hour/sq. ft./degrees F at 15-mph exterior wind velocity, when tested in accordance with AAMA 1503.1. Test unit to be 4 ft. x 6 ft.
2. Provide window units that have a maximum solar heat gain coefficient (SHGC) of 0.39.

J. Field Leakage Test: The Owner reserves the right to employ an independent testing agency to perform in-place field tests for water leakage. Complete on-site window mock-up and surrounding wall construction at earliest possible date in order that any problems or failures can be identified before majority of windows have been installed. Field test will include a prolonged water spray test. Any uncontrolled water leakage will be considered a failure. Contractor shall pay for all remedial work and all retesting due to failures.

1.7 PROJECT CONDITIONS

A. Weather: Perform work of this Section only when existing or forecasted weather conditions are within the limits established by manufacturers of the materials and products used.

B. Substrates: Proceed with work only when substrate construction and penetration work is complete.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Store under cover and protect from weather damage.

B. Sequence deliveries to avoid delays but minimize on-site storage.

1.9 WARRANTIES

A. Aluminum Windows and Related Materials: Provide a written warranty, signed by the manufacturer agreeing to repair or replace work which exhibits defects in materials or workmanship, including all extrusions, weatherstripping, panning, and trim, and all hardware. Defects" is defined to include, but not limited to, leakage of water, abnormal aging or deterioration, abnormal deterioration or fading of finishes, and failure to perform as

required. Include requirement for removal and replacement of windows and connected

adjacent work.

1. Windows: Manufacturer shall warrant for five years against defects in material and workmanship under normal use.
2. Insulating Glass Units: Glass manufacturer shall warrant seal for ten years against visual obstruction from film formation or moisture collection between internal glass surfaces, excluding that caused by glass breakage or abuse.
3. Powder Paint Finish: Finish conforming to AAMA 2605 shall be warranted for twenty years against checking, cracking, chalking, or fading.

## PART 2 PRODUCTS

### 2.1 WINDOW AND GLAZING SYSTEMS

A. Basis-of-Design Product:
Windows: Raynaer Aluminum Masterline 8 series, AW-PG100
Oversize aluminum glazing assemblies: Raynaer Aluminum Concept Wall CW50 series

### 2.2 MATERIALS AND PRODUCTS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required

B. Thermal Barrier: The thermal barrier shall consist of integral structural thermal break made with glass-reinforced nylon strips installed continuously and mechanically bonded to the aluminum.

C. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.

D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

E. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC3 severe service conditions; provide sufficient strength to withstand design pressure indicated. F. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, non-shrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement..

### 2.3 GLAZING

A. Glass shall be triple glazed insulated glass in accordance with requirements of Section 08 81 00.

B. Factory glaze windows and doors.

2.4 FABRICATION

A. Fabricate windows and doors to be truly straight, plumb, level and square, within tolerances permitted by reference standards.

B. Fabricate work to sizes, shapes, and profiles indicated on Contract Documents and approved shop drawings.

C. Fabricate work with uniform, tight hairline joints, free from sharp edges.

D. Provide manufacturer's structural thermal break made with glass reinforced nylon strips installed continuously and mechanically bonded to the aluminum frame. Comply with AAMA TIR A8. Fabricate frames to prevent water from coming in contact with sealed edges of insulating glass.

E. Windows shall be re-glazable without dismantling sash or framing.

2.5 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash weight and dimensions.

B. Dual Action Window Typical Hardware:
1. Concealed Handle: Handle to be concealed within the sash stile; First motion turn inward, second motion tilt inward.
2. Handle Finish: Painted to match interior window color.
3. Hinges: Concealed Stainless Steel Hinges..

2.6 FINISH

A. Finish: AAMA 2605, Coating: Superior Performance Powder coating: One-coat dry system with resin containing 70% fluoropolymer; thermosetting;.
1. Color as indicated on finish schedule and to match Architect's sample.

PART 3 EXECUTION

3.1 INSPECTION

A. The Installer/Erector shall examine substrates, supports, and conditions detrimental to the

proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning of installation will be construed as installer accepting substrates and conditions.

3.2 INSTALLATION

A. General Installation Requirements: Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this section.

B. Installation: Install window units plumb, level, in alignment and plane without warp or rack. Anchor securely in place.

C. Dissimilar Materials: Isolate all dissimilar metals. Comply with ANSI/AAMA 101, Appendix.

D. Sealants: Install sills and subframes in a thick bed of sealant. Comply with applicable requirements of Section 07 92 00, Joint Sealers.

E. Flashing: Coordinate with flashing installation to ensure weathertight construction and assembly. Thoroughly seal all penetrations through flashings with thick bed of sealant. Comply with applicable requirements of Section 07 60 00, Flashing and Sheet Metal.

F. Air barriers: Coordinate with air barrier installation to ensure proper termination for continuous barrier.

3.3 TOLERANCES

A. The following allowable installed tolerances are allowable variations from locations and dimensions indicated by the Contract Documents. Do not add these tolerances to any allowable tolerances indicated for other work.

1. Allowable Variation from True Plumb, Line and Level: $\pm$ 1/8 in. in 20 ft.-0 in.

3.4 ADJUSTING, CLEANING, TOUCH-UP, AND PROTECTION

A. Clean exposed surfaces using manufacturer recommended materials and methods. Remove and replace work which cannot be successfully cleaned.

B. Touch-up damaged coatings and finishes. Eliminate all visible evidence of repair.

C. Provide temporary protection at all times during the course of the work, and immediately after completion to ensure the work of this Section is not damaged or deteriorated in any way at time of final acceptance. Remove temporary protections and reclean as necessary immediately prior to final acceptance.

END OF SECTION

3.8 DOOR HARDWARE SCHEDULE

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. Hardware Sets:

**Set 1.0**
Not Used

**Set 2.0**
Not Used

**Set 2.1**
Exterior Egress (Existing)
Doors: D005, D006, D007
3 Hinge
1 Rim Exit Device (Passage)
1 Door Closer
1 Overhead Stop
1 Perimeter Seals (heads & jambs)
1 Door Bottom
1 Threshold
1 Magnetic Lock w/ Bond Sensor, Request to Exit
1 Card Reader
1 Emergency Exit Button
NOTE: Coordinate new door hardware with existing door and/or frame preps.

**Set 2.2**
Exterior Egress (Existing)
Doors: D001, D002, D003, D004
3 Hinge
1 Rim Exit Device (Storeroom)
1 Door Closer (as needed)
1 Overhead Stop
1 Kick Plate
1 Perimeter Seals (heads & jambs)
1 Door Bottom (as needed)
1 Door Position Switch
NOTE: Coordinate new door hardware with existing door and/or frame preps.

**Set 3.0**
Not Used

**Set 3.1**
Record Storage (Fire-Rated)
Doors: D038
3 Hinge
1 Cylindrical Lock (Passage)
1 Door Closer
1 Wall/Floor Stop
1 Perimeter Seals (heads & jambs)
1 Magnetic Lock
1 Card Reader
1 Request to Exit
1 Emergency Exit Button

**Set 3.2**
Interview, Hallway (Fire-Rated)
Doors: D009, D010, D040, D041, D124
3 Hinge
1 Cylindrical Lock (Passage)
1 Overhead Stop
1 Perimeter Seals (heads & jambs)
1 Magnetic Lock w/ Bond Sensor
1 Card Reader
1 Request to Exit
1 Emergency Exit Button

**Set 3.3**
Interview, Hallway, Weapons
Doors: D026, D027, D029, D103
3 Hinge
1 Cylindrical Lock (Passage)
1 Overhead Stop
3 Silencer
1 Magnetic Lock w/ Bond Sensor
1 Card Reader
1 Emergency Exit Button
1 Request to Exit

**Set 3.4**
Stair (Existing)
Doors: D139
1 Cylindrical Lock (Passage)
1 Wrap-around Plate (as needed)
1 Door Closer
1 Overhead Stop
3 Silencer
1 Magnetic Lock w/ Bond Sensor
1 Card Reader
1 Request to Exit
1 Emergency Exit Button
NOTE: Coordinate new door hardware with existing door and/or frame preps.

**Set 4.0**
Not Used

**Set 5.0**
Electrical, Storage, Interview, IT, Closet (Existing)
Doors: D020, D035, D101, D102, D111, D134, D137
1 Cylindrical Lock (Storeroom)
1 Wrap-around Plate (as needed)
1 Wall Stop
3 Silencer
NOTE: Coordinate new door hardware with existing door and/or frame preps.

**Set 5.1**
Expansion Tank, Utility, Storage, Janitor
Doors: D014, D032, D042, D106
3 Hinge
1 Cylindrical Lock (Storeroom)
1 Wall/Floor Stop
3 Silencer

**Set 5.2**
Expansion Tank (Fire-Rated)
Doors: D021
3 Hinge
1 Cylindrical Lock (Storeroom)
1 Door Closer
1 Wall/Floor Stop
3 Perimeter Seals (head & jambs)

**Set 6.0**
Storage (Pair)
Doors: D135
6 Hinge
1 Manual Flush Bolt Set (inactive leaf)
1 Cylindrical Lock (Storeroom) (active leaf)
2 Silencer

**Set 6.1**
Storage (Pair)
Doors: D136
6 Hinge
1 Manual Flush Bolt Set (inactive leaf)
1 Cylindrical Lock (Passage) (active leaf)
2 Silencer

**Set 7.0**
Conference, Hall (Existing)
Doors: D118, D125, D131
1 Cylindrical Lock (Classroom)
1 Wrap-around Plate (as needed)
1 Wall/Floor Stop
3 Silencer
NOTE: Coordinate new door hardware with existing door and/or frame preps.

**Set 8.0**
Detectives
Doors: D112
3 Hinge (as needed)
1 Cylindrical Lock (Office)
1 Wrap-around Plate (as needed)
3 Silencer
NOTE: Coordinate new door hardware with existing door and/or frame preps.

**Set 8.1**
Lieutenant, Command Lobby, Misc. Offices
Doors: D107, D113, D114, D115, D116, D117, D128, D129
3 Hinge
1 Cylindrical Lock (Office)
1 Wall/Floor Stop
3 Silencer

**Set 9.0**
Bathroom
Doors: D104, D105, D122, D123
3 Hinge
1 Cylindrical Lock (Privacy)
1 Door Closer
1 Wall/Floor Stop
3 Silencer
NOTE: Verify swing direction of door meet ADA requirements.

**Set 9.1**
Bathroom (Existing)
Doors: D034
3 Hinge
1 Cylindrical Lock (Privacy)
1 Wrap-around Plate (as needed)
1 Door Closer
1 Wall/Floor Stop
3 Silencer
NOTE: Coordinate new door hardware with existing door and/or frame preps. Verify swing direction of door meet ADA requirements.

**Set 10.0**
Storage, Roll Call, Stair, Dispatch, Break
Doors: D030, D031, D037, D109, D110, D138
3 Hinge (as needed)
1 Cylindrical Lock (Passage)
1 Wrap-around Plate (as needed)
3 Silencer
NOTE: Coordinate new door hardware with existing door and/or frame preps.

**Set 10.1**
Lobby, Hallway, Multi-purpose (Fire-Rated)
Doors: D008, D100, D119, D120
3 Hinge (as needed)
1 Cylindrical Lock (Passage)
1 Door Closer
1 Overhead Stop
1 Perimeter Seals (head & jambs)

**Set 10.2**
Interview, Hallway, Prisoner Processing, Closet, Storage
Doors: D011, D012, D015, D016, D019, D039, D121, D126, D127, D130, D132, D133
3 Hinge (as needed)
1 Cylindrical Lock (Passage)
1 Door Closer
1 Overhead Stop

3 Silencer

**Set 11.0**
Not Used

**Set 12.0**
Locker Room
Doors: D028, D033
3 Hinge
1 Push Plate
1 Pull Plate
1 Door Closer
1 Wall/Floor Stop
3 Silencer

**Set X**
Detention Hardware
Doors: D013, D017, D018, D022, D023, D024, D025
All Door Hardware by Door Manufacturer

**END OF SECTION**

# SECTION 08 7100
# FINISH HARDWARE

## PART 1 - GENERAL

### 1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.02 SUMMARY

A. Section Includes

1. Furnishing and installation of all mechanical finish hardware necessary for all doors, and hardware as specified herein and as enumerated in hardware sets and as indicated and required by actual conditions at the building. The hardware shall include the furnishing of all necessary screws, bolts, expansion shields, drop plates, and all other devices necessary for the proper application of the hardware. Installation shall include field modification and preparation of existing doors and/or frames for new hardware being installed. Provide necessary fillers, Dutchmen, reinforcements, and fasteners for mounting new hardware and to cover existing door/frame preps.

B. Related Sections

1. Division 6 Section - Finish Carpentry

2. Division 8 Section - Wood Doors

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere, unless specifically listed in the hardware sets:

1. Windows

2. Cabinets of all kinds, including open wall shelving and locks.

3. Signage, except as noted.

4. Complete toilet accessories including coat hooks, unless note otherwise.

5. Overhead doors, unless noted otherwise.

### 1.03 REFERENCES

A. Applicable state and local building codes and standards.

B. FIRE/LIFE SAFETY

1. NFPA - National Fire Protection Association

a. NFPA 70 – National Electric Code
b. NFPA 80 - Standard for Fire Doors and Fire Windows
c. NFPA 101 - Life Safety Code
d. NFPA 105 - Smoke and Draft Control Door Assemblies

C. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies

2. UL 10C - Positive Pressure Test of Fire Door Assemblies

3. UL 1784 - Air Leakage Tests of Door Assemblies

4. UL 305 - Panic Hardware

D. Accessibility

1. ADA - Americans with Disabilities Act

2. Rhode Island Accessibility Code – SBC-14, 15, 16

E. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule

2. Recommended Locations for Builders Hardware

F. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties

**1.04 SUBMITTALS**

A. General: Submit the following in accordance with Conditions of Contract and Division 1 requirements. Prior to submittal field verify existing doors and/or frames receiving new hardware and/or existing conditions receiving new openings. Verify new hardware is compatible with the existing door/frame preparation and/or existing conditions. Advise architect within the submittal package of incompatibility or issues.

B. Catalog Cuts: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Final Hardware Schedule Content: Submit schedule with hardware sets in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, Include the following information:

1. Door Index; include door number, heading number, and Architects hardware set number.

2. Opening Lock Function Spreadsheet; list locking device and function for each opening.

3. Type, style, function, size, and finish of each hardware item.

4. Name and manufacturer of each item.

5. Fastenings and other pertinent information.

6. Location of each hardware set cross-referenced to indications on Drawings.

7. Explanation of all abbreviations, symbols, and codes contained in schedule.

8. Mounting locations for hardware.

9. Door and frame sizes and materials.

10. Name and phone number for the local manufacturer's representative for each product.

11. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and/or access control components). Operational description should include how the door will operate on egress, ingress, and/or fire/smoke alarm connection.

D. Key Schedule: After a keying meeting between representatives of the Owner, Architect, hardware supplier, and, if requested, the representative for the lock manufacturer, provide a keying schedule, listing the levels of keying, as well as an explanation of the key system's function, the key symbols used, and the door numbers controlled. Utilize ANSI A156.28 “Recommended Practices for Keying Systems” as a guideline for nomenclature, definitions, and approach for selecting the optimal keying system.

E. Samples: If requested by the Architect, submit production sample or sample installations as requested of each type of exposed hardware unit in the finish indicated, and tagged with a full description for coordination with the schedule.

1. Samples will be returned to the supplier in like-new condition. Units that are acceptable to the Architect may, after final check of operations, be incorporated into the Work, within limitations of key coordination requirements.

F. Templates: After final approval of the hardware schedule, provide templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware.

G. Riser and Wiring Diagrams: After final approval of the hardware schedule, submit riser and wiring diagrams as required for the proper installation of complete electrical, electromechanical, and electromagnetic products.

H. Operations and Maintenance Data: Provide in accordance with Division 01 and include the following:

1. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.

2. Catalog pages for each product.

3. Name, address, and phone number of local representative for each manufacturer.

4. Parts list for each product.

5. Copy of final approved hardware schedule, edited to reflect “As installed.”

6. Copy of final keying schedule.

7. As installed “Wiring Diagrams” for each opening connected to power, both low voltage and 110 volts.

8. One (1) complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

9. Copy of warranties including appropriate reference numbers for manufacturers to identify the project.

I. Certificates of Compliance: Upon request of Architect or Authority Having Jurisdiction certificates of compliance for fire-rated hardware and installation instructions shall be made available.

## 1.05 QUALITY ASSURANCE

A. Substitutions: Products are to be those specified to ensure a uniform basis of acceptable materials. Requests for substitutions must be made in accordance with Division 1 requirements. If proposing a substitute product, submit product data for the proposed item with product data for the specified item and indicate basis for substitution and savings to be made. Provide sample if requested. Certain products have been selected for their unique characteristics and particular project suitability.

1. Items specified as "no substitute” shall be provided exactly as listed.

2. Items listed with no substitute manufacturers listed have been requested by the Owner or Architect to match existing for continuity and/or future performance and maintenance standards or because there is no known equal product.

3. If no other products are listed in a category, then "no substitute" is implied.

B. Supplier Qualifications: A recognized architectural hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides a certified Architectural Hardware Consultant (AHC) available to the Owner, Architect, and Contractor, at reasonable times during the course of the Work for consultation.

C. Single Source Responsibility: Obtain each type of hardware (latch and locksets, hinges, exit devices, closers, etc.) from a single manufacturer.

D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwrites Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to the authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

E. Electronic Security Hardware: When electrified hardware is included in the hardware specification, the hardware supplier must employ an individual knowledgeable in electrified components and systems, who is capable of producing wiring diagrams and consulting as needed. Coordinate installation of the electronic security hardware with the Architect and electrical engineers and provide installation and technical data to the Architect and other related subcontractors. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

## 1.06 DELIVERY, STORAGE, AND HANDLING

A. Tag each item or package separately with identification related to the final hardware schedule and include installation instructions with each item or package.

B. Each article of hardware shall be individually packaged in manufacturer's original packaging.

C. Contractor will provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

D. Items damaged in shipment shall be replaced promptly and with proper material and paid for by whomever did the damage or caused the damage to occur.

E. Hardware shall be handled in a manner to avoid damage, marring, or scratching. Irregularities that occur to the hardware after it has been delivered to the Project shall be corrected, replaced, or repaired by the Contractor. Hardware shall be protected against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. No direct shipments will be allowed unless approved by the Contractor.

**1.07 WARRANTY**

A. Provide manufacturer's warrantees as specified in Division 1 and as follows:

1. Closers: 10 years

2. Locksets: 3 years

3. Other hardware: 1 year.

B. No liability is to be assumed where damage or faulty operation is due to improper installation, improper use, or abuse.

C. Products judged to be defective during the warranty period shall be replaced or repaired in accordance with the manufacturer's warranty, at no additional cost to the Owner.

**1.08 MAINTENANCE**

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

A. The Awarding Authority has determined that certain products should be selected for their unique characteristics and particular project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: “No Substitute” (NO OTHER PRODUCTS WILL BE CONSIDERED FOR THOSE LISTED IN PROJECTS DOCUMENTS.)

B. Approval of manufacturers other than those listed shall be in accordance with paragraph 1.05.A.

C. Note that even though an acceptable substitute manufacturer may be listed, the product must provide all the functions and features of the specified product, or it will not be approved.

| Item | Scheduled Manufacturer | Acceptable Substitute |
|---|---|---|
| Hinges | Assa Abloy | NO SUBSTITUTE |
| Locksets | Assa Abloy | NO SUBSTITUTE |
| Stops & Holders | Assa Abloy | NO SUBSTITUTE |
| Cylinders & Keying | Assa Abloy | NO SUBSTITUTE |

D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

E. Where the hardware specified is not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having the same operation and quality as the type specified, subject to the Architect's approval.

## 2.02 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.

2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.

3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent that no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Review door specification and advise Architect if thru-bolts are required.

4. Hardware shall be installed with the fasteners provided by the hardware manufacturer.

B. Hinges

1. Provide five-knuckle, ball bearing hinges of type, material, and height as outlined in the following guide for this specification:

a. 1-3/4-inch-thick doors, up to and including 36 inches wide:
Exterior: standard weight, bronze/stainless steel, 4-1/2 inches high
Interior: standard weight, steel, 4-1/2 inches high
b. 1-3/4-inch-thick doors over 36 inches wide:
Exterior: heavy weight, bronze/stainless steel, 5 inches high
Interior: heavy weight, steel, 5 inches high
c. 2 inches or thicker doors:
Exterior: heavy weight, bronze/stainless steel, 5 inches high
Interior: heavy weight, steel, 5 inches high

2. Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.

3. Where new hinges are specified for existing doors and/or existing frames, the new hinge size must be identical to hinge preparation present in the existing door and/or existing frame.

4. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins

5. The width of hinges shall be 4-1/2 inches at 1-3/4-inch-thick doors, and 5 inches at 2 inches or thicker doors. Adjust hinge width as required for door, frame, and/or wall conditions to allow proper degree of opening.

6. Provide hinges with electrified option where specified. Provide with sufficient number and gage of concealed wires to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to the electrified locking component.

7. Provide mortar guard for each electrified hinge specified, unless specified in hollow metal frame specification.

8. Acceptable manufacturers and/or products: Ives 5BB series, Hager BB series, Stanley FBB Series.

~~C. Cylindrical Locks - Grade 1~~

1. Provide cylindrical locks conforming to ANSI A156.2 Series 4000, Grade 1. Cylinders: Refer to 2.04 KEYING.

2. Provide solid steel rotational stops to control excessive rotation of the lever.

3. Lockset to be completely refunctionable. Lockset design shall allow function of lock to be changed into over twenty other common functions by swapping easily accessible parts.

4. Provide locks with a standard 2-3/4 inches backset, unless noted otherwise, with a 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.

5. Provide locksets with a separate anti-rotation throughbolts and shall have no exposed screws. Levers shall operate independently and shall have two external return spring cassettes mounted under roses to prevent lever sag.

6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.

7. Lever trim shall be solid cast levers without plastic inserts, and wrought roses on both sides. Locksets shall be thru-bolted to assure proper alignment.

   ~~a. Lever design shall be Schlage Rhodes.~~
   ~~b. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.~~

8. Acceptable manufacturers and/or products: Schlage ND series, No Substitute.

D. Door Stops and Holders

1. Provide door stops for all doors in accordance with the following requirements:

    a. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
    b. Where wall stops cannot be used, provide dome type floor stops of the proper height.
    c. At any opening where a wall or floor stop cannot be used, a medium duty surface mounted overhead stop shall be used.

2. Acceptable manufacturers and/or products: Assa Abloy's Product Lines.

~~E. Silencers~~

1. Provide "Push-in" type silencers for each hollow metal or wood frame. Provide three for each single frame and two for each pair frame. Omit where gasketing is specified or required by code.

2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

**2.03 FINISHES**

A. Finish of all hardware shall be US26D (BHMA 626/652) with the exceptions as follows:

~~**2.04 KEYING**~~

~~A. Provide cores and cylinders for the Owner's Existing Schlage Everest D Restricted Conventional Core, key system conforming to the following requirements:~~

1. Provide restricted patented conventional cylinders at al keyed devices, locksets, and exit device cylinder dogging. Restricted shall control the access to the products by requiring a signed letter of authorization and/or authorization form from the Owner or authorized agent of the Owner. Patent shall protect against the unauthorized manufacturing and duplication of the products. Restricted patented cylinders shall not be operable by non-patented key blanks. Restricted patented cylinders shall incorporate a mechanism to check for the patented features on the keys. Provide Split Key Construction Keys for use during construction. The hardware supplier, accompanied by the Owner or Owner's security agent, shall remove all Construction Inserts upon completion of the building.

2. Provide permanent cores and cylinders keyed by the manufacturer or authorized distributor into the existing key system as directed by the Owner. Provide owner with a copy of the bitting list, return receipt requested.

3. The hardware supplier, accompanied by a qualified factory representative for the manufacturer of the cores and cylinders, shall meet with Owner and Architect to review keying requirements and lock functions prior to ordering finish hardware. Submit a keying schedule to Architect for approval.

4. Provide keys as follows

    ~~a. Ten grand master keys for each set.~~
    ~~b. Ten master keys for each set.~~
    ~~c. Three keys per core and/or cylinder.~~
    ~~d. Six extractor tools.~~
    ~~e. Six split key construction keys for each type (Contractor is to provide one set of split key construction keys to Architect).~~

5. Visual key control:

   a. ~~Keys shall be stamped with their respective key set number and stamped "DO NOT DUPLICATE".~~
   b. ~~All keys shall be stamped with their respective key set letters.~~
   c. ~~Do not stamp any keys with the factory key change number.~~
   d. ~~Do not stamp any cores with key set on face (front) of Core. Stamp on back or side of cores so not to be visible when core is in cylinder.~~

6. Deliver all keys and/or key blanks from the factory or authorized distributor directly to the Owner in sealed containers, return receipt requested. Failure to comply with these requirements may be cause to require replacement of all or any part of the keying system that was compromised at no additional cost to the Owner.

7. Approved products: Schlage Everest D Restricted, No Substitute.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Prior to installation of any hardware, examine all doors, frames, walls, and related items for conditions that would prevent proper installation of finish hardware. Correct all defects prior to proceeding with installation.

### 3.02 INSTALLATION

A. Coordination:

1. Prior to installation of hardware, schedule and hold a meeting for the purpose of instructing installers on proper installation and adjustment of finish hardware. Representatives of locks, exit devices, closers, automatic operators, and electrified hardware shall conduct training; provide at least 10 days notice to representatives. After training a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.

2. Prior to ordering electrified hardware, schedule and hold a meeting for the purpose of coordinating finish hardware with security, electrical, doors and frames, and other related suppliers. A representative of the supplier of finish hardware, and doors and frames, the electrical subcontractor, and the Owner's security contractor shall meet with the Owner, Architect, and General Contractor prior to ordering finish hardware. After meeting a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.

B. Hardware will be installed by qualified tradesmen, skilled in the application of commercial grade hardware. For technical assistance, if necessary, installers may contact the manufacturer's rep for the item in question, as listed in the hardware schedule.

C. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.

D. Install each hardware item in compliance with the manufacturer's instructions and recommendations, using only the fasteners provided by the manufacturer.

E. Do not install surface mounted items until finishes have been completed on the substrate. Protect all installed hardware during painting.

F. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

G. Operating parts shall move freely and smoothly without binding, sticking, or excessive clearance.

H. Existing Doors and/or Frames: Remove existing hardware being replaced, tag, and store according to contract documents. Field modify and prepare existing door and/or frame for new hardware being installed. Provide necessary fillers, Dutchmen, reinforcements, and fasteners for mounting new hardware and to cover existing door/frame preps.

I. Wire (including low voltage), conduit, junction boxes, and pulling of wire is by Division 16, Electrical. Electrical Contractor shall connect wire to door position switches and run wire to central room or area as directed by the Architect. Wires shall be tested and labeled with the Architects opening number. Connections to/from power supplies to electrified hardware and any connection to fire/smoke alarm system, and/or smoke evacuation system where specified is by Division 16 Electrical.

## 3.03 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door, to insure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.

B. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make a final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Clean adjacent surfaces soiled by hardware installation.

D. Instruct Owner’s personnel in the proper adjustment, lubrication, and maintenance of door hardware and hardware finishes.

## 3.04 FIELD QUALITY CONTROL

A. Prior to Substantial Completion, the installer, accompanied by representatives of the manufacturers of locks, exit devices, closer, and any electrified hardware, shall perform the following work:

1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.

2. Consult with and instruct Owner’s personnel in recommended additions to the maintenance procedures.

3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.

4. Prepare a written report of current and predictable problems of substantial nature in the performance of the hardware.

5. At completion of project, a qualified factory representative for the manufacturers of locksets, closer, exit devices, and access control products shall arrange and hold a training session to instruct the Owner’s personnel on the proper maintenance, adjustment, and/or operation of their respective products. After training a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.

## 3.05 PROTECTION

A. Provide for the proper protection of complete items of hardware until the Owner accepts the project as complete. Damaged or disfigured hardware shall be replaced or repaired by the responsible party.

## 3.06 HARDWARE SCHEDULE

A. Provide hardware for each door to comply with requirements of Section “Finish Hardware,” hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.

B. It is intended that the following schedule includes complete items of finish hardware necessary to complete the work. If a discrepancy is found in the schedule, such as a missing item, improper hardware for a frame, door or fire codes, the preamble will be the deciding document.

C. Locksets, exit devices, and other hardware items are referenced in the Hardware Sets for series, type, and function. Refer to the preamble for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets: To be provided by the contractor for the Architect’s review.

**END OF SECTION**

# SECTION 08 8100
# EXTERIOR GLAZING

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Glass in exterior assemblies not factory glazed.
B. Glazing compounds and accessories.
C. Glass requirements for factory glazed assemblies when referenced.

### 1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers.
B. Section 07 9005 - Joint Sealers: Sealants for other than glazing purposes.
C. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.
D. Section 08 1613 - Fiberglas Doors: Glazed lites in fiberglas doors.
E. Section 08 4229.23 – Sliding Automatic Entrances: Glazing furnished as part of door assembly.
F. Section 08 4313 – Aluminum-framed Storefront: Glazing furnished by wall manufacturer.
G. Section 08 5413 - Fiberglass Windows: Glazing furnished by window manufacturer.
H. Section 08 6300 - Metal-Framed Skylights: Glazing furnished by skylight manufacturer.
I. Section 08 8000 – Glazing for interior doors and framed openings.
J. Section 08 8300 - Mirrors.
K. Section 08 8813 – Fire-Resistant Glazing: Glazing for fire rated openings
L. Section 13 4900 - Radiation Protection: Lead glass.

### 1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
C. ASTM C1036 - Standard Specification for Flat Glass; 2011e1.
D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
E. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.
F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
G. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2012a.
H. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.
I. GANA (SM) - GANA Sealant Manual; Glass Association of North America; 2008.
J. ICC (IBC) - International Building Code; 2012.

## PART 2 PRODUCTS

### 2.01 GLAZING UNITS

A. Type IG-1 - Sealed Insulating Glass Units: Vision glazing, with Low-E coating.
   1. Application: All exterior glazing unless otherwise indicated, including lites without type indicated.
   2. Between-lite space filled with argon.
   3. Thermal Resistance (U-Value): as required by IgCC model.

4. Basis of Design: PPG Industries, Inc: www.ppgideascapes.com.
5. Outboard Lite: Annealed float glass, 1/4 inch (6 mm) thick, minimum.
   a. Low-E Coating: PPG Solarban 67 on #2 surface.
   b. Coating: No coating on outboard lite.
   c. Tint: Clear.
6. Inboard Lite: Annealed float glass, 1/4 inch (6 mm) thick.
   a. Coating: No coating on inboard lite.
   b. Tint: Clear.
7. Total Thickness: 1 inch (25 mm).
8. Total Visible Light Transmittance: 85% percent, nominal.

B. Type IG-2 Sealed Insulating Glass Units: Safety glazing.
   1. Application: Provide this type of glazing in the following locations:
      a. Glazed lites in exterior doors.
      b. Glazed sidelights and panels next to doors.
      c. Other locations required by applicable federal, state, and local codes and regulations.
      d. Other locations indicated on the drawings.
   2. Features: Same as IG-1 except use fully tempered float glass for both outboard and inboard lites.
   3. Tint: Clear.

F. Type IG-3 – Daylight Optimizing Glazing: Translucent, showing shadows but not forms. Designed to project sunlight deeper into the space.
   1. Application: Glazed lites in exterior in exterior window in multi-purpose room clerestory.
   2. Type: Solera Sealed Insulating glass units as basis of design. Type L R2.2.
   3. Thickness: 1 inch.

A. Type IG-4 - Sealed Insulating Glass Units: Translucent glazing.
   1. Application: Provide this type of glazing in the following locations:
      a. Glazed lites in exterior upper dormer windows at hubs and neighborhoods.
   2. Outboard Lite: Same as IG-1
   3. Inboard Lite: 1/4” laminated glazing
      a. Tint: Clear.
      b. Laminating layer color to be white.
   4. Total Thickness: 1 inch (25 mm).

## 2.02 EXTERIOR GLAZING ASSEMBLIES

A. Performance Criteria: Select type and thickness of glass to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Design Pressure: Calculated in accordance with applicable codes.
   2. Use the procedure specified in ASTM E1300 to determine glass type and thickness.
   3. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
   4. Glass thicknesses listed are minimum.

B. Air and Vapor Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier:
   1. In conjunction with vapor retarder and joint sealer materials described in other sections.
   2. To maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

## 2.03 GLASS MATERIALS

A. Glass Manufacturers:
   1. Cardinal Glass Industries: www.cardinalcorp.com.
   2. Guardian Industries Corp: www.sunguardglass.com.

3. Cardinal Glass Industries: www.cardinalcorp.com
4. Pilkington North America Inc: www.pilkington.com/na.
5. Viracon, Architectural Glass segment of Apogee Enterprises, Inc: www.viracon.com.
6. PPG Industries, Inc: www.ppgideascapes.com. Basis of Design.
7. Advanced Glazings Limited, www.advancedglazings.com.

B. Float Glass: Provide float glass based glazing unless noted otherwise.
1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.
2. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and Kind FT.
3. Tinted Types: ASTM C1036, Class 2 - Tinted, color and performance characteristics as indicated.
4. Thicknesses: As indicated; for exterior glazing comply with requirements indicated for wind load design regardless of thickness indicated.

C. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
1. Laminated Safety Glass: Comply with 16 CFR 1201 test requirements for Category II.
2. Plastic Interlayer:
a. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch (0.762 mm) thick, minimum.
b. Ionoplast Interlayer: 0.035 inch (0.889 mm) thick, minimum.

## 2.04 SEALED INSULATING GLASS UNITS

A. Manufacturers:
1. Any of the manufacturers specified for float glass.
2. Fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

B. Sealed Insulating Glass Units: Types as indicated.
1. Application: Exterior, except as otherwise indicated.
2. Durability: Certified by an independent testing agency to comply with ASTM E2190.
3. Edge Spacers: Aluminum, bent and soldered corners.
4. Edge Seal: Glass to elastomer with supplementary silicone sealant.
5. Purge interpane space with dry hermetic air.

## 2.05 GLAZING COMPOUNDS

A. Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; grey color.

B. Butyl Sealant: Single component; ASTM C920, Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

C. Polysulfide Sealant: Two component; chemical curing, non-sagging type; ASTM C920, Type M, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

D. Polyurethane Sealant: Single component, chemical curing, non-staining, non-bleeding; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 20 to 35; white color.

E. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; clear color.

## 2.06 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) x width of glazing rabbet space minus 1/16 inch (1.5 mm) x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch (75 mm) long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; hardness range of 5 to 30 cured Shore A durometer; coiled on release paper; black color.
   1. Width: As required for application.
   2. Thickness: As required for application.
   3. Spacer Rod Diameter: As required for application.

D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; white color.

E. Glazing Clips: Manufacturer's standard type.

**2.07 SOURCE QUALITY CONTROL**

A. See Section 01 4000 - Quality Requirements, for additional requirements.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

**3.02 PREPARATION**

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

D. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.

E. Install sealants in accordance with manufacturer's instructions.

**3.03 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)**

A. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.

B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

C. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

**3.04 INSTALLATION - EXTERIOR DRY METHOD (TAPE AND GASKET SPLINE GLAZING)**

A. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.

E. Trim protruding tape edge.

**3.05 INSTALLATION - EXTERIOR WET/DRY METHOD (PREFORMED TAPE AND SEALANT)**

A. Cut glazing tape to length and set against permanent stops, 3/16 inch (5 mm) below sight line. Seal corners by butting tape and dabbing with butyl sealant.

B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.

D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.

E. Install removable stops, with spacer strips inserted between glazing and applied stops 1/4 inch (6.4 mm) below sight lines.
   1. Place glazing tape on glazing pane of unit with tape flush with sight line.

F. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch (9 mm) below sight line.

G. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

**3.06 CLEANING**

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

D. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

**3.07 PROTECTION**

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

**END OF SECTION**

# SECTION 09 2116
# GYPSUM BOARD ASSEMBLIES

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Metal stud wall framing.

B. Gypsum wallboard.

C. Joint treatment and accessories.

### 1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 07 9200 - Joint Sealants: Sealing gaps in construction other than gypsum board or plaster work.

### 1.03 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.

B. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014.

C. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2015.

D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.

E. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.

F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.

G. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.

H. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014a.

I. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2015.

J. GA-216 - Application and Finishing of Gypsum Board; 2013.

### 1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

## PART 2 PRODUCTS

### 2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

## 2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. Clarkwestern Dietrich Building Systems LLC; www.clarkdietrich.com.
   2. Marino; www.marinoware.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf (L/120 at 240 Pa).
   1. Studs: "C" shaped with flat or formed webs with knurled faces.
   2. Runners: U shaped, sized to match studs.

## 2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company; www.americangypsum.com.
   2. Georgia-Pacific Gypsum; www.gpgypsum.com.
   3. National Gypsum Company; www.nationalgypsum.com.
   4. USG Corporation; www.usg.com.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Thickness:
      a. Vertical Surfaces: 5/8 inch (16 mm).
   3. Paper-Faced Products:
      a. American Gypsum Company; LightRoc Gypsum Wallboard.
      b. Georgia-Pacific Gypsum; ToughRock.

C. Impact Resistant Wallboard:
   1. Application: High-traffic areas indicated.
   2. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
   3. Soft Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
   4. Paper-Faced Type: Gypsum wallboard as defined in ASTM C1396/C1396M.
   5. Thickness: 5/8 inch (16 mm).
   6. Edges: Tapered.

## 2.04 ACCESSORIES

A. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel, or rolled zinc, unless noted otherwise.
   1. Corner Beads: Low profile for tape embedment, for 90 degree outside corners and archways.
   2. J-Beads: for tape embedment, at all joints to dissimilar materials

B. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
   2. Ready-mixed vinyl-based joint compound.

C. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.

D. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion resistant.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

### 3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Studs: Space studs at 16 inches on center (at 406 mm on center).
   1. Extend partition framing to structure where indicated and to ceiling in other locations.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

C. Blocking: Install wood blocking for support of:
   1. Wall mounted door hardware.
   2. Visual Display Monitors
   3. White boards

### 3.03 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Installation on Metal Framing: Use screws for attachment of gypsum board.

### 3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim (J Bead): Install at locations where gypsum board abuts dissimilar materials.

### 3.05 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

**END OF SECTION**

# SECTION 09 2216
# NON-STRUCTURAL METAL FRAMING

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Metal partition, ceiling, and soffit framing.

B. Framing accessories.

### 1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking within stud framing.

B. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

C. Section 08 3100 - Access Doors and Panels.

D. Section 09 2116 - Gypsum Board Assemblies: Metal studs for gypsum board partition framing.

### 1.03 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.

B. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.

D. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2013.

E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2011.

G. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007 (Reapproved 2013).

H. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

I. ASTM E413 - Classification for Rating Sound Insulation; 2010.

### 1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
   2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.

C. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

### 1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:
   1. CEMCO: www.cemcosteel.com.
   2. Clarkwestern Dietrich Building Systems LLC: www.clarkdeitrich.com.
   3. Marino: www.marinoware.com.
   4. Simpson Strong Tie: www.strongtie.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

### 2.02 FRAMING MATERIALS

A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf (240 Pa).
   1. Studs: C shaped with flat or formed webs with knurled faces.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C shaped.
   4. Furring: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).

B. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

C. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
   1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
   2. Material: ASTM A653/A653M steel sheet, SS Grade 50, with G60/Z180 hot dipped galvanized coating.

D. Tracks and Runners: Same material and thickness as studs, bent leg retainer notched to receive studs with provision for crimp locking to stud.

E. Furring and Bracing Members: Of same material as studs; thickness to suit purpose; complying with applicable requirements of ASTM C754.

F. Fasteners: ASTM C1002 self-piercing tapping screws.

G. Anchorage Devices: Powder actuated.

H. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: fill wall cavity.

I. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board. Refer to section 07 9005 Joint Sealers.

### 2.03 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members to suit design requirements.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

### 3.02 INSTALLATION OF STUD FRAMING

A. Comply with requirements of ASTM C754.

B. Extend partition framing to structure where indicated and to ceiling in other locations.

C. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

D. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

E. Align and secure top and bottom runners at 24 inches (600 mm) on center.

F. At partitions indicated with an acoustic rating:
   1. Provide components and install as required to produce STC rating of 45-49, based on published tests by manufacturer conducted in accordance with ASTM E90 with STC rating calculated in accordance with ASTM E413.
   2. Place one bead of acoustic sealant between runners and substrate, studs and adjacent construction.
   3. Place one bead of acoustic sealant between studs and adjacent vertical surfaces.

G. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

H. Install studs vertically at 16 inches (400 mm) on center.

I. Align stud web openings horizontally.

J. Secure studs to tracks using crimping method. Do not weld.

K. Fabricate corners using a minimum of three studs.

L. Double stud at wall openings, door and window jambs, not more than 2 inches (50 mm) from each side of openings.

M. Brace stud framing system rigid.

N. Coordinate erection of studs with requirements of door frames; install supports and attachments.

O. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

P. Blocking: Use wood blocking secured to studs. Provide blocking for support of plumbing fixtures.

### 3.03 CEILING AND SOFFIT FRAMING

A. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

B. Install furring independent of walls, columns, and above-ceiling work.

C. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

D. Space main carrying channels at maximum 72 inch (1 800 mm) on center, and not more than 6 inches (150 mm) from wall surfaces. Lap splice securely.

E. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

F. Place furring channels perpendicular to carrying channels, not more than 2 inches (50 mm) from perimeter walls, and rigidly secure. Lap splices securely.

G. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches (600 mm) past each opening.

H. Laterally brace suspension system.

**3.04 TOLERANCES**

A. Maximum Variation From True Position: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation From Plumb: 1/8 inch in 10 feet (3 mm in 3 m).

**END OF SECTION**

# SECTION 09 3000
# TILING

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Complete ceramic tile work.

### 1.2 RELATED SECTIONS:

A. Gypsum wallboard construction - Section 09 2116.

### 1.3 QUALITY ASSURANCE:

A. ANSI A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
B. ANSI A108.10 - Installation of Grout in Tilework.
C. ANSI A118.4 - Latex-Portland Cement Mortar.
D. ANSI A118.6 - Ceramic Tile Grouts.
E. ANSI A137.1 - Specifications for Ceramic Tile.

### 1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's descriptive literature of setting and grouting materials in accordance with Section 01 3300.
B. Samples: Submit following samples for approval and selection of colors:
   1. Manufacturer's selected colors for each type of tile.
   2. Grout colors.
C. Certificates: Manufacturer's certification that materials meet Specification requirements, including master grade certificates for tile in accordance with ANSI A137.1.
D. Maintenance Data: Compile and submit maintenance instructions in accordance with Section 01730. Include complete manufacturer's instructions for care, cleaning and maintenance of tile and grout products.

### 1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials in unbroken, manufacturer's original sealed containers and store in dry, protected area.
B. Tile cartons bearing brand name and contents, and grade-sealed in accordance with ANSI A137.1.

### 1.6 PROJECT CONDITIONS:

A. Environmental: Set and grout tile when temperature is minimum 50° F. and rising.
B. Protection: Protect adjacent work surfaces before tile work begins.

## PART 2 - PRODUCTS

### 2.1 CERAMIC FLOOR TILE:

A. Qualities: Standard-grade quality.

1. Color: As Specified

B. Standard: Section 5.1, ANSI A137.1.

C. Source: As Specified

**2.2 TRIM UNITS:**

A. Qualities: As required for complete installation.

B. Standard: Section 5.1, ANSI A137.1.

C. Source: Same as floor tile.

**2.3 RELATED MATERIALS:**

A. Flexible Latex-Portland Cement Mortar: ANSI A118.4, Kera-Bond Dry-set Mortar with undiluted Keralastic Liquid Polymer Additive by Mapei Corp.

B. Grout: Polymer-modified Portland cement grout, ANSI A118.6, Ker 800 by Mapei Corp. Color as selected.

C. Water: Potable.

D. Joint Sealant: As specified in Section 07920.

E. Joint Backing: Closed-cell foam polyethylene.

**2.4 MIXES:**

A. Flexible, Latex-Portland Cement Mortar: Mix in accordance with manufacturer's recommendations.

B. Grout: Mix in accordance with manufacturer's recommendations.

**PART 3 - EXECUTION**

3.1 EXAMINATION AND PREPARATION OF SURFACES:

A. Examine surfaces to receive tile for defects or conditions that would prevent quality installation of tile.

B. Examine surfaces to receive tile for deviations beyond allowable surface tolerances:

1. Dry-Set, Latex-Portland Cement Mortar Methods:

a. Maximum variation in sub-floor surface: 1/8 in. in 10 ft.

b. Maximum variation in vertical surfaces: 1/8 in. in 8 ft.

C. Do not proceed until defects are corrected. Installation of work constitutes acceptance of surfaces to receive tile.

D. Condition of surfaces to receive tile:

1. Surfaces firm, dry, clean and free of oily or waxy films.

2. Grounds, anchors, plugs, hangers, bucks, electrical and mechanical work in or behind tile installed prior to tile installation.

**3.2 LAYING OUT TILE WORK:**

A. Layout tile work on walls so that no tiles less than half size occur.

**3.3 INSTALLATION:**

A. Allowable Tolerances: Completed work shall be within following tolerances, plus or minus within specified distance, non-cumulative:

1. Wall Areas: True to plane within 1/8 in. in 8 ft.

2. Corners, Intersections of Planes: Plumb and square, 1/8 in. in 8 ft.

B. Ceramic Tile: Prepare surface, fit, set, grout and clean in accordance with applicable requirements of reference standards:
   1. Install wall tile with flexible latex-portland cement mortar: ANSI A108.5
C. Grout: Grout tile in accordance with ANSI A108.10 and grout manufacturer's recommendations. Leave grout smooth and uniform in color without voids or pinholes.

**3.4 PROTECTION AND CURING:**

A. Damp cure grouts a minimum of 72 hours after grouting. Maintain minimum 40°F. temperature.
B. Close areas to traffic until tile is firmly set. Provide adequate barricades.

3.5 CLEANING:

A. Sponge and wash tile thoroughly, diagonally across joints. Polish with clean dry cloths and leave thoroughly clean. Use of acid is prohibited.

End of Section

# SECTION 09 5100
# SUSPENDED ACOUSTICAL CEILINGS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

### 1.02 RELATED REQUIREMENTS

A. Section 23 3700 - Air Outlets and Inlets: Air diffusion devices in ceiling.

B. Section 26 5100 - Interior Lighting: Light fixtures in ceiling system.

### 1.03 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2013a.

B. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

### 1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on suspension system components.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Basis-of-Design: Armstrong World Industries, Inc; www.armstrong.com.
   2. CertainTeed Corporation; www.certainteed.com.
   3. USG; www.usg.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Suspension Systems:
   1. Basis-of-Design: Armstrong World Industries, Inc; www.armstrong.com.
   2. CertainTeed Corporation; www.certainteed.com.
   3. USG; www.usg.com.

C. ~~Cloud System:~~
   ~~1. Basis of Design: Armstrong Axiom Trim~~

### 2.02 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Tile Type III: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:
   1. Size: 24 by 24 inches
   2. Thickness: 3/4 inches
   3. Edge: Square.
   4. Surface Color: White.
   5. Products:
      a. Armstrong ULTIMA Health Zone

### 2.03 SUSPENSION SYSTEM(S)

A. Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

B. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; intermediate-duty.
   1. Profile: Tee; 15/16 inch (24 mm) wide face.
   2. Construction: Double web.
   3. Finish: White painted.

### 2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Armstrong Axiom Trim or equal, 8” profile as detailed or square edge if not shown. White.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

### 3.02 INSTALLATION - SUSPENSION SYSTEM

A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

B. Locate system on room axis according to reflected plan.

C. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

D. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

G. Support fixture loads using supplementary hangers located within 6 inches (150 mm) of each corner, or support components independently.

H. Do not eccentrically load system or induce rotation of runners.

### 3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Install units after above-ceiling work is complete.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

**END OF SECTION**

# SECTION 09 5610
# FLOORING PREPARATION

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. This section applies to all floors identified in the contract documents as to receive the following types of floor coverings:

1. Tiling Carpeting.
2. Accessories.

B. Preparation of existing wood and concrete floor slabs for installation of floor coverings, including floor leveler for existing defects and repaired areas.

C. Testing of concrete floor slabs for moisture and alkalinity (pH).

D. Preparation of wood-based subfloors for installation of new floor coverings. Patching compound (floor leveler) application to new screw heads throughout the work area.

E. Removal of existing floor coverings, adhesives, loose or incompatible floor leveler, wall base, and transition strips within the work areas shown.

F. Treating of areas with exposed adhesive with floor sealer/primer as recommended by carpet tile manufacturer.

### 1.02 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements: Additional requirements relating to testing agencies and testing.

B. Section 01 7320 - Waste Management: Handling of existing floor coverings removed.

### 1.03 REFERENCES

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Flooring; 2011.

B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

### 1.05 SUBMITTALS

A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:

1. Moisture and alkalinity (pH) limits and test methods.
2. Manufacturer's required bond/compatibility test procedure.

B. Testing Agency's Report:

1. Description of areas tested; include floor plans and photographs if helpful.
2. Summary of conditions encountered.
3. Moisture and alkalinity (pH) test reports.
4. Copies of specified test methods.
5. Recommendations for remediation of unsatisfactory surfaces.
6. Submit report to Architect.

7. Submit report not more than two business days after conclusion of testing.

C. Adhesive Bond and Compatibility Test Report.

D. Sealer Materials Product Data: Manufacturer's published data on each product to be used for remediation.

1. Manufacturer's installation instructions.

2. Specimen Warranty: Copy of warranty to be issued by coating manufacturer and certificate of underwriter's coverage of warranty.

**1.06 QUALITY ASSURANCE**

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.

1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:

1. Provide access for and cooperate with testing agency.

2. Confirm date of start of testing at least 10 days prior to actual start.

3. Allow at least 4 business days on site for testing agency activities.

4. Achieve and maintain specified ambient conditions.

5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

**1.07 DELIVERY, STORAGE, AND HANDLING**

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

**1.08 FIELD CONDITIONS**

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F (18 degrees C) or more than 85 degrees F (30 degrees C).

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

A. Patching Compound (floor leveler): Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:

1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Sealer: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. Consult carpet tile manufacturer for appropriate sealer to us over cut-back.

## PART 3 EXECUTION

### 3.01 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings and carpet, as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

### 3.02 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:

1. Preliminary cleaning.
2. Moisture vapor emission tests; 3 tests in the first 1000 square feet (100 square meters) and one test in each additional 1000 square feet (100 square meters), unless otherwise indicated or required by flooring manufacturer.
3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
5. Specified remediation, if required.
6. Patching, smoothing, and leveling, as required.
7. Other preparation specified.
8. Adhesive bond and compatibility test.
9. Protection.

### 3.03 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

### 3.04 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet (1.4 kg per 93 square meters) per 24 hours.

F. Report: Report the information required by the test method.

**3.05 ALKALINITY TESTING**

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.

C. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.

D. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch (25 mm) in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

**3.06 PREPARATION**

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

**3.07 ADHESIVE BOND AND COMPATIBILITY TESTING**

A. Comply with requirements and recommendations of floor covering manufacturer.

**3.08 PROTECTION**

A. Cover prepared floors with building paper or other durable covering.

**END OF SECTION**

**SECTION 09 5753**

**SECURITY CEILING ASSEMBLIES**

## PART 1 – GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Secure steel ceiling assemblies
2. Welded steel mesh infill panels
3. Framing members and structural grid
4. Perimeter and intermediate support angles or tubes
5. Fasteners and anchors
6. Factory-applied primer or galvanizing

B. Related Sections:

1. 05 50 00 – Metal Fabrications
2. 05 59 63 – Detention Enclosures (wall partitions)
3. 08 34 63 – Detention Doors and Frames
4. 09 91 00 – Painting

### 1.2 REFERENCES

A. ASTM A36/A36M – Structural Steel.

B. ASTM A123/A123M – Zinc Coating (Hot-Dip Galvanized).

C. ASTM A653/A653M – Steel Sheet, Zinc-Coated (Galvanized).

D. AWS D1.1 – Structural Welding Code – Steel.

### 1.3 SUBMITTALS

A. Product Data: Manufacturer’s data for mesh panels, framing members, anchors, finishes.

B. Shop Drawings:

1. Plan layout with ceiling grid dimensions

2. Framing member sizes, spacing, connections

3. Panel sizes and locations

4. Access panel locations (if any)

5. Anchorage details.

C. Samples:

1. Mesh sample, minimum 6" x 6"

2. Finish color sample (if applicable)

D. Certificates: Welding procedures and welder qualifications (if required).

E. Warranty Documentation

**1.4 QUALITY ASSURANCE**

A. Fabricator Qualifications: Minimum 5 years experience producing secure ceiling assemblies.

B. Installer Qualifications: Minimum 3 years experience with security ceiling systems.

C. Welding Standards: AWS D1.1, certified welders.

D. Pre-Installation Conference (optional): Coordinate integration with walls, mechanical and electrical trades, and security systems.

**1.5 DELIVERY, STORAGE, AND HANDLING**

A. Deliver in labeled sections with protective packaging.

B. Store elevated, dry, and protected from corrosion.

C. Handle carefully to prevent damage and distortion.

**1.6 WARRANTY**

A. Manufacturer’s standard 1-year warranty covering materials and fabrication defects.

**PART 2 – PRODUCTS**

**2.1 MANUFACTURERS**

A. Basis of Design: Trussbilt, Habersham Metal Products, RR Brink, Southern Folger, or approved equivalent.

B. Substitutions: Permitted per Division 01 requirements with prior approval.

**2.2 MATERIALS**

A. Structural Steel Shapes and Plates: ASTM A36/A36M.

B. Steel Tubing: ASTM A500 Grade B.

C. Steel Sheet: ASTM A653/A653M, galvanized.

D. Mesh Panels: Welded steel wire grid or flattened expanded metal

1. Minimum 3/16" diameter wire

2. Typical grid spacing: 2" x 2" or as approved

3. Fully welded intersections for rigidity

E. Fasteners: Tamper-resistant or concealed where exposed.

F. Anchors: Expansion bolts or masonry anchors suitable for substrate.

G. Primer: Rust-inhibitive, shop-applied.

H. Optional Finish: Hot-dip galvanized per ASTM A123/A123M for high-humidity or exterior applications.

**2.3 FABRICATION**

A. Ceiling Grid Framing: Minimum 1-1/2" x 1-1/2" x 3/16" steel angle or tubing

1. Spacing not to exceed 48" o.c. in either direction unless otherwise shown

2. Continuous perimeter angle or tube welded or bolted to walls and structural elements.

B. Mesh Panels: Framed with welded steel angle or tubing

1. Fully welded corners, square and true

2. Sized for grid layout with minimal gaps.

C. Access Panels (if required): Hinged and lockable

1. Reinforced to match strength of fixed panels

2. Tamper-resistant hardware.

D. Connections: Welded or bolted per manufacturer’s standards.

1. Tamper-resistant fasteners at field joints.

E. Welds: Continuous where required for strength

1. Ground smooth on exposed faces

**2.4 FINISH**

A. Shop Primer: Rust-inhibitive coating on all cleaned surfaces.

B. Optional Finish: Hot-dip galvanized for enhanced corrosion protection

1. Powder-coat finish if specified, color as selected.

**PART 3 – EXECUTION**

**3.1 EXAMINATION**

A. Verify dimensions, substrate readiness, and conditions.

B. Confirm compatibility with wall enclosures, mechanical, electrical, and security systems.

C. Report any unsatisfactory conditions to Architect.

**3.2 INSTALLATION**

A. Install per manufacturer’s instructions and approved shop drawings.

B. Install perimeter framing securely anchored to walls and structural substrates.

C. Install intermediate framing members at designed spacing.

D. Fit and fasten mesh panels securely into grid framework:

1. Weld or bolt panels to framing

2. Use tamper-resistant fasteners at all accessible connections.

E. Install access panels where indicated:

1. Align and secure for tight fit

2. Install locks or security latches.

F. Coordinate with mechanical and electrical trades for penetrations, conduits, and fixtures.

G. Maintain continuity of security barrier at all penetrations with collars, sleeves, or guards.

**3.3 FIELD FINISHING**

A. Touch up abrasions or field welds with compatible primer.

B. Field-paint as specified in Section 09 91 00.

C. Ensure consistent finish over all exposed components.

**3.4 ADJUSTING AND CLEANING**

A. Adjust access panels and doors for smooth operation and proper security latching.

B. Clean surfaces of dirt, oil, and debris.

C. Replace or repair damaged or marred components as directed.

**3.5 PROTECTION**

A. Protect installed ceiling assemblies from damage during construction.

B. Repair damage to match original finish and security performance.

**END OF SECTION**

# SECTION 09 6500
# RESILIENT FLOORING

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

### 1.02 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

B. ASTM F1344 - Standard Specification for Rubber Floor Tile; 2015.

C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).

D. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; Resilient Floor Covering Institute; October 2011.

### 1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

### 1.04 DELIVERY, STORAGE, AND HANDLING

A. Store all materials off of the floor in an acclimatized, weather-tight space.

### 1.05 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

## PART 2 PRODUCTS

### 2.01 TILE FLOORING

A. Rubber Tile: Type I- Homogeneous, color and pattern throughout thickness
   1. Manufacturers:
      a. Burke Flooring ; www.burkeflooring.com.
      b. Flexco, Inc ; www.flexcofloors.com.
      c. Johnsonite, a Tarkett Company ; www.johnsonite.com.
      d. Roppe, Basis of Design.
   2. Minimum Requirements: Comply with ASTM F1344, of Class corresponding to type specified.
   3. Size: 12 by 12 inch (305 by 305 mm).
   4. Total Thickness: 0.125 inch (3.2 mm).
   5. Texture: Smooth.
   6. Pattern: Marbleized.
   7. Color: To be selected by Architect from manufacturer's full range.

### 2.02 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
   1. Manufacturers:
      a. Burke Flooring ; www.burkeflooring.com.
      b. Johnsonite, a Tarkett Company ; www.johnsonite.com.
      c. Roppe Corp ; www.roppe.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.
   2. Height: 4 inch (100 mm).
   3. Thickness: 0.125 inch (3.2 mm) thick.
   4. Finish: Satin.
   5. Color: To be selected by Architect from manufacturer's full range.
   6. Accessories: Premolded external corners and internal corners.

### 2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer, including primer over asphaltic adhesive.

C. Moldings, Transition and Edge Strips: Same material as flooring.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
   1. Test in accordance with ASTM F710.
   2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

### 3.02 PREPARATION

A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

D. Prohibit traffic until filler is fully cured.

E. Clean substrate.

F. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

### 3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints and butt seams tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

**3.04 TILE FLOORING**

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.

**3.05 RESILIENT BASE**

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

C. Scribe and fit to door frames and other interruptions.

**3.06 CLEANING**

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

**3.07 PROTECTION**

A. Prohibit traffic on resilient flooring for 48 hours after installation.

**END OF SECTION**

# SECTION 09 6513
# RESILIENT BASE AND ACCESSORIES

## PART 1 GENERAL

### 1.1 SUMMARY

A. Provide resilient wall base and accessories.

### 1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.

C. Submit extra stock equal to 2% of total used.

### 1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Performance: Fire performance meeting requirements of building code and local authorities.

## PART 2 PRODUCTS

### 2.1 MATERIALS

A. Resilient Wall Base:
1. Type: TV (vinyl).
2. Group: I (solid, homogeneous)
3. Style: Cove.
4. Thickness: 0.125 inch
5. Height: 4 inches.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. Comply with manufacturer's instructions and recommendations. Install in proper relation to adjacent work.

B. Install base and accessories to minimize joints. Install base with joints as far from corners as practical.

C. Clean, polish, and protect.

**END OF SECTION**

# CARPET TILE
# SECTION 09 6813

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Carpet tile.
B. Accessories and installation materials.

### 1.2 RELATED SECTIONS:

A. Resilient base - Section 09 6513.

### 1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's descriptive literature of each product in accordance with Section 01 3300, including manufacturer's installation instructions for carpet tile.
B. Samples: Submit verification samples of each scheduled color of carpet, for Architect's approval. Carpet delivered to job site shall match approved samples in quality, color and pattern.
C. Maintenance Data: Submit 4 copies of manufacturer's complete recommended cleaning and maintenance instructions, including identification of maintenance products and instructions for repair and replacement of carpet tile.

### 1.4 QUALITY ASSURANCE:

A. Installer Qualifications: Minimum 5 years experience, as commercial carpet installer of carpet tile.

### 1.5 PROJECT CONDITIONS:

A. Environmental Requirements: Maintain minimum temperature of 65°F. in spaces to receive carpet for a period of 24 hours prior to installation and for duration of installation.

### 1.6 MAINTENANCE:

A. Maintenance Material:
1. Deliver usable overage of remnants of one-half carpet tile or larger to Owner upon completion and acceptance of installation.
2. Store in delivery cartons, properly marked, where directed by Owner.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. InterfaceFLOR
B. Shaw Contract Group

### 2.2 CARPET TILE 1:

A. Qualities: Modular carpet tile, tufted cut pile, 100% solution dyed.
1. Size: 50 cm x 50 cm
2. Color: Charcoal.
3. Patterns: As scheduled.

B. Construction:
1. Type: Tufted cut pile.
2. Tufted weight: 11.0 oz./sq.yd.
3. Face Fiber: 100% Solution dyed, type 6 nylon.
4. Gauge: 5/64 in.
5. Finished pile height: 0.06 in.
6. Backing:
- 60 total recycled content.
- Tear strength – ASTM D624
- Tensile strength – ASTM D3574
- Delamination strength – ASTM 3936
7. Protection system: Protekt.

C. Performance:
1. Flammability:
a. Radiant Panel test - ASTM E 648 Class I
b. Smoke Density - ASTM E 662 less than 450
2. Electrostatic Propensity:
a. AATCC 134, less than 3.5 kv, built in permanent conductive fiber lifetime commercial limited.

D. Source: Micro Line by Interface.

### 2.3 CARPET TILE 2:

A. Qualities: Modular carpet tile, tufted textured loop, 100% solution dyed.
   4. Size: 50 cm x 50 cm
   5. Color: Charcoal.
   6. Patterns: As scheduled.

B. Construction:
   1. Type: Tufted textured loop.
   2. Tufted weight: 14.0 oz./sq.yd.
   3. Face Fiber: 100% Solution dyed, type 6 nylon.
   4. Gauge: 1/12 in.
   5. Finished pile height: 0.15 in.
   6. Backing:
      - 58 total recycled content.
      - Tear strength – ASTM D624
      - Tensile strength – ASTM D3574
      - Delamination strength – ASTM 3936
   7. Protection system: Protekt.

C. Performance:
   1. Flammability:
      a. Radiant Panel test - ASTM E 648 Class I
      b. Smoke Density - ASTM E 662 less than 450
   2. Electrostatic Propensity:
      a. AATCC 134, less than 3.5 kv, built in permanent conductive fiber lifetime commercial limited.

**2.4 CARPET TILE 3:**

A. Qualities: Modular carpet tile, multi-level pattern loop, 93% solution dyed, 7% yarn died.
   7. Size: 18 in x 36 in
   8. Color: 14760 Hermatite.
   9. Patterns: As scheduled.

B. Construction:
   1. Type: Multi-level pattern loop.
   2. Tufted weight: 22.0 oz./sq.yd.
   3. Face Fiber: 93% Solution dyed, type 6 nylon/7% yarn died.
   4. Gauge: 1/12 in.
   5. Finished pile height: 0.127 in.
   6. Backing:
      - Tear strength – ASTM D624
      - Tensile strength – ASTM D3574
      - Delamination strength – ASTM 3936
   7. Protection system: ssp shaw soil protection.

C. Performance:
   1. Flammability:
      a. Radiant Panel test - ASTM E 648 Class I
      b. Smoke Density - ASTM E 662 less than 450
   2. Electrostatic Propensity:
      a. AATCC 134, less than 3.5 kv, built in permanent conductive fiber lifetime commercial limited.

**2.5 INSTALLATION MATERIALS:**

A. Incidental Materials: Provide incidental materials required to properly install carpet tile in accordance with manufacturer's instructions.

B. Releasable Adhesive: Blue Glue by 3M Co., or other releasable adhesives recommended by carpet tile manufacturer.

C. Edge Strips: Mercer, black snap-down edge for carpet-to-hard surface, with recommended adhesive.

D. Leveling Compound: Latex compound recommended by carpet manufacturer.

## PART 3 - EXECUTION

**3.1 EXAMINATION AND PREPARATION:**

A. Examination:
   1. Examine sub-flooring for cracks, holes, abrasions, rough spots and ridges or other conditions that will adversely affect execution and quality of work.
   2. Do not proceed until defects are corrected.
B. Preparation:
   1. Prior to laying carpet, clean sub-floors free of moisture, dust, grease, wax, paint and other foreign matter that would affect installation.
   2. Fill cracks and depressions in existing floors with leveling compound. Trowel and feather edge to a smooth and level surface.
   3. Carefully check dimensions and other conditions in facilities and be responsible for proper fitting of carpet in areas designated.

**3.2 INSTALLATION - CARPET TILE:**

A. Install carpet tile in accordance with carpet manufacturer's printed instructions, except as otherwise specified. Maintain single dye lot.
B. Install carpet tile with releasable adhesive at areas recommended by carpet tile manufacturer.
C. Lay out carpet tile from center of room. Adjust layout to assure maximum use of full tile size in doorways and heavy traffic areas.
D. Install tile with tight, uniform, straight joints.
E. Cut and fit carpet tile neatly into breaks and recesses, against bases, permanent cabinets and equipments.
F. Neatly cut carpet around floor openings, electrical outlets, and other projections.
G. Install reducer strip where carpet meets other flooring materials, including door opening locations. Trim toe of reducer to same thickness as adjacent flooring material.
H. Completed installation shall be uniform in appearance and free of buckling, pucking, curling, and color mismatches, and other objectionable defects.

**3.3 INSTALLATION TOLERANCES:**

A. Joints between carpet tile shall be tight but not compressed. Periodically measure carpet tile installation to verify joint tightness.

**3.4 PROTECTION AND CLEANING:**

A. Remove spots and smears of adhesive from carpet with cleaning agent. Replace stained or damaged carpet.
B. Remove rubbish, wrapping papers and debris.
C. Upon completion, vacuum with a pile lifter or commercial beater-bar type vacuum cleaner.
D. After each area of carpet has been installed, protect from soiling and damage.
E. Do not allow heavy wheeled traffic loads over completed carpet tile areas unless protective plywood runways are used.

**END OF SECTION**

# SECTION 09 9100
# PAINTING & COATING

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Complete painting and finishing of new surfaces included in the Work.
   1. Surfaces that are left unfinished by other sections of Specifications shall be painted or finished as a part of this section.
   2. Copper, bronze, chromium plate, nickel, stainless steel, aluminum, Monel metal, lead, and lead coated copper shall not be painted or finished.
   3. Other surfaces not to be painted include items with factory applied final finish; concealed ducts and pipes; and plenums above suspended ceilings, except as noted otherwise.

B. Painting or finishing existing surfaces where scheduled or required as a result of alterations work.

### 1.2 RELATED SECTIONS:

A. Caulking and sealing - 07 9000
B. Taping and bedding of gypsum board - 09 2116.

### 1.3 SUBMITTALS:

A. Product Data: Submit paint schedule in accordance with Section 01 3300. List each surface and its proposed paint products and systems, including manufacturer's name, product name and line number for each material.

### 1.4 QUALITY ASSURANCE:

A. Product Labels: Include manufacturer's name, type of paint, stock number, color and label analysis **on label of containers.**

### 1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials in original containers with seals unbroken and labels intact.
B. Store materials and equipment in a single lockable area of project site. Provide adequate means to protect floors and adjacent surfaces of this area from damage.
C. Store rags, paint, and solvents in closed metal containers located in designated area.
D. Comply with applicable health and fire regulations.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. Except as otherwise specified, materials shall be products of following manufacturers:
   1. ICI Paint Stores. (ICI)
   2. Pittsburgh Paints. (PPG)
   3. Pratt and Lambert, Inc. (PL)
   4. Sherwin-Williams Co. (SW)

B. Materials selected for coating systems for each type surface shall be product of a single manufacturer, unless otherwise specified

### 2.2 MATERIALS:

A. Select products from Material List below. Select primary products of a single manufacturer for each coating or paint system, unless otherwise specified.
B. Secondary products such as linseed oil, turpentine and shellacs shall be first line quality products of a reputable manufacturer.
C. Colors: As indicated.
D. Paint Material List:
   1. Ornamental Metal Primer:
      SW, Pro Industrial Pro-Cryl Primer, B66-310 Series
      - Or approved equal.
   2. Interior Galvanized Metal Primer:
      SW, Pro Industrial Pro-Cryl Primer, B66-310 Series

- Or approved equal.

3. Interior Wood Primer:
   SW, ProBlock Primer, Interior Oil Based, B79W8810
   - Or approved equal.
   - To be applied off site.
4. Interior Drywall Primer:
   SW, ProMar 200 Zero VOC Latex Primer, B28W2600
   - Or approved equal.
4. Alkyd Satin Enamel:
   SW, Pro-Green 200 Alkyd Semi-Gloss Enamel, Low or Zero VOC.
   - Or approved equal.
5. Latex Eggshell Enamel:
   SW, Pro-Industrial Zero VOC Acrylic Eg-Shel, Series B66-600, Zero VOC.
   - Or approved equal.
6. Latex Flat Wall Paint:
   SW, Pro-Mar 200 Latex Flat Wall Paint, Series B30-200, Zero VOC.
   - Or approved equal.
7. Latex Semi-gloss Paint:
   SW, Pro-Industrial Zero VOC Acrylic Semi-Gloss, Series B66-650, Zero VOC.
   - Or approved equal.
8. Latex Flat Wall Paint: - Fire retardant
   SW, Pro-Mar 200 Latex Flat Wall Paint, Series B30W200. Low or Zero VOC.
   - Or approved equal.
9. Conversion Varnish:
   SW, Kem Var, Dull Sheen.
   - Or approved equal.
   - To be applied offsite.
10. Texture Paint: USG Sheetrock Wall and Ceiling Spray Texture Finish.
11. Wood Stain:
    SW, Wood Classics, Interior Oil Stain, Series A49-200
    - Or approved equal.
    - To be applied off site.
12. Wood Varnish:
    SW, Wood Classics, Waterborne, Polyurethane Varnish, Series A68 Series
    - Or approved equal.
    - To be applied off site.

**2.3 MIXING AND TINTING:**

A. Accomplish job site tinting and mixing only when approved by Architect. Use tinting colors recommended by paint manufacturer for specific type of finish.
B. Thin paints only when specifically allowed by manufacturer; do not exceed thinning directions.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

A. Examine surfaces scheduled to receive paint and finishes for conditions that will adversely affect execution, permanence, or quality of finish work, and which cannot be put into an acceptable condition through normal preparatory work.
B. Do not proceed with surface preparation or coating applications until conditions are suitable. Application of paint or finish to surfaces shall constitute acceptance of that surface.

**3.2 GENERAL APPLICATION REQUIREMENTS:**

A. The intent of these Specifications is to produce highest quality appearance of paint and finish surfaces. Employ skilled mechanics only.
B. Finish tops, bottoms, and edges of doors same as balance of doors after they are fitted.

C. Clean surfaces free of foreign matter before applying paint or finishes.
D. Maintain ambient temperature in building of not less than 60°F. for 24 hours prior to and minimum of 24 hours after interior painting.
E. Provide a minimum of 20-foot candles illumination for surfaces to be painted or finished.

**3.3 PREPARATION OF SURFACES:**

A. Remove dirt, dust, oil, grease, and other contaminants from surfaces to be painted.
B. Sand woodwork smooth and clean surface before finishing.
C. Paste wood filler, applied on open grain wood, when set shall be wiped across grain of wood, then with grain to secure a clean surface.
D. Coat surfaces to be stained with a uniform coat of stain and wipe excess off.
E. Sand enamel and varnish finish on wood between coats using a fine sandpaper to produce an even, smooth finish. Thoroughly clean surfaces.
F. Wash metal surfaces with mineral spirits to remove dirt, oil, or grease before applying primer. Remove rust or scale by wire brushing or sanding clean before painting. Clean marred shop coats and touch up with primer.
G. Pretreat galvanized metal surfaces as recommended by paint manufacturer.
H. Fill scratches, cracks, and abrasions in gypsum board with a spackling compound flush with adjoining surface. Remove ridges and other protrusions by scraping flush with surfaces. When dry, sand smooth and seal before application of priming coat.
I. Properly prepare existing surfaces required to be repainted. Remove loose, chipped or cracked existing paint. Thoroughly clean surfaces prior to painting. Fill and sand cracks and depressions. Lightly sand existing metal surfaces.
J. Provide full primer/sealer coat on existing painted surfaces unless specified finish coat material is compatible with existing paint.
K. Completely remove existing finish on existing wood doors scheduled to be refinished.
L. Fill and sand metal door frames to provide a smooth surface before finishing. Touch-up factory prime coat before applying first coat.
M. Touch-up shop coats on metal surfaces before applying finish.

**3.4 APPLICATION:**

A. Final coat of paint shall have visual evidence of solid hiding and uniform appearance, and shall be smooth, free of brush marks, streaks, sags, runs, laps, or skipped areas.
B. Apply paint with suitable brushes, rollers, or spray equipment, as recommended by manufacturer.
C. Allow previous coats to thoroughly dry before applying succeeding coats.
D. Edges of paint adjoining other materials or colors shall be sharp and clean with no overlapping.
E. Slightly vary color of successive coats.
F. Adjust transparent finishes to obtain matching appearance between new and existing doors.
G. Sand and dust between each coat to remove visual defects.
H. Apply each coat of paint uniformly to minimum wet film (MWF) thickness specified in schedule below, or as recommended by manufacturer.

**3.5 CLEANING AND PATCHING:**

A. Upon completion of work, remove paint spots from floor, glass, and other finished surfaces. Remove from premises rubbish and accumulated materials. Leave work in clean, orderly, and acceptable condition.
B. Spot painting will be allowed to correct soiled or damaged paint surfaces only when touch-up spot will blend into surrounding finish and is invisible to normal viewing. Otherwise, re-coat entire section to corners or visible stopping point.

**3.6 PROTECTION:**

A. Protect completed finish and painting work, and protect adjacent finish surfaces from paint splatter, spills and stains.
B. Use adequate drop cloths and masking procedures during progress of work.

**3.7 SCHEDULE OF PAINTING:**

A. Interior Hollow Metal Frames:
Touch up shop primer or existing paint.
1st coat - Alkyd Satin Enamel (MWF 2.9 mils)

2nd coat - Same (Omit on existing frames).

B. Interior Metals:
1st coat - Ornamental Metal Primer (MWF 3.6 mils)
2nd coat - Alkyd Satin Enamel (MWF 2.9 mils)

C. Interior Galvanized Metals:
1st coat - Interior Galvanized Steel Primer (MWF 3.6 mils)
2nd coat - Alkyd Satin Enamel (MWF 3.6 mils)

D. Interior Wood - Transparent Finish (Existing Doors):
Completely remove existing finish down to bare wood. Apply new finish as follows:
Light stained conversion varnish finish, dull rubbed sheen, closed grain effect (AWI System TR-2/TR-4, Premium Grade).
1st coat - Paste Filler
2nd coat - Wood Stain to match existing
3rd coat - Sealer (Sand w/222 grit)
4th coat - Conversion Varnish (MWF 3.2 mils)
5th coat - Same

E. Interior Wood - Transparent Finish (New Doors):
Light stained conversion varnish finish, dull rubbed sheen, closed grain effect (AWI System TR-2/TR-4, Premium Grade).
1st coat - Paste Filler
2nd coat - Wood Stain to match existing
3rd coat - Sealer (Sand w/222 grit)
4th coat - Conversion Varnish (MWF 3.2 mils)
5th coat - Same

F. Gypsum Board Walls:
1st coat - Texture Paint - apply with roller to match existing texture
2nd coat - Latex Eggshell Enamel (MWF 3.6 mils)
3rd coat - Same

G. Gypsum Board Ceilings:
1st coat - Texture Paint - apply with roller to match existing texture
2nd coat - Latex Interior Flat Wall Paint (MWF 4.0 mils)

H. Fire Retardant Plywood Wall Panels:
1st coat - Latex Interior Flat Wall Paint - Fire Retardant (MWF 4.8 mils)
2nd coat - Same

**END OF SECTION**

# SECTION 10155

# TOILET COMPARTMENTS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Powder coated steel partitions.

### 1.2 RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Concealed steel support members.

B. Section 06110 - Wood Framing: Concealed wood framing and blocking for compartment support.

C. Section 10800 - Toilet and Bath Accessories.

### 1.3 REFERENCES

A. ASTM International:
1. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM D 1735 - Standard Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus
3. ASTM D 2247 - Standard Practice for Testing Water Resistance of Coatings in 100 percent Relative Humidity

B. United States Green Building Council (USGBC): LEED Green Building Rating System.

### 1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. [ Product Data]: Manufacturer's data sheets on each product to be used, including:
1. Literature indicating typical panel, pilaster, door, hardware and fastening.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods.

C. Shop Drawings:
1. Dimensioned plans indicating layout of toilet compartments.
2. Dimensioned elevations indicating heights of doors, pilasters, separation partitions, and other components; indicate locations and sizes of openings in compartment separation partitions for toilet and bath accessories to be installed in partitions; indicate floor and ceiling clearances.
3. Details indicating anchoring components (bolt layouts) and methods for project conditions; indicate components required for installation, but not supplied by toilet compartment manufacturer.

D. Selection Samples: For each finish product specified, one complete set of color selection guides representing manufacturer's full range of available colors, textures and patterns.

E. Verification Samples: For each finish product specified, two samples representing actual product, color, texture and pattern.

F. LEED Green Building Rating System: Submit manufacturer's documentation of recycled content, in accordance with LEED credit calculations.

G. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards.

B. Store products indoors in manufacturer's or fabricator's original containers and packaging, with labels clearly identifying product name and manufacturer. Protect from damage.

C. Lay cartons flat, with adequate support to ensure flatness and to prevent damage to pre-finished surfaces.

D. Do not store where ambient temperature exceeds 120 degrees F (49 degrees C).

## 1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Do not deliver materials or begin installation until building is enclosed, with complete protection from outside weather, and building temperature maintained at a minimum of 60 degrees F (15.6 degrees C).

## 1.7 WARRANTY

A. Manufacturers Standard Warranty: Provide warranty for Powder Coated Steel Material against chipping, flaking, cracking, or discoloration for 3 years, assuming proper maintenance according to manufacturer's recommendations.

## 1.8 COORDINATION

A. Coordinate Work with placement of support framing and anchors in walls and ceilings.

# PART 2 PRODUCTS

## 2.1 MANUFACTURERS

A. Acceptable Manufacturer: ASI Global Partitions, which is located at: 900 Clary Connector; Eastanollee, GA 30538; Tel: 706-827-2700; Fax: 706-827-2710; Email:request info (sales@asi-globalpartitions.com); Web:http://asi-globalpartitions.com
   1. Other Acceptable Manufacturer: ASI Accurate Partitions; Burr Ridge IL; Tel: 708-442-6800; Web: http://www.asi-accuratepartitions.com.
   2. No other manufacturer will be accepted without ASTM performance compliance.
   3. Substitutions will be considered provide they are an “as equal” and are in the best interest of the client (IE. Cost-Savings)

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

## 2.2 COMPARTMENTS AND SCREENS

A. Toilet Compartments: Floor anchored/overhead braced.
   1. Compartment Depth and Width: As scheduled and indicated on Drawings.
   2. Door Width: 24 inches (610 mm), minimum; at ADA accessible compartments 36 inches (915 mm) minimum.
   3. Height Above Floor: 12 inches (305 mm).
   4. Door/Panel Height: 72 inches (1829 mm) - Ultimate Privacy.
   5. Pilaster Height: 82 inches (2083 mm).

B. Privacy and Urinal Screens: Wall hung.
   1. Screen Panel Size: 24 inches (610 mm) wide by 42 inches (1067 mm) high.
   2. Height Above Floor: 18 inches (457 mm) for 42 inches (1067 mm) high.

## 2.3 POWDER COATED STEEL TOILET COMPARTMENTS

A. Doors, Panels, Screens, and Pilasters: Tension leveled, cold-rolled galvannealed steel face sheet, bonded under pressure to honeycomb core with non-toxic adhesive.
   1. Doors, Screens, and Panels: 1 inch (25 mm) thick; 22 gage (0.760 mm) steel.
   2. Pilasters: Overhead Braced, Floor to Ceiling 1-1/4 inches (32 mm) thick, 22 gage (0.912 mm) steel.
   3. Edge Moldings: Continuous roll-formed interlocking, 22 gage (0.760 mm) steel crown molding, brazed and ground smooth at corners.

B. Finish: Epoxy/polyester powder coat electrostatically applied to phosphate treated steel, baked to cure. Color as selected from manufacturer's standard colors.

C. Door Hardware: Attached with theft resistant barrel nuts and shoulder screws.
   1. Finish: Stainless Steel, No. 4 satin finish.
   2. Hinges: Top hinge recessed and interlocked in door, with nylon pin in the plane of the door, through-bolted. Bottom hinge recessed in door, with mating box and pintle nylon cams providing the bearing surface; adjustable to allow door to rest at any position within a 270 degree range; through-bolted.
   3. Strike and Keeper: With concealed latch assembly and provisions for external emergency access.
   4. Handicapped Access: ADA paddle handles on doors.
   5. Coat Hook and Bumper: Manufacturer's standard surface mounted. No tamper resistant screws required.
   6. Door Pull: Standard on ADA compartments. Two per ADA door.
   7. Fastening Hardware: Theft resistant heads.

D. Mounting Brackets: Type 304 Stainless Steel, No. 4 satin finish, stirrup brackets with theft resistant screws.

E. Mounting Channels: 4 inches (102 mm) deep. Ultimate Privacy; painted to match partition color.

F. Pilaster Shoes: Type 304 Stainless Steel, No. 4 satin finish. Minimum 4 inches (102 mm) high secured to floor w/internal clips for ceiling hung, floor to ceiling and floor mounted. For floor mounted overhead braced the shoe shall be 3 inches (76 mm) high.

G. Headrail: Manufacturer's standard, Anodized Aluminum with anti-grip profile.

H. Pilaster Anchors: Floor Anchored/Overhead Braced.
   1. Inverted stirrup with jack bolt for leveling during installation and permanent height adjustment.

2. Welded to base of pilaster, with "L" brackets coupled to stirrup bracket and floor for full range adjustment; concealed by pilaster shoe after installation.

## PART 3 EXECUTION

### 3.1 EXAMINATION AND PREPARATION

A. Inspect and prepare substrates using the methods recommended by the manufacturer for achieving best result for the substrates under project conditions. Clean surfaces thoroughly prior to installation.

B. Do not proceed with installation until substrates have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

C. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
   1. Verify dimensions of areas to receive compartments.
   2. Verify locations of built-in framing, anchorage, bracing, and plumbing fixtures.

### 3.2 INSTALLATION

A. Install in accordance with approved shop drawings and manufacturer's instructions.

B. Fasten components to adjacent materials and to other components using purpose-designed fastening devices.

C. Adjust pilaster anchors for substrate variations; conceal anchors with pilaster shoes.

D. Equip each compartment door with hinges and door latch.

E. Install door strike keeper on pilasters in alignment with door latch.

F. Equip each compartment door with one coat hook and bumper.

G. Installation Tolerances:
   1. Maximum variations from plumb or level: 1/8 inch (3 mm).
   2. Clearance between wall surface and panels or pilasters: 1-1/2 inch (38 mm) maximum.

### 3.3 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors.

B. Adjust adjacent components for consistency of line or plane.

### 3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C. Remove factory protective coverings and clean finish surfaces in accordance with manufacturer's instructions before substantial completion.

**-- END OF SECTION –**

# SECTION 10 2800
# TOILET AND BATH ACCESSORIES

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Accessories for toilet rooms, showers, and utility rooms.

B. Electric hand dryers.

C. Grab bars.

### 1.02 RELATED REQUIREMENTS

A. Section 06 1000 – Rough Carpentry: Blocking and supports

B. Section 06 1100 – Wood Framing

C. Section 08 8300 – Mirrors

D. Section 09 2916 – Gypsum Board Assemblies

E. Section 09 3000 – Tiling

F. Section 10 2113 – Toilet Compartments

G. Plumbing fixtures are specified on the Architectural drawings. As all MEP+FP is design-build, the contractor is responsible for providing code compliant fixtures.

H. Electrical requirements are the contractor's responsibility as all MEP+FP is design-build.

### 1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; current edition; (ADA Standards for Accessible Design).

B. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004 (Reapproved 2010).

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

### 1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: For each type of product indicated, including finishing materials.

C. Certificate: Provide certifications stating that materials comply with requirements.

D. Samples: Accessory supplier shall submit a complete line of samples:
   1. For the Architect’s approval
   2. Before submission of accessory schedules
   3. Before any materials are ordered
   4. Label each sample with the following:
      a. Architect’s accessory designation
      b. Manufacturer’s product name number
      c. Manufacturer’s type designation
      d. Key type used. Provide scheduled working keys and locks.
      e. Product Sizes
   5. Architect will take possession of samples until delivery of all other accessories to the project is complete. Architect shall be held harmless due to loss or damage sustained by samples in Architect’s care.
   6. After order is complete, samples will be as mutually agreed:
      a. Returned to accessory supplier

b. Incorporated in the work
c. Rendered to the Owner as Extra Stock

E. Maintenance Data: For toilet compartments to include in maintenance manuals.

**1.06 QUALITY ASSURANCE**

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

**1.07 DELIVERY, STORAGE, AND HANDLING: Comply with Division 01 and the following:**

A. As recommended by manufacturer's instructions and recommendations.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

**1.6 COORDINATION**

A. Completely coordinate the work of this Section with the Work of other Sections. Verify dimensions and work of other trades which adjoin materials of this Section before the installation of items herein specified.

B. Coordinate sizes and locations of recessed accessories with wall depths.

**1.7 PROJECT CONDITIONS**

A. Field Measurements: Verify actual locations of fixtures, walls, columns, ceilings, and other construction contiguous with Work by field measurements before fabrication.

**PART 2 PRODUCTS**

**2.01 ACCESSORY SCHEDULE**

A. As shown and scheduled in Drawings.

B. Other Acceptable Manufacturers:
1. A & J Washroom Accessories Inc: www.ajwashroom.com.
2. American Specialties, Inc: www.americanspecialties.com.
3. Bradley Corporation: www.bradleycorp.com.
4. Substitutions: Section 01 6000 - Product Requirements.

C. ~~Electric Hand/Hair Dryers:~~
~~1. American Dryer, Inc; ExtremeAir GXT: www.americandryer.com.~~
~~2. Excel Dryer; ElevatorEco: www.exceldryer.com.~~
~~3. World Dryer Corporation; SMARTdri: www.worlddryer.com.~~
~~4. Substitutions: Section 01 6000 - Product Requirements.~~

**2.02 FINISHES**

A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.

**2.03 TOILET ROOM ACCESSORIES**

A. Shelf with Utility Hooks and Mop Strip:
1. Basis-of-Design Product: American Specialties Inc., Shelf with Utility Hooks and Mop Strip
2. Model #1308
3. Length: 34-inches
4. Finish: Satin Stainless Steel

B. Grab Bar: Stainless steel, nonslip grasping surface finish

1. Basis-of-Design Product: American Specialties Inc.,
2. Model #3100 Series
3. Lengths: 18, 36, 42 inch as noted on drawing.
4. Finish: Satin Stainless Steel
5. Heavy Duty Grab Bars: Floor supports are not acceptable.
    a. Push/Pull Point Load: Minimum 900 pound-force, minimum.
    b. Dimensions: 1-1/2 inch (38 mm) outside diameter, minimum 0.125 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.

C. Sanitary Napkin Disposal
1. Basis-of-Design Product: American Specialties Inc., Partition Mounted Dual Access Toilet Paper Dispenser and Sanitary Disposal/ Barrier Free Access
2. Model #20852
3. Size: 7 1/4 inch by 10 inch
4. Finish: Stainless steel with satin finish.
    a. Tamper-resistant screw attachment of cover to mounting plate.

D. Toilet Paper Dispenser
1. By Owner

E. Mirrors: Stainless steel framed, 6 mm thick float glass mirror.
1. Basis-of-Design Product: American Specialties Inc., Mirror
2. Model #20650-B
3. Size: 3'-0" tall x 2'-0" wide.

F. Recessed Waste Receptacle
1. By Owner

G. Paper Towel
1. By Owner

H. Soap Dispenser
1. By Owner

I. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
1. Style: Horizontal.
2. Material: Stainless steel.
3. Mounting: Surface.
4. Manufacturers:
    a. American Specialties, Inc: www.americanspecialties.com.
    b. Foundations Worldwide, Inc: www.brocar.com.
    c. Koala Kare Products: www.koalabear.com.

## 2.04 SHOWER AND TUB ACCESSORIES

A. Shower Curtain Rod: Stainless steel tube, 1 inch (25 mm) outside diameter, 0.04 inch (1.0 mm) wall thickness, satin-finished, with 3 inch (75 mm) outside diameter, minimum 0.04 inch (1.0 mm) thick satin-finished stainless steel flanges, for installation with exposed fasteners.

B. Shower Curtain:
1. Material: Opaque vinyl, 0.008 inch (0.2 mm) thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
2. Color: As selected from manufacturer's standard colors.
3. Shower curtain hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
4. Product: # 9535 manufactured by Bradley Corporation.

C. Folding Shower Seat: Wall-mounted recessed; welded tubular seat frame, structural support members, hinges and mechanical fasteners of Type 304 stainless steel, L-shaped, right hand seat.
   1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of Ivory color.
   2. Size: ADA compliant.
   3. Product: B-5181 manufactured by Bobrick Washroom Equipment, Inc..

D. Robe Hook: Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
   1. Product: B-672 manufactured by Bobrick Washroom Equipment, Inc..

### 2.05 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch (1.3 mm) thick stainless steel, Type 304, with 1/2 inch (12 mm) returned edges, 0.06 inch (1.6 mm) steel wall brackets.
   1. Drying rod: Stainless steel, 1/4 inch (6 mm) diameter.
   2. Hooks: 3, 0.06 inch (1.6 mm) stainless steel rag hooks at shelf front.
   3. Mop/broom holders: 4 spring-loaded rubber cam holders at shelf front.
   4. Length: 36 inches (900 mm).
   5. Product: B-224 manufactured by Bobrick Washroom Equipment, Inc..

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

### 3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

### 3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on the drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

D. Grab Bars: Install to withstand a downward load of at least 250 lbf , when tested according to ASTM F 446.

E. Comply with the Americans with Disabilities Act (ADA and governing Architectural Barriers Board requirements relative to mounting locations and height.

F. Wherever cutting and fitting is required to install accessories into surfaces which are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protections with finishing work specified in Division 09.

G. Do not install surface-mounted items until finishes have been completed on the substrate.

H. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

I. Locations and Heights: Confirm prior to installation.

J. Anchor Each Accessory: Securely - provide one fasteners for each fastener hole.

K. Fire-Resistive Construction Around Accessories Recessed into Fire-Resistive Work: Maintain continuity

### 3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

**END OF SECTION**

# SECTION 10 4400
# FIRE PROTECTION SPECIALTIES

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

### 1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

### 1.03 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.

### 1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate cabinet physical dimensions.

C. Product Data: Provide extinguisher operational features.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Ansul, Inc; Red Line: www.ansul.com.
   2. Pyro-Chem: www.pyrochem.com.
   3. Strike First Corporation of America; Water Fire Extinguisher: www.strikefirstusa.com.

B. Fire Extinguisher Cabinets and Accessories:
   1. Ansul, Inc.: www.ansul.com.
   2. JL Industries, Inc: www.jlindustries.com.
   3. Larsen's Manufacturing Co.: www.larsensmfg.com.
   4. Potter-Roemer: www.potterroemer.com.
   5. Pyro-Chem: www.pyrochem.com.
   6. Strike First Corporation of America; EL-Elite Architectural Series Fire Extinguisher Cabinet, Non-Fire Rated: www.strikefirstusa.com.
   7. Substitutions: See Section 01 6000 - Product Requirements.

### 2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gage.
   1. Class: A:B:C.
   2. Size: 5 pound (2.27 kg).

### 2.03 FIRE EXTINGUISHER CABINETS

A. Product: Larsen's Manufacturing Co; Vertical Duo

B. Metal: Formed aluminum.

B. Cabinet Configuration: Recessed type, 5/16” Flat Trim.

C. Door: 1/2 inch thick, reinforced for flatness and rigidity; latch. Satin finish pull handle. Hinge doors for 180 degree opening with continuous piano hinge. Provide self adjusting roller catch.

D. Door Glazing: Tempered Safety Glass, clear.

**2.04 ACCESSORIES**

A. Extinguisher Brackets: Formed steel, chrome-plated.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

**3.02 INSTALLATION**

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings.

C. Secure rigidly in place.

D. Place extinguishers and accessories in cabinets.

**3.03 SCHEDULES**

A. Corridors: Fire Extinguisher in recessed cabinet locate as shown on code plan.

B. Boiler Room: 1 Fire Extinguisher hung on bracket locate near exterior door.

**END OF SECTION**

# SECTION 12 2400
# WINDOW SHADES

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Window shades and accessories.

### 1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

B. Section 09 2116 - Gypsum Board Assemblies: Substrate for window shade systems.

### 1.03 REFERENCE STANDARDS

A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2010.

### 1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details.

### 1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of experience.

### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

### 1.07 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

### 1.08 WARRANTY

A. Provide 25 year manufacturer's warranty from the Date of Substantial Completion, covering the following: mounting hardware, headbox, clutch, fascia and shade fabric

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Manually Operated Roller Shades:
   1. Draper, Inc: www.draperinc.com.
      a. Product: Clutch Operated FlexShade
   2. Lutron Electronics Co., Inc: www.lutron.com.
   3. Hunter Douglas: www.hunterdouglas.com.

B. Shade Fabric: Mermet Natte, color to be selected from manufacturer’s standard range.

C. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

### 2.02 ROLLER SHADES

A. Roller Shades: Fabric roller shades complete with mounting brackets, roller tubes, hembars, hardware and accessories; fully factory-assembled.
   1. Drop: Regular roll.
   2. Size: As indicated on drawings.

B. Fabric: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation; PVC-free; 100 percent recycled.
   1. Flammability: Pass NFPA 701 large and small tests.

C. Roller Tube: As required for type of operation, extruded aluminum with end caps.
   1. Fabric Attachment: Utilize double sided adhesive tape.

D. Hembars and Hembar Pockets: Wall thickness designed for weight requirements and adaptation to uneven surfaces, to maintain bottom of shade straight and flat.

### 2.03 ACCESSORIES

A. Fascias: Size as required to conceal shade mounting.

B. Brackets and Mounting Hardware: As recommended by manufacturer for mounting configuration and span indicated.

C. Fasteners: Non-corrosive, and as recommended by shade manufacturer.

### 2.04 FABRICATION

A. Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch (13 mm) space between bottom bar and window stool.

B. Dimensional Tolerances: As recommended in writing by manufacturer.

C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

### 3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

### 3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Adjust level, projection and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure shades for smooth operation.

### 3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

### 3.05 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

### 3.06 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

### 3.07 SCHEDULE

A. Provide manual window shades at all windows in all rooms. The following rooms are to receive motorized window shades:

1. North Cafeteria
2. South Cafeteria
3. Gymnasium / Auditorium

**END OF SECTION**

**12 3661**
**Solid Surfacing Countertops**

**PART 1 – GENERAL**

**1.01 SECTION INCLUDES:**

A. Solid surfacing countertops.

**1.02 RELATED SECTIONS:**

A. Cabinets - Section 06 4100.
B. Joint sealants - Section 07 9200.

**1.03 SUBMITTALS:**

A. Product Data: Submit manufacturer's literature and installation instructions in accordance with Section 01 3000.
B. Samples: Submit following samples
   1. Manufacturer’s standard color samples.
   2. One 12 x 12 in. sq. sample of countertop with edge treatment.

**PART 2 – PRODUCTS**

2.01 SOLID SURFACING COUNTERTOPS:

A. Qualities: Homogeneous, monolithic cast plastic, filled methyl methacrylate, smooth finish; or homogeneous, thermoset polymer alloy, comprised of polyester and acrylic components mixed with alumina trihydrate. Fabricate each countertop as one, monolithic unit.
   1. Thickness: 3/4 inch or as recommended by sub-contractor for stability
   2. Edge Treatment: As selected from manufacturer’s standard.
   3. Color: As scheduled.
B. Source: TBD

**2.02 RELATED MATERIALS:**

A. Adhesive: As recommended by manufacturer.

**PART 3 - EXECUTION**

**3.01 EXAMINATION:**

A. Examine substrate surfaces for conditions that would affect proper application of countertops.
B. Do not proceed until defects are corrected.

**3.2 INSTALLATION:**

A. Tops:
   1. Install plumb and level in accordance with manufacturer's directions. Maintain uniform 1/16 to 1/8 in. joints between tops and adjacent construction.
   2. Adhere tops to substrates with adhesives.
   3. Caulk perimeter joints with silicone sealant as specified in Section 07 920, color to match top.

**END OF SECTION**

# SECTION 12 4813
# ENTRANCE FLOOR MATS AND FRAMES

## PART 1 GENERAL

### 1.01 SECTION INCLUDES
A. Extruded aluminum entrance floor grilles.

### 1.02 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data indicating properties of walk-off surface, component dimensions.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS
A. Entrance Floor Grilles:
1. Mats, Inc;: www.matsinc.com.
a. Product: Grate Mat
2. Arden Architectural Specialties, Inc: www.ardenarch.com.
3. Reese Enterprises, Inc: www.reeseusa.com.

### 2.02 ENTRANCE FLOOR GRILLES AND GRATINGS
A. Entrance Floor Grilles: Recessed extruded aluminum grille assembly with nominal 1 inch (25 mm) wide tread strips running perpendicular to traffic flow, slots between treads, and perimeter frame forming sides of recess; grille hinged for access to recess.
1. Height: 3/8 inches.
2. Tread Surfaces: Nylon carpet.
C. Mounting: Top of concrete floor slab.
D. Cut to fit full width of vestibule.

### 2.03 FABRICATION
A. Construct recessed mat frames square, tight joints at corners, rigid. Coat surfaces with protective coating where in contact with cementitious materials.
B. Fabricate mats in single unit sizes; fabricate multiple mats where indicated.

## PART 3 EXECUTION

### 3.01 EXAMINATION
A. Verify that floor opening for mats are ready to receive work.

### 3.02 PREPARATION
A. Mats: Verify size of floor recess before fabricating mats.
B. Vacuum clean floor recess.

### 3.03 INSTALLATION
A. Install frames to achieve flush plane with finished floor surface.
B. Install walk-off surface in floor recess flush with finish floor after cleaning of finish flooring.

**END OF SECTION**

**SECTION 14 24 00**
**MACHINE ROOM-LESS HYDRAULIC PASSENGER ELEVATORS**

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section includes: Machine room-less hydraulic passenger elevators as shown and specified. Elevator work includes:
   1. Standard pre-engineered hydraulic passenger elevators.
   2. Elevator car enclosures, hoistway entrances and signal equipment.
   3. Operation and control systems.
   4. Jack(s).
   5. Accessibility provisions for physically disabled persons.
   6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
   7. Materials and accessories as required to complete the elevator installation.

B. Related Sections:
   1. Division 1 General Requirements: Meet or exceed all referenced sustainability requirements.
   2. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
   3. Division 4 Masonry: Installing inserts, sleeves and anchors in masonry.
   4. Division 5 Metals:
      a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
      b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
   5. Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
   6. Division 16 Sections:
      a. Providing electrical service to elevators, including fused disconnect switches where permitted. (note: fused disconnect switch to be provided as part of elevator manufacture product, see section 2.11 Miscellaneous elevator components for further details.)
      b. Emergency power supply, transfer switch and auxiliary contacts.
      c. Heat and smoke sensing devices.
      d. Convenience outlets and illumination in control room (if applicable), hoistway and pit.
   7. Division 22 Plumbing
      a. Sump pit and oil interceptor.
   8. Division 23 Heating, Ventilation and Air Conditioning
      a. Heating and ventilating hoistways and/or control room.

C. Work Not Included: General contractor shall provide the following in accordance with the requirements of the Model Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Part 3 for hydraulic elevators. State or local requirements must be used if more stringent. The cost of this work is not included in the TK Elevator's proposal, since it is a part of the building construction.
   1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.

2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.
3. Hatch walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2" at any point.
4. Elevator hoistways shall have barricades, as required.
5. Install bevel guards at 75° on all recesses, projections or setbacks over 2" (4" for A17.1 2000 areas) except for loading or unloading.
6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide divider beams between hoistway at each floor and roof.
7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
8. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42" minimum, (48" minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.
9. All wire and conduit should run remote from the hoistways.
10. When heat, smoke or combustion sensing devices are required, connect to elevator control cabinet terminals. Contacts on the sensors should be sided for 12 volt D.C.
11. Install and furnish finished flooring in elevator cab.
12. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. The general contractor shall supply the drywall framing so that the wall fire resistance rating is maintained, when drywall construction is used.
13. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator contractor.
14. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.
15. To maintain legal fire rating (masonry construction), door frames are to be anchored to walls and properly grouted in place.
16. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
17. General Contractor shall fill and grout around entrances, as required.
18. All walls and sill supports must be plumb where openings occur.
19. Locate a light fixture (200 lx / 19 fc) and convenience outlet in pit with switch located adjacent to the access door.
20. Provide telephone line, light fixture (200 lx / 19 fc), and convenience outlet in the hoistway at the landing where the elevator controller is located. Typically this will be at the landing above the 1st floor. Final location must be coordinated with elevator contractor.
21. As indicated by elevator contractor, provide a light outlet for each elevator, in center of hoistway.
22. For signal systems and power operated door: provide ground and branch wiring circuits.
23. For car light and fan: provide a feeder and branch wiring circuits to elevator control cabinet.
24. Controller landing wall thickness must be a minimum of 8 1/2 inches thick. This is due to the controller being mounted on the second floor landing in the door frame on the return

side of the door. For center opening doors, the controller is located on the right hand frame (from inside the elevator cab looking out). These requirements must be coordinated between the general contractor and the elevator contractor.

25. Cutting, patching and recesses to accommodate hall button boxes, signal fixtures, etc..

**1.02 SUBMITTALS**

A. Product data: When requested, the elevator contractor shall provide standard cab, entrance and signal fixture data to describe product for approval.

B. Shop drawings:
   1. Show equipment arrangement in the corridor, pit, and hoistway and/or optional control room. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
   2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
   3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
   4. Indicate electrical power requirements and branch circuit protection device recommendations.

C. Powder Coat paint selection: Submit manufacturer's standard selection charts for exposed finishes and materials.

D. Plastic laminate selection: Submit manufacturer's standard selection charts for exposed finishes and materials.

E. Metal Finishes: Upon request, standard metal samples provided.

F. Operation and maintenance data. Include the following:
   1. Owner's manuals and wiring diagrams.
   2. Parts list, with recommended parts inventory.

**1.03 QUALITY ASSURANCE**

A. Manufacturer Qualifications: An approved manufacturer with minimum 15 years of experience in manufacturing, installing, and servicing elevators of the type required for the project.
   1. The manufacturer of machines, controllers, signal fixtures, door operators cabs, entrances, and all other major parts of elevator operating equipment.
      a. The major parts of the elevator equipment shall be manufactured by the installing company and not be an assembled system.
   2. The manufacturer shall have a documented, on-going quality assurance program.
   3. ISO-9001:2000 Manufacturer Certified
   4. ISO-14001:2004 Environmental Management System Certified

B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than 15 years of satisfactory experience installing elevators equal in character and performance to the project elevators.

C. Regulatory Requirements:
    1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
    2. Building Code: National.
    3. NFPA 70 National Electrical Code.
    4. NFPA 80 Fire Doors and Windows.
    5. Americans with Disabilities Act - Accessibility Guidelines (ADAAG)
    6. Section 407 in ICC A117.1, when required by local authorities
    7. CAN/CSA C22.1 Canadian Electrical Code
    8. CAN/CSA B44 Safety Code for Elevators and Escalators.
    9. California Department of Public Health Standard Method V1.1–2010, CA Section 01350

D. Fire-rated entrance assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(b), and NFPA Standard 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory (2 hour label in Canada).

E. Inspection and testing:

    1. Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
    2. Arrange for inspections and make required tests.
    3. Deliver to the Owner upon completion and acceptance of elevator work.

F. Sustainable Product Qualifications:
    1. Environmental Product Declaration:
        a. GOOD: If Product Category Rules (PCR) are not available, produce a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that has at least a cradle to gate se.
        b. BEST: If Product Category Rules (PCR) are available, produce and publish an Environmental Product Declaration (EPD) based on a critically reviewed life-cycle assessment conforming to ISO 14044, with external verification recognized by the EPD program operator.
    2. Material Transparency:
        a. GOOD: Provide Health Product Declaration at any level
        b. BETTER: Provide Health Product Declaration (HPD v2 or later). Complete, published declaration with full disclosure of known hazards, prepared using the Health Product Declaration Collaborative's "HPD builder" on-line tool.
        c. BEST: Cradle to Cradle Material Health Certificate v3, Bronze level or higher.
    3. LEED v4 – Provide documentation for all Building Product Disclosure AND Optimization credits in LEED v4 for product specified.
    4. Living Building Challenge Projects: Provide Declare label for products specified.

## 1.04 DELIVERY, STORAGE AND HANDLING

A. Manufacturing shall deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

## 1.05 PROJECT CONDITIONS

A. Temporary Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

### 1.06 WARRANTY

A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months after final acceptance.

### 1.07 MAINTENANCE

A. Furnish maintenance and call back service for a period of 12 months for each elevator after completion of installation or acceptance thereof by beneficial use, whichever is earlier, during normal working hours excluding callbacks.
   1. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours.
   2. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
   3. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Manufacturer: Design based around TK Elevator’s endura Machine Room-Less hydraulic elevator.

### 2.02 MATERIALS, GENERAL

A. All Elevator Cab materials including frame, buttons, lighting, wall and ceiling assembly, laminates and carpet shall have an EPD and an HPD, and shall meet the California Department of Public Health Standard Method V1.1–2010, CA Section 01350 as mentioned in 1.03.9 of this specification.

B. Colors, patterns, and finishes: As selected by the Architect from manufacturer's full range of standard colors, patterns, and finishes.

C. Steel:
   1. Shapes and bars: Carbon.
   2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
   3. Finish: Factory-applied baked enamel for structural parts, powder coat for architectural parts. Color selection must be based on elevator manufacture’s standard selections.

D. Plastic laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness. Laminate selection must be based on elevator manufacture’s standard selections.

E. Flooring by others.

**2.03 HOISTWAY EQUIPMENT**

A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub-floor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.

B. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.

C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.

D. Guides: Slide guides shall be mounted on top and bottom of the car.

E. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.

F. Jack: A jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to ensure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Provide the following jack type: Twin post holeless. Two jacks piped together, mounted one on each side of the car with a polished steel hydraulic plunger housed in a sealed steel casing having sufficient clearance space to allow for alignment during installation. Each plunger shall have a high pressure sealing system which will not allow for seal movement or displacement during the course of operation. Each Jack Assembly shall have a check valve built into the assembly to allow for automatically re-syncing the two plunger sections by moving the jack to its fully contracted position. The jack shall be designed to be mounted on the pit floor or in a recess in the pit floor. Each jack section shall have a bleeder valve to discharge any air trapped in the section..

G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.

H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit. Provide proper viscosity grade inherently biodegradable oil as specified by the manufacturer of the power unit (see Power Unit section 2.04.G for further details)

I. Pit moisture/water sensor located approximately 1 foot above the pit floor to be provided. Once activated, elevator will perform “flooded pit operation”, which will run the car up to the designated floor, cycle the doors and shut down and trip the circuit breaker shunt to remove 3 phase power from all equipment, including pit equipment.

J. Motorized oil line shut-off valve shall be provided that can be remotely operated from the controller landing service panel. Also a means for manual operation at the valve in the pit is required.

**2.04 POWER UNIT**

A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit located in the elevator pit consisting of the following items:
   1. NEMA 4/Sealed Oil reservoir with tank cover including vapor removing tank breather
   2. An oil hydraulic pump.
   3. An electric motor.
   4. Electronic oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.

B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.

C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating – motors shall be capable of 80 starts per hour with a 30% motor run time during each start.

D. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
   1. Relief valve shall be adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
   2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
   3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
   4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
   5. Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.
   6. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
   7. A secondary hydraulic power source (powered by 110VAC single phase) must be provided. This is required to be able to raise (reposition) the elevator in the event of a system component failure (i.e. pump motor, starter, etc.)
   8. Oil Type: Provide a zinc free, inherently biodegradable lubricant formulated with premium base stocks to provide outstanding protection for demanding hydraulic systems, especially those operating in environmentally sensitive areas.

## 2.05 HOISTWAY ENTRANCES

A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.
   1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates (where required), sight guards, and necessary hardware.
   2. Main landing door & frame finish: ASTM A1008 steel panels, factory applied powder coat finish with factory-applied powder coat finish entrance frame.
   3. Typical door & frame finish: ASTM A366 steel panels, factory applied powder coat enamel finish with factory-applied powder coat finish entrance frame.

B. Integrated Control System: the elevator controller to be mounted to hoistway entrance above 1st landing. The entrance at this level, shall be designed to accommodate the control system and provide a means of access to critical electrical components and troubleshooting features. See section 2.09 Control System for additional requirements.

C. At the controller landing, the hoistway entrance frame shall have space to accommodate and provide a lockable means of access (group 2 security) to a 3 phase circuit breaker. See section 2.11 Miscellaneous Elevator Components for further details

D. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.

E. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
   1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
   2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
   3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.

F. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

## 2.06 PASSENGER ELEVATOR CAR ENCLOSURE

A. Car Enclosure:
   1. Walls: Cab type TKAP, reinforced cold-rolled steel with two coats factory applied baked enamel finish, with applied vertical wood core panels covered on both sides with high pressure plastic laminate.
   2. Reveals and frieze: a. Reveals and frieze: Powder Coated
   3. Canopy: Cold-rolled steel with hinged exit.
   4. Ceiling: Downlight type, metal pans with suspended LED downlights and dimmer switch. Number of downlights shall be dependent on platform size with a minimum of six. The metal pans shall be finished with a stainless steel, no. 4 brushed finish.
   5. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with brushed stainless steel

6. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
   a. Door Finish: Stainless steel panels: No. 4 brushed finish.
   b. Cab Sills: Extruded aluminum, mill finish.
7. Handrail: Provide 1.5' diameter cylindrical metal on side and rear walls on front opening cars and side walls only on front and rear opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
8. Ventilation: Manufacturer's standard exhaust fan, mounted on the car top.
9. Protection pads and buttons: Not required

B. Car Top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station shall give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

## 2.07 DOOR OPERATION

A. Door Operation: Provide a direct or alternating current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. The door control system shall be digital closed loop and the closed loop circuit shall give constant feedback on the position and velocity of the elevator door. The motor torque shall be constantly adjusted to maintain the correct door speed based on its position and load. All adjustments and setup shall be through the computer based service tool. Door movements shall follow a field programmable speed pattern with smooth acceleration and deceleration at the ends of travel. The mechanical door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. AC controlled units with oil checks, or other deviations are not acceptable.
   1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
   2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
   3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel shall reverse and the door shall reopen to answer the other call.
   4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer shall sound. When the obstruction is removed, the door shall begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors shall stop and resume closing only after the obstruction has been removed.

5. Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors shall reverse and reopen. After the obstruction is cleared, the doors shall begin to close.
6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors shall recycle closed then attempt to open six times to try and correct the fault.
7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors shall recycle open then attempt to close six times to try and correct the fault.
8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.

B. Door Protection Device: Provide a door protection system using microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

## 2.08 CAR OPERATING STATION

A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Wrap return shall have a brushed stainless steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED's shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided.

B. Emergency Communications System: Integral phone system provided.

C. Auxiliary Operating Panel:

D. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.

E. Special Equipment: Not Applicable

F. Digital Services: Cloud-based IoT monitoring system comes standard with these options:

Remote Monitoring with Application Programming Interface (API) Integration

ADA Phone - Code Compliant Cellular Connectivity

A17.1 2019 Code - Enhanced Communications

Smart Device Elevator Calling with occupant app API integration

## 2.09 CONTROL SYSTEMS

A. Controller: Shall be integrated in a hoistway entrance jamb. Should be microprocessor based, software oriented and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.

B. Service Panel – to be located outside the hoistway in the controller entrance jamb and shall provide the following functionality/features:
   1. Access to main control board and CPU
   2. Main controller diagnostics
   3. Main controller fuses
   4. Universal Interface Tool (UIT)
   5. Remote valve adjustment
   6. Electronic motor starter adjustment and diagnostics
   7. Operation of pit motorized shut-off valve with LED feedback to the state of the valve in the pit
   8. Operation of auxiliary pump/motor (secondary hydraulic power source)
   9. Operation of electrical assisted manual lowering
   10. Provide male plug to supply 110VAC into the controller
   11. Run/Stop button

C. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.

D. Emergency Power Operation: (10-DOA) Upon loss of the normal power supply, building-supplied standby power is available on the same wires as the normal power supply. Once the loss of normal power is detected and standby power is available, the elevator is lowered to a pre-designated landing and the doors are opened. After passengers have exited the elevator, the doors are closed and the car is shut down. When normal power is restored, the elevator automatically resumes operation.

E. Special Operation: Not Applicable

F. Digital Services:

   Cloud-based IoT Monitoring System (standard): Contractor shall provide a cloud-based IoT (internet of things) monitoring system capable of tracking door movements and timing, trips, power cycles, car calls, out-of-service events and modes. This observation will continue 24/7 and it shall be capable of providing service technicians a minimum of three recommended solutions for defined failure events and automatically dispatch service technicians in the event of failure(s) while sending notifications to end users of changes in their equipment’s state via both email and mobile device. Access to IoT and related equipment data and status will be made available in both a web portal and mobile application secured by password and username with at least two-factor authentication. Finally, this system must be self-contained and not require internet provision by others.

Along with the monitoring system, options are available.

Remote Monitoring with Application Programming Interface (API) Integration: Contractor shall provide a portal and mobile device application (app) that communicates relevant service and operational information such as elevator operational status, open service call tickets, call ticket history and performance and service history. This system shall provide a REST application programming interface (API) capable of transmitting relevant information from the cloud-based IoT monitoring system. This data includes equipment operational status, door movements, service and maintenance history, traffic statistics and failure alerts.

ADA Phone – Code Compliant Cellular Connectivity: Contractor shall provide a phone service through a self-contained cellular based VoIP system. This system shall meet code, include a backup battery capable of powering the emergency communication equipment for 4+ hours in the event of a power outage. The solution shall have remote monitoring capability to ensure continuous connectivity with a means of remote troubleshooting. Remote monitoring capability shall include, at a minimum, the ability to monitor connectivity and power supply. Remote monitoring shall be capable of providing local alerts to response personnel when on-site intervention is required.

A17.1 2019 Code – Enhanced Communications: For jobs installed under enforcement of 2018 International Building Code or ASME A17.1-2019/CSA B44:19 Safety Code, contractor will provide a video camera necessary for viewing the elevator cab interior floor as well as a position indicator display in the cab operating panel capable of providing means of two-way, text-based communication when the emergency call button is engaged in the elevator car. These components, and associated cloud-based monitoring platform, will be non-proprietary in nature, allowing customization on where to direct emergency calls, while offering capability for any party to provide the emergency monitoring services.

Smart Device Elevator Calling with Occupant app API Integration: Contractor will provide an elevator calling application for smart devices (app) that can be accessed through Android and IOS smart device operating systems. This calling service shall be accomplished on both, Destination Dispatch and Traditional ETA elevator control system applications. Furthermore, a single, common and consistent app shall have the same user experience and user interface on both Destination Dispatch and Traditional ETA dispatching control systems. To enable mobile calling functionality without creating unnecessary wear on elevator components resulting from false calls, proximity detection beacons shall be installed in the elevator lobby at each floor. These beacons shall detect user smart devices and restrict calling of elevators when the user is not within a pre-configured range of elevator entrance. Beacon-based proximity detection distance must be configurable to accommodate various building and floor layouts. Once Bluetooth signal is detected, the user can place a floor call directly from their handheld or wearable device. The elevator calling app shall remove the need for interaction with hall fixtures, buttons or kiosks. This system shall be capable of placing an automatic call to a user-configured destination floor automatically based on both location in building (floor) and time of day. App users shall be able to configure their own source or starting floor, destination floor and schedule of automatic calling service, and be able to configure multiple automatic calling services and routines. System shall have reasonable ability to auto-provision users from access control system and not require duplicate entry of users for access control purposes. Finally, all services above shall be made available via an application programming interface (API) so that a 3rd party or tenant occupant app could be integrated with elevator smart device calling service so that users could receive multiple occupant experience-based services in a

single, common, 3rd party mobile device application (app).

## 2.10 HALL STATIONS

A. Hall Stations, General: Vandal resistant buttons with center jewels which illuminate to indicate that a call has been registered at that floor for the indicated direction. Each button shall be provided with an internal automatic stop to prevent damage of switches that register the call. Provide 1 set of pushbutton risers. All fixtures shall be vandal resistant type.
    1. Provide one pushbutton riser with faceplates having a brushed stainless steel finish.
        a. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.

B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.

C. Hall Position Indicator: An electronic dot matrix position indicator shall be provided and mounted for optimum viewing. As the car travels, its position in the hoistway shall be indicated by the illumination of the alphanumeric character corresponding to the landing which the elevator is stopped or passing. When hall lanterns are provided, the position indicator shall be combined with the hall lanterns in the same faceplate. Faceplates shall match hall stations. Provide at main landing only.

D. Hall lanterns: Not Applicable

E. Special Equipment: Not Applicable

## 2.11 MISCELLANEOUS ELEVATOR COMPONENTS

A. Oil Hydraulic Silencer: Install multiple oil hydraulic silencers (muffler device) at the power unit location. The silencers shall contain pulsation absorbing material inserted in a blowout proof housing.

B. Lockable three phase circuit breaker with auxiliary contact with shunt trip capability to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb and should be sized according to the National Electrical Code.

C. Lockable single phase 110V circuit breaker for cab light and fan to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb should be sized according to the National Electrical Code

# PART 3 EXECUTION

## 3.01 EXAMINATION

A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and/or control room, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator

installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

## 3.02 INSTALLATION

A. Install elevator systems components and coordinate installation of hoistway wall construction.
   1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
   2. Comply with the National Electrical Code for electrical work required during installation.

B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.

C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.

D. Welded construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.

E. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.

F. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.

G. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.

H. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.

I. Lubricate operating parts of system, where recommended by manufacturer.

## 3.03 FIELD QUALITY CONTROL

A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and recommended by Code and governing

regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.

B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

### 3.04 ADJUSTING

A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

### 3.05 CLEANING

A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; it shall not be cleaned with bleach-based cleansers.

B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.
   1. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

### 3.06 PROTECTION

A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

### 3.07 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

### 3.08 ELEVATOR SCHEDULE

A. Elevator Qty. 1
   1. Elevator Model: endura MRL Twinpost above-ground 1-stage
   2. Elevator Type: Hydraulic Machine Room-Less, Passenger

3. Rated Capacity: 2500 lbs.
4. Rated Speed: 110 ft./min.
5. Operation System: TAC32H
6. Travel:
7. Landings: 3 total
8. Openings:
    a. Front: 2
    b. Rear: 1
9. Clear Car Inside: 6'-8" wide x 4'-3 1/2" deep
10. Inside clear height: 7'-4" standard
11. Door clear height: 7'-0" standard
12. Hoistway Entrance Size: 3'-6" wide x 7'-0" high
13. Door Type: One-speed | LH Side opening
14. Power Characteristics: 208 volts, 3 Phase, 60 Hz.
15. Seismic Requirements: Zone
16. Hoistway Dimensions: 8'-4" wide x 6'-8 3/4" deep
17. Pit Depth: 4'-0"
18. Button & Fixture Style: Vandal Resistant Signal Fixtures
19. Special Operations: None
20. Digital Services:
    a. Remote Monitoring with Application Programming Interface (API) Integration
    b. ADA Phone - Code Compliant Cellular Connectivity
    c. A17.1 2019 Code - Enhanced Communications
    d. Smart Device Elevator Calling with occupant app API integration

**END OF SECTION**

**SECTION 21 0000**

**FIRE PROTECTION TABLE OF CONTENTS**

**PART 1 – GENERAL ..... 1**

1.1 GENERAL REQUIREMENTS AND REFERENCES ..... 1
1.2 DEFINITIONS ..... 1
1.3 SCOPE ..... 2
1.4 RELATED WORK UNDER OTHER SECTIONS ..... 2
1.5 REGULATORY REQUIREMENTS ..... 3
1.6 SUBMITTALS ..... 4
1.7 SURVEYS AND MEASUREMENTS ..... 7
1.8 COORDINATION ..... 7
1.9 MECHANICAL AND ELECTRICAL COORDINATION ..... 8
1.10 COORDINATION DRAWINGS ..... 8
1.11 INSTALLATION REQUIREMENTS ..... 9
1.12 TYPICAL DETAILS ..... 9
1.13 SLEEVES, INSERTS ..... 9
1.14 FIRESTOPPING, SMOKEPROOFING & WATERPROOFING ..... 9
1.15 CORING, DRILLING ..... 10
1.16 ACCESSIBILITY ..... 10
1.17 SUPPLEMENTARY SUPPORTING STEEL ..... 10
1.18 TOOLS AND EQUIPMENT ..... 10
1.19 PORTABLE AND DETACHABLE PARTS ..... 10
1.20 RECORD DRAWINGS, PROJECT CLOSEOUT ..... 10
1.21 GUARANTEE/WARRANTY ..... 11
1.22 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS ..... 12
1.23 QUALITY ASSURANCE ..... 12
1.24 DELIVERY, STORAGE AND HANDLING ..... 13
1.25 STAGING AND SCAFFOLDING ..... 13
1.26 EXTRA MATERIALS ..... 13
1.27 DESIGN CRITERIA ..... 14
1.28 FIRE PROTECTION WORKING PLANS ..... 14
1.29 UNIT PRICES ..... 17

**PART 2 – PRODUCTS ..... 17**

2.1 PIPE AND FITTINGS ..... 17
2.2 UNDERGROUND FIRE SERVICE ..... 17
2.3 WET PIPE SPRINKLER (175 psi) ..... 18
2.4 DRY PIPE SPRINKLER ..... 19
2.5 VALVES ..... 20
2.6 HANGERS, ANCHORS, CLAMPS AND INSERTS ..... 22
2.7 FIRE DEPARTMENT INLET CONNECTION ..... 22
2.8 SPRINKLER HEADS ..... 22
2.9 SPRINKLER CABINET ..... 24
2.10 SIGNALING DEVICES ..... 24
2.11 WATER PRESSURE GAUGES ..... 24
2.12 SLEEVES AND PENETRATIONS ..... 25

**PART 3 – EXECUTION ..... 25**

3.1 COORDINATION ..... 25
3.2 SHUT DOWNS ..... 25
3.3 TESTS ..... 26

3.4 PIPE VALVE AND EQUIPMENT IDENTIFICATION ..... 26
3.5 ANCHORS AND INSERTS ..... 27
3.6 TYPICAL DETAILS ..... 27
3.7 CORING, DRILLING ..... 27
3.8 SUPPLEMENTARY SUPPORTING STEEL ..... 27
3.9 SPRINKLER SYSTEM INSTALLATION ..... 28
3.10 WATER SERVICE ..... 28
3.11 SEISMIC RESTRAINTS ..... 29

# SECTION 21 0000
# FIRE PROTECTION

## PART 1 – GENERAL

### 1.1 GENERAL REQUIREMENTS AND REFERENCES

A. Include “General Requirements” and applicable parts of Division 1 as part of this section.

B. Examine all other sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this section. Where paragraphs of this section conflict with similar paragraphs of Division 1, requirements of this section shall prevail.

C. Coordinate work with that of all other trades affecting, or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.

D. The Subcontractor shall be responsible for filing all documents, payment of all fees, and securing of all inspections and approvals necessary for the work of this section.

E. The Fire Protection Subcontractor shall carry in the Bid Price all Utility Company and Municipal back charges for all materials furnished and work performed by them in conjunction with this Contract and pay same to the respective agency upon demand. The Fire Protection Subcontractor shall not be entitled to additional compensation after the submittal of his bid price should he fail, for any reason, to obtain the total back charge costs to be incurred by the local utility companies or municipal agencies.

### 1.2 DEFINITIONS

A. As used in this section, “provide,” means “furnish and install”, and “POS” means “Provided Under Other Sections”.

B. As used in the Contract Drawings and Specifications for Fire Protection work, certain non-technical words shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions of other documents governing the Fire Protection work.

1. “Furnish” means: Purchase and deliver to the project site complete with every necessary appurtenance and support all as part of the Fire Protection work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased item(s) are free of all liens, claims, or encumbrances.

2. “Install” means: Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the Fire Protection work.

3. “Provide” means: “Furnish” and “Install”.

4. “New” means: Manufactured within the past two (2) years and never before used.

C. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any fire protection item in the Contract Drawings or Specifications for Fire Protection work carries with it the instruction to furnish, install and connect the item as part of the Fire Protection work, regardless of whether or not this instruction is explicitly stated.

D. It shall be understood that the Specifications and Drawings for Fire Protection work are complimentary and are to be taken together for a complete interpretation of the Fire Protection work.

## 1.3 SCOPE

A. Perform work and provide material and equipment as shown on Contract Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.

1. Water supply from existing main to building.
2. Exterior water service piping (sprinkler).
3. Post indicator valve on water service.
4. Wet pipe sprinkler system and all components.
5. Dry pipe sprinkler system for attic and all components.
6. Fire department inlet connections.
7. Sprinkler heads, piping, fittings, hangers and valves.
8. Gate valves, check valves, drain valves, fire department valves.
9. Preparation of complete and detailed Shop Drawings in accordance with NFPA No. 13.
10. Preparation of complete and detailed Working Plans.
11. Submitting Drawings and obtaining necessary approvals, permits and certificates.
12. Tests.
13. Securing hydrant flow test data reports.
14. Hydraulic calculations.
15. Miscellaneous steel support.
16. Furnish and install water flow switches and tamper switches. Flow and tamper switches shall be wired to the fire alarm system under the Electrical section of this specification.

B. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.

C. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from Authorities Having Jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

D. Before submitting bid, visit and carefully examine site to identify existing conditions and difficulties that will affect work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions that are visible or readily construed by experienced observer.

E. Before starting work in a particular area of the project, visit site and examine conditions under which work must be performed including preparatory work done under other Sections or Contracts or by Owner. Report conditions that might affect work adversely in writing through Contractor to Architect. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing and preparatory work.

## 1.4 RELATED WORK UNDER OTHER SECTIONS

A. The following items are not included in this section and will be performed under the designated sections.

1. Temporary Facilities.
2. Earthwork: Excavation and backfill.
3. Concrete:
    a. Equipment foundations.
    b. Housekeeping pads.
    c. Rebar for items “a, and b” above.
4. Masonry: All openings in masonry walls.
5. Waterproofing, Dampproofing and Caulking.
6. Roofing and Flashing.
7. Painting: All painting.
8. Finished Carpentry and Millwork.
9. Steel Doors and Frames.
10. Finished Hardware.
11. Elevators and Lifts.
12. Electrical.
13. Plumbing.
14. HVAC.
15. Kitchen equipment.
16. Electric power wiring for all equipment.
17. Fire alarm system and controls.
18. Utilities beyond 5’-0” from the building.
19. Installation of access panels.
20. Electric heat tracing.
21. Concrete basins and pits.
22. Fuel oil storage and piping systems.

## 1.5 REGULATORY REQUIREMENTS

A. Comply with all applicable Federal and State laws, and all Local Codes, By-laws and Ordinances.

B. Where provisions of the Contract Documents conflict with any codes, rules or regulations, the latter shall govern. Where the contract requirements are in excess of applicable codes, rules or regulations, the contract provisions shall govern unless the Architect rules otherwise.

C. Request inspections from Authorities Having Jurisdiction, and obtain all permits and pay for all fees and inspection certificates as applicable and/or required. All permits and certificates shall be turned over to the Owners at the completion of the work. Copies of Permits shall be given to the Resident Engineer prior to the start of work.

D. Unless otherwise specified or indicated, materials and workmanship and equipment performance shall conform with the adapted by the State edition of the following standards, codes, Specifications, requirements and regulations:

1. State Building Code.

2. National Electric Code (NEC).
3. Environmental Protection Agency (EPA).
4. Department of Environmental Protection (DEP).
5. Local Ordinances, Regulations of the City or Town of Portsmouth, RI.
6. National Fire Protection Association (NFPA).
7. Owner's Insurance Underwriters.
8. American National Standards Institute (ANSI).
9. American Society of Mechanical Engineers (ASME).
10. American Society of Testing and Materials (ASTM).
11. American Welding Society (AWS).
12. Commercial Standards, U.S. Department of Commerce (CS).
13. Factory Mutual (FM).
14. National Electrical Manufacturers Association (NEMA).
15. American Gas Association (AGA).
16. Underwriter's Laboratories, Inc. (UL).
17. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
18. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS).
19. Americans with Disabilities Act (ADA).

E. All Fire Protection work shall meet or exceed any other State and Local Codes and/or Authorities Having Jurisdiction including all other standards indicated herein.

**1.6 SUBMITTALS**

A. This paragraph shall supplement Division 1.

B. Definitions:

1. Shop Drawings: Scaled detailed working Drawings (system layout) and equipment Specifications (cut sheets) indicating all information in accordance with requirements of the applicable NFPA Standards for the specific fire protection systems to be installed in accordance with the Registered Professional Engineer's plans and Specifications.
2. Coordination Drawings: Detailed, large-scale layout Shop Drawings showing HVAC, Electrical, Plumbing and Fire Protection work superimposed to identify conflicts and ensure inter-coordination of Mechanical, Electrical, Architectural, Structural and other work.

C. Submittals, Procedures and Format:

1. Review submittal packages for compliance with Contract Documents and then submit to Architect for review. Submit transparency and two (2) blue or black-line reproductions of each Shop Drawing larger than 8-1/2" x 11". Submit eight (8) sets of each smaller shop drawing. After review, transparency original of each large Shop Drawing and six (6) sets of each small shop drawing will be returned with reviewer's marks. Electronically submitted shop drawings are acceptable.
2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:
   a. Title.

b. Name and location of project.

c. Names of Architect, Engineer, Contractor and Subcontractor(s).

d. Names of Manufacturer, Supplier, Vendor, etc.

e. Date of submittal.

f. Whether original submittal or resubmitted.

g. Contractors' license number and expiration date.

3. Shop Drawings showing manufacturer's product data shall contain detailed dimensional Drawings, accurate and complete description of materials of construction, manufacturer's published performance characteristics and capacity ratings (performance data alone is not acceptable), electrical requirements and wiring diagrams.

D. Acceptable Manufacturers:

1. The Fire Protection design for this project is based on the single manufacturer listed in the specification, schedule or shown on the Contract Drawings. In these Specifications certain "Alternate Manufacturers" are listed as being acceptable. These are acceptable only if, as a minimum, they:

a. Meet all performance criteria listed in the schedules and outlined in the Specifications.

b. Have identical operating characteristics to those called for in the Specifications.

c. Fit within the available space it was designed for, including space for maintenance and component removal, with no modifications to either the space or the product. Clearances to walls, ceilings and other equipment will be at least equal to those shown on the Contract Documents. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Architect has determined that the manufacturer's products will fit within the available space. This determination is solely the responsibility of the Contractor.

d. For equipment mounted in areas where structural matters are a consideration, the products must have a weight no greater than the product listed in the schedules or Specifications.

e. Products must adhere to all architectural considerations including, but not limited to, being the same size and of the same physical appearance as scheduled or specified products.

E. Substitutions: Substitution of products by Manufacturers other than those listed shall only be done in accordance with subparagraph "F" "Substitutions and Deviations".

F. Substitutions and Deviations:

1. Deviations from the Contract Documents and the substitution of materials or equipment relative to the "Acceptable Manufacturers" (referred to above) shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the substitution or deviation to the attention of the Architect. The letter shall describe changes in the system shown and physical characteristics (connections to adjacent materials, electrical services, service access requirements, and other characteristics), and differences in operating characteristics.

2. Without letters flagging the substitution or deviation to the Architect, it is possible that the Architect may not notice such substitution or deviation or may not realize its ramifications. Therefore, if such letters are not submitted to the Architect, the Contractor shall hold the Architect and his consultants harmless for any and all adverse consequences resulting from

the deviations being implemented. Adverse consequences shall include, but not be limited to, excessive noise, excessive maintenance, shortened longevity, spatial coordination problems, and inadequate performance versus scheduled design. This shall apply regardless of whether the Architect has reviewed or approved Shop Drawings containing the deviation, and will be strictly enforced.

3. Do not request substitute materials or equipment unless identical material or equipment has been operated successfully for at least three (3) consecutive years. Such materials and equipment shall be a regular cataloged item shown in the current catalog of the manufacturer. When deviation or substitution is permitted, coordinate fully with related changes to Architectural, Structural, Plumbing, Fire Protection, Mechanical, and other work. Ensure that related changes necessary for coordination of substituted items are made within the Contract Price. Assume full responsibility for safety, operation and performance of the altered system.
4. Substitutions of equipment, systems, etc. requiring approval of local Authorities must comply with such regulations and be filed by the Contractor (should filing be necessary).
5. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance, as delineated in schedules and in the Specifications, shall be interpreted as minimum performance.
6. Approval of proposed deviations or substitutions, if any, will be made at discretion of Architect.
7. If equipment is proposed for substitution that is not tested and rated according to industry-wide standards, the Architect shall have the right to have performance tests completed, at the Contractor's expense, to confirm the manufacturer's performance claims.

G. Submittal Notations: Submittals will be returned from the Architect marked as illustrated below:

| | |
|---|---|
| ☐ NO EXCEPTION TAKEN | ☐ ACCEPTED AS NOTED |
| ☐ NOT ACCEPTED | ☐ REVISE AND RESUBMIT |

1. Checking is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Any action shown is subject to the requirements of the Contract Drawings and Specifications. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site; fabrication process and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.

H. Schedule: Incorporated the Shop Drawing review period into the construction schedule so that work is not delayed. Contractor shall assume full responsibility for delays caused by not incorporating the following Shop Drawing review time requirements into his project schedule. Allow at least ten (10) working days, exclusive of transmittal time, for review each time shop a Shop Drawing is submitted or resubmitted with the exception that fifteen (15) working days, exclusive of transmittal time, are required for the following:

1. Coordination Drawings, if required by this Specification.
2. If more than five (5) Shop Drawings of this trade are received in one (1) calendar week.

I. List of Proposed Equipment and Materials: Within four (4) weeks after Award of Contract and before ordering materials or equipment, submit a complete list of proposed materials and equipment and indicate manufacturer's names and addresses. No consideration will be given to partial lists submitted out of sequence.

J. Responsibility:

1. The intent of submittal review is to check for capacity, rating, and certain construction features. Contractor shall ensure that work meets requirements of the Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with submittals marked “REVIEWED” to extent that they agree with the Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the Shop Drawing errors or deviations from requirements of the Contract Documents. The Architect’s noting of some errors while overlooking others will not excuse the Contractor for proceeding in error. Contract Document requirements are not limited, waived, nor superseded in any way by review.
2. Inform Subcontractors, Manufacturers, Suppliers, etc., of scope and limited nature of review process and enforce compliance with the Contract Documents.

K. Material and equipment requiring Shop Drawing Submittals shall include but not be limited to:

1. Wet pipe sprinkler system components including alarm valves, pipe, fittings, sprinkler heads, pressure gauges, etc.
2. Dry pipe sprinkler system components including dry pipe valves, pipe, fittings, sprinkler heads, air compressor, pressure gauges, etc.
3. Fire department connections.
4. Sprinkler heads, pipe, fittings, hangers and valves.
5. Valves including gate, fire department, drain and test type.
6. Access panels.
7. Seismic restraints.
8. Sprinklers shall be referred to on Contract Drawings and shall be specifically identified by the listed manufacturer’s style or series designation. Trade names and abbreviations are not permitted.

## 1.7 SURVEYS AND MEASUREMENTS

A. Base all required measurements, both horizontal and vertical, on reference points established by the General Contractor and be responsible for the correct laying out of the Fire Protection work. In the event of a discrepancy between actual measurements and those indicated, notify the General Contractor in writing. Do not proceed with the work required until written instructions have been issued by the General Contractor.

## 1.8 COORDINATION

A. Fire Protection Subcontractor shall furnish and install various electrical items relating to the fire protection equipment and control apparatus. The Electrical Subcontractor shall be required to connect power wiring to this equipment unless noted otherwise.

B. The Fire Protection and Electrical Subcontractors shall coordinate their respective portions of the work, as well as the electrical characteristics of the fire protection equipment.

C. All power wiring and local disconnect switches will be provided by the Electrical Subcontractor for the line voltage power.

D. 120V and above power wiring sources extended and connected to fire protection control panels, transformers and switches shall be the responsibility of the Electrical Subcontractor.

E. Flow and tamper switches shall be connected to the Building's fire alarm system by the Electrical Subcontractor.

## 1.9 MECHANICAL AND ELECTRICAL COORDINATION

A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of Mechanical and Electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with Structural and other trades and to meet Architectural requirements.

B. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the work.

C. Furnish to other trades advance information on locations and sizes of all frames, boxes, sleeves and openings needed for their work. Furnish information and Shop Drawings necessary to allow trades affected by the work to install their work properly and without delay.

D. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Architect. Where the Fire Protection work shall interfere with the work of other trades, assist in coordinating the space conditions to make satisfactory adjustments before installation. Without extra cost to the Owner, make reasonable modifications to the work as required by normal Structural interferences. Pay the General Contractor for additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not properly coordinated. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.

E. If any Fire Protection work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the fire protection trades involved without extra cost to the Owner.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect for review and approval.

G. Protect all materials and work of other trades from damage which may be caused by the Fire Protection work, and repair all damages without extra cost to the Owner.

## 1.10 COORDINATION DRAWINGS

A. Coordination Drawings:

1. The Sheetmetal Subcontractor shall prepare a complete set of 3D model electronic Drawings at a scale not less than 3/8" equals 1'-0", showing structure and other information as needed for coordination. He shall show sheetmetal layout thereon. These will be the Coordination Drawings.

2. The main paths of egress and for equipment removal, from main Mechanical, Electrical, Plumbing and Fire Protection rooms must be clearly shown on the Coordination Drawings. All fire and smoke partitions must be highlighted on the Coordination Drawings for appropriate coordination.

3. Each of the below specialty trades shall add its work to these background Drawings with appropriate elevations and grid dimensions. Specialty trade information is required for fan rooms and mechanical rooms, horizontal exits from duct shafts, crossovers, and for spaces in and above ceilings where congestion of work may occur such as corridors, and even entire floors. Drawings shall indicate horizontal and vertical dimensions, to avoid interference with structural framing, ceilings, partitions, and other services.

   a. Specialty Trades:

1) Plumbing System.
2) HVAC Piping and Associated Control System.
3) Electrical.
4) Sheetmetal Work.
5) Sprinkler System.

4. Each specialty trade shall sign and date each electronic Coordination Drawing. Return Drawings to the Sheetmetal Subcontractor, who shall route them sequentially to all specialty trades.
5. Where conflicts occur with placement of materials of various trades, the Sheetmetal Subcontractor will be responsible to coordinate the available space to accommodate all trades. Any resulting adjustments shall be initialed and dated by the specialty trade. The Sheetmetal Subcontractor shall then final date and sign each Coordination Drawing. If he cannot resolve conflicts, the decision of the General Contractor shall be final, subject to the approval of the Architect.
6. A Subcontractor who fails to promptly review and incorporate his work on the Coordination Drawings shall assume full responsibility of any installation conflicts affecting his work and of any schedule ramifications.
7. The Sheetmetal Subcontractor shall make electronic copies of all Coordination Drawings. Fabrication shall not start until such electronic Drawings are received by the Architect/Engineer and have been reviewed.
8. Review of Coordination Drawings shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with Architectural, Structural, Mechanical, Electrical, Plumbing and Fire Protection Contractors.

## 1.11 INSTALLATION REQUIREMENTS

A. The arrangement of all Fire Protection work shown on the Contract Drawings is diagrammatic only and indicates the minimum requirements of the work. Conditions at the building including actual measurements shall determine the details of the installation. All work shall be laid out and installed so as to require the least amount of cutting and patching.

B. Check the Architectural plans and Specifications before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Architect for his determination prior to proceeding with the work.

## 1.12 TYPICAL DETAILS

A. Typical details where shown on the Contract Drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the Contract Drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the Contractor shall have the prior approval of the Architect.

## 1.13 SLEEVES, INSERTS

A. Furnish and install all sleeves, inserts, anchor bolts and similar items to be set into masonry or concrete, as required for Fire Protection work as indicated in Division 1. Internal diameter of sleeve shall be 1/2” larger than the outside diameter of the pipe or insulation covered line passing through it.

## 1.14 FIRESTOPPING, SMOKEPROOFING & WATERPROOFING

A. All cutting, patching, firestopping and waterproofing shall be performed by the Fire Suppression Subcontractor. Refer to Sections 01 73 29 – CUTTING AND PATCHING, 07 00 01 – WATERPROOFING, DAMPPROOFING & CAULKING, and 07 84 13 PENETRATION FIRESTOPPING for project requirements.

### 1.15 CORING, DRILLING

A. Core, cut and/or drill all holes in walls and floors required for the installation of sleeves and supports for the Fire Protection work.

### 1.16 ACCESSIBILITY

A. Install all work such that parts requiring periodic inspection, operation, maintenance and repair are readily accessible.

B. Furnish all access panels appropriate to particular conditions, to be installed by trades having responsibility for the construction of actual walls, floors or ceilings at required locations.

### 1.17 SUPPLEMENTARY SUPPORTING STEEL

A. Provide all supplementary (non-structural) steelwork required for mounting or supporting equipment and materials.

B. Steelwork shall be firmly connected to building construction as required. Locations and methods of attachment shall be approved by the Architect.

C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer's published requirements.

D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction: all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.

E. All manufactured steel parts and fittings shall be galvanized.

### 1.18 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the mechanical and electrical equipment at the site.

### 1.19 PORTABLE AND DETACHABLE PARTS

A. Contractors shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment, etc. necessary for the proper operation and maintenance of the Fire Protection system until final completion of the work, at which time they shall be handed over to the Owners.

### 1.20 RECORD DRAWINGS, PROJECT CLOSEOUT

A. As the work progresses and for the duration of Contract, maintain a complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design. Work shall be updated on a weekly basis and shall be made available for review by Architect. Failure to perform this work shall be reason for withholding requisition payments. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.

B. At completion of the work prepare a complete set of electronic Record Drawings showing all systems as actually installed, including all fire alarms and electrical circuitry. The electronic

copies will be made available for the Fire Protection Contractor's copying, at his expense, for the Record Drawings. The quantity of electronic copies which are made available shall in no way be interpreted as setting a limit to the number of Drawings necessary to show the required information. The Fire Protection Contractor's professional Draft Person shall transfer changes to electronic copies. Submit sets of prints to Architect for comments as indicated in Division 1 – 01 77 00 – CONTRACT CLOSEOUT.

C. The Architect will not certify the accuracy of the Record Drawings. This is the sole responsibility of the Fire Protection and General Contractors.

D. This trade shall submit the Record Drawings for approval by the Fire and Building Departments in a form acceptable to the departments, when required by the jurisdiction.

E. Record Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer, make and model numbers of final equipment installation.

**1.21 GUARANTEE/WARRANTY**

A. Guarantee and 24 hour service.

1. Guarantee Work of this Section in writing for not less than one (1) year following the date of acceptance by the Owner. If the equipment is used for temporary service etc, prior to acceptance by the Owner, the bid price shall include an extended period of warranty covering the one (1) year of occupancy, starting from the date of acceptance by the Owner. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to the Architect's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.
2. In addition to guarantee requirements of Division 1 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's name.
3. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor without any reimbursement.
4. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Architect.
5. Provide 24 hour service beginning on the date the project is accepted by the Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the Owner. Service can be provided by this Contractor or a separate service organization. Choice of service organization shall be subject to Architect and Owner approval. Submit name and a phone number that will be answered on a 24 hour basis each day of the week, for the duration of the service.
6. Submit copies of equipment and material warranties to Architect before final payment.
7. At end of guarantee period, transfer manufacturer's equipment and material warranties still in force to Owner.
8. This paragraph shall not be interpreted to limit Owner's rights under applicable codes and laws and under this Contract.
9. PART 2 paragraphs of this Specification may specify warranty requirements that exceed those of this paragraph. Those paragraphs shall govern.
10. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of Work by Owner, and shall not initiate the guarantee period.

11. Manufacturer's Engineer and Technical Staff on site shall analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to Owner's satisfaction then advise the Architect in writing, describe efforts to rectify situation, and provide analysis of cause of problem. The Architect and/or Engineer will direct course of action.

## 1.22 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

A. Refer to Section 01 70 00 – CONTRACT CLOSEOUT and 01 78 23 – OPERATION AND MAINTENANCE DATA for submittal procedures pertaining to Operating and Maintenance Manuals.

B. Each copy of the approved Operating and Maintenance Manual shall contain copies of approved Shop Drawings, equipment literature, cuts, bulletins, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed. Each Manual shall have the following minimum contents:

1. Table of Contents.
2. Introduction:
    a. Explanation of manual and its purpose and use.
    b. Description of systems.
    c. Safety precautions necessary for equipment.
    d. Illustrations, schematics and diagrams.
    e. Installation drawing.
3. Maintenance:
    a. Maintenance and lubricating instructions.
    b. Replacement charts.
    c. Trouble-shooting charts for equipment components.
    d. Testing instructions for each typical component.
    e. Two (2) typed sets of instructions for ordering spare parts. Each set shall include name, price, telephone number and address of where they may be obtained.
4. Manufacturer's Literature: The equipment for which Shop Drawings have been submitted and approved.

## 1.23 QUALITY ASSURANCE

A. The requirements of the State Building Code and Local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.

B. All work shall comply with the adapted by the State editions of the codes as referenced herein.

C. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

1. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

D. Follow manufacturer's directions for articles furnished, in addition to directions shown on Contract Drawings or specified herein.

E. Protect all work, materials, and equipment from damage during process of work. Replace all

damaged or defective work, materials and equipment without additional cost to the Owner.

F. All equipment and materials for permanent installation shall be the products of recognized Manufacturers and shall be new.

G. Equipment and materials shall:

1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed and labeled.
2. Be without blemish or defect.
3. By products which will meet with the acceptance of all Authorities Having Jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be so examined, tested and certified.

H. All items of equipment or material of one generic type shall be the product of one manufacturer throughout.

I. For items which are to be installed but not purchased as part of the Fire Protection work, the Fire Protection work shall include:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into any point on the property line at grade level.
3. Their safe handling and field storage until the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement, if necessary, shall be coordinated with the Contractor who originally purchased the item.
5. Mounting in place, including the purchase and installation of all dunnage, supporting members, and fastenings, necessary to adapt them to architectural and structural conditions.

J. Items which are to be installed but not purchased as part of the Fire Protection work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one (1) week of the date of delivery to the project of the items in question. The Fire Protection work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

## 1.24 DELIVERY, STORAGE AND HANDLING

A. All materials for the work of this section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials shall be delivered and stored in their original containers, plainly marked with the products' and manufacturer's name. Materials in broken containers or in packages showing watermarks or other evidence of damage shall not be used and shall be removed from the site.

## 1.25 STAGING AND SCAFFOLDING

A. Provide staging and scaffolding for all the work of this section complying with Division 1 requirements.

## 1.26 EXTRA MATERIALS

A. Furnish extra materials described in following product specification sections that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

## 1.27 DESIGN CRITERIA

A. Provide wet-pipe sprinklers in all areas. Provide dry-type sprinkler system in all areas where ambient temperature is 40 deg. F or below.

B. Design sprinkler system according to the following:

1. Sprinkler Occupancy Hazard Classifications as follows:
    a. Building Services Areas: Ordinary Hazard, Group 2.
    b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
    c. General Storage Areas: Ordinary Hazard, Group 2.
    d. Mechanical Equipment Rooms: Ordinary Hazard, Group 2.
    e. Office and Public Areas: Light Hazard.
    f. Attic: Light Hazard.
2. Minimum Density for Automatic Sprinkler Piping Design – as follows:
    a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
    b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
    c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
    d. Special Occupancy Hazard: As determined by Authorities Having Jurisdiction.
3. Maximum Protection Area per Sprinkler – as follows:
    a. Office Space: 225 square feet.
    b. Utility Areas: 130 square feet.
    c. Storage Areas: 130 square feet.
    d. Mechanical Equipment Rooms: 130 square feet.
    e. Electrical Equipment Rooms: 130 square feet.
    f. Attic: 225 square feet.

C. Secure water flow test data taken from fire hydrants nearest site. If recent flow test data is not available from city records, make necessary tests as required by NFPA Standard to determine character of water supply.

D. Run piping horizontally and at right angles to walls and ceilings. Center sprinkler heads with respect to ceiling components, such as ceiling grid, lighting fixtures, HVAC diffusers and speakers, as directed by Architect.

E. Add a 10 psi safety factor to hydraulic calculations for a cushion against future pipe main deterioration. Pipe velocity in sprinkler piping shall not exceed 20 FPS.

F. Provide dry sprinkler system for sprinklers in areas subject to freezing.

G. Provide test connections at highest point of main portion of each sprinkler system, with 1” pipe and valve. Test pipe shall be connected to sprinkler pipe at least 1-1/4” in size and shall discharge outside building.

H. Utilize Victaulic Testmaster 2 for Inspectors test and draining the system.

I. Provide sprinklers in all areas except where exempted by code or Authority Having Jurisdiction.

## 1.28 FIRE PROTECTION WORKING PLANS

A. Submit working plans to indicate actual sprinkler system and/or combination system piping layout. Working plans shall be signed and sealed by a Professional Engineer.

B. Seismic restraints: All seismic restraints shall be indicated on working plans including locations and type of plan, details and calculations.

C. Hydraulic calculations shall be signed and sealed by Professional Engineer. Submit working plans and hydraulic calculations to:

1. Architect/Engineer.
2. Insurance Underwriter.
3. Building Department.
4. Fire Department.

D. Submit working plans and hydraulic calculations in one complete package. When it is not possible to submit entire system design in one package due to job conditions, submit plans of entire building indicating areas not yet defined. Submit working plans and hydraulic calculations to:

1. Architect/Engineer.
2. Insurance Underwriter.
3. Building Department.
4. Fire Department.

E. Working plans shall be at least 1/8”=1’ scale of sheets of uniform size. Working plans shall show all data required by NFPA No. 13, including but not limited to:

1. Name of Owner and Occupant.
2. Location, including street address.
3. Point of compass.
4. Full height cross section, or schematic diagram, if required for clarity; including ceiling construction and method of protection for nonmetallic piping.
5. Location of partitions.
6. Location of fire walls.
7. Occupancy class of each area or room.
8. Location and size of concealed spaces, closets, attics, and bathrooms.
9. Any small enclosures in which no sprinklers are to be installed.
10. Size of city main in street and whether dead-end or circulating; and, if dead-end, direction and distance to nearest circulating main. City main test results and system elevation relative to test hydrant.
11. Other sources or water supply, with pressure or elevation.
12. Make, type, and nominal orifice size of sprinklers.
13. Temperature rating and location of high-temperature sprinklers.
14. Total area protected by each system on each floor.
15. Number of sprinklers on each riser per floor.
16. Total number of sprinklers on each dry pipe system.

17. Approximate capacity in gallons of each dry pipe system.
18. Pipe type and schedule of wall thickness.
19. Nominal pipe size and cutting lengths of pipe (or center-to-center dimensions).
    a. Note: Where typical branch lines prevail, it will be necessary to size only one typical line.
20. Location and size of riser nipples.
21. Type of fittings and joints and location of all welds and bends. The Contractor shall specify on Contract Drawing any sections to be shop welded and the type of fittings or formations to be used.
22. Type and locations of hangers, sleeves, braces, and methods of securing sprinklers when applicable.
23. All control valves, check valves, drain pipes, and test connections.
24. Make, type, model, and size of alarm or dry pipe valve.
25. Kind and location of alarm bells.
26. Size and location of hose outlets, hand hose, and related equipment.
27. Underground pipe size, length, location, weight, material, point of connection to city main; the type of valves, meters, and valve pits; and the depth that the top of the pipe is laid below grade.
28. Piping provisions for flushing.
29. Where the equipment is to be installed as an addition to an existing system, enough of the existing system indicated on the plans to make all conditions clear.
30. For hydraulic designed systems, the information on the hydraulic data nameplate.
31. A graphic representation of the scale used on all plans.
32. Name and Address of Contractor.
33. Hydraulic reference points shown on the plan shall correspond with comparable reference points on the hydraulic calculation sheets.
34. The minimum rate of water application (density), the design area of water application, in-rack sprinkler demand, and the water required for hose streams both inside and outside.
35. The total quantity of water and the pressure required noted at a common reference point for each system.
36. Relative elevations of sprinklers, junction points, and supply or reference points.
37. If room design method is used, all unprotected wall openings throughout the floor protected.
38. Calculation of loads for sizing, and details of sway bracing.
39. The setting for pressure-reducing valves.
40. Information about backflow preventers (manufacturer, size, type).

F. Working plans will be subject to (Architect's) (Owner's) final approval. Submit to (Architect) (Owner) after review by other Authorities. If necessary to submit plans to Architect before review by other Authorities, identify Authorities that have not reviewed plans and resubmit for final approval when review by all parties is complete.

G. Sprinkler pipe sizing shall be based on hydraulic calculations.

H. Fire protection contractor shall provide piping layout on measured Drawings. For renovation

projects, this shall require Contractor to field survey existing building and prepare reproducible Drawings on which to show building background and all Fire Protection work.

I. Working Plans shall show all hangers and supports from floors, walls, underside of slabs and structural steel members. Where piping cannot be supported from walls or slabs, contractor shall provide additional structural steel bracing to support pipe.

J. Working Plans shall be submitted with the shop drawing cover sheet from Division 1. Any deviations from original plans and Specifications shall be noted. Any hydraulic deviations shall be noted.

### 1.29 UNIT PRICES

A. The Fire Protection Subcontractor shall list the following unit prices in bid proposal which shall include the complete installation (labor and materials) for each item(s):

1. Cost for addition of pendent head.
2. Cost for addition of sidewall head.
3. Cost for addition of upright head
4. Cost for addition of institutional sprinkler head.
5. Savings or deduction for eliminating a sprinkler head.

B. Above prices shall include 10 feet of piping, connection, sprinkler heads, fittings, hangers, labor system draining and refill, drawing involvement and any other associated costs for the addition or deletion of a sprinkler head.

## PART 2 – PRODUCTS

### 2.1 PIPE AND FITTINGS

A. Piping shall meet applicable ANSI or ASTM standard requirements and shall have manufacturer's name and standard marked on each length. Joints shall meet applicable ANSI or ASTM standards requirements. Where ANSI or ASTM standard does not exist, joints and fittings shall bear UL listing symbol.

B. General Material Notes:

1. System components shall be rated for the maximum working pressure to which they are exposed, but not less than 175 psig.
2. Pipe, tube valves and fittings shall meet or exceed ASTM/ANSI standards listed in the National Fire Protection Codes and specifically in NFPA-13.
3. All threaded piping and fittings shall conform to thread cuts listed in ANSI/ASME B1.20.1.
4. Welded methods shall comply with all the requirements listed in American Welding Society document D10.9, Levels AR-3.
5. Provide one-piece chrome plated escutcheons for all wall, floor and ceiling pipe penetrations in finished rooms and areas.

### 2.2 UNDERGROUND FIRE SERVICE

| **Ductile Iron** | **2" and Smaller** | **2-1/2" and Larger** |
|---|---|---|
| Pipe | Type "K" copper water tube conforming to ASTM B88 annealed. | Ductile iron AWWA C151. Cement lining ANSI A21.4 and AWWA C104. The outside coating shall |

| | | |
|---|---|---|
| | | be a bituminous coating of 1ml minimum thickness. The pipe shall be clearly marked with the letters "Ductile" of "DI" and shall indicate weight, class and casting period. |
| Fittings | ANSI/ASME B16.22 wrought copper and bronze pressure fittings. | Ductile iron 250 psi rating conforming to AWWA C-11, cement lining AWWA C-104. The fittings shall be clearly marked with the letters "Ductile" or "DI" and shall have an outside bituminous coating of 1 ml. |
| Joints | ANSI/AWS A5.8 BcuP silver braze. | Push on joint shall conform to a single rubber gasket joint per ANSI A21.11 and AWWA C111. Flange joints and pipe flanges shall conform to ANSI B16.1. Flanged joints are to be fitted such that the contact faces bear uniformly on the gasket and are made with uniform bolt stress. |
| Flanges | | Flanges shall be plain faced, CI150 and shall match the piping system and fittings on which they are installed. |
| Gaskets/Bolts | | Gaskets shall be full-face rubber 1/8" thick. Bolts and nuts shall conform to ANSI B18.2.1 and B18.2.2, respectively. |

A. Notes:

1. This contractor shall make submittal to the Water Authority Having Jurisdiction and secure all local permits and approval for the underground water piping system prior to submitting Shop Drawings to the Engineer. The shop drawing submittal to the Engineer shall include an approval notification from the local Water Authority.
2. Receiving, Storage and Handling: Pipe shall be unloaded using slings, hooks, pipe tongs or skids. Care should be taken to avoid injury to coating or lining. Store lubricant for rubber joints in a sanitary condition and as an aid in disinfection of the main. Rubber gaskets shall be used on a first in, first out basis and stored in a cool, dark location.
3. Thrust restraint shall be installed at all changes in direction, tees, deadends and where changes in pipe size occur by the use of concrete thrust blocks, restrained joints and tie rods.
4. Excavation, shoring and dewatering will be done under Division 33.

**2.3 WET PIPE SPRINKLER (175 psi)**

| Carbon Steel | 2" and Smaller | 2-1/2" and Larger |
|---|---|---|
| Pipe | Welded and seamless black steel pipe conforming to ASTM A53, ASTM A795 or ANSI/ASTM A135, Schedule 40. | Welded and seamless black steel pipe conforming to ASTM A795 or ANSI/ASTM A135, Schedule 10. |
| Fittings | Cast iron fittings. ANSI/ASME B16.1 and B16.4 | Mechanical grooved couplings with ductile iron housing clamps to |

| | | |
|---|---|---|
| | | engage and lock, “C” shaped composition sealing gasket, steel bolts, nuts and Vic plug gasket (pre-tube). |
| Joints | Thread. Apply joint compound or Teflon tape to male pipe threads on threaded systems. | Weld or roll groove. Welding procedures shall conform to the requirements of AWS D.10.9, level AR3. |
| Flanges | Flanges shall be plain faced and shall be CI-150 and shall conform to ANSI B.16.5. | Flanges shall be plain faced and shall be CI-150 and shall conform to ANSI B16.5. |
| Gaskets/Bolts | Gaskets shall be full face rubber 1/8” thick. Bolts and nuts shall conform to ANSI B18.2.1 and B18.2.2, respectively. | Gaskets shall be full face rubber 1/8” thick. Bolts and nuts shall conform to ANSI B18.2.1 and B18.2.2, respectively. |

A. Notes: Pipe material and fittings shall meet the standards set forth for pipe and tube in the National Fire Code NFPA 13, Section 6.3.

B. Grooved joint couplings shall consist of two (2) ductile iron housing segments, pressure responsive elastomer gasket, and ASTM A449 zinc-electroplated steel bolts and nuts.

1. Rigid: Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with NFPA-13. Couplings shall be fully installed at a visual pad-to-pad offset contact. Couplings that require gapping of bolt pads or specific torque ratings for proper installation are not permitted. Installation-Ready, for direct stab installation without field disassembly. Basis of Design: Victaulic Style 009H and 107N.

2. Flexible: Use in locations where vibration attenuation and stress relief are required. Basis of Design: Victaulic Style 177 Installation-Ready, and Style 77.

## 2.4 DRY PIPE SPRINKLER

| **Galvanized Steel** | **2” and Smaller** | **2 - 2-1/2” and Larger** |
|---|---|---|
| Pipe | Welded and seamless black steel pipe conforming to ASTM A53 Schedule 40. Galvanized to ASTM A795. | Welded and seamless black steel pipe conforming to ASTM A53 Schedule 40 or Schedule 10. Galvanized to ASTM A795. |
| Fittings | Galvanized cast iron Class 150 fittings ANSI/ASTM B16.1 and screw fittings per ANSI/ASME B.16.4. Mechanical grooved couplings with malleable iron housing clamps to engage and lock, “C” shaped composition sealing gasket, steel bolts, nuts and washers. | Galvanized cast iron class 150 fittings ANSI/ASME B.16.1 and screw fittings per ANSI/ASME B.16.4, ASME 31.1, 31.3. Mechanical grooved couplings with ductile iron housing clamps to engage and lock, “C” shaped composition sealing gasket, steel bolts, nuts, Vic plus pre-tube gasket. |
| Joints | Roll grooved, cut grooved or thread. Apply joint compound or Teflon to male pipe threads on threaded systems. | Roll groove or thread. Apply joint compound or Teflon tape to male pipe threads on threaded systems. |
| Flanges | | Flanges shall be plain face and shall be C1-150 and shall conform |

| | | |
|---|---|---|
| | | to ANSI B16.5. |
| Gaskets/Bolts | | Gaskets shall be full face rubber 1/8" thick. Bolts and nuts shall conform to ANSI B18.2.1 and B18.2.2, respectively. |

A. Notes:

1. Pipe material fittings shall meet the standards set forth for pipe and tube in the NFPA 13, Section 2-3.
2. Holes drilled or cut into the pipe system for fittings such as Mechanical tees, shall be re-galvanized after the hole drilling process.
3. Galvanic protection shall be reapplied after all cut groove processes.
4. Rubber gaskets or rubber flange gasket and couplings with rubber or neoprene gaskets are not allowed where ambient temperatures exceed 150°F unless listed for this service.

B. Grooved joint couplings shall consist of two (2) ductile iron housing segments, pressure responsive elastomer gasket, and ASTM A449 zinc-electroplated steel bolts and nuts.

1. Rigid: Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with NFPA-13. Couplings shall be fully installed at visual pad-to-pad offset contact. Couplings that require gapping of bolt pads or specific torque ratings for proper installation are not permitted. Installation-Ready, for direct stab installation without field disassembly. Basis of Design: Victaulic Style 009H and 107N.
2. Flexible: Use in locations where vibration attenuation and stress relief are required. Basis of Design: Victaulic Style 177 Installation-Ready, and Style 77.

## 2.5 VALVES

A. Valves shall be of materials and weights required by NFPA standards.

B. Valves that control mains inside building shall be approved OS&Y, 175 psi, unless noted otherwise, Basis of Design: Victaulic Series 771. Valves shall be normally open and shall accommodate tamper switches wired under Electrical Section. Victaulic Series 705 grooved end butterfly valves with pressure responsive seat, stainless steel stem (stem shall be offset from the disc centerline to provide complete 360-degree circumferential seating), and weatherproof actuator housing with built-in tamper switches UL/FM approved to 300 psi is acceptable.

C. Check valves shall be approved pattern, 250 psi, installed vertically or horizontally, Victaulic Series 717. Alarm valves shall be 300 psi UL/FM Victaulic Series 751 or approved equal suitable for variable pressure operation and wet pipe system.

D. Valves shall be UL-listed and FM-approved. Valves 2A and smaller shall be bronze body iron sized threaded end, Victaulic style 717, UL/FM approved 250 psi; valves 2-1/2" and larger shall be ductile iron body grooved end, Victaulic Series 705 butterfly valve UL/FM approved at 300 psi. Valves at fire pump shall be iron body butterfly.

E. Sprinkler Alarm Valves:

1. Sprinkler alarm valves and trim are described in the following charts: See Drawings for valve location and quantities.

Wet Pipe Valve

| | |
|---|---|
| Description | 175 psig working pressure, ductile iron body, grooved seat alarm port, external bypass, brass seat and removable hand |

| | |
|---|---|
| | hole cover hinged to a stainless steel clapper assembly. Valve internal components shall be replaceable with valve in the installed position. Size range: 1-1/2" to 8". |
| Manufacturers and Model No. | Victaulic Series 751 alarm check valve. |
| Trim Required | 300 psig trim kit. Victaulic Variable Pressure trim kit with retarding chamber, water pressure gauges to indicate the inlet and outlet pressures and water motor and electric pressure switch with approved connected alarms. All installed trim must be UL listed and FM approved for use with the Wet valve. |
| Prefabrication Requirements | All components ready for maintenance and inspection. Provide drip check valve, drain cup, alarm test shut-off valve, drain check valve. Provide the standard trim kit with gages. |
| Certification/Approvals | UL listed.<br>FM approved.<br>Accepted by the Local Authority Having Jurisdiction. |
| Guarantee | |
| Start-up and Service | Test and set valve to the satisfaction of the Authority Having Jurisdiction. Instruct Owner's Representative for valve actuation and maintain. |
| Capacities | See hydraulic data. |
| Acceptable Manufacturers | Viking Corporation<br>Reliable Automatic Sprinkler Co.<br>Victaulic Co. |

Dry Pipe Valve

| | |
|---|---|
| Description | Latching low differential valve utilizing external activator air pressure to provide a positive differential and mechanical seal. Provide a complete trim kit with a water motor alarm and electrical switches. Provide an accelerator with the system (as needed). Valve shall be externally resettable, and all internal components shall be replaceable with valve in the installed position. Required air pressure shall be 13-psi (90-kPa). |
| Manufacturers and Model No. | Victaulic Series 768-NXT dry pipe valve. |
| Accelerator | As required. |
| Air Compressor | Maintenance air compressor. Coordinate and match voltage requirements with field electrical service. |
| Prefabrication Requirements | All components ready for maintenance and inspection. Provide drip check valve, drain cup, alarm test shut-off valve, drain check valve. Provide the standard trim kit with gauges. Provide air compressor, dry actuator, air flow pressure switch, and system accelerator (if needed). |
| Certification/Approvals | UL listed.<br>FM approved.<br>Accepted by the Local Authority Having Jurisdiction. |
| Guarantee | |
| Start-up and Service | Test and set valve to the satisfaction of the Authority Having Jurisdiction. Instruct Owner's Representative on dry valve operation and reset procedure. |
| Capacities | See Drawings. |
| Acceptable Manufacturers | Viking Corporation<br>Reliable Sprinkler Company<br>Victaulic Co. |

## 2.6 HANGERS, ANCHORS, CLAMPS AND INSERTS

A. Hangers shall meet NFPA Standards. Provide adjustable swivel rings for piping 3” and smaller and adjustable clevis hangers for 4” and larger piping. Support piping from building structure to maintain required grade and pitch of pipe lines, prevent vibration, secure piping in place. Secure hangers to insets where practical. Hanger rods shall have machine threads.

B. Provide vertical brackets and guides for pipe risers at each floor and where horizontal piping is racked along walls. Trapeze hangers may be used where conditions permit.

C. Hanger rods shall be connected to beam clamp, or UL-listed concrete inserts. Beam clamps shall have retaining straps.

D. Hanger spacing shall meet requirements of state and local codes.

E. Pipe supports, vertical and horizontal, shall not bear on sleeves.

F. All support devices shall conform to seismic standards.

G. Provide seismic restraint calculations.

## 2.7 FIRE DEPARTMENT INLET CONNECTION

A. Provide polished brass inlet connections where shown on Contract Drawings, of size and type indicated, with brass caps and chains. Provide integral lettering as required by local Fire Department to indicate use for sprinklers and fire standpipe. Threads shall match local Fire Department.

B. On branch line to inlet connection, provide approved straightway check valve installed in horizontal position. Piping shall be arranged to drain between check valve and fire department inlet connection by approved ball drip connection piped to nearest drain or through wall.

C. Fire Department flush inlet connection shall be Potter-Roemer Figure No. 5023 (4” x 2-1/2” x 2-1/2”) chrome-plated. Square plate with lettering [INSERT LETTERING] with caps and chains. Threads shall match local Fire Department standards.

D. Fire Department flush inlet connection shall be Potter-Roemer STORZ Figure No. 5795, chrome-plated. Square plate with lettering [INSERT LETTERING] with caps and chain.

E. At the low point near each fire department connection, provide a 90-degree elbow with drain connection to allow for localized system drainage to prevent freezing. Basis of Design: Victaulic FireLock #10-DR.

## 2.8 SPRINKLER HEADS

A. Provide UL-listed and/or FM-approved, (quick response for light hazard) sprinkler heads.

B. Heads shall have ordinary degree temperature ratings, except in areas subject to abnormal heating conditions, where sprinkler heads shall have temperature ratings high enough to prevent accidental discharge. Minimum fusing temperature shall be 155°F.

C. Sprinklers shall be glass bulb type, with hex shaped wrench boss integrally cast into the sprinkler body to reduce the risk of damage during installation. (Wrenches shall be provided by the sprinkler manufacturer that directly engage the cast wrench boss). Basis of Design: Victaulic.

D. Sprinkler heads shall be by Victaulic, Tyco, or Reliable.

E. The following table indicates head types:

Sprinkler Head Specifications

| | | |
|---|---|---|
| Upright Sprinkler | Finish:<br>Temperature Rating:<br>Link:<br>Response Application:<br>Approvals:<br><br>Equivalent to: | Bronze<br>155°F (212°F Mechanical Rooms)<br>Glass bulb<br>Standard<br>UL, FM, Local Authority Having Jurisdiction<br>Victaulic V27 or V34 |
| Concealed | Finish:<br>Cover Plate:<br>Temperature Rating:<br>Link:<br>Response Application:<br>Approvals:<br><br>Equivalent to: | White (coordinate with Architect)<br>White<br>155°F<br>Glass bulb<br>Standard<br>UL, FM, Local Authority Having Jurisdiction<br>Victaulic V38 |
| Pendent/Gasketed | Finish:<br>Cover Plate:<br>Temperature Rating:<br>Link:<br>Response Application<br>Approvals:<br><br>Equivalent to: | Brass<br>White with dust tight seal/gasket<br>155°F<br>Glass bulb<br>Standard<br>UL, FM, Local Authority Having Jurisdiction<br>Victaulic V38 |
| Recess Pendent | Finish:<br>Temperature Rating:<br>Link:<br>Response Application:<br>Approvals:<br><br>Equivalent to: | Bronze<br>155°F<br>Glass bulb<br>Standard<br>UL, FM, Local Authority Having Jurisdiction<br>Victaulic V27 or V34 |
| Sidewall | Finish:<br>Cover Plate:<br>Temperature Rating:<br>Link:<br>Orifice Coefficient:<br>Response Application:<br>Approvals:<br><br>Equivalent to: | Chrome<br>Chrome<br>155°F<br>Glass bulb<br>5.6<br>Standard<br>UL, FM, Local Authority Having Jurisdiction<br>Victaulic V27 or V34 HSW |
| Dry Vertical Concealed | Finish:<br>Cover Plate:<br>Temperature Rating:<br>Link:<br>Response Application:<br>Approvals:<br><br>Equivalent to: | White (coordinate with Architect)<br>White<br>155°F<br>Fusible Alloy or glass bulb<br>Standard<br>UL, FM, Local Authority Having Jurisdiction<br>Victaulic V33 or Viking Model |

| | | |
|---|---|---|
| Dry Vertical Recessed Pendent | Finish:<br>Temperature Rating:<br>Link:<br>Response Application:<br>Approvals:<br><br>Equivalent to: | Chrome<br>155°F<br>Glass bulb<br>QR<br>UL, FM, Local Authority Having Jurisdiction<br>Victaulic V36 or Viking Model M |
| Quick Response Extended Coverage | Finish:<br>Temperature Rating:<br>Link:<br>Response Application:<br>Approvals:<br><br>Equivalent to: | Bronze<br>155°F<br>Glass bulb<br>QREC<br>UL, FM, Local Authority Having Jurisdiction<br>Victaulic V27 or V34 |

F. Flexible Stainless Steel Sprinkler Drop Systems may be used to locate sprinklers as required by final finished ceiling tiles and walls. The drop shall include a UL approved Series AH2 braided hose with a bend radius to 2-inch to allow for proper installation in confined spaces. The hose shall be listed for [(4) bends at 31" length] [(5) bends at 36" length] [(8) bends at 48" length] [10 bends at 60" length] [(12) bends at 72" length]. Union joints shall be provided for ease of installation. The flexible drop shall attach to the ceiling grid using a one-piece open gate Series AB1 or AB2 bracket. The bracket shall allow installation before the ceiling tile is in place. The braided drop system is UL listed and FM Approved for sprinkler services to 175 psi (1206 kPa). Basis of Design: Victaulic Vic-Flex.

## 2.9 SPRINKLER CABINET

A. Provide enameled steel sprinkler cabinet with approved number of sprinkler heads as required by NFPA. Provide appropriate sprinkler wrench with each type of head in each cabinet.

## 2.10 SIGNALING DEVICES

A. Tamper Switches to be:

1. "Potter" OSYSU-2 with two sets of SPDT contacts for installation on S+OS&Y valves or equivalent tamper switch.
2. "Potter" PCVS-2 with two sets of SPDT contacts for installation on PIV and butterfly valves or equivalent tamper switch.
3. Milwaukee BB-SCK02 with two sets of SPDT contacts for installation on built-in tamper switches for butterfly valves.

B. Water flow switches to be "Potter" WSR-F with retard and two sets of SPDT contacts or equivalent.

C. Pressure switches to be "Potter" PS100-2A with two sets of SPDT contacts.

D. High/low pressure switches to be Potter PS40-2A with two sets of SPDT contacts. One set of contacts to operate on decrease of pressure and the other to operate on increase of pressure.

E. Electric bell to be "Potter" PBA-AC.

## 2.11 WATER PRESSURE GAUGES

A. Water pressure gauges of the double spring Bourdon type, as manufactured by U.S. Gauge American, Mueller, Trerice, Ashcroft or approved equal, shall be installed at the top of standpipe risers and at fire pump and alarm check valves. The gauges shall have 3-1/2" diameter face with brass case and shall be Underwriter's approved.

B. Gauges shall be controlled by a valve with arrangements for drainage. An outlet, at least one quarter of an inch in size, plugged for the installation of the inspector's gauge shall be located between each valve and gauge.

C. Dial graduations reading in "psig" shall be such that the normal operating pressure of the system installed shall be indicated near the middle of the scale.

D. The accuracy of the gauges shall be within one (1) percent of the scale range.

### 2.12 SLEEVES AND PENETRATIONS

A. Pipe Sleeve Materials:

1. Sleeves through floors and through exterior, structural and fire-rated construction shall be galvanized Schedule 40 steel pipe.

2. Sleeves through partitions and non-fire-rated construction shall be 26 gauge galvanized steel with lock longitudinal seams or approved plastic pipe.

3. Provide waterproofing membrane locking devices at floors. Provide 150 lb. Slip-on welding flanges at exterior wall penetrations.

B. Fire stop penetration seals in fire-rated construction shall conform to ASTM E814 and shall be ceramic fiber (ProSet Systems Firewall); mineral fiber (Manville Thermo-mat); or silicone foam (Dow RTV 3-6548). Provide mineral fiberboard, matting or putty for damming and forming. Finish seals flush to wall surface and fill gaps with silicone adhesive sealant caulking (Dow 96-081 RTV or approved equal). Provide 1" thick ceramic fiber board on both sides of penetrations in 2 and 3 hour rated walls and floors less than 8" thick. All penetration seals shall be installed in accordance with listing requirements.

C. Packing for sleeves that do not require maintenance of fire rating shall be oakum, silicate, foam, ceramic fiber or mineral fiber with approved sealant. Pack or foam to within one inch of both wall surfaces. Seal penetration packing with approved caulking and paintable waterproof mastic surface finish or silicone caulking.

D. Wall and floor penetration fire stops shall be UL listed, FM approved.

## PART 3 – EXECUTION

### 3.1 COORDINATION

A. Cooperate and coordinate with work of other Sections in executing work of this Section.

B. Verify conditions and take field measurements as required to ensure work shall fit actual conditions. Field corrections to fabricate work and adjustments to adjacent work where required for proper installation of work shall be subject to Architect's approval. Corrections and adjustments shall be permitted only when not detrimental to appearance and function of work.

### 3.2 SHUT DOWNS

A. Work with Owner in maintaining integrity of new fire protection system. Coordinate and minimize any and all shut downs of fire protection system as follows:

1. Give proper notice to Owner when making shutdowns, a minimum of two full weeks.

2. Perform all duties required by Owner when making a shut down.

3. Fill out a Shutdown Notice form answering all items requested such as time and location of shut down, systems affected, areas affected, etc. when requesting a shut down.

4. Provide fire watch as required during a shut down.

5. Duration of shut downs shall be kept to a minimum.
6. In no case shall the fire protection system be shut down during off-hours of work day without a fire watch.
7. System shall be returned to normal operating conditions at end of work day.

### 3.3 TESTS

A. Test sprinkler system as required by NFPA Insurance Underwriters, Factory Mutual and agencies that have jurisdiction.

B. Test water flow detecting devices including associated alarm circuits through inspection test connection.

C. Test sprinkler system under pressure of 200 psi for two hours. Correct defects and leaks. Caulking will not be allowed.

D. Submit written approval of tests from Authorities Having Jurisdiction over installation to Owner before Final Acceptance of work.

E. Submit written approval of tests from Authorities Having Jurisdiction over installation to Owner before Final Acceptance of work.

F. Do not backfill before testing and approval.

G. Notify Architect and various departments and bureaus 48 hours before tests are to be made.

H. Operating test of sufficient duration shall be made for systems, equipment, fixtures and accessories to Owner's satisfaction.

I. General:

1. Test sprinkler and make watertight before painting and concealment. Make partial tests as required, during progress of work. Tests shall be witnessed by: General Contractor, Insurance Underwriter's Representative, Municipal Inspector and a Representative of the Architect.
2. Standpipe and sprinkler system shall be tested to hydrostatic test of 200 psi in accordance with NFPA requirements.
3. If inspection or test show defects, such defective work or material shall be replaced and inspection and tests shall be repeated. Repairs to piping shall be made with new material.

### 3.4 PIPE VALVE AND EQUIPMENT IDENTIFICATION

A. Provide color-coded pipe identification markers. Pipe markers shall be snap-on laminated plastic with acrylic coating. Pipe markers shall be applied after painting.

B. Provide arrow marker with each pipe content marker to indicate direction of flow. If flow can be in either direction, use double-headed arrow marker.

C. Mains shall be labeled at points of entrance and exit from mechanical room, next to valves, on risers, at tee fittings, at points of entrance and exit from building, at least once in each room and at intervals not longer than 20 feet.

D. In general, 2" high legend shall be used for pipe lines 4" diameter and larger than ¾" high legend shall be used for pipe lines 3" diameter and smaller.

E. Markers shall be Seton Setmark or approved equal.

F. Color banding shall meet latest ANSI and OSHA requirements.

G. Markers shall have legend with "black" letters:

| Service | Legend | Background Color |
|---|---|---|
| Sprinkler | Sprinkler | Red |
| Fire | Fire | Red |

H. Valve Tags:

1. All valves on pipes of every description shall have neat, circular brass valve tags of at least 1.5 inches in diameter, attached with brass hook to each valve stem. Stamp on these valve tags in letter as large as practical, the number of the valve and the service such as “S.P.” for sprinkler. The numbers of each service shall be consecutive.
2. All valves on equipment, tanks and pumps shall be numbered by 3 inch diameter red metal discs with white numbers 2 inches high secured to stem of valves by means of brass hooks or small solid link brass chain.

I. Equipment:

1. Nameplates shall be made of black surface, white core laminated “Bakelite” with indented letters.
2. Nameplates shall be a minimum of 3 inches long by 1.5 inches high and bear the equipment name as designated in these Specifications.
3. Equipment identification designations shall be taken from equipment schedules as indicated on the Contract Drawings or specified herein.

## 3.5 ANCHORS AND INSERTS

A. Inserts shall be UL listed and FM approved and shall be steel of type to receive machine bolt head or nut after installation. Inserts shall permit adjustment of bolt in one horizontal direction and shall develop strength of bolt when installed in properly cured concrete.

B. Provide anchors as necessary for attachment of equipment supports and hangers.

## 3.6 TYPICAL DETAILS

A. Typical details where shown on the Contract Drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the Control Drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the Contractor shall have the prior approval of the Owner.

## 3.7 CORING, DRILLING

A. Core, cut and/or drill all holes in walls and floors required for the installation of sleeves and supports for the Fire Protection work.

## 3.8 SUPPLEMENTARY SUPPORTING STEEL

A. Provide all supplementary steelwork required for mounting or supporting equipment and materials.

B. Steelwork shall be firmly connected to building construction as required.

C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer’s published requirements.

D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction; all turns shall be made at forty-five and ninety degrees, and/or as

dictated by construction and installation conditions.

E. All manufactured steel parts and fittings shall be galvanized; manufacturer shall be Unistrut or equivalent.

## 3.9 SPRINKLER SYSTEM INSTALLATION

A. Sprinkler risers shall have pressure gauges at the top and supervised control valves at the bottom.

B. Final sprinkler system test shall be witnessed by Authority Having Jurisdiction, Sales Representative, Owner's Representative and an Insurance Underwriter's Representative. Valves shall be properly adjusted for maximum pressure setting allowable as required and a typewritten report of such tests and adjustments shall be submitted to the Architect.

C. Grooved Joints: Install in accordance with the manufacturer's latest published installation instructions. Pipe ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to (and including) groove. Gasket shall be manufactured by the coupling manufacturer and verified as suitable for the intended service. A Factory Trained Representative (direct employee) of the coupling manufacturer shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and product installation. The Representative shall periodically visit the job site and review installation to ensure best practices in grooved joint installation are being followed. Contractor shall remove and replace any improperly installed products.

D. Signaling devices shall consist of the following:

1. Electric micro switch locks on zone valves and water flow control switches on each floor supply be wired to fire alarm panel and Building Automation System.
2. Alarm devices provided on alarm valves and pipes by Sprinkler Contractor.
3. Fire alarm zone panels and wiring by Electrical Contractor and System Automation Contractor.
4. Complete coordination shall be exercised between Sprinkler Contractor and Electrical Contractor to ensure electrical connections are compatible with fire alarm system described under Electrical Section.

E. Electric micro switch locks on zone valves and water flow control switches on each floor supply wired to fire alarm panel and Building Automation Sprinkler.

F. Alarm devices provided on alarm valves and pipes by Sprinkler Contractor.

G. Fire alarm zone panels and wiring by Electrical Contractor.

H. Complete coordination exercised between Sprinkler Contractor and Electrical Contractor to ensure electrical connections are compatible with fire alarm system described under Section 26 00 00.

## 3.10 WATER SERVICE

A. Provide water service piping. Provide offsets required to avoid conflicts with ledge and other unforeseen circumstances. Work associated with street main tapping and water service piping to building shall meet requirement of Local Authority. When work is not in progress, plug open ends of pipe to ensure that foreign matter does not enter piping system.

B. Tap existing main under pressure with a full tapping sleeve. Taping valve shall be UL listed and FM approved, iron body, bronze-mounted, non-rising stem, square head, mechanical joint end, 175 psi working pressure with valve box extensions to grade; box shall be approved by local Water Department.

C. Provide thrust blocks and tie rods for fittings used to change direction of water service piping. Where adequate bearing cannot be obtained for thrust blocks, provide tie rods.

D. Coordinate with pipe bedding provided under Division 33. Keep excavation open until system has been inspected, tested and approved.

E. Test water service piping at 200 psi for two (2) hours. Leakage shall not exceed 2 quarts per hour per 100 joints regardless of pipe diameter. Before connection to building water system, flush and disinfect water service.

### 3.11 SEISMIC RESTRAINTS

A. All piping, equipment and devices shall be seismically supported as required by Local and State Codes, and NFPA.

**END OF SECTION**

**SECTION 22 0000**

**PLUMBING TABLE OF CONTENTS**

**PART 1 – GENERAL ..... 1**

1.1 GENERAL REQUIREMENTS AND REFERENCES ..... 1
1.2 DEFINITIONS ..... 1
1.3 SCOPE ..... 1
1.4 RELATED WORK UNDER OTHER SECTIONS ..... 3
1.5 REGULATORY REQUIREMENTS ..... 3
1.6 SUBMITTALS ..... 4
1.7 SURVEYS AND MEASUREMENTS ..... 7
1.8 COORDINATION ..... 8
1.9 MECHANICAL AND ELECTRICAL COORDINATION ..... 8
1.10 MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS ..... 9
1.11 INSTALLATION REQUIREMENTS ..... 9
1.12 TYPICAL DETAILS ..... 10
1.13 SLEEVES, INSERTS ..... 10
1.14 CORING, DRILLING ..... 10
1.15 ACCESSIBILITY ..... 10
1.16 SUPPLEMENTARY SUPPORTING STEEL ..... 10
1.17 TOOLS AND EQUIPMENT ..... 10
1.18 PORTABLE AND DETACHABLE PARTS ..... 10
1.19 RECORD DRAWINGS, PROJECT CLOSEOUT ..... 10
1.20 GUARANTEE/WARRANTY ..... 11
1.21 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS ..... 12
1.22 QUALITY ASSURANCE ..... 12
1.23 DELIVERY, STORAGE AND HANDLING ..... 13

**PART 2 – PRODUCTS ..... 14**

2.1 PIPE MATERIALS ..... 14
2.2 COPPER PIPE (FOR CW, HWR, HW, TW SYSTEMS) ..... 15
2.3 STEEL PIPE (FOR NATURAL GAS SYSTEM) ..... 15
2.4 SANITARY WASTE AND VENT, STORM DRAIN ..... 17
2.5 FORCE MAIN ..... 17
2.6 PRESSURE, FLOW AND TEMPERATURE CONTROL DEVICES ..... 18
2.7 INSULATION ..... 18
2.8 PIPE SUPPORTS ..... 20
2.9 SLEEVES, INSERTS, FIRE STOPPING AND ESCUTCHEONS ..... 21
2.10 CLEANOUTS, TRAPS AND STRAINERS ..... 22
2.11 THERMOMETERS AND PRESSURE GAUGES ..... 23
2.12 WALL HYDRANTS AND HOSE BIBBS ..... 23
2.13 WATER HAMMER ARRESTERS ..... 23
2.14 PLUMBING FIXTURES AND TRIM ..... 24
2.15 EQUIPMENT – GENERAL ..... 24
2.16 WATER HEATERS ..... 25
2.17 PUMPS ..... 25

**PART 3 – EXECUTION ..... 26**

3.1 DEMOLITION ..... 26
3.2 COORDINATION ..... 26
3.3 EXPANSION PROVISIONS ..... 26
3.4 PIPE IDENTIFICATION ..... 26

3.5 TAGS, VALVES, EQUIPMENT AND INSTRUMENTS ..... 27
3.6 FLASHING AND COUNTER FLASHING ..... 28
3.7 JOINTS AND CONNECTIONS ..... 28
3.8 INTERIOR WATER SUPPLY SYSTEM ..... 28
3.9 INTERIOR SANITARY WASTE, STORM, DRAINAGE AND VENT PIPING ..... 29
3.10 WATER ENTRANCE ..... 29
3.11 WATER METER ..... 30
3.12 FIXTURE ROUGHINGS ..... 30
3.13 EQUIPMENT ROUGHINGS AND CONNECTIONS ..... 30
3.14 INSTALLATION OF SPECIALTY ITEMS ..... 31
3.15 INSTALLATION OF FIXTURES ..... 31
3.16 GAS SERVICE, METER, VENTS AND PIPING ..... 31
3.17 CROSS CONNECTION PROTECTION ..... 32
3.18 CLEANING ..... 32
3.19 DISINFECTION OF WATER SYSTEMS - INTERIOR AND EXTERIOR ..... 33
3.20 TESTING AND ADJUSTING – GENERAL ..... 33
3.21 TESTING: PIPING SYSTEMS ..... 35
3.22 SEISMIC RESTRAINTS ..... 37

# SECTION 22 0000

# PLUMBING

## PART 1 – GENERAL

### 1.1 GENERAL REQUIREMENTS AND REFERENCES

A. Include “General Requirements” and applicable parts of Division 1 as part of this section.

B. Examine all other sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this section. Where paragraphs of this section conflict with similar paragraphs of Division 1, requirements of this section shall prevail.

C. Coordinate work with that of all other trades affecting, or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.

D. The Plumbing Subcontractor shall be responsible for filing all documents, payment of all fees, and securing of all inspections and approvals necessary for the work of this section.

E. The Plumbing Subcontractor shall carry in the Bid Price all Utility Company and Municipal back charges for all materials furnished and work performed by them in conjunction with this Contract and pay same to the respective agency upon demand. The Plumbing Subcontractor shall not be entitled to additional compensation after the submittal of his bid price should he fail, for any reason, to obtain the total back charge costs to be incurred by the local utility companies or municipal agencies.

### 1.2 DEFINITIONS

A. As used in this section, “provide” means “furnish and install”, and “POS” means “Provided Under Other Sections”.

B. As used in the Drawings and Specifications for Plumbing work, certain non-technical words shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions of other documents governing the Plumbing work.

1. “Furnish” means: Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the Plumbing work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased item(s) are free of all liens, claims, or encumbrances.

2. “Install” means: Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the Plumbing work.

3. “Provide” means: “Furnish” and “Install”.

4. “New” means: Manufactured within the past two (2) years and never before used.

C. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any plumbing item in the Drawings or Specifications for Plumbing work carries with it the instruction to furnish, install and connect the item as part of the Plumbing work, regardless of whether or not this instruction is explicitly stated.

D. It shall be understood that the Specifications and Drawings for Plumbing work are complimentary and are to be taken together for a complete interpretation of the Plumbing work except that indications on the Drawings, which refer to an individual element of work, take precedence over the Specifications where they conflict.

### 1.3 SCOPE

A. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.
   1. Domestic water piping system.
   2. Non-potable water system including reduced pressure backflow preventer for HVAC.
   3. Backflow preventers.
   4. Domestic water heaters.
   5. Interior sanitary waste and vent piping system.
   6. Interior sanitary drainage system.
   7. Sump pump.
   8. Force main piping (ejector and sump discharge).
   9. Circulation Pumps.
   10. Interior rainwater drainage system.
   11. Plumbing fixtures and trim.
   12. Natural gas system.
   13. Extend all gas train vents to atmosphere.
   14. Final connection to all gas fired equipment including valves, regulators, drip and dirt pockets, unions and necessary appurtenances.
   15. Roof, area and floor drains.
   16. Hose bibs and wall hydrants.
   17. Insulation.
   18. Valves.
   19. Water hammer arresters.
   20. Fittings unions, flanges and couplings.
   21. Flashing of floor drains.
   22. Service water connections to kitchen equipment.
   23. Roughing and final connections to kitchen equipment.
   24. Hangers, plates and inserts.
   25. Cleaning, testing and disinfection of piping systems.
   26. All supplementary steel for piping and equipment support.
   27. Guarantees.
   28. Drilling for installation of inserts.
   29. Flexible connections.
   30. Core drilling.
   31. Fire seal off all penetrations in floors and walls to the rating of the barrier.

B. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items,

appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.

C. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from Authorities Having Jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

D. Before submitting bid, visit and carefully examine site to identify existing conditions and difficulties that will affect work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions that are visible or readily construed by experienced observer. Site visit is particularly important because this is renovation work.

E. Before starting work in a particular area of the project, visit site and examine conditions under which work must be performed including preparatory work done under other Sections or Contracts or by Owner. Report conditions that might affect work adversely in writing through Contractor to Architect. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing and preparatory work.

## 1.4 RELATED WORK UNDER OTHER SECTIONS

A. The following items are not included in this section and will be performed under other sections.

1. Temporary Facilities.
2. Earthwork: Excavation and backfill.
3. Concrete:
   a. Equipment foundations.
   b. Housekeeping pads.
4. Masonry: All openings in masonry walls.
5. Waterproofing, Damp-proofing and Caulking.
6. Roofing and Flashing.
7. Painting: All painting except as specified herein.
8. Finish Carpentry and Millwork.
9. Steel Doors and Frames.
10. Finish Hardware.
11. Elevators and Lifts.
12. Fire Protection.
13. Electrical.
14. HVAC.
15. Foundation drains.
16. Site drainage.
17. Furnishing of toilet accessories such as toilet paper holders, mirrors and soap dispensers.
18. Utility structures.

## 1.5 REGULATORY REQUIREMENTS

A. Comply with all applicable Federal and State laws, and all Local codes, By-laws and Ordinances.

B. Where provisions of the Contract Documents conflict with any codes, rules or regulations, the latter shall govern. Where the contract requirements are in excess of applicable codes, rules or regulations, the contract provisions shall govern unless the Architect rules otherwise.

C. Request inspections from Authorities Having Jurisdiction, obtain all permits and pay for all fees and inspection certificates as applicable and/or required. All permits and certificates shall be turned over to the Owners at the completion of the work. Copies of permits shall be given to the resident engineer prior to the start of work.

D. Unless otherwise specified or indicated, materials and workmanship and equipment performance shall conform with the latest edition of the following standards, codes, Specifications, requirements and regulations:

1. Local and State Building, Plumbing, Mechanical, Electrical, Fire and Health Department Codes.
2. American Gas Association (AGA).
3. National Fire Protection Association (NFPA).
4. American Insurance Association (AIA), formerly National Board of Fire Underwriters.
5. Occupational Safety and Health Act (OSHA).
6. Factory Mutual Association (FM).
7. Underwriter's Laboratories (UL).

E. All Plumbing work shall meet or exceed any other state and local codes and/or Authorities Having Jurisdiction including all other standards indicated herein.

## 1.6 SUBMITTALS

A. This paragraph shall supplement Division 1.

B. Definitions:

1. Shop Drawings: Information prepared by the Contractor to illustrate portions of the work in more detail than shown in the Contract Documents.
2. Coordination Drawings: Detailed, large-scale layout Shop Drawings showing HVAC, Electrical, Plumbing and Fire Protection work superimposed to identify conflicts and ensure inter-coordination of Mechanical, Electrical, Architectural, Structural and other work.

C. Submittals Procedures and Format:

1. Review submittal packages for compliance with Contract Documents and then submit to Architect for review. Submit transparency and two (2) blue or black-line reproductions of each Shop Drawing larger than 8-1/2" x 11". Submit eight (8) sets of each smaller shop drawing. After review, transparency original of each large Shop Drawing and six (6) sets of each small shop drawing will be returned with reviewer's marks. Electronically submitted shop drawings are acceptable.
2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:
   a. Title.
   b. Name and location of project.
   c. Names of Architect, Engineer, Contractor and Subcontractor(s).
   d. Names of Manufacturer, Supplier, Vendor, etc.

e. Date of submittal.

f. Whether original submittal or resubmitted.

3. Shop Drawings showing manufacturer's product data shall contain detailed dimensional Drawings, accurate and complete description of materials of construction, manufacturer's published performance characteristics and capacity ratings (performance data alone is not acceptable), plumbing requirements and wiring diagrams. Drawings shall clearly indicate location (terminal block or wire number), voltage and function for all field terminations, and other information necessary to demonstrate compliance with all requirements of Contract Documents.

D. Acceptable Manufacturers:

1. The Architect's Plumbing design for each project is based on the single manufacturer listed in the schedule or shown on the Drawings. In Division 15 of these Specifications certain "Alternate Manufacturers" are listed as being acceptable. These are acceptable only if, as a minimum, they:

a. Accepted by Architect and Engineer.

b. Meet all performance criteria listed in the schedules and outlined in the Specifications.

c. Have equivalent operating characteristics to those called for in the Specifications.

d. Fit within the available space it was designed for, including space for maintenance and component removal, with no modifications to either the space or the product. Clearances to walls, ceilings and other equipment will be at least equal to those shown on the Contract Documents. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Architect has determined that the manufacturer's products will fit within the available space. This determination is solely the responsibility of the Contractor.

e. For equipment mounted in areas where structural matters are a consideration, the products must have a weight no greater than the product listed in the schedules or Specifications.

f. Products must adhere to all architectural considerations including, but not limited to, being the same size and of the same physical appearance as scheduled or specified products.

E. Substitutions: Substitution of products by manufacturers other than those listed shall only be done in accordance with subparagraph "F" "Substitutions and Deviations".

F. Substitutions and Deviations:

1. Deviations from the Contract Documents and the substitution of materials or equipment relative to the "Acceptable Manufacturers" referred to above, shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the substitution or deviation to the attention of the Architect. The letter shall describe changes in the system shown and physical characteristics (connections to adjacent materials, plumbing services, service access requirements, and other characteristics), and differences in operating characteristics or cycles.

2. Without letters flagging the substitution or deviation to the Architect, it is possible that the Architect may not notice such substitution or deviation or may not realize its ramifications. Therefore, if such letters are not submitted to the Architect, the Contractor shall hold the Architect and his consultants harmless for any and all adverse consequences resulting from the deviations being implemented. Adverse consequences shall include, but not be limited to, excessive noise, excessive maintenance, shortened longevity, spatial coordination

problems, and inadequate performance versus scheduled design. This shall apply regardless of whether the Architect has reviewed or approved Shop Drawings containing the deviation, and will be strictly enforced.

3. Do not request substitute materials or equipment unless identical material or equipment has been operated successfully for at least three (3) consecutive years. Such materials and equipment shall be a regular cataloged item shown in the current catalog of the manufacturer. When deviation or substitution is permitted, coordinate fully with related changes to Architectural, Structural, Plumbing, Fire Protection, Mechanical, and other work. Ensure that related changes necessary for coordination of substituted items are made within the Contract Price. Assume full responsibility for safety, operation and performance of the altered system.
4. Substitutions of equipment, systems, etc. requiring approval of local Authorities must comply with such regulations and be filed by the Contractor (should filing be necessary).
5. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance, as delineated in schedules and in the Specifications, shall be interpreted as minimum performance.
6. Approval of proposed deviations or substitutions, if any, will be made at discretion of Architect.
7. If equipment is proposed for substitution that is not tested and rated according to industry-wide standards, the Architect shall have the right to have performance tests completed, at the Contractor's expense, to confirm the manufacturer's performance claims.

G. Submittal Notations: Submittals will be returned from the Architect marked as illustrated below:

| | |
|---|---|
| □ NO EXCEPTION TAKEN | □ ACCEPTED AS NOTED |
| □ NOT ACCEPTED | □ REVISE AND RESUBMIT |

1. Checking is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Any action shown is subject to the requirements of the Drawings and Specifications. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site; fabrication process and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.

H. Schedule: Incorporated the Shop Drawing review period into the construction schedule so that work is not delayed. Contractor shall assume full responsibility for delays caused by not incorporating the following Shop Drawing review time requirements into his project schedule. Allow at least ten (10) working days, exclusive of transmittal time, for review each time a Shop Drawing is submitted or resubmitted with the exception that fifteen (15) working days, exclusive of transmittal time, are required for the following:

1. Copies of all backflow preventer permits.
2. Certification of domestic water system disinfection.
3. Coordination Drawings, if required by this Specification.
4. Adjustment and balancing certification.
5. If more than five (5) Shop Drawings of this trade are received in one (1) calendar week.

I. List of Proposed Equipment and Materials: Within four (4) weeks after Award of Contract and before ordering materials or equipment, submit a complete list of proposed materials and equipment and indicate manufacturer's names and addresses. No consideration will be given to partial lists submitted out of sequence.

J. Responsibility:

1. The intent of submittal review is to check for capacity, rating, and certain construction features. Contractor shall ensure that work meets requirements of the Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with submittals marked “REVIEWED” to extent that they agree with the Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the Shop Drawing errors or deviations from requirements of the Contract Documents. The Architect’s noting of some errors while overlooking others will not excuse the Contractor for proceeding in error. Contract Documents requirements are not limited, waived, nor superseded in any way by review.
2. Inform Subcontractors, Manufacturers, Suppliers, etc. of scope and limited nature of review process and enforce compliance with the Contract Documents.

K. Material and equipment requiring Shop Drawing Submittals shall include but not be limited to:

1. Plumbing fixtures and trim.
2. Sump pumps.
3. Water heaters.
4. Roof and floor drains.
5. Hose bibs and wall hydrants.
6. Piping.
7. Fittings, unions, flanges and couplings.
8. Insulation.
9. Sleeve packing.
10. Valves
11. Water hammer arresters.
12. Flashing of floor drains.
13. Backflow preventers.
14. Hangers, plates and inserts.
15. Flexible connections.
16. Receptors for condensate drainage.
17. Circulation pumps.
18. Fire-rated penetration assembles (ASTM E814, UL 1479).
19. Access panels.
20. Shop Drawings shall be submitted as a single bound package, organized and titled.

## 1.7 SURVEYS AND MEASUREMENTS

A. Base all required measurements, both horizontal and vertical, on reference points established by the General Contractor and be responsible for the correct laying out of the Plumbing work. In the event of a discrepancy between actual measurements and those indicated, notify the General Contractor in writing. Do not proceed with the work required until written instructions have been issued by the General Contractor.

## 1.8 COORDINATION

A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of Mechanical and Electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with Structural and other trades and to meet Architectural requirements.

B. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the work.

C. Furnish to other trades advance information on locations and sizes of all frames, boxes, sleeves and openings needed for their work. Furnish information and Shop Drawings necessary to allow trades affected by the work to install their work properly and without delay.

D. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Architect. Where the Plumbing work shall interfere with the work of other trades, assist in coordinating the space conditions to make satisfactory adjustments before installation. Without extra cost to the Owner, make reasonable modifications to the work as required by normal Structural interferences. Pay the General Contractor for additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not properly coordinated. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.

E. If any Plumbing work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the plumbing trades involved without extra cost to the Owner.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect for review and approval.

G. Protect all materials and work of other trades from damage which may be caused by the Plumbing work, and repair all damages without extra cost to the Owner.

## 1.9 MECHANICAL AND ELECTRICAL COORDINATION

A. Plumbing Subcontractor shall furnish and install various electrical items relating to the plumbing equipment and control apparatus. The Electrical Subcontractor shall be required to connect power wiring to this equipment unless noted otherwise.

B. The Plumbing and Electrical Subcontractors shall coordinate their respective portions of the work, as well as the electrical characteristics of the plumbing equipment.

C. All power wiring and local disconnect switches will be provided by the Electrical Subcontractor for the line voltage power. All control and interlocking wiring shall be the responsibility of the Plumbing Subcontractor.

D. 120V and above power wiring sources extended and connected to heating and ventilating control panels, transformers and switches shall be the responsibility of the Electrical Subcontractor. All low voltage thermostats, zone valve and any switch wiring shall be the responsibility of the HVAC Subcontractor.

E. Temperature control and equipment wiring shall be installed by the Plumbing Subcontractor.

F. Pipe heat tracing shall be furnished and installed by the Electrical Subcontractor. Power connections shall be by the Electrical Subcontractor.

G. The Electrical Subcontractor will provide all magnetic starters except those furnished as an integral part of packaged equipment.

## 1.10 MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS

A. Coordination Drawings:

1. The Sheetmetal Subcontractor shall prepare a complete set of electronic Drawings at a scale not less than 3/8” equals 1’-0”, showing structure and other information as needed for coordination. He shall show sheetmetal layout thereon. These will be the Coordination Drawings.
2. The main paths of egress and for equipment removal, from main Mechanical and Electrical rooms must be clearly shown on the Coordination Drawings.
3. Each of the below specialty trades shall add its work to these background Drawings with appropriate elevations and grid dimensions. Specialty trade information is required for fan rooms and mechanical rooms, horizontal exits from duct shafts, crossovers, and for spaces in and above ceilings where congestion of work may occur such as corridors, and even entire floors. Drawings shall indicate horizontal and vertical dimensions, to avoid interference with structural framing, ceilings, partitions, and other services.
    a. Specialty Trades:
        1) Plumbing System.
        2) HVAC Piping and Associated Control System.
        3) Fire Suppression System.
        4) Electrical.
        5) Sheet Metal Work.
4. Each specialty trade shall sign and date each electronic Coordination Drawing. Return Drawings to the Sheetmetal Subcontractor, who shall route them sequentially to all specialty trades.
5. Where conflicts occur with placement of materials of various trades, the Sheetmetal Subcontractor will be responsible to coordinate the available space to accommodate all trades. Any resulting adjustments shall be initialed and dated by the specialty trade. The Sheetmetal Subcontractor shall then final date and sign each Coordination Drawing. If he cannot resolve conflicts, the decision of the General Contractor shall be final, subject to the approval of the Architect.
6. A Subcontractor who fails to promptly review and incorporate his work on the Coordination Drawings shall assume full responsibility of any installation conflicts affecting his work and of any schedule ramifications.
7. The Sheetmetal Subcontractor shall make electronic copies of all Coordination Drawings. Fabrication shall not start until such transparencies of completed Drawings are received by the Architect/Engineer and have been reviewed.
8. Review of Coordination Drawings shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with Architectural, Structural, Mechanical, and Electrical Contractors.

## 1.11 INSTALLATION REQUIREMENTS

A. The arrangement of all Plumbing work shown on the Drawings is diagrammatic only and indicates the minimum requirements of the work. Conditions at the building including actual measurements shall determine the details of the installation. All work shall be laid out and installed so as to require the least amount of cutting and patching.

B. Review the Architectural Drawings and Specifications before ordering any material and

equipment. Any discrepancies shall be brought to the attention of the Architect for his determination prior to proceeding with the work.

### 1.12 TYPICAL DETAILS

A. Typical details where shown on the Drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the Drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the Contractor shall have the prior approval of the Architect.

### 1.13 SLEEVES, INSERTS

A. Furnish and install all sleeves, inserts, anchor bolts and similar items to be set into masonry or concrete, as required for Plumbing work. Internal diameter of sleeve ball shall be 1/2" larger than the outside diameter of the pipe or insulation covered line passing through it.

### 1.14 CORING, DRILLING

A. Core, cut and/or drill all holes in walls and floors required for the installation of sleeves and supports for the Plumbing work.

### 1.15 ACCESSIBILITY

A. Install all work such that parts requiring periodic inspection, operation, maintenance and repair are readily accessible.

B. Furnish all access panels appropriate to particular conditions, to be installed by trades having responsibility for the construction of actual walls, floors or ceilings at required locations.

### 1.16 SUPPLEMENTARY SUPPORTING STEEL

A. Provide all supplementary (non-structural) steelwork required for mounting or supporting equipment and materials.

B. Steelwork shall be firmly connected to building construction as required. Locations and methods of attachment shall be approved by the Architect.

C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer’s published requirements.

D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction: all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.

E. All manufactured steel parts and fittings shall be galvanized.

### 1.17 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the plumbing equipment at the site.

### 1.18 PORTABLE AND DETACHABLE PARTS

A. Contractors shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment, etc. necessary for the proper operation and maintenance of the Mechanical and Electrical systems until final completion of the work, at which time they shall be handed over to the Owners.

### 1.19 RECORD DRAWINGS, PROJECT CLOSEOUT

A. As work progresses and for the duration of Contract, maintain a complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design. Work shall be updated on a weekly basis and shall be made available for review by Architect. Failure to perform this work shall be reason for withholding requisition payments. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.

B. At the completion of work, prepare a complete set of electronic Record Drawings showing all systems as actually installed. The electronic copies will be made available for the Plumbing Contractor's copying, at his expense. The quantity of copies which are made available shall in no way be interpreted as setting a limit to the number of Drawings necessary to show the required information. The Plumbing Contractor's professional Draft Person shall transfer changes to electronic copies. Submit three (3) electronic sets of prints to Architect for comments as to compliance with this section.

C. The Architect will not certify the accuracy of the Record Drawings. This is the sole responsibility of the Plumbing Contractor.

D. This trade shall submit the Record Drawings for approval by the Fire and Building Departments in a form acceptable to the departments, when required by the jurisdiction.

E. Record Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer, make and model numbers of final equipment installation.

## 1.20 GUARANTEE/WARRANTY

A. Guarantee and 24 Hour Service:

1. Guarantee Work of this Section in writing for not less than one (1) year following the date of acceptance by the Owner. If the equipment is used for temporary power etc, prior to acceptance by the Owner, the bid price shall include an extended period of warranty covering the one (1) year of occupancy, starting from the date of acceptance by the Owner. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to the Architect's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

2. In addition to guarantee requirements of Division 1 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's name.

3. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor without any reimbursement.

4. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Architect.

5. Provide 24 hour service beginning on the date the project is accepted by the Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the Owner. Service can be provided by this Contractor or a separate service organization. Choice of service organization shall be subject to Architect and Owner approval. Submit name and a phone number that will be answered on a 24 hour basis each day of the week, for the duration of the service.

6. Submit copies of equipment and material warranties to Architect before final payment.

7. At end of guarantee period, transfer manufacturer's equipment and material warranties still in force to Owner.
8. This paragraph shall not be interpreted to limit Owner's rights under applicable codes and laws and under this Contract.
9. PART 2 paragraphs of this Specification may specify warranty requirements that exceed those of this paragraph. Those paragraphs shall govern.
10. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of Work by Owner, and shall not initiate the guarantee period.
11. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to Owner's satisfaction, advise the Architect in writing, describe efforts to rectify situation, and provide analysis of cause of problem. The Architect and/or Engineer will direct course of action.

## 1.21 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

A. Refer to Section 01700 – CONTRACT CLOSEOUT for submittal procedures pertaining to operating and maintenance manuals.

B. Each copy of the approved operating and maintenance manual shall contain copies of the approved Shop Drawings, equipment literature, cuts, bulletins, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed. Each manual shall have the following minimum contents:

1. Table of Contents.
2. Introduction:
    a. Explanation of manual and its purpose and use.
    b. Description of the plumbing systems.
    c. Safety precautions necessary for equipment.
    d. Illustrations, schematics and diagrams.
    e. Installation drawing.
3. Maintenance:
    a. Maintenance and lubricating instructions.
    b. Replacement charts.
    c. Trouble-shooting charts for equipment components.
    d. Testing instructions for each typical component.
    e. Two (2) typed sets of instructions for ordering spare parts. Each set shall include name, price, telephone number and address of where they may be obtained.
4. Manufacturer's Literature:
    a. The equipment for which Shop Drawings have been submitted and approved.

## 1.22 QUALITY ASSURANCE

A. The requirements of the State Building Code and Local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.

B. All work shall comply with the latest editions of the codes as referenced herein.

C. Follow manufacturer's directions for articles furnished, in addition to directions shown on the Drawings or specified herein.

D. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to the Owner.

E. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.

F. Equipment and materials shall:

1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed and labeled.
2. Be without blemish or defect.
3. Not be used for temporary purposes.
4. Be in accordance with the latest applicable ASME standards.

G. Products shall meet with the acceptance of all Authorities Having Jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be so examined, tested and certified.

H. All items of equipment or material of one generic type shall be the product of one manufacturer throughout.

I. For items which are to be installed but not purchased as part of the Electrical work, the Electrical work shall include:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into any point on the property line at grade level.
3. Their safe handling and field storage until the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement, if necessary, shall be coordinated with the Contractor who originally purchased the item.
5. Field erection and internal wiring as necessary for their proper operation.
6. Mounting in place, including the purchase and installation of all dunnage, supporting members, and fastenings, necessary to adapt them to architectural and structural conditions.
7. Their connection to building wiring including the purchase and installation of all termination junction boxes necessary to adapt and connect them to this wiring. Included also shall be the purchase and installation of any substitute lugs or other wiring terminations as may be necessary to adapt their terminals to the building wiring as called for and to the connection methods set forth in these Specifications.

J. Items which are to be installed but not purchased as part of the Plumbing work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the Plumbing work will be considered only if presented in writing within one (1) week of the date of delivery to the project of the items in question. The Plumbing work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

## 1.23 DELIVERY, STORAGE AND HANDLING

A. All materials for the work of this section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials shall be delivered and stored in their original containers, plainly marked with the products' and manufacturer's name. Materials in broken containers or in packages showing watermarks or other evidence of damage shall not be used and shall be removed from the site.

## PART 2 – PRODUCTS

### 2.1 PIPE MATERIALS

A. The table below indicates pipe class for each service. Refer to the following pages for expanded Specifications for the respective class.

PIPE MATERIALS SPEC INDEX

| Service | Code | Maximum Operating (psig) | Service Limits (Temperature °F) | Pipe Material |
|---|---|---|---|---|
| Domestic Cold Water | CW | 150 below grade | 250 | Copper |
| Domestic Hot Return | HWR | 150 below grade | 250 | Copper |
| Domestic Hot Water | HW | 150 below grade | 250 | Copper |
| Non-Potable Water | NPW | 100 | 250 | Copper |
| Tempered Water | TW | 100 | 250 | Copper |
| Natural Gas | G | 50 | 70 | C. Steel |
| Sanitary Waste & Vent | S | Gravity | 120 | PVC |
| Storm Drain | D | Gravity | 80 | PVC |
| Force Main | FM | 75 | 120 | G. Steel |

B. Each valve type shall be the product of a single manufacturer. Each system shall be provided with valves as required by Code and shown on the Drawings and shall be installed to facilitate operation, replacement and repair.

C. Provide access panels for concealed valves behind non-removable ceilings or walls.

D. Provide shut-off valves on supply piping to individual pieces of equipment.

E. Provide pipe dope, Teflon tape, wax rings, neoprene gaskets and other jointing compounds as required by best standard practice and only on service as recommended by manufacturer.

F. Apply putties and jointing compounds for plumbing fixtures and trim as recommended by manufacturers.

G. Valves on insulated piping system shall be equipped with extended handles to accommodate insulation thickness.

H. Provide 1-piece chrome plated escutcheons for all wall, floor and ceiling pipe penetrations in finished rooms and areas.

## 2.2 COPPER PIPE (FOR CW, HWR, HW, TW SYSTEMS)

| | 1/2" to 3" | 4" and Larger |
|---|---|---|
| Pipe | Seamless copper water tube, drawn temper, Type L. ASTM B-88. See Note 1. | Seamless copper water tube, drawn temper, Type L. ASTM B-8. See Notes 2 & 5. |
| Fittings | Wrought copper, solder-joint. ASTM B-16.22. | Ductile iron coupling with copper alkyd enamel paint coating, ASTM A-536. Grade "E" EPDM elastomer gasket. ASTM D-2000. Equal to Victaulic Style 606 coupling. ASTM B-75 copper alloy fittings. ASTM B-584 grooved end cast bronze fittings for 6" pipe size. |
| Joints | ASTM B-32 solder filled material, Alloy Sb5 "95/5." ASTM B-813 liquid or paste flux. Soldering procedures shall comply with ASTM B-828. | Rolled groove prepared and assembled in accordance with manufacturer's instructions. |
| Mechanical Joints | Cast copper alloy unions, hexagonal stock with ball-and-socket joint, solder joint ends. ASME B-6.18. | ANSI Class 150 flange adapter equal to Victaulic Style 641 for connections to flanged equipment. ANSI B-16.1 flange dimensions. Watts G-4000-FDA series. |
| Valves Gate | Use ball valve. | Use ball valve. |
| Ball | All bronze, 3 piece, full port, PTFE seats, solder end connections. 600 psig WOG. Apollo 82-200, Milwaukee BA-350, Watts B-6801. | Class 125, cast iron body, epoxy coated. Full port, flanged ends, stainless steel ball and stem. ANSI B16.1 flange dimensions. Watts G-4000 FDA series. |
| Check | Bronze body and clapper, solder ends, 200 WOG. Jenkins 4093, WOG. Milwaukee 1509, Stockham B-309. | Iron body, bronze mounted, flanged ends, 200 Jenkins 625-C, Milwaukee F-2974-M, Stockham G-931. |
| Balancing | All bronze, 2 piece, RPTFE seats, solder end connections. 600 psig WOG. Apollo 70-100, Milwaukee BA-150, Watts B-6001. CamLock handle. | Cast iron lug body butterfly valve. Bronze disc, replaceable EPT liner and stainless steel stem, 200 psig CWP. |

A. Notes:

1. Below grade water piping 3" and smaller be Type K copper with bituminous coating copper brazed joints, BcuP filler alloy. ANSI/AWS A5.8 procedures shall be per ANSI/AWS B2.2.
2. Contact between dissimilar metals shall be made with dielectric couplings or dielectric flanges. Contact between ferrous and stud bolts and bronze flanges shall be electrically insulated with non-metallic washers.
3. Provide mechanical joint connections to all equipment such as water heaters, pumps, compressors, etc.

## 2.3 STEEL PIPE (FOR NATURAL GAS SYSTEM)

| | 2" and Smaller | 2-1/2" and Larger |
|---|---|---|

| | | |
|---|---|---|
| Pipe | Schedule 40 carbon steel ASTM A53 Grade B, A106 Grade A or A120. | Schedule 40 Carbon Steel ASTM A-53, Grade B, A106 Grade A or A120. |
| Fittings | Screwed malleable iron 125 psi. | Butt weld carbon steel Schedule 40, A234. |
| Unions | Screw 150X malleable iron A105 Grade II. | Use flange. |
| Flanges | 150# raised face, screwed, A105. | 150# raised face weld neck A105 ASTM A181. Grade I. 150# flat face for cast iron valve. |
| Valves, Plugs, Gas Cock | Use ball valve. | Iron body, greaseable and lubricated tapered plug, flanged end, 175 working pressure Nordstrom 143, Serck Audco LSW-133-GG, Walworth. |
| Solenoid | Honeywell Skinner Value U121XXXXX/423/XXXXX with coils, printed circuit and other parts for intrinsic safe Specifications completely encapsulated within the enclosure using epoxy material. Operated at 24 VDC with an intrinsic safety barrier. | |
| Ball (Gas) | Bottom loaded pressure stem. Valve rated at 600 psi WOG. Watts B-6000-UL-MASS or equal. | |
| Emergency Gas Shut-Off | Zurn Accudoor custom valve box with brushed stainless finish. Flush door, glass pane, labeled “Safety Gas Shut-off Valve”, T-handle locks. Furnish and install approved ball valve as specified above. | |
| Check (Gas) | 150# Class, bronze swing check valve, aluminum disc, screwed cap and threaded ends. Approved equal to Eclipse, Inc. series 1000. | |
| Gaskets | 1/16” red rubber, wire inserted. 150# raised face and 125 flat-face gasket. | |

A. Notes:

1. Provide two wrenches for each gas cock size.
2. The Contractor, at his option, may weld piping down to 1-1/4” if permitted by local codes.
3. All welders for gas piping must be certified per the requirements of Section 15000.
4. All exterior black steel gas piping shall be painted with two (2) coats of epoxy-based paint. Coordinate color architect.
5. When steel comes in contact with dissimilar material, provide dielectric couplings or dielectric flanges. Contact between ferrous stud bolts and bronze flanges shall be electrically insulated with non-metallic washers. Provide union connections to all pneumatically operated equipment.

## 2.4 SANITARY WASTE AND VENT, STORM DRAIN

| | Above Grade | Below Grade |
|---|---|---|
| Piping | Schedule 40 solid core PVC DWV piping conforming to ASTM D2665 & NSF-14, with ends for solvent cemented joints. | Schedule 40 solid core PVC DWV piping conforming to ASTM D2321 & NSF-14, with ends for solvent cemented joints. |
| Fittings | PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns. | PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns. |
| Joints | Solvent Cement: ASTM D 2564. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24). Primer: ASTM F 656. Primer shall have a VOC content of 550g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24). | Solvent Cement: ASTM D 2564. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24). Primer: ASTM F 656. Primer shall have a VOC content of 550g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24). |
| Backwater Valve | Cast iron gravity flow type, bronze mounted, hub end. Exterior shall be mastic coated, bolted or extended cover in accordance with installation parameters. J.R. Smith Co. 7012-7022, JOSAM 67500, Zurn Industries Z-1095. | |

A. Notes:

1. Copper tube and fittings shall not be used on urinal wastes.
2. CISPI 310 no-hub couplings will not be accepted as equal to manufacturer's listed.
3. Schedule 40 DWV solid core PVC plastic pipe and fittings joined by solvent welding may be provided and installed upon written approval by Owner. Cellular (foam) core PVC shall not be installed.

## 2.5 FORCE MAIN

| | 3" and Smaller | 4" and Larger |
|---|---|---|
| Pipe | Schedule 40 galvanized steel. ASTM A53 Grade B, A106 Grade A or A120. | Schedule 40 galvanized steel. ASTM A53 Grade B, A106 Grade A or A120. |
| Fittings | Screwed cast iron 125 psi galvanized. | Grooved malleable iron 125 psi galvanized. |
| Unions | Screwed 150# malleable iron 105 Grade II, galvanized. | Use flanges. |
| Flanges | 150# raised face, screwed, A105 galvanized. | 150# raised face galvanized uniflange, ASTM A181, Grade I. 150# flat face for cast iron valve. |
| Gaskets | 1/16" red rubber, wire inserted. 150 raised face and 125 flat face gasket. | |

| | | |
|---|---|---|
| Valves | | |
| Gage | 2-1/2" and Smaller: 125# Class, all bronze, rising stem, solid disc, solder ends, screwed bonnet, screw ends, Milwaukee 148, Jenkins 47CJ, Stockham B-114. | 3" and Larger: 125# Class, iron body, OS&Y bronze-mounted, flanged ends. Milwaukee F-2885-M Jenkins 651-C, Stockham G-623. |
| Check | Horizontal swing, composition disc, all bronze, threaded ends, 200 psi WP. Milwaukee 509, Jenkins 352C | Outside lever and weight swing check, IBBM for installation at no more than 45° from horizontal, flanged end, 200 psi WP. Jenkins 477-L, Stockham G-391-L&W. |

## 2.6 PRESSURE, FLOW AND TEMPERATURE CONTROL DEVICES

A. Thermostatic Mixing Valves:

1. Pre-piped thermostatic mixing valve, inlet check valves, isolation valves, dial thermometer and mounting hardware.
2. Acceptable manufacturers: Powers, Leonard or Symmons.

B. Pressure Reducing Valves on Water Services:

1. PRV 2" and smaller shall be pressure regulating, all-bronze construction with separate strainer, thread end, 200 psi inlet pressure, adjustment range 25-75 psi with built in bypass feature: Watts 45B, or equivalent by Cash-Acme or Wilkens.
2. Full flow range pressure reducing valves shall be equal to Watts control valve Model 115.
3. Supply a strainer upstream of all PRV valves.

C. Pressure and Temperature Relief Valves on Water Heaters:

1. Combination pressure and temperature (P&T) relief valves shall be automatic, ASME-rated, AGA and CGA-certified, ANSI standard, bronze body. Pressure relieving setting shall be 150% of the working pressure of the unit to a maximum of 150 psi; temperature relieving setting shall be 120° F. Temperature relieving capacity shall be selected on AGA-CGA rating.
2. Valves shall be by Watts Regulator Co. Approved equivalent valves by Robertshaw or Cash-Acme may be provided.

D. Vacuum Relief Valves on Cold Water Inlet to Water Heaters and Tanks:

1. Relief valves shall be bronze body composition disc with 200 psi working pressure and 250° F temperature rating.
2. Valves shall be by Watts Regulator Co. Approved equivalent valves by Taco or B&G may be provided.

E. Vacuum Breakers:

1. Atmospheric vacuum breakers shall be all-bronze, for temperature up to 210° F: Watts 800 or equivalent by Neptune or Febco.

F. Strainers: Strainers shall be wye strainers, bronze body, stainless steel screens, 400 psi working pressure, threaded end with blow-off valved and piped to drain by strainers shall be Watts 777 series or equivalent by Wilkins or Febco.

## 2.7 INSULATION

A. Insulation shall be by Owens-Corning, Certain-Teed or Manville.

B. Insulation shall be installed by insulation firm regularly specializing in this work and employing men particularly skilled therein. No covering applied by plumber's "helpers" will be acceptable.

C. Insulation installation shall meet manufacturer's recommendations. No insulation shall be applied until piping has passed tests as required by Authorities Having Jurisdiction.

D. Insulation, jackets and adhesives shall be flame-retardant and shall have ASTM E-84 fire hazard ratings of 25 flame spread, 50 smoke developed and 50 fuel contributed.

1. Interior Applications – Jackets:

a. Type a – Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints. Jacket shall be heavy duty fire retardant material with glass fiber reinforcing and self-sealing lap. Jacket will be factory applied to the insulation. Jacket shall have neat, white Kraft finish or white vinyl suitable for painting, with bead puncture resistance of 50 units minimum. Vapor barrier shall be .001" aluminum foil adhered to the inner surface of the jacket. Permeance shall not exceed 0.02 perms. Jacket shall be Owens-Corning Fiberglass "ASJ-SSL" or Manville Flamesafe "AP-T".

b. Type b – PVC Jackets: One piece, pre-molded type.

E. Insulation and jacketing shall be in accordance with following:

1. Type A: Glass fiber insulation; ANSI/ASTM C547; "k" value of 0.22 – 0.28 at 100° F non-combustible.

2. Type B: Molded, flexible closed cell vinyl, ASTM D635; "k" value of 1.17 bacterial resistant.

F. Schedule: The following piping systems require insulation:

| Piping System | Type | Insulation Thickness Inch (mm) | Jacket Type |
|---|---|---|---|
| Domestic Hot Water Supply/Return Less Than 1-1/2" | A | 1-1/2" | a, b |
| Domestic Hot Water Supply/Return 1-1/2" and Larger | A | 2-1/2" | a, b |
| Tempered Domestic Water Supply/Return Less than 1-1/2" | A | 1-1/2" | a, b |
| Tempered Domestic Water Supply/Return 1-1/2" and Larger | A | 2-1/2" | a, b |
| Domestic Cold Water | A | 1" | a, b |
| Roof Drains and Horizontal Rainwater | A | 1" | a, Note 3 |
| Non-Potable Water | A | 1" | a, b |
| Handicap Lav. Hot Water and Waste | B | 1/8" | b |

1. Notes:

a. Insulation shall include drain sump body and all horizontal piping to and including the elbow down to vertical.

b. Unless noted otherwise, Section "F" pertains to all piping specified system. This note pertains to all piping scheduled above.

G. Insulation of exterior piping and fittings shall be covered with 0.016" thick smooth aluminum jacket

with longitudinal zee closures. Jacket shall be secured at both joints with 2" wide aluminum straps centered over butt joint of jacket. Provide ½" wide aluminum bands on 12" centers. Fitting covers shall be manufactured for purpose intended and shall be of same material.

H. Pipe hangers shall be outside insulation and shall incorporate 12", 26 gauge protection shields. Insulation on piping that passes through walls or partitions shall pass continuously through sleeves, except at firewalls, smoke partitions and floor penetrations where space between sleeves and piping shall be fire stopped with approved packing.

I. Insulate equipment as specified. Refer to following equipment Specifications for additional requirements:

1. Water heaters.
2. Hot water storage tanks.

## 2.8 PIPE SUPPORTS

A. Provide adjustable clevis hangers for hanger sizes 4" and larger and cast brass split-ring hinged hangers or band type hangers for smaller. Support piping from building structure to maintain required grade and pitch of pipe lines, prevent vibration, secure piping in place and provide for expansion and contraction. Hangers on all insulated pipe shall be clevis type.

B. Provide vertical brackets and guides for horizontal piping where it is racked along walls. Trapeze hangers may be used where conditions permit. Provide all necessary pipe clips, anchors and sundries for proper alignment and support of piping. Hangers for copper piping shall be coated for dielectric isolation. Hangers for PVC, polypropylene and other plastic piping shall be extended V-shaped, with angle iron pipe supports as necessary.

C. Hangers for gas piping shall be steel hangers with cast rollers or pipe and roller supports.

D. Hanger rods shall have machine threads. Beam clamps, concrete inserts and expansion shields shall be provided as required. No ramset or shot shields will be allowed.

E. Hanger spacing shall meet requirements of State and Local Plumbing Codes. In no case shall horizontal piping be supported at intervals greater than 10'-0".

F. Piping below basement or lowest level slab (that is, buried piping), need not be supported from structure if slab is not designed as structural slab. The Plumbing Contractor shall support all piping under structural slabs on grade.

G. Pipe supports shall not bear on sleeves.

H. Friction clamps shall be installed at base of plumbing risers and at each floor. Friction clamps shall not be supported from or rest on sleeves.

I. Horizontal piping shall be suspended from building structure by mild steel rod connecting pipe hanger to inserts, beam clamps, angle brackets and lag screws as required by Building Construction in accordance with the following:

| Rod Size | Pipe Size |
|---|---|
| 3/8" | 1/2" to 2" |
| 1/2" | 2-1/2" to 4" |
| 5/8" | 5" to 12" |
| 3/4" | 15" |

J. Hangers on insulated lines shall be sized to fit the outside diameter of pipe insulation. Provide hangers for insulated piping with 12" long, 18 gauge galvanized insulation shields.

K. Piping at equipment and control valves shall be supported to prevent strains or distortions in connected equipment and control valves. Piping at equipment shall be supported to allow for removal of equipment, valves and accessories with a minimum of dismantling and without requiring additional support after these items are removed.

L. Piping installed under this Section shall be independently supported from building structure by means of beam attachments and not from piping, ductwork or conduit of other trades. Supplementary steel, including factory-fabricated channels, required to meet the requirements specified herein, shall be provided by the Plumbing Contractor.

M. Maximum spacing of hangers on runs of steel, copper or brass pipe shall be as follows:

| Schedule: Hanger Spacing in Feet/Pipe Material | | |
|---|---|---|
| Pipe Size (Inches) | Steel (Feet) | Copper or Brass (Feet) |
| 1/2 to 1 | 7 | 5 |
| 1 to 1/4 | 10 | 6 |
| 1 to 1/2 | 10 | 8 |
| 2 to 8 | 10 | 10 |

N. Maximum spacing of hangers on no hub cast iron soil pipe shall be 5' and hangers shall be provided at all changes in direction. Hanger rods to support piping from the structure or supplementary steel shall not exceed 4' in total length. Where pipe support assemblies exceed 4' in total length, Plumbing Contractor shall provide factory-fabricated channels and associated accessories.

O. Hangers in areas exposed to weather or in unheated spaces shall be provided with a shop coat of rust inhibited paint. Hanger rods shall be hot dipped galvanized.

P. Hangers and rods for under slab piping shall be hot dipped galvanized.

## 2.9 SLEEVES, INSERTS, FIRE STOPPING AND ESCUTCHEONS

A. All pipes passing through floors, walls or partitions shall be provided with sleeves having an internal diameter one inch larger than the outside diameter of pipe. Pipe Sleeve Materials:

1. Sleeves through floors and through exterior, structural and fire-rated construction, shall be hot dipped galvanized Schedule 40 steel pipe. Sleeves shall extend 1" above finished floor.

2. Sleeves through partitions and non-fire-rated construction shall be 26 gauge galvanized steel with lock longitudinal seams or approved plastic pipe.

3. Provide waterproofing membrane locking devices at floors. Provide 150 lb. Slip-on welding flanges at exterior wall penetrations.

B. Fire stop penetration seals in fire-rated construction shall be products of STI SpecSeal, 3M, Proset Systems Firefill or Dow and shall be installed in accordance with the latest requirements of ASTM E814 (UL 1479). Fire stop penetration sealants for non-metallic and insulated piping shall be intumescent (STI SpecSeal Series 100 Sealant or SpecSeal Collar or approved equal). Provide mineral fiberboard, matting or putty for damming and forming. Finish seals flush to wall surface and fill gaps with silicone adhesive sealant caulking (Dow 96-081 RTV or approved

equal). Provide 1” thick ceramic fiberboard on both sides of penetrations in 2 and 3 hour rated walls and floors less than 8” thick.

C. Packing for sleeves that do not require maintenance of fire rating shall be oakum, silicate foam, ceramic fiber or mineral fiber with approved sealant. Pack or foam to within one inch of both wall surfaces. Seal penetration packing with approved caulking and paintable waterproof mastic surface finish or silicone caulking.

D. Waterproof Pipe Penetrations:

1. Sleeves through outside walls shall be provided with pipe to wall penetration closures equal to Link-Seal Thunderline Corporation. Seals shall be mechanical type of interlocking rubber links shaped to fill space between pipe and sleeve. Links shall be assembled with bolts to form a belt around the pipe with pressure plate under each bold head and nut. After seal assembly is positioned, tightening of bolts will provide watertight seal. This Contractor shall determine the required inside diameter of each individual sleeve before ordering, fabricating or installing. The inside diameter of each sleeve shall be sized as recommended by the manufacturer to fit the pipe and Link-Seal to assure a watertight joint.

2. Prefabricated modular sleeves shall be Mason Industries (SWS) or approved equal stiffened galvanized steel sleeves with preformed closed-cell elastomeric seal (non-fire rated) or preformed mineral fiber or silicone foam seal (fire rated).

3. Provide waterproof 1” single ring set in silicone and bolted to floor or wall at chipped and drilled penetrations of existing slabs on grade and existing walls below grade.

E. Inserts shall be individual or strip type or pressed steel construction with accommodation for removable nuts and threaded rods up to 3/4" diameter, permitting lateral adjustment. Individual inserts shall have an opening at the top to allow reinforcing rods up to 1/2" diameter to be passed through the insert body. Strip inserts shall have attached rods with hooked ends to allow fastening to reinforcing rods.

F. Unless otherwise specified herein, escutcheons shall be cast brass chrome plated type and provided with a set screw to properly hold escutcheon in place.

## 2.10 CLEANOUTS, TRAPS AND STRAINERS

A. Provide cleanouts in soil, waste and storm drainage piping on straight runs at changes in directions and at foot of stacks and other points where required by inspecting Authorities. Cleanouts shall suit construction in which they are to be installed.

B. Maximum horizontal distance on straight runs between cleanouts in piping 4” and smaller shall be 50 feet. In piping 5” and larger, maximum horizontal distance between cleanouts shall be 100 feet.

C. Cleanouts shall be same size as pipe 4” and smaller. Cleanouts for piping larger than 4” shall be sized per local code and in no circumstance shall they be less than 4” in diameter. No reduction in cleanout sizes for pipe 4” and smaller is permitted.

D. Traps not integral with fixtures and in accessible locations shall have brass trap screw protected by water seal and will be regarded as cleanout.

E. Bodies of cleanout ferrules in bell and spigot piping shall be standard pipe sizes conforming in thickness to that required for pipe and fittings and shall extend not less than 3/4" above hub of pipe.

1. Cleanout plug shall be cast brass with raised nut 3/4" high.

2. Cleanouts in copper waste piping shall be soldered brass cleanout fittings with extra heavy brass screw plugs of same size as line.

3. Cleanouts in threaded waste piping shall be cast iron, drainage T pattern, 90 branch fitting with extra heavy brass screw plugs of same size as pipe.
4. Floor cleanouts in finished areas shall be per schedules equivalent to J.R. Smith, Wade or Zurn.
5. Floor cleanouts in unfinished areas shall be per schedules equivalent to J.R. Smith, Wade or Zurn.

F. Provide test tees with cleanout plugs at foot vertical soil, waste, acid waste and roof conductor lines and at each floor. Cleanouts on vertical lines concealed behind finished walls shall extend to back of finish wall; provide wall plate. Obtain Architect's approval for wall plate locations and reroute piping if necessary.

G. Cleanouts shall open in direction of flow of drainage line served or at right angles thereto.

H. Keep cleanout plugs clean and unimpeded. Prevent covering with cement, plaster or other permanent finished materials.

## 2.11 THERMOMETERS AND PRESSURE GAUGES

A. Provide bronze Bourdon tube pressure gauges where shown on Drawings and where specified, by U.S. Gauge, Trerrice or Weksler, accurate to +1%.

1. Gauges shall have white faces with black-filled engraved lettering. Gauge bodies shall be set in phenolic cases. Provide pulsation dampers and gauge cocks to isolate each gauge.
2. Gauges shall be easily accessible and easily read. Gauges readable from floor at less than 5 feet shall be 4-1/2" dials. Other gauges shall have 6" dials. Gauges graduations shall meet limit requirements of normal operation. Gauges shall indicate at mid-scale.
3. Provide pressure gauges at the inlet and outlet of each pump.
4. Provide pressure gauges at each water entrance, downstream of the water meter and on each side of PRV stations.

B. Provide separable well V-case thermometers by U.S. Gauge, Terrice or Weksler where shown on Drawings and where specified. Thermometers shall have 9" scale and white face with black-filled engraved letters. Thermometers shall be angular or straight stemmed, as conditions necessitate. Thermometer wells shall be bronze and shall be installed so as to ensure minimum restriction of water flow in pipe and shall be installed to be able to be viewed from the floor.

1. Provide thermometer at the inlet and outlet of each water heater and where shown on Drawings. Thermometers shall have scale range of 30°-240° F with 2° scale division.
2. Provide thermometer in hot water return system at each hot water recirculation pump and where shown on Drawings. Scale range shall be 30°-240° F with 2° scale division.

## 2.12 WALL HYDRANTS AND HOSE BIBBS

A. Provide wall hydrants as shown on the Drawings. Provide hose bibs in every toilet core where more than one (1) flushing fixture is shown.

B. Wall hydrant shall be recessed box anti-siphon, non-freeze, key-operated, 3/4". Hydrant shall be J.R. Smith or equivalent by Josam or Zurn. Coordinate cover and plate finish with Architect prior to ordering any units.

C. Hose bib shall be chrome plated bronze or brass with replaceable hexagonal disc, hose thread spout and integral vacuum breaker in conformance to ANSI/ASSE 1011. Hose bib shall be equal to Chicago No. 952 or equivalent, T&S Brass or Watersaver.

## 2.13 WATER HAMMER ARRESTERS

A. Provide water hammer arresters at fixtures with automatic solenoid or cylinder operated valves, automatic flush valves quick-closing valves or solenoid valves and where indicated on Drawings.

B. Fixtures and equipment in battery installation may use single water hammer arrester properly sized for connected load.

C. Provide proper access to water hammer arresters in chases, utilizing a minimum 12” x 12” access panel furnished by this Contractor.

D. Water hammer arresters shall be installed in accordance with manufacturer’s recommendations and not less than one (1) installed per core piping hot system and core piping cold system. Arresters shall be equal to J.R. Smith, Zurn or PPP.

## 2.14 PLUMBING FIXTURES AND TRIM

A. Refer to Architectural and Plumbing Drawings for quantities, locations and mounting heights of fixtures provided under this Section.

B. Fixture trim, traps, faucets, escutcheons and waste pipes exposed to view in finished spaces shall be I.P.S. brass with polished chromium plating (CP) over nickel finish.

C. Vitreous china fixtures shall be regular selection fused and vitrified to produce homogeneous material with close grain without pores. Surfaces that contact walls, floors and other fixtures shall be set true.

D. Enameled surfaces on cast iron fixtures shall be of suitable thickness to provide the highest commercial grade. Exterior exposed surfaces not enameled shall be treated at factory with one (1) coat of filler.

E. Affix manufacturer’s guarantee label or trademark to fixture to indicate first quality. Acid-resisting enamel fixture shall bear manufacturer’s symbol signifying resistance to acid.

F. Set fixtures with wall outlet flanges at proper distance from floors and walls with closet setting compound or gasket.

G. Catalog designations and manufacturer’s names of vitreous china and enameled cast iron fixtures are specified to establish standards of quality for performance and materials. Equivalent fixtures by Toto, American Standard or Eljer may be submitted for consideration.

H. Vitreous china and enameled cast-iron fixtures shall be white throughout, unless specified otherwise. Closet seats shall match closet fixture color.

I. Fixture Types: As listed on Plumbing Contract Drawings.

1. Notes:

a. Standards:

1) Floor Drains:

a) Cast Iron – ASME A112.21.1M

b) Plastic – ASTM A112.21.M

c) Cast Iron Trench Drains – ASME A112.21.1M

2) Cleanouts: Cast Iron – ASME A112.36.2M

3) Roof Drains: Cast Iron – ASME A112.21.2M

4) Sleeve Systems: UL 1479

## 2.15 EQUIPMENT – GENERAL

A. The following mechanical equipment is to be supplied by a single manufacturer as part of this

package unless otherwise noted.

B. Equipment Tags:

1. All equipment shall be tagged using black phenol background with a 1/4" white engraved lettering tag affixed to the piece. Tag shall be minimum of 2” high and 4” long for large equipment and shall include the tag number and the piece.

2. Equipment Tag Sequence (Example):

a. G-CMP – 1XXX where:

b. G – Indicates system (Natural Gas)

c. CMP – Indicates equipment (Booster Pump)

d. 1 – Indicates piece number (1, 2, 3…)

e. XXX – Indicates building number (if applicable)

C. All equipment furnished in the following pages shall be furnished with seismic anchoring points. Equipment supplied shall be constructed with a seismic rating.

## 2.16 WATER HEATERS

A. Provide water heaters of sizes and types indicated on the schedule sheets. Heaters shall be tested at 200 psi and rated for working pressure of 150 psi and shall bare stamp certifying testing and rating. Tanks with capacity greater than 120 gallons or input rating greater than 200,000 Btu/hr shall meet ASME Boiler and Pressure and Vessel Code requirements.

B. Provide pressure and temperature relief valve and vacuum relief valve.

1. Pressure and temperature relief valves shall be at least 3/4" and shall be rated and listed for heater input rating and as required by ANSI and ASME Standards. Temperature relief valves shall be installed within top 6” of tank.

2. Vacuum relief valves shall meet ANSI standards requirements and shall be rated and listed for heater input rating and as required by ANSI and ASME Standards. Temperature relief valves shall be installed within top 6” of tank.

C. Storage type heaters shall have minimum standby heat loss in accordance with requirements of State Energy Code. Tank and heaters which are not factory insulated and jacketed shall be field insulated.

D. Field insulation of tanks and heaters shall consist of minimum of 2” fiberglass insulation. Refer to insulation paragraph for additional requirements.

1. Insulation shall be cut or mitered where necessary to fit shape and contour of equipment. Insulation shall be banded or wired in place on 12” centers or impaled over pins on 18” centers. Point up open joints with insulating cement.

2. Apply 1” hexagonal mesh over insulation, lacing edges together. Apply 1/2" thick coat of insulating cement and trowel to smooth finish. Adhere glass cloth jacket over cement with approved lagging adhesive. Size jacket with one brush coat of lagging adhesive.

E. Heaters and tanks shall be of size and type as scheduled on Plumbing Contract Drawings.

## 2.17 PUMPS

A. The following pumps are included:

1. Hot water circulating pumps:

a. Hot water circulating pumps shall be all bronze, centrifugal of sizes indicated on the

schedule sheets or equivalent by Taco, B&G or Grundfoss.

b. Provide Minneapolis-Honeywell or approved equivalent line voltage aquastat with separable socket to control each pump, approximately 15'-0" from pump, on suction side. Provide a disconnect switch for each pump. (Allow for constant circulation if thermostatic mixing valves are used on the water heater.)

c. Pump capacity and motor shall be indicated on the Drawings. All motors to be high efficiency.

2. Sump pumps and sewage ejectors shall be of sizes and types indicated on schedule sheets or equivalent by Zoeller, Liberty or Stancor.

## PART 3 – EXECUTION

### 3.1 DEMOLITION

A. Disconnect and dismantle existing plumbing systems and equipment to be demolished and leave debris and disconnected equipment on floor for removal under Section 2070 – Selective Demolition.

B. Remove existing plumbing stacks, mains and branches when serving fixtures to be demolished. Remove piping back to active main and provide valve cap or plug to suit system. Obtain existing record Drawings from Owner. Maintain existing plumbing risers and stacks serving fixtures to remain.

C. After walls and ceilings are removed and piping is exposed, verify piping serves only plumbing fixtures indicated for demolition before shut-down for disconnection. Identify existing piping which serves fixtures to remain. Promptly notify Architect of active piping to be maintained when located in partitions to be demolished.

D. Remove existing stacks and risers located in existing partitions to be demolished and provide new off-set at ceiling and drop through floor and reconnect to existing services at the floor below.

### 3.2 COORDINATION

A. Cooperate and coordinate with work of other Sections in executing work of this Section.

### 3.3 EXPANSION PROVISIONS

A. Allow for expansion with offsets, loops, swing joints, expansion joints and other means, where necessary to protect piping systems as shown. Take-offs from mains to run outs shall not have less than a three (3) elbow swing.

B. Anchor mains and risers with loops or offsets to structure to impart expansion toward loops and offsets. Anchors shall be forged wrought iron, secured to pipe and structure. Provide vibration isolation as required and as specified.

C. Provide pipe alignment guides to guide expanding pipe to move freely from anchor points towards expansion joints, offsets and other expansion provisions.

### 3.4 PIPE IDENTIFICATION

A. Provide color-coded pipe identification markers on piping installed under this section. Pipe markers shall be snap-on laminated plastic protected by clean acrylic coating. Pipe markers shall be applied after Architectural painting where such is required.

B. Provide arrow marker with each pipe content marker to indicate direction of flow. If flow can be in either direction, use double-headed arrow marker.

C. Main shall be labeled at points of entrance and exit from mechanical room, adjacent to each

valve, on each riser, at each tee fitting, at points of entrance and exit from building, at least once in each room and at intervals no longer than 20'.

D. In general, 2" high legend shall be used for pipe lines 4" in diameter and larger, and 3/4" high legend shall be used for pipe lines 3" in diameter and smaller.

E. Markers shall be Seton, MIS or approved equivalent.

F. Color banding shall meet ANSI latest and OSHA requirements.

G. Markers shall have legends and color coding with black letters:

1. Markers are to be applied to all piping, regardless of under jacket colors per the following schedule:

| Service | Legend | Background Color |
|---|---|---|
| Cold Water | Cold Water | Green |
| Hot Water | Domestic Hot Water | Yellow |
| Hot Water Return | Domestic Hot Water Return | Yellow |
| Non-Potable Water | Non-potable | Yellow |
| Exhaust Gas | Exhaust Gas | Yellow |
| Sanitary | Sanitary Sewer | Green |
| Vent | Vent | Yellow |
| Rainwater | Storm Sewer | Green |
| Pump Discharge | Pump Discharge | Green |
| Fuel Gas | Fuel Gas | Yellow |

H. In Mechanical Rooms, Storage Rooms, Janitor's Closets and other areas without hung ceilings, colored PVC jackets shall be used per the following schedule:

1. All insulated piping exposed in mechanical rooms shall be covered with a Ceel-Co plastic jacket. Color pattern and system identification legend shall be as in the following schedule:

2. This plastic jacket shall include fitting covers and piping covers.

3. Piping to be covered with this plastic jacket shall be insulated and finished as herein specified and then the plastic jacket shall be applied.

### 3.5 TAGS, VALVES, EQUIPMENT AND INSTRUMENTS

A. Upon completion of work, attach engraved laminated plastic tags to all valves and instrumentation. Equipment shall bear a stamped stainless tag. Tags shall have black characters on white face, consecutively numbered and prefixed with letter "P" for general valves. Tags shall bear the number used in the P&IDs for those items so marked.

B. Embossed or engraved aluminum or brass tags may be substituted if desired. Tags shall be at least 1/8" thick.

C. Tags shall be at least 1” diameter with numerals at least 3/8” high and attached by “S” hooks and chains.

D. Nameplates, catalog numbers and rating identifications shall be securely attached to electrical and mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.

E. Non-potable water outlets shall be identified with permanently attached yellow color-code or 4” high triangle tag reading “Water Unsafe”.

F. Coordinate numbering system with existing piping tags as not to duplicate numbers.

### 3.6 FLASHING AND COUNTER FLASHING

A. Floor drains shall be flashed watertight with 20 ounce sheet copper flashing which shall extend 8” beyond drain flashing flange.

B. Provide counter flashing for roof penetrations required under this Section including vents and roof drains.

C. Flashing of vents, roof drains and other penetrations of roof required under this Section shall be done under other Sections.

### 3.7 JOINTS AND CONNECTIONS

A. Joints and connections shall be permanent and shall be gas and water-tight. Jointing shall be types specified for serviced indicated. Joints and connections shall meet requirements of manufacturer’s best recommended practice. All transitions between different piping materials shall be made using approved adapters. Adapters for transitions between two (2) types of piping materials shall be manufactured for purpose intended.

### 3.8 INTERIOR WATER SUPPLY SYSTEM

A. Provide a complete, new (domestic and/or protected) hot and cold water piping system as indicated on Drawings and as specified, including supplies to fixtures and indicated equipment. Piping shall be pitched at least 1” in 40 feet so that it can be drained completely at low points with drain valves. Piping shall be pitched up toward fixtures for proper air relief. Provide automatic air vents with outlet piped to floor and gate valve ahead of air vents, where offsets cannot be vented by means of fixture connections.

1. Pipe used in piping assembly shall be clean and shall have ends square and reamed before putting into fittings.
2. Cut tube to required length with hacksaw or tube cutter designed for copper work.
3. Remove burrs from inside and outside of cut edge and clean end of tube with steel wool or sand cloth until discoloration is removed and metal is smooth and bright.
4. Oxides shall be removed by sand cloth and brush.
5. Removal of oxides or discoloration of pipe and fittings by acids or self-cleaning flux is forbidden.
6. Apply a thin, uniform and complete coating of reliable brand of soldering flux (Nokorode or Crest) to cleaned surfaces of tube and fittings.
7. When joints are soldered, remove excess solder with a cloth or brush leaving a fillet of solder in chamber at end of the fitting.
8. Where quick closing valves such as solenoid or flush valves are being used, piping shall be protected from water hammer by shock absorbers. Shock absorbers shall be installed at all batteries of fixtures that are operated by flush valves. Shock absorbers shall be as manufactured by PPP, J.R. Smith, or Zurn, and shall conform to the Plumbing and Drainage

Institute (PDI) published requirements.

9. Connections to tanks and equipment shall be made with unions.
10. Water services supplying the building shall flow through in-line strainers and shall have containment backflow protection as indicated.
11. Shut-off and control valves on main distribution and branch lines shall be located for easy access and operation. Branch piping shall be valved with access panels provided as required at locations shown on Drawings and determined in field.
12. Specialty piping and fittings (copper pressure-seal-joint fittings, etc.) shall be installed in strict accordance with manufacturer's installation guidelines, requirements and recommendations. Join tubing and fittings with tools recommended by fitting manufacturer.

## 3.9 INTERIOR SANITARY WASTE, STORM, DRAINAGE AND VENT PIPING

A. Provide waste, drainage and vent lines shown in building as shown on Drawings. Vents shall extend through roof and shall increase to at least 4". Piping shall be assembled and installed without undue strains and stresses and provision shall be made for expansion, contraction and structural settlement.

B. Interior horizontal sanitary waste and storm drainage piping shall be installed in practical alignment at uniform grade of at least 1/8" per foot, but 1/4" per foot where code dictates and as shown on Drawings.

C. Vents from fixtures or line of fixtures, when connected to vent line serving other fixtures, shall be extended at least 6" above flood level rim of highest of fixtures to prevent use of vent line as waste. No vent terminal shall be directly beneath door, window or other ventilating opening of building, nor shall any vent be within 12 feet horizontally of such opening.

D. Provide sleeves for pipe that pass through walls.

E. Provide 3" air gap on equipment and drains that discharge to floor drains.

F. Provide an air gap in which the vertical distance through the free atmosphere between the waste pipe and the floor rim of the receptacle into which it is discharging is a minimum of 2 pipe diameters greater.

G. Piping shall be run straight and plumb and offsets shall be made at an angle of not less than 45.

H. Carefully lay out work in advance so pipes pass through openings and permit proper pitch to stacks. Due to extensive ventilation and lighting systems all trades shall coordinate work with work of other trades.

I. Aboveground PVC piping shall be installed according to ASTM D2665. Underground PVC piping shall be installed according to ASTM D2321.

J. For PVC piping, solvent cement joints shall be used for joints. All surfaces shall be cleaned and dry prior to applying the primer and solvent cement. Installation practices shall comply with ASTM F402. The joint shall conform to ASTM D2855 and ASTM D2665 appendixes.

K. Cleanouts:

1. Provide cleanouts with brass caps and screws same size as pipe up to 4 inches and not less than 4 inches for larger piping at the ends of all branches on soil and waste piping and in such other portions of the piping where run is over 50 feet. Locate floor cleanouts as indicated on Drawings.

## 3.10 WATER ENTRANCE

A. Run exterior water service piping for domestic water, beginning 10'-0" outside building wall, as

shown on Contract Drawings.

B. When water pipe laying is not in progress, close ends of pipe with watertight plugs. If water enters pipe, flush and clean line.

C. Keep excavation for underground water main open until system has been tested, inspected and approved.

D. Piping shall be bedded as specified in Division 33.

### 3.11 WATER METER

A. Provide compound water meters that meet AWWA C701-70 requirements for cold water meters and the Municipal Water Authority.

B. Coordinate installation of water meter with local Water Authority.

C. Registers shall be straight reading, hermetically sealed calibrated in cubic feet and shall meet Section 9.3 of AWWA standard requirements. Provide center swept test hands.

D. Meter shall register at least 98% and no more than 102% of water actually passing through meter at any rate of flow, within range of 15 gpm to 800 gpm.

E. Main casing shall be bronze. Bolts shall be stainless steel.

F. Meter shall permit easy removal of interior parts without disturbing meter connections to pipeline.

G. Provide magnetic couplings to transmit motion from measuring chamber to register unit.

H. Provide remote register. Remote register plug/jack to conform to and be compatible with Owner's standard building automated system.

I. Measuring chamber shall be removable from main line case for repair and re-calibration.

J. Meter shall be by manufacturer approved by local Water Authority.

### 3.12 FIXTURE ROUGHINGS

A. Install rough plumbing including fixture carriers and supports, valves and water hammer arresters within chase tolerances. Supply roughing through finish walls and at hose bibbs and shower heads shall be secure and free of movement. Locate valves and water hammer arresters within 12 inches of approved access panel location.

B. Align exposed waste and supply pipe roughings with fixture connections within 1 inch tolerance. Provide flush valves in alignment with the fixture, without vertical or horizontal offsets. Obtain fixture manufacturer roughing data sheets for recommended roughing dimensions.

C. Provide fixture templates for Casework Contractor for counter mounted sinks and lavatories.

1. Rough handicapped use water closets to locate the flush valve handle on the wide side of the toilet stall.

D. Secure fixture supports to floor slab construction with lag bolts and metal expansion shields to support at least 250 pounds on the front rim of the fixture for 5 minutes.

E. Mounting heights shall be in accordance with all local and state codes and latest ADA Standards.

F. Provide fixture rough-in piping connections, sizes in accordance with schedule on Drawings.

### 3.13 EQUIPMENT ROUGHINGS AND CONNECTIONS

A. Provide roughing and final connections for water, waste, air and gas systems including indirect wastes, traps, tailpieces, stops and supplies, valves and unions for all equipment and fixtures including those supplied under other sections.

B. Provide complete plumbing roughings with capped and valved service with union of flange to suit Owner furnished equipment.

C. Refer to Architectural floor plans and Equipment schedules for all equipment provided under other sections or by Owner. Roughing for all equipment including floor drain locations shall be based on approved Shop Drawings. Install indirect waste discharge to spill into floor drain funnel. Floor drain grate and sediment bucket shall be removable.

### 3.14 INSTALLATION OF SPECIALTY ITEMS

A. Install vacuum relief valves located above the top of the heater on cold water supply lines to water heaters.

B. Gauges: Install gauges where indicated on the Drawings and as specified. Install pressure gauges at water service entrance on inlet and outlet sides of strainers, filters, backflow preventers and pumps. Install temperature gauges on inlet and outlet side of water heaters and on recirculation line at least 10 feet upstream of circulation pumps. Gauges shall be legible from 4 feet to 6 feet above the floor.

C. Trap Primers: Install trap primer and related piping through the floor and connect to primer connection on floor drains in all areas where maintaining the trap seal could be a problem.

D. Water Hammer Arresters: Provide water hammer protection at all self-closing fixtures and equipment. Equip quick-closing valves such as flush valves and solenoids with water hammer arresters. Banks of plumbing fixtures may be protected with a single properly sized and located PDI certified arrester. Obtain approval for access panel location prior to installation.

### 3.15 INSTALLATION OF FIXTURES

A. Mount fixtures level at the elevations shown on Architectural Drawings. Refer to toilet room elevations and casework details.

B. Install handicapped use fixtures in accordance with the requirements to the Architectural Access Board Code, latest ADA standards and ANSI A117.1. Insulate hot water supply and waste piping under lavatories.

1. Where urinals are provided, install one urinal with the rim mounted 17 inches above the finish floor in compliance with the Handicapped Code.

C. Grout walls and floor mounted fixtures watertight where the fixtures are in contact with walls and floors.

D. Caulk deck-mounted trim at the time of assembly, including fixture and casework mounted. Caulk self-rimming sinks installed in casework.

### 3.16 GAS SERVICE, METER, VENTS AND PIPING

A. Gas meter and piping to meter from gas main, will be provided by Gas Company. Pay charges associated with Gas Company installation. Gas piping provided under this Section shall begin at building side of gas meter.

B. Piping shall be done by licensed gas fitter (as required by Code).

C. Gas piping shall pitch to drain and shall have drip pockets at least 6” long with removable caps at low points. Branch connections shall be taken from top or side of horizontal running main. Provide gas cock or valve on connections to fixtures or equipment.

D. Provide union connection between shut-off cock and equipment to permit disconnection of equipment.

E. Provide pressure reducing valve between meter and building piping, as required by Gas

Company, piped and vented to outside of building.

F. Provide individual vents from regulators, pressure switches and reliefs on factory packaged equipment gas trains at all equipment located on this system. It is this Contractor's responsibility to extend all vents to atmosphere terminal at a safe location in conjunction with the Fuel Gas Code.

G. Gas piping and safety devices shall meet requirements of NFPA No. 54 and shall be subject to inspection and approval of State Gas Regulatory Board.

1. Special Note: Provide aluminum check valves on all gas pipes that enter rooms where compressed air is installed or when both compressed air and gas piping connect to the same piece of equipment. This is required in all areas where gas and air are present.

H. Provide a gas cock valve at each branch run out from main or riser serving gas outlets.

I. Piping shall be securely fastened, separately hung, and shall not support any other weight or piping. Piping dropped in concrete block walls shall be factory wrapped for corrosion protection.

J. Gas valves or cocks shall not be concealed and shall be readily accessible for inspection and repair.

K. Welded piping shall conform to the latest requirements of the Rhode Island Fuel Gas Code.

## 3.17 CROSS CONNECTION PROTECTION

A. All potable water piping outlets and connections to equipment or machinery shall be protected against backflow by means of an air-gap or approved backflow preventer.

B. Backflow preventer type, application and installation shall comply with the all Rhode Island Department of Environmental Protection (DEP) and local Water Authority Drinking Water Regulations.

C. Mount backflow preventers horizontally, unless device is approved for vertical installation, at heights and with clearances as required by DEP regulations.

1. Reduced pressure backflow preventers shall be installed between 36" to 48" above the floor with a minimum of 6" clear space all around.

2. Double check valve assemblies shall be installed such that the top of the device is between 30" and 53" above the finished floor, with 12" clear space all around.

D. Submit plans to DEP and obtain permit for each reduced pressure or double check valve backflow preventer installation and submit copies of permit to Architect for record.

E. Provide indirect waste piping with funnel to receive discharge from reduced pressure backflow preventer atmospheric vents and spill through air gap into floor drain.

## 3.18 CLEANING

A. Clean systems thoroughly before testing. Fixtures, equipment, pipe, valves and fittings shall be free of grease, metal cuttings, dirt and other foreign material. Remove protective covers. Fixtures (including lavatories, water closets and urinals) shall be cleaned and ready for use.

B. Repair stoppage, discoloration and damage to parts of building, finish and furnishings due to failure to properly clean piping system within Contract Price.

C. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

D. After the completion of the work, all materials and equipment surfaces shall be thoroughly cleaned and polished in accordance with the finish of the material. All chromed surfaces shall be highly polished.

E. Before the systems are tested and balanced, pipes and equipment shall be thoroughly cleaned so that no dirt, dust, or other foreign matter will be deposited in or carried through the systems.

F. Water systems shall be thoroughly flushed and cleansed of any and all deleterious materials at least once before system is placed in operation. At this time, these systems will be carefully checked for leaking and defects as hereinafter specified. An approved cleansing agent will be used in flushing.

G. At all times, keep the premises clear of undue accumulation of rubbish.

H. On completion of the work, remove all rubbish and debris resulting from this contract and dispose of same. At any time should the General Contractor be dissatisfied with the performance of clean-up responsibilities, he may elect, after proper notification, to undertake this operation and back charge this Subcontractor accordingly.

I. All equipment shall be thoroughly cleaned and left in a satisfactory condition for proper operation at project completion.

J. Before placing orders for pre-cleaned pipe, fittings, valves, etc., the Contractor shall submit the manufacturer's cleaning Specifications to the Engineer for approval.

K. The supplying of pre-cleaned materials or the Engineer's approval of the manufacturer's cleaning Specifications, does not relieve the Contractor of the responsibility for meeting the requirements for cleanliness outline in this specification.

## 3.19 DISINFECTION OF WATER SYSTEMS - INTERIOR AND EXTERIOR

A. Water piping systems shall be thoroughly disinfected with a solution containing no less than 50 parts per million of available chlorine. Chlorinating materials shall be either liquid chlorine or sodium hypochlorite solution, and shall be introduced into the system and drawn to all points in the system. Disinfection solution shall be allowed to remain in system for 24 hours. During this time, valves and faucets shall be opened and closed several times. After disinfection, solution shall be flushed from the system with clear water until residual chlorine content is no greater than 0.2 parts per million.

1. Notify all parties 48 hours prior to cleaning system.
2. Bypass all building filters.
3. Perform chlorination prior to heating the domestic hot water system. Run circulation pumps on the domestic HW system.
4. Provide advance notice to all trades prior to procedure. Post warning signs throughout the job site.
5. Collect samples randomly and at end user points.

B. Work shall be supervised by Owner and performed by approved chemical testing laboratory and results sent to the Architect or Architect's representative for verification.

C. Testing laboratory shall submit a summary of test procedure for approval prior to any work performed. Subcontractor shall provide valves required to disinfect water supply system in part as required by phasing of construction and to provide isolating valves and draw-off valves for proper containment, phasing and flushing.

## 3.20 TESTING AND ADJUSTING – GENERAL

A. Scope:

1. Test and adjust plumbing systems as specified and as required by Code.
2. Testing, balancing and adjusting shall in no way relieve guarantee requirements.

3. Provide services of qualified personnel, equipment and apparatus required to perform tests.
4. All systems shall be thoroughly adjusted for perfect intended operation. All mechanical equipment shall be adjusted for flow, temperature, etc. of fluid. The entire hot water circulation system shall be thoroughly balanced so hot water draw from fixtures shall be as quickly available as possible. Pumps, relief valves and pressure reducing valves shall be adjusted as required. Submit in writing to the Engineer upon completion of this work that it is complete and ready for use.

B. Before date of acceptance, furnish Architect with certificates of testing and inspection indicating approval of Authorities Having Jurisdiction and conformance with requirements of Contract Documents.

C. General:

1. Submit proposed test procedures, recording forms and test equipment for review before testing.
2. Notify Architect and Authorities involved at least 48 hours before testing and inspection.
3. Do not paint, cover or conceal work before testing, inspecting and obtaining approval; this includes backfilling and application of insulation.
4. Costs of repairs and restoration of work of other trades and of existing building surfaces or material damaged during cleaning or testing shall be borne by trade performing cleaning or testing.

D. No tests shall be started until systems have been cleaned as described under “Cleaning” paragraph. Provide temporary piping and connections for testing, flushing or draining systems to be tested.

1. Repair or replace leaks, damage and defects that result from tests to like-new condition. Remove and replace defective materials with acceptable materials.
2. Piping and joints shall be made tight without caulking. Continue tests until systems operate without adjustments and repair to equipment or piping.
3. Provide testing instruments, force pumps, gauges, equipment and labor necessary to conduct tests. Instruments used for testing and balancing shall have been calibrated within six months before balancing. Instrument calibration shall be certified.’
4. Submit six (6) copies of complete testing and balancing report to Architect for review.

E. Final test shall be made after vertical and horizontal pipes and roughing-in have been run and before sewer or fixture connection is made.

1. After soil, waste and storm lines, etc. have been installed outlets shall be temporarily plugged up.
2. Fill pipes with water to top of vertical lines and allow them to remain so filled for 24 hours.
3. Retesting after leaks are repaired shall be at no additional cost.

F. Pressurized Piping Systems:

1. Leak tests shall be conducted in accordance with ANSI applicable codes and as specified herein.
2. Before piping of various systems has been covered or furred-in, piping systems shall be tested tight for 1 hour under hydrostatic pressure, 1-1/2 times systems working pressures, but not greater than test pressure of 150 psig.
3. Tests shall be witnessed by Architect and pronounced satisfactory before pressure is removed or any water drained off.

4. Equipment shall be valved off or removed during test if equipment pressure rating is less than test pressure.
5. Retest systems after leaks are repaired within Contract Price.

G. Gravity Systems: Test under water pressure at heads specified in Plumbing Codes. Fill pipe lines with water to top of 5 foot vertical section of pipe or to level of top of vent pipe; maintain head pressure for 30 minutes.

H. Potable Water System Test:

1. Certification of the potable water system integrity shall be required where separate systems of potable and non-potable water are provided to supply plumbing fixtures.
2. Fill potable water system to capacity with clean clear water. Introduce water at top of piping system (Hot and Cold). During filling, introduce green food coloring dye into piping system. A floor-by-floor survey shall be conducted. Operate each outlet (Hot and Cold) connected to potable water system until coloring has been observed. A method of maintaining the level of water and coloring shall be employed in order to make up the drawn off amounts. A survey sheet shall indicate each floor and the room number sequentially.
3. This survey is required to be performed after all pressure testing and flushing of the piping system, but before sterilization. Further, it is required that all fixtures connected to the potable water system be installed prior to the test.

I. Pumps shall be tested to check impeller trim and operating characteristics. Following data shall be recorded and submitted to Architect for review:

1. Flow at operating conditions where flow venturi or orifices are installed in system.
2. Shutoff pressure required to check impeller trim.
3. Discharge pressure at operating conditions.
4. Suction pressure at operating conditions.
5. Motor amperage on each phase at operating conditions.

J. Prove capacity and performance of each piece of equipment by field tests as specified herein various paragraphs. Equipment and instruments required for tests, as well as additional thermowells or gauge connections shall be installed at no additional cost to Owner.

1. Qualified representative of Equipment Manufacturer shall be present. Architect may witness tests, if he so desires.
2. Test requirements shall include, but not be limited to, the following:
   a. Domestic water pumps.
   b. Sump pumps.

K. Examine Part 2 for supplemental testing requirements.

### 3.21 TESTING: PIPING SYSTEMS

A. General:

1. Piping systems shall be subjected to testing water or air as noted and shall hold tight at the pressure head stated for the time interval required without adding air or water. While any system is being tested, required head or pressure shall be maintained until joints are inspected.
2. Tests shall be witnessed by inspector having jurisdiction, and the Architect within 48 hour notice, given these Authorities.

3. Equipment, material, and labor required for testing of various systems, or part thereof, shall be provided by Plumbing Contractor.

B. Sanitary, Waste and Roof Water Conductor System:

1. Water test shall be applied to drainage system either in their entirety or in sections as required, after rough piping has been installed.

2. If applied to entire system, openings in piping system shall be tightly closed, except the highest opening and system filled with water to point of overflow.

3. If system is tested in sections, each opening shall be tightly closed except highest opening in the section under test and each section shall be filled with water but no section shall be tested with less than a 10' head of water.

4. In testing successive sections, at least upper 10' of next preceding section shall be tested so that no joint of piping in building, except the uppermost 10' of the system shall be submitted to a test of less than a 10' head of water.

5. Water shall be kept in system for at least 15 minutes before inspection starts; the system shall then be made tight at all points.

C. Points of drainage systems tested with air instead of water shall be tested by attaching an air compressor testing apparatus to suitable opening and, after closing all other inlets or outlets, forcing air into systems until a uniform gauge pressure of 5 psi or sufficient pressure to balance a column of mercury 10" high. Pressure shall be held without introduction of additional air for a period of at least 15 minutes.

D. All existing and new sanitary, waste and vent piping installed under the floor slab shall be video camera scoped and recorded prior to installation and upon completion, prior to final acceptance. Any debris found in underground piping shall be flushed and removed as part of this contract. All video recordings and results shall be submitted to the Owner as part of the closeout documents.

E. Interior Water Piping System: Upon completion of water supply systems or section thereof, as required, system shall be tested and proved tight under a water pressure of 150 psi. Gauge shall be located on lowest new floor and pressure shall hold for a period of one (1) hours without introducing additional water. Water used for testing shall be from a potable source of supply.

F. Natural Gas Piping Systems – Domestic Gas:

1. Upon completion of gas piping system or section thereof, as required, test by attaching an air compressor testing apparatus to any suitable opening, and after closing all other inlets and outlets, force air into the system until a uniform pressure of at least 6" mercury or 3 lb. gauge for a period of no less than 30 minutes for each 500 cubic feet of pipe volume without showing any drop in pressure. Pressure shall be measured with a mercury manometer, slope gauge, or an equivalent device calibrated to read in increments of no greater than 1/10 lbs.

G. Testing Summary:

1. W&V – with water to a 10 foot head for 30 minutes.

2. Water – with potable water to 150 psi for one hour.

3. Gas (Low Pressure) – with air to 6" mercury for ten minutes.

H. Defective Work: If inspection or tests show defects, such defective work or material shall be replaced and inspection and tests shall be repeated. Repairs to piping shall be made with new material. No caulking or screwed joints or holes shall be acceptable.

I. Additional Tests:

1. Provide additional tests such as smoke pressure tests as required by regulations or as

directed by Authorities making the inspection.

2. Provide for any repeated test as directed by the Architect, to make all systems tight as required.
3. Visual inspections of joints and valves shall be made as directed by the Architect.

### 3.22 SEISMIC RESTRAINTS

A. All piping, equipment and devices shall be seismically supported as required by the Building Code.

**END OF SECTION**

**SECTION 23 0000**

**HVAC TABLE OF CONTENTS**

**PART 1 – GENERAL ..... 1**

1.1 GENERAL REQUIREMENTS AND REFERENCES ..... 1
1.2 DEFINITIONS ..... 1
1.3 SCOPE ..... 1
1.4 REGULATORY REQUIREMENTS ..... 2
1.5 SUBMITTALS ..... 3
1.6 SURVEYS AND MEASUREMENTS ..... 5
1.7 COORDINATION ..... 6
1.8 MECHANICAL AND ELECTRICAL COORDINATION ..... 6
1.9 MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS ..... 7
1.10 INSTALLATION REQUIREMENTS ..... 7
1.11 TYPICAL DETAILS ..... 8
1.12 SLEEVES, INSERTS ..... 8
1.13 CORING, DRILLING ..... 8
1.14 ACCESSIBILITY ..... 8
1.15 SUPPLEMENTARY SUPPORTING STEEL ..... 8
1.16 TOOLS AND EQUIPMENT ..... 8
1.17 PORTABLE AND DETACHABLE PARTS ..... 8
1.18 RECORD DRAWINGS, PROJECT CLOSEOUT ..... 9
1.19 GUARANTEE/WARRANTY ..... 9
1.20 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS ..... 10
1.21 QUALITY ASSURANCE ..... 11
1.22 DELIVERY, STORAGE AND HANDLING ..... 12

**PART 2 – PRODUCTS ..... 12**

2.1 DUCTWORK AND AIR DISTRIBUTION EQUIPMENT ..... 12
2.2 ACOUSTICAL DUCT LINING ..... 21
2.3 DUCT INSULATION: ..... 22
2.4 PIPING AND FITTINGS ..... 23
2.5 VARIABLE REFRIGERANT FLOW (VRF) SYSTEMS ..... 25
2.6 VALVES AND STRAINERS ..... 60
2.7 PIPE INSULATION ..... 61
2.8 PIPE HANGERS AND SUPPORTS ..... 63
2.9 SLEEVES AND PENETRATIONS ..... 64
2.10 ESCUTCHEONS AND DUCT COLLARS ..... 65
2.11 MOTORS, STARTERS AND WIRING ..... 65
2.12 PACKAGED, AIR COOLED, DX ROOFTOP UNIT ..... 66
2.13 CABINET UNIT HEATERS (HOT WATER) ..... 70
2.14 LOUVERS ..... 70
2.15 FIN TUBE RADIATION ..... 71
2.16 INLINE CENTRIFUGAL FANS ..... 72
2.17 VIBRATION ISOLATION AND SEISMIC RESTRAINTS FOR HVAC SYSTEMS ..... 72
2.18 SPLIT SYSTEM DIRECT EXPANSION AIR CONDITIONING ..... 93
2.19 AUTOMATIC TEMPERATURE CONTROLS (DIRECT DIGITAL CONTROL) ..... 94
2.20 PACKAGED AIR-TO-AIR ENERGY RECOVERY WITH HEATING AND COOLING ..... 128
2.21 SEQUENCE OF OPERATIONS ..... 132

**PART 3 – EXECUTION ..... 133**

3.1 COMMISSIONING OF EQUIPMENT AND SYSTEMS ..... 133

3.2 SPECIAL RESPONSIBILITIES ..... 133
3.3 MATERIALS AND WORKMANSHIP ..... 135
3.4 CONTINUITY OF SERVICES ..... 135
3.5 TAGS ..... 136
3.6 PIPE AND DUCT IDENTIFICATION ..... 136
3.7 ACCESS AND ACCESS PANELS ..... 137
3.8 PENETRATIONS AND SLEEVES ..... 137
3.9 ANCHORS AND INSERTS ..... 138
3.10 INSTALLATION OF EQUIPMENT ..... 138
3.11 PAINTING ..... 139
3.12 CLEANING ..... 139
3.13 STARTUP, TESTING, ADJUSTING AND BALANCING FOR HVAC ..... 139
3.14 VRF SYSTEM PROJECT SUPERVISION ..... 145
3.15 VRF SYSTEM COMMISSIONING ..... 147
3.16 VRF SYSTEM OWNER TRAINING AND TECHNICAL SUPPORT ..... 151

# SECTION 23 0000

# HVAC

## PART 1 – GENERAL

### 1.1 GENERAL REQUIREMENTS AND REFERENCES

A. Include “General Requirements” and applicable parts of Division 1 as part of this section.

B. Examine all other sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this section. Where paragraphs of this section conflict with similar paragraphs of Division 1, requirements of this section shall prevail.

C. Coordinate work with that of all other trades affecting, or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.

D. The HVAC Subcontractor shall be responsible for filing all documents, payment of all fees, and securing of all inspections and approvals necessary for the work of this section.

### 1.2 DEFINITIONS

A. As used in this section, “provide” means “furnish and install”, “POS” means “Provided Under Other Sections” and “HVAC” means “Heating, Ventilating and Air Conditioning”.

B. As used in the Drawings and Specifications for Mechanical Work, certain non-technical words shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions of other documents governing the HVAC work.

1. “Furnish” means: Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the HVAC work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased item(s) are free of all liens, claims, or encumbrances.
2. “Install” means: Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the HVAC work.
3. “Provide” means: “Furnish” and “Install”.
4. “New” means: Manufactured within the past two (2) years and never before used.

C. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any HVAC item in the Drawings or Specifications for HVAC work carries with it the instruction to furnish, install and connect the item as part of the HVAC work, regardless of whether or not this instruction is explicitly stated.

D. It shall be understood that the Specifications and Drawings for HVAC work are complimentary and are to be taken together for a complete interpretation of the HVAC work except that indications on the Drawings, which refer to an individual element of work, take precedence over the Specifications where they conflict.

### 1.3 SCOPE

A. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.

B. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is

not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.

C. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from Authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

D. Before submitting bid, visit and carefully examine site to identify existing conditions and difficulties that will affect work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions that are visible or readily construed by experienced observer. Site visit is particularly important because this is renovation work.

E. Before starting work in a particular area of the project, visit site and examine conditions under which work must be performed including preparatory work done under other Sections or Contracts or by Owner. Report conditions that might affect work adversely in writing through Contractor to Architect. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing and preparatory work.

## 1.4 REGULATORY REQUIREMENTS

A. Perform work strictly as required by rules, regulations, standards, codes, ordinances and laws of Local, State and Federal governments, and all other Authorities that have legal jurisdiction over the site. Materials and equipment shall be manufacturer installed and tested as specified in latest editions of applicable publications, standards, rulings and determinations of:

1. Local and State Building, Plumbing, Mechanical, Electrical, Fire and Health Department Codes.
2. American Gas Association (AGA).
3. National Fire Protection Association (NFPA).
4. American Insurance Association (A.I.A.) (formerly National Board of Fire Underwriters).
5. Occupational Safety and Health Act (OSHA).
6. Underwriters' Laboratories (UL).

B. Material and equipment shall be listed by Underwriters' Laboratories (UL), and approved by ASME and AGA for intended service.

C. When requirements cited in this Specification conflict with each other or with Contract Documents the most stringent shall govern work. The Architect may relax this requirement when such relaxation does not violate the rulings of Authorities that have jurisdiction. Approval for such relaxation shall be obtained in writing.

D. Most recent editions of applicable Specifications and publications of the following organizations shall form part of the Contract Documents.

1. American National Standards Institute (ANSI).
2. American Society of Mechanical Engineers (ASME).
3. National Electric Manufacturers Association (NEMA).
4. American Society for Testing and Materials (ASTM).
5. American Water Works Association (AWWA).
6. American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).

7. Air Moving and Conditioning Association (AMCA).
8. Sheetmetal and Air Conditioning Contractors National Association (SMACNA).
9. Air Conditioning and Refrigeration Institute (ARI).
10. Thermal Insulation Manufacturers Association (TIMA).

## 1.5 SUBMITTALS

A. This section shall supplement Division 1.

B. Definitions:

1. Shop Drawings: Information prepared by the Contractor to illustrate portions of the work in more detail than shown in the Contract Documents.
2. Coordination Drawings: Detailed, large-scale layout Shop Drawings showing HVAC, Electrical, Plumbing and Fire Protection work superimposed to identify conflicts and ensure inter-coordination of Mechanical, Electrical, Architectural, Structural and other work.
3. Manufacturer's Product Data: Information prepared by the manufacturer which depicts standard equipment.

C. Submittals Procedures and Format:

1. Review submittal packages for compliance with Contract Documents and then submit to Architect for review. Submit transparency and two (2) blue or black-line reproductions of each Shop Drawing larger than 8-1/2" x 11". Submit eight (8) sets of each smaller shop drawing. After review, transparency original of each large Shop Drawing and six (6) sets of each small shop drawing will be returned with reviewer's marks. Electronically submitted shop drawings are acceptable.
2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:
    a. Title.
    b. Name and location of project.
    c. Names of Architect, Engineer, Contractor and Subcontractor(s).
    d. Names of Manufacturer, Supplier, Vendor, etc.
    e. Date of submittal.
    f. Whether original submittal or resubmitted.
3. Shop Drawings showing layouts of systems shall contain sufficient plans, elevations, sections, details and schematics to describe work clearly. They shall be ¼" = 1'-0" and shall indicate work of other Sections where physical clearances are critical and where interferences are possible. Provide larger scale details as necessary. Sheetmetal Drawings shall show elements of Architect's reflected ceiling plan, exposed ductwork, walls, partitions, diffusers, registers, grilles, fire dampers, sleeves and other aspects of construction as necessary for coordination.

D. Acceptable Manufacturers:

1. The Architect's Mechanical/Electrical design for each project is based on the single manufacturer listed in the schedule or shown on the Drawings. In Division 15 of these Specifications certain "Alternate Manufacturers" are listed as being acceptable. These are acceptable only if, as a minimum, they:
    a. Meet all performance criteria listed in the schedules and outlined in the Specifications.

b. Have identical operating characteristics to those called for in the Specifications.

c. Fit within the available space it was designed for, including space for maintenance and component removal, with no modifications to either the space or the product. Clearances to walls, ceilings and other equipment will be at least equal to those shown on the Contract Documents. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Architect has determined that the manufacturer's products will fit within the available space. This determination is solely the responsibility of the Contractor.

d. For equipment mounted in areas where structural matters are a consideration, the products must have a weight no greater than the product listed in the schedules or Specifications.

e. Products must adhere to all architectural considerations including, but not limited to, being the same size and of the same physical appearance as scheduled or specified products.

E. Substitutions: Substitution of products by manufacturers other than those listed shall only be done in accordance with subparagraph "F" "Substitutions and Deviations".

F. Substitutions and Deviations:

1. Deviations from the Contract Documents and the substitution of materials or equipment relative to the "Acceptable Manufacturers" referred to above, shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the substitution or deviation to the attention of the Architect. The letter shall describe changes in the system shown and physical characteristics (connections to adjacent materials, electrical services, service access requirements, and other characteristics), and differences in operating characteristics or cycles.

2. Without letters flagging the substitution or deviation to the Architect, it is possible that the Architect may not notice such substitution or deviation or may not realize its ramifications. Therefore, if

3. such letters are not submitted to the Architect, the Contractor shall hold the Architect and his consultants harmless for any and all adverse consequences resulting from the deviations being implemented. Adverse consequences shall include, but not be limited to, excessive noise, excessive maintenance, shortened longevity, spatial coordination problems, and inadequate performance versus scheduled design. This shall apply regardless of whether the Architect has reviewed or approved Shop Drawings containing the deviation, and will be strictly enforced.

4. Do not request substitute materials or equipment unless identical material or equipment has been operated successfully for at least three (3) consecutive years. Such materials and equipment shall be a regular cataloged item shown in the current catalog of the manufacturer. When deviation or substitution is permitted, coordinate fully with related changes to Architectural, Structural, Plumbing, Fire Protection, Mechanical, and other work. Ensure that related changes necessary for coordination of substituted items are made within the Contract Price. Assume full responsibility for safety, operation and performance of the altered system.

5. Substitutions of equipment, systems, etc. requiring approval of local Authorities must comply with such regulations and be filed by the Contractor (should filing be necessary).

6. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance, as delineated in schedules and in the Specifications, shall be interpreted as minimum performance.

7. Approval of proposed deviations or substitutions, if any, will be made at discretion of Architect.
8. If equipment is proposed for substitution that is not tested and rated according to industry-wide standards, the Architect shall have the right to have performance tests completed, at the Contractor's expense, to confirm the manufacturer's performance claims.

G. Submittal Notations: will be returned from the Architect marked as illustrated below:

| | |
|---|---|
| NO EXCEPTION TAKEN | ACCEPTED AS NOTED |
| NOT ACCEPTED | REVISE AND RESUBMIT |

1. Checking is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Any action shown is subject to the requirements of the Drawings and Specifications. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site; fabrication process and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.

H. Schedule: Incorporate the Shop Drawing review period into the construction schedule so that work is not delayed. Contractor shall assume full responsibility for delays caused by not incorporating the following Shop Drawing review time requirements into his project schedule. Allow at least ten (10) working days, exclusive of transmittal time, for review each time a Shop Drawing is submitted or

I. re-submitted with the exception that fifteen (15) working days, exclusive of transmittal time, are required for the following:

1. Automatic temperature controls.
2. Coordination Drawings, if required by this Specification.
3. If more than five (5) Shop Drawings of this trade are received in one (1) calendar week.

J. List of Proposed Equipment and Materials: Within four (4) weeks after Award of Contract and before ordering materials or equipment, submit a complete list of proposed materials and equipment and indicate manufacturer's names and addresses. No consideration will be given to partial lists submitted out of sequence.

K. Responsibility:

1. The intent of submittal review is to check for capacity, rating, and certain construction features. Contractor shall ensure that work meets requirements of the Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with submittals marked "REVIEWED" to extent that they agree with the Contract Documents. Submittal review shall not diminish responsibility under this
2. Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the Shop Drawing errors or deviations from requirements of the Contract Documents. The Architect's noting of some errors while overlooking others will not excuse the Contractor for proceeding in error. Contract Document requirements are not limited, waived, nor superseded in any way by review.
3. Inform Subcontractors, Manufacturers, Suppliers, etc. of scope and limited nature of review process and enforce compliance with the Contract Documents.

## 1.6 SURVEYS AND MEASUREMENTS

A. Base all required measurements, both horizontal and vertical, on reference points established by the General Contractor and be responsible for the correct laying out of the Mechanical work. In the event of a discrepancy between actual measurements and those indicated, notify the General Contractor in writing. Do not proceed with the work required until written instructions have been issued by the General Contractor.

## 1.7 COORDINATION

A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of Mechanical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with Structural and other trades and to meet Architectural requirements.

B. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the work.

C. Furnish to other trades advance information on locations and sizes of all frames, boxes, sleeves and openings needed for their work. Furnish information and Shop Drawings necessary to allow trades affected by the work to install their work properly and without delay.

D. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Architect. Where the HVAC work shall interfere with the work of other trades, assist in coordinating the space conditions to make satisfactory adjustments before installation. Without extra cost to the Owner, make reasonable modifications to the work as required by normal Structural interferences. The Mechanical Contractor shall be liable for any additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not properly coordinated. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.

E. If any HVAC work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the trades involved without extra cost to the Owner.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect for review and approval.

G. Protect all materials and work of other trades from damage which may be caused by the Mechanical work, and repair all damages without extra cost to the Owners.

## 1.8 MECHANICAL AND ELECTRICAL COORDINATION

A. The HVAC Subcontractor shall furnish and install various electrical items relating to the heating and ventilating equipment and control apparatus. The Electrical Subcontractor shall be required to connect power wiring to this equipment unless noted otherwise.

B. The HVAC and Electrical Subcontractors shall coordinate their respective portions of the work, as well as the electrical characteristics of the heating, ventilating and air conditioning equipment.

C. All power wiring and local disconnect switches will be provided by the Electrical Subcontractor for the line voltage power. All control and interlocking wiring shall be the responsibility of the HVAC Subcontractor.

D. 120V and above power wiring sources extended and connected to HVAC control panels, transformers and switches shall be the responsibility of the Electrical Subcontractor. All low voltage thermostats and any switch wiring shall be the responsibility of the HVAC Subcontractor.

E. Temperature control and equipment wiring shall be installed by the HVAC Subcontractor.

F. The Electrical Subcontractor will provide all magnetic starters except those furnished as an integral part of packaged equipment.

## 1.9 MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS

A. Coordination Drawings:

1. The Sheetmetal Subcontractor shall prepare a complete set of electronic Drawings at a scale not less than 3/8" equals 1'-0", showing structure and other information as needed for coordination. He shall show sheetmetal layout thereon. These will be the Coordination Drawings.
2. The main paths of egress and for equipment removal, from main Mechanical and Electrical rooms must be clearly shown on the Coordination Drawings. All fire and smoke partitions must be highlighted on the Coordination Drawings for appropriate coordination.
3. Each of the below specialty trades shall add its work to these background Drawings with appropriate elevations and grid dimensions. Specialty trade information is required for fan rooms and mechanical rooms, horizontal exits from duct shafts, crossovers, and for spaces in and above ceilings where congestion of work may occur such as corridors, and even entire floors. Drawings shall indicate horizontal and vertical dimensions, to avoid interference with structural framing, ceilings, partitions, and other services.
    a. Specialty Trades:
        1) Plumbing System.
        2) HVAC Piping and Associated Control System.
        3) Electrical.
        4) Sheet Metal Work.
        5) Sprinkler System.
4. Each specialty trade shall sign and date each electronic Coordination Drawing. Return Drawings to the Sheetmetal Subcontractor, who shall route them sequentially to all specialty trades.
5. Where conflicts occur with placement of materials of various trades, the Sheetmetal Subcontractor will be responsible to coordinate the available space to accommodate all trades. Any resulting adjustments shall be initialed and dated by the specialty trade. The Sheetmetal Subcontractor shall then final date and sign each Coordination Drawing. If he cannot resolve conflicts, the decision of the General Contractor shall be final, subject to the approval of the Architect.
6. A Subcontractor who fails to promptly review and incorporate his work on the Coordination Drawings shall assume full responsibility of any installation conflicts affecting his work and of any schedule ramifications.
7. The Sheetmetal Subcontractor shall make electronic copies of all Coordination Drawings. Fabrication shall not start until such electronic Drawings are received by the Architect/Engineer and have been reviewed.
8. Review of Coordination Drawings shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with Architectural, Structural, Mechanical, and Electrical Contractors.

## 1.10 INSTALLATION REQUIREMENTS

A. The arrangement of all HVAC work shown on the Drawings is diagrammatic only and indicates the minimum requirements of the work. Conditions at the building including actual measurements

shall determine the details of the installation. All work shall be laid out and installed so as to require the least amount of cutting and patching.

B. Review the Architectural Drawings and Specifications before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Architect for his determination prior to proceeding with the work.

### 1.11 TYPICAL DETAILS

A. Typical details where shown on the Drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the Drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the Contractor shall have the prior approval of the Architect.

### 1.12 SLEEVES, INSERTS

A. Furnish and install all sleeves, inserts, anchor bolts and similar items to be set into masonry or concrete, as required for mechanical work. Internal diameter of sleeve ball shall be 1/2" larger than the outside diameter of the pipe or insulation covered line passing through it.

### 1.13 CORING, DRILLING

A. Core, cut and/or drill all small holes 4.5” diameter or less in walls and floors required for the installation of sleeves and supports for the Mechanical Electrical work.

### 1.14 ACCESSIBILITY

A. Install all work such that parts requiring periodic inspection, operation, maintenance and repair are readily accessible.

B. Furnish all access panels appropriate to particular conditions, to be installed by trades having responsibility for the construction of actual walls, floors or ceilings at required locations.

### 1.15 SUPPLEMENTARY SUPPORTING STEEL

A. Provide all supplementary (non-structural) steelwork required for mounting or supporting equipment and materials.

B. Steelwork shall be firmly connected to building construction as required. Locations and methods of attachment shall be approved by the Architect.

C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer’s published requirements.

D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction: all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.

E. All manufactured steel parts and fittings shall be galvanized.

### 1.16 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the mechanical equipment at the site.

### 1.17 PORTABLE AND DETACHABLE PARTS

A. Contractors shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment, etc. necessary for the proper operation and maintenance of the

Mechanical and Electrical systems until final completion of the work, at which time they shall be handed over to the Owners.

## 1.18 RECORD DRAWINGS, PROJECT CLOSEOUT

A. As work progresses and for the duration of Contract, maintain a complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately including

B. work installed as a modification or addition to the original design. Work shall be updated on a weekly basis and shall be made available for review by Architect. Failure to perform this work shall be reason for withholding requisition payments. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.

C. At the completion of work, prepare a complete set of Record Drawings showing all systems as actually installed. The copies will be made available for the HVAC Contractor's copying, at his expense, to serve as backgrounds for the Record Drawings. The quantity of copies which are made available shall in no way be interpreted as setting a limit to the number of Drawings necessary to show the required information. The HVAC Contractor's professional Draft Person shall transfer changes to electronic CAD files. Submit three (3) sets of electronic copies to Architect for comments as to compliance with this section.

D. The Architect will not certify the accuracy of the Record Drawings. This is the sole responsibility of the Mechanical Contractor.

E. This trade shall submit the Record Drawings for approval by the Fire and Building Departments in a form acceptable to the departments, when required by the jurisdiction.

F. Record Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer, make and model numbers of final equipment installation.

## 1.19 GUARANTEE/WARRANTY

A. Guarantee and 24 hour service.

1. Guarantee Work of this Section in writing for not less than one (1) year following the date of acceptance by the Owner. If the equipment is used for temporary heat, cooling, etc., prior to acceptance by the Owner, the bid price shall include an extended period of warranty covering the one (1) year of occupancy, starting from the date of acceptance by the Owner. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to the Architect's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

2. In addition to guarantee requirements of Division 1 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's name.

3. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor without any reimbursement.

4. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Architect.

5. Provide 24 hour service beginning on the date the project is accepted by the Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall

be at no cost to the Owner. Service can be provided by this Contractor or a separate service organization. Choice of service organization shall be subject to Architect and Owner approval. Submit name and a phone number that will be answered on a 24 hour basis each day of the week, for the duration of the service.

6. Submit copies of equipment and material warranties to Architect before final payment.
7. At end of guarantee period, transfer manufacturer's equipment and material warranties still in force to Owner.
8. This paragraph shall not be interpreted to limit Owner's rights under applicable codes and laws and under this Contract.
9. PART 2 paragraphs of this Specification may specify warranty requirements that exceed those of this paragraph. Those paragraphs shall govern.
10. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of Work by Owner, and shall not initiate the guarantee period.
11. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to Owner's satisfaction, advise the Architect in writing, describe efforts to rectify situation, and provide analysis of cause of problem. The Architect and/or Engineer will direct course of action.

## 1.20 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

A. Obtain at time of purchase of equipment, three copies of operation, lubrication and maintenance manuals for all items. Assemble literature in coordinated manuals with additional information describing combined operation of field-assembled units, including as-built wiring diagrams. The manual shall contain the names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment. Divide manuals into three sections or books as follows:

1. Directions for and sequence of operation of each item of HVAC system, e.g. air handling units and boilers. Sequence shall list valves, switches and other devices used to start, stop and control system. Detail procedure to be followed in case of malfunctions. Include detailed approved flow diagrams of temperature control, heating, condensate, chilled water, condenser water, etc. as appropriate for systems provided. Include approved valve directory showing each valve number, location of each valve and equipment or fixture controlled by valve.
2. Detailed maintenance and troubleshooting manuals containing data furnished by manufacturer for complete maintenance. Include copy of balancing report.
3. Lubrication instructions detailing type of lubricant, amount and intervals recommended by manufacturer for each item of equipment. Include additional instructions necessary for implementation of first class lubrication program. Include approved summary of lubrication instructions in chart form, where appropriate.

B. Furnish three copies of manuals to the Architect for approval and distribution to the Owner. Deliver manuals no less than 30 days prior to acceptance of equipment to permit the Owner's personnel to become familiar with equipment and operation prior to acceptance.

C. Provide framed and glazed charts as follows: mount as directed by the Architect.

1. Flow diagrams from first part of manual as described above.
2. Valve directory.
3. Lubrication chart from third part of manual.

D. Operating Instructions: Upon completion of installation or when the Owner accepts portions of building and equipment for operational use, instruct the Owner's operating personnel in any or all parts of the various systems. Instructions shall be performed by factory authorized personnel. The Owner shall determine which systems require additional instructions. The duration of instructions shall take equipment through complete cycle of operation (at least five working days). Make adjustments under operating conditions.

E. Each contractor shall be responsible for his work and equipment until finally inspected, tested and accepted. Carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plug during construction to prevent entry of obstructing material.

F. Each separate contractor shall protect the work and material of other trades that might be damaged by his work or workmen and make good all damage thus caused.

**1.21 QUALITY ASSURANCE**

A. The requirements of the State Building Code and Local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.

B. All work shall comply with the latest editions of the codes as referenced herein.

C. Follow manufacturer's directions for articles furnished, in addition to directions shown on Drawings or specified herein.

D. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to the Owner.

E. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.

F. Equipment and materials shall:

1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed and labeled.
2. Be without blemish or defect.
3. Not be used for temporary purposes.
4. Be in accordance with the latest applicable ASHRAE standards.

G. Purchase products which will meet with the acceptance of all Authorities Having Jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be so examined, tested and certified.

H. Except for plans, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.

I. For items which are to be installed but not purchased as part of the HVAC work, the Mechanical Contractor work shall include:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into any point on the property line at grade level.
3. Their safe handling and field storage until the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement, if necessary, shall be coordinated with the Contractor who

originally purchased the item.

5. Field erection and internal wiring as necessary for their proper operation.
6. Mounting in place, including the purchase and installation of all dunnage, supporting members, and fastenings, necessary to adapt them to architectural and structural conditions.

J. Items which are to be installed, but not purchased as part of the HVAC work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the HVAC work will be considered only if presented in writing within one (1) week of the date of delivery to the project of the items in question. The mechanical work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

### 1.22 DELIVERY, STORAGE AND HANDLING

A. All materials for the work of this section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials shall be delivered and stored in their original containers, plainly marked with the products' and manufacturer's name. Materials in broken containers or in packages showing watermarks or other evidence of damage shall not be used and shall be removed from the site.

## PART 2 – PRODUCTS

### 2.1 DUCTWORK AND AIR DISTRIBUTION EQUIPMENT

A. Reference Standards:

1. Material, construction and installation shall meet requirements of most recent editions of the following standards and references, except for more stringent requirements specified or shown on the Drawings:

| Standard | As Applicable To |
|---|---|
| SMACNA HVAC Duct Construction Standards Metal and Flexible | Sheetmetal Ductwork; Duct Liners; Adhesives; Fasteners; Flexible Ductwork |
| SMACNA HVAC Air Duct Leakage Test Manual | Duct Leakage Testing |
| SMACNA Fibrous Glass Duct Construction Standards | Fibrous Glass Ductwork; Tapes |
| SMACNA Ducted Electric Heat Guide for Air Handling Systems | Electric Duct Heaters |
| SMACNA Thermoplastic Duct (PVC) Construction Manual | PVC Ductwork |
| ADC and TIMA Flexible Duct Performance Standards | Flexible Ductwork |
| NFPA 90A | Fire Dampers; Fire Resistance Standards for Ducts and Liners |

| | |
|---|---|
| NFPA 96 | Kitchen Hood Exhaust Ductwork |
| NFPA 45 | Laboratories using chemicals |
| SMACNA Guidelines for Welding Sheetmetal | Welded Galvanized, Black Iron and Stainless Ductwork |

B. General:

1. Provide supporting and hanging devices necessary to install the entire HVAC system including ductwork and equipment, and to prevent vibration.
2. Provide vertical and horizontal supports as required by code to meet minimum applicable earthquake resistance standards.
3. Ductwork shall be free from vibration under all conditions of operation. Dimensions shown on the Drawings for lined ductwork are net inside dimensions. Increase ductwork dimensions to accommodate lining requirements.
4. Pipe or conduit crossing duct: No pipe, conduit, hanger, Architectural element nor structural member shall pass through ductwork.
5. When making offsets and transformations necessary to accommodate structural conditions, preserve full cross-sectional area of the ductwork as shown on the Drawings.
6. Ductwork shall have pressure-velocity classifications as follows:

| Duct Construction Class | Static Pressure Rating | Pressure | SMACNA Seal Class | SMACNA Leakage Class | Velocity |
|---|---|---|---|---|---|
| 10” | 10” | Pos. * | A | 3 | 2000 fpm or greater |
| 6” | 6” | Pos. * | A | 3 | 2000 fpm or greater |
| 4” | 4” | Pos. * | A | 3 | 4000 fpm or less |
| 3” | 3” | Pos. or Neg. | A | 3 | 4000 fpm or less |
| 2” | 2” | Pos. or Neg. | A | 6 | 2500 fpm or less |

   a. For negative pressures over 3” w.g., refer to SMACNA Round and Rectangular Industrial Duct Construction Standards for joint and intermediate reinforcement requirements.
   b. Unless otherwise specified or shown on the Drawings, the following pressure classifications shall be used for the types of ductwork listed below:
      1) 2” Class: All ductwork.
7. Sealing requirements for Class A, Leakage Class 3, galvanized, non-welded aluminum or non-welded stainless steel ductwork:
   a. Transverse Joints:
      1) During assembly, seal all flanged transverse joints with sealing tape of quality equal to Hardcast Inc. Model 1902-FR. Corners shall be sealed as described by SMACNA and when applicable per manufacturer’s published procedures. After sealant has cured, seal entire joint with Hardcast Inc. Model RTA-50 adhesive on to Hardcast

Inc. duct tape or approved equal.

2) Seal all non-flanged longitudinal seams during ductwork fabrication with Hardcast Inc. Cold Seal Model 1001 or approved equal.

b. Longitudinal Seams: Seal all longitudinal seams during ductwork fabrication with Hardware Inc. Cold Seal Model 1001 or approved equal.

c. Joints and Ductwork Penetrations:

1) Seal all duct joints at takeoffs, access doors, damper bearing penetrations, flexible duct connections etc., with Hardcast Inc. Versa Grip Model 102 or approved equal.

2) Note, access doors and damper rod penetrations shall be equipped with proper hardware for sealing.

8. Sealing requirements for Class A, Leakage Class 6, galvanized, non-welded aluminum or non-welded stainless steel ductwork:

a. Transverse Joints:

1) During assembly seal all flanged transverse joints with sealing tape of quality equal to Hardcast Inc. Model 1902-FR. Corners shall be sealed as described by SMACNA and when applicable per manufacturer's published procedures.

2) Seal all non-flanged transverse joints with Hardcast Inc. Versa Grip Model 102 or approved equal.

b. Longitudinal Seams: Seal all longitudinal seams during ductwork fabrication with Hardcast Inc. Cold Seal Model 1001 or approved equal.

c. Joints and Ductwall Penetrations: Seal all duct joints at takeoffs, access doors, damper bearing penetrations, flexible duct connections etc., with Hardcast Inc. Versa Grip Model 102 or approved equal.

9. Sealing requirements for Class B, Leakage Class 12, galvanized, non-welded, aluminum or non-welded stainless steel ductwork:

a. Transverse Joints:

1) During assembly seal all flanged transverse joints with sealing tape of quality equal to Hardcast Inc. Model 1902-FR.

2) Corners shall be sealed as described by SMACNA and when applicable per manufacturer's published procedures.

3) Seal all non-flanged transverse joints with Hardcast Inc. Versa Grip Model 102 or approved equal.

b. Longitudinal Seams: Seal all longitudinal seams during ductwork fabrication with Hardcast Inc. Cold Seal Model 1001 or approved equal.

10. Support:

a. Space hangers as required by SMACNA (8 ft. max.) for horizontal duct on 8 ft. centers, unless concentrated loadings require closer spacing.

b. Support vertical duct on each floor or slab it penetrates.

c. Supports for ductwork and equipment shall be galvanized unless specified otherwise.

11. Connections:

a. Connect inlets and outlets of air handling units and fans to ductwork with flexible connections unless fan has vibration isolator mounts inside unit with flexible connections

and no external vibration isolators. Exception: Do not use flex on life safety smoke exhaust fans.

b. Indoors, flexible connections shall be neoprene-coated fibrous glass fire retardant fabric, by Ventifabrics, or Durodyne. Outdoors, flexible connections shall be DuPont hyplon-coated fibrous glass fire, weather and UV-resistant by Ventifabrics or Durodyne.

c. Secure flexible connections tightly to air handlers with metal bands. Bands shall be same material as duct construction.

d. Connections from trunk to branch duct shall be as detailed on Drawings.

12. Construction:

a. No sharp metal edges shall extend into air streams.

b. Install drive slips on air-leaving side of duct with sheetmetal screws on 6” centers.

c. Spin in collars shall NOT be used for branch connections in 3” or higher pressure class ductwork.

13. Joints:

a. Longitudinal lock seams shall be double-locked and flattened to make tight joints.

b. Make transverse joints, field connections, collar attachments and flexible connections to ducts and equipment with sheetmetal screws or bolts and nuts. Do not use rivets or staples.

14. Prefabricated Transverse Duct Joints:

a. Transverse joints in galvanized sheetmetal ductwork may be made with galvanized gasketed frame and angle duct systems by Ductmate, TDF, TDC, or approved equal. Angles shall be at least 20 gauge. Prefabricated transverse duct joints shall not be used for duct 16 ga. and heavier, nor for duct 23 ga. and lighter.

b. Secure angles to duct with screws (using clutched arbor) or spot-welds spaced as recommended by manufacturer for duct pressure class.

15. Elbows and Bends:

a. Elbows and bends for rectangular ducts shall have centerline radius of 1-1/2 times duct width wherever possible. Elbows for grease

b. exhaust and fume hood exhaust shall be full radius. Vanes or mitered duct are not allowed.

c. Where centerline radius is less than 1-1/2 times duct width (on supply, return and exhaust ductwork), elbows shall be radius throat (square throat allowed when turning around column or other close objects) with radius heel. For elbows whose width is greater than 48 inches and/or where shown on plans, provide splitter vanes. Install vanes in accordance with SMACNA. Where multiple elbows are separated by less than ten duct diameters use splitter (full length) vanes.

d. For round ductwork provide stamped elbows, with centerline radii equal to 1-1/2 times duct diameter, or gored elbows as follows:

| Elbow Angle | No. of Gores |
|---|---|
| 0° - 36° | 2 |
| 37° - 72° | 3 |

| | |
|---|---|
| 73° - 90° | 5 |

e. Elbows for flat oval ducts shall have centerline radii equal to 1-1/2 times duct diameter in plane of bend, or gored elbows with gores as specified for round ducts.

16. Access Panels/Doors:

a. Provide proper pressure and leakage rated, gasketed, duct mounted access panels/doors for the following items with minimum sizes, as indicated. Access doors shall be of double wall construction. Access doors in insulated ducts shall be insulated. Gauges of door materials, number of hinges, number and type of door locks shall be as required by the SMACNA Duct Construction

b. Standards. Hinged doors are not acceptable, screwed or bolted access panels are not acceptable. Doors shall be chained to frame with a minimum length of 6" to prevent loss of door. For seal Class A, access doors shall be leakage rated, neoprene gasketed UL 94 HF1 listed, DUCTMATE "sandwich" or approved equal. Door metal shall be the same gauge as the attached duct material. For grease and high temperature ducts, door assembly shall be rated for 2300° F. The minimum sizes shall be:

1) Fire dampers – 12" x 12", or larger.

2) Combination Fire/Smoke dampers – 12" x 12", or larger.

3) Smoke dampers – 6" x 6" minimum.

4) Automatic control dampers – 6" x 6" minimum.

5) Manual volume dampers 2 sq. ft. and larger – 6" x 6" minimum.

6) Inlet side to all coils – 12" x 12", or larger.

7) Suction and discharge sides of inline fans – 24" x 24" minimum

8) At additional locations indicated on Drawings, or specified elsewhere – 12" x 12" minimum.

9) Generally access doors are not shown on the Drawings, but shall be provided in accordance with the above.

17. Extractors shall have adjusting rod and locknut on outside of duct.

18. Connections to roof fans:

a. Shall be at least 22 gauge galvanized steel soldered watertight.

b. Solder side seams at least 12" up from bottom.

c. Provide suitable dielectric gaskets to join dissimilar materials.

19. Plenums and Connections to Louvers:

a. Shall be 18 ga. minimum cross-broken and properly reinforced with galvanized angle irons to SMACNA requirements.

b. Shall have bottom and corner seams soldered watertight at least 12" up from bottom.

c. Shall have neoprene gaskets or other non-corrodible material to make connections to louvers watertight.

d. Shall pitch connection back towards the louver. Provide half-coupling drain connection at bottom of plenum unless noted otherwise. Pipe drain to nearest floor drain.

e. Shall have unused portions of louvers blocked-off with sheetmetal; sealed air and watertight; insulated with 2" thick 6 lb. Density rigid or board insulation.

20. Duct Pressure Tests:
    a. Pressure test ducts after takeoffs and wall penetrations are in place and before applying exterior insulation. Correct any leaks.
    b. Pressure and leak test 10% of ductwork at 100% of operating system pressure. Duct shall be constructed so there is no joint or structural failure at the test pressure.
21. Duct Leakage Tests: Leak testing shall be per SMACNA HVAC Air Duct Leakage Test Manual. Provide orifice assembly including straightening vanes, orifice-plate mounted in straight tube with properly located pressure
22. taps, and U-tube manometer or other device as specified by SMACNA. The orifice assembly shall be calibrated accurately and shall come with calibration curve. Leakage classes shall be as previously specified. Submit leak test report (per SMACNA format) for Architect review. Drawings of ductwork tested shall also be submitted with report, indicating presence of takeoffs, wall penetrations, joints, etc.
23. Materials:
    a. Sheetmetal ducts shall be constructed of hot-dipped galvanized sheetmetal with G90 Commercial coating according to ASTM 527 unless specified otherwise.
    b. Flexible Ductwork:
        1) Flexible ductwork, connecting to uninsulated or unlined duct, shall be polyester core with corrosion-resistant helical wire reinforcing. The polyester core shall be minimum two-ply and shall have a minimum thickness of 0.0017". Flex duct shall be UL rated for 6" WC positive pressure, 2" WC negative pressure with a maximum velocity of 4000 FPM. Flexduct must be listed as a Class 1 Connector according to UL 181 and shall meet the requirements of NFPA 90A. The maximum ASTM E-84 fire-hazard rating shall be 25 flame spread, 50 fuel contributed and 50 smoke developed. Uninsulated flexible duct shall be equivalent to Wiremold, Type WB, or Flexmaster Types 2 and 4 (not type 9).
        2) Flexible duct connected to insulated or lined duct shall also be insulated and shall be equivalent to Wiremold Type WK or Flexmaster Types 2 or 4 (not type 9), with 1-1/2" 3/4 lb. density fiberglass insulation and an aluminized reinforced vapor barrier.
        3) Submittals shall include data or number of polyester plies and minimum thickness of polyester core, in addition to other data listed above required to ensure that submitted product meets the requirements of these Specifications.
        4) If flex duct other than the model numbers of the vendors listed above is submitted, a sample of the flex duct shall be submitted to the Architect. The Architect shall have sole discretion in determining whether the submitted flex duct is equivalent to that of the named vendors above.
        5) Unless otherwise indicated, flexible duct shall not exceed 5'-0" long.

C. 2" and Lower Pressure Class Ductwork – Rectangular:
    1. Ducts wider than 19" with more than 10 square feet of unbraced panel shall be beaded or cross-broken.
    2. Internal stiffening struts shall only be used upon prior written approval of the Architect.
    3. Make changes in duct size with tapered connections as required by SMACNA. Changes shall NOT exceed 30° from line of airflow. Take-off to the diffusers shall be 45° leading edge type or bellmouth type.
    4. Transverse joints shall be TDF/TDC or slip joints; use flat or standing seam according to

SMACNA. Where the duct size requires a standing seam but space restrictions dictate flat seam, notify Architect prior to fabrication.

D. 2” and Lower Pressure Class Ductwork – Round:

1. Joints:

   a. Longitudinal joints shall be spiral seam, butt welded, lap and seam welded, or ACME lock-grooved seam. Snap lock seams shall be used on 1/2" w.g. pressure class duct only.

   b. Transverse joints shall be beaded sleeve joint or other approved joints listed in SMACNA. Use three (3) or more sheetmetal screws at 15” uniform intervals along circumference of joints.

2. Branch fittings shall be conical tee (Buckley or equal) or combination tee as shown in SMACNA.

E. Fire Dampers:

1. Provide fire dampers throughout the air distribution system(s) as required by applicable codes, standards and Authorities. Provide an access door for each fire damper of sufficient size to repair the internal fusible link (see access panel/door section). Fire dampers indicated on the Drawings may not fully represent the exact number required for this project. It is the Contractor’s responsibility, at no additional cost to the Owner, to provide all required dampers.

2. Fire dampers shall be the fusible link spring loaded type. Where in ductwork served by fans which shut off during a fire alarm condition, dampers shall be

3. the static type, similar to Greenheck Model FD series. Where in ductwork served by fans which do not shut off during a fire alarm condition, dampers shall be the dynamic type, similar to Greenheck Model DFD series.

4. Fire damper frames shall be fitted with angle iron stop and stainless steel spring latch, and shall be securely fastened to building construction.

5. Seal spaces between damper frames and walls and between damper frames and floor with approved fire-retardant material.

6. The use of fire dampers shall NOT reduce net free area of duct below that shown on Drawings. Fire dampers shall be Type B with the blades of the fire dampers out of the air stream.

7. Samples of fire dampers shall be submitted to and approved by Local Authorities Having Jurisdiction.

8. Dampers shall bear 1-1/2 hour UL-rating fire damper label and shall be constructed and installed as required by UL-555.

9. Fire dampers shall be Buckley, Greenheck, Ruskin, Nailor Industries, Pottorff or Prefco for use in the proper duct pressure classification.

10. Dampers shall be installed per SMACNA with breakaway connections and nose pieces on duct liner (see SMACNA HVAC Duct Construction Standards).

F. Volume Dampers:

1. Provide manually adjustable rectangular parallel blade dampers for

2. duct heights less than 12” with factory-installed locking hand quadrants extended 2” for all dampers installed in externally insulated duct:

   a. On each supply, return and general duct take-off.

b. At each take-off to register, grille or diffuser (not all are shown on Drawings for clarity).

3. Volume dampers shall be manufactured approximately 5/16” smaller in width and 1/8” smaller in height than size of duct in which they are installed; e.g., nominal damper size is 24” x 10”; actual size is approximately 23-11/16” x 9-7/8”.
4. Volume damper frames shall be constructed of #6063 extruded aluminum reinforced channel with minimum thickness of 0.050”. Opposed damper blades shall be #6063 extruded aluminum with minimum thickness of 0.050” and shall include reinforcing ribs. Each blade shall be supported in the damper frame by individual Teflon axle bearings, and shall be driven by stainless steel connecting slide linkage controlled by 3/8” square steel control shaft.
5. All required volume dampers may not be indicated on Drawings, but volume dampers shall be provided as necessary for systems balancing.
6. Dampers 12” and larger in height shall be opposed multi-blade type.
7. Where volume dampers are inaccessible, use locking type ceiling regulators and miter gear or worm gear for all horizontal dampers. Bearing coupling for bottom duct control may be used for shaft on vertical blade dampers. The 3/8” rod between ceiling regulator and damper shall be provided by Contractor.
8. Damper blades shall be two gauges heavier than adjoining ductwork, and shall be riveted to supporting rods. Hem over edges parallel to rods.
9. Brackets shall be galvanized metal, secured to ductwork with sheetmetal screw with locking quadrant arms (see Seal Class Section for additional requirements). Provide 2” handle extension for all dampers on externally insulated ductwork.
10. Note: All required volume dampers may not be indicated on Drawings but dampers shall be provided as necessary for system balancing.

G. Remote Control Operated Balancing Dampers:

1. Round remote control operated balancing dampers applicable for use in HVAC systems with velocities to 2,600 fpm by United Enertech model i-3, Young Regulators or equal as approved by engineer.
2. Submit manufacturer’s product data including performance data.
   a. Include differential pressure ratings and maximum system velocity.
   b. Indicate materials, dimensions, construction, and installation details.
   c. Include damper pressure drop data based on procedures performed in accordance with AMCA 500-D.
3. Ratings:
   a. Temperature Rating 35°F to 120°F (2°C to 49°C)
   b. Maximum Velocity: 2600 fpm (13.2 m/s)
   c. Maximum Differential Pressure Rating: 3" w.g.
4. Construction:
   a. Frame: Min. 24 ga galvanized steel, 8" deep
   b. Blade: Round, minimum 24 ga galvanized steel, mechanically fastened to blade
   c. Axels: Zinc Plated Steel Pins
   d. Bearings: Nylon 6/6 Molded synthetic
   e. Mounting: Vertical and/or Horizontal

f. Actuator: DC voltage, Direct Drive, Electronic pulse

g. Remote: Portable hand held power pack with RJ-11 cable

h. Finish: Mill Galvanized

5. Accessories and Options (Engineer to select and edit as required)

a. Custom RJ-11 cable length: _____inches.

b. Aluminum construction

c. Stainless Steel construction

d. Oval damper in lieu of round

e. Choice of RJ-11 cable terminal points: J50, J100, or J150

6. Installation

a. Install dampers at locations indicated n the drawings and in accordance with manufacturer's instructions.

b. Install dampers round and free from racking. Do not stretch or compress damper frame or sleeve into the opening or duct.

c. Handle dampers using the sleeve or frame. Do not move or lift the damper by the blades, cable, or actuator

d. Install remote options (if applicable) of Model J50, J100, or J150 Terminal points.

e. Connect RJ-11 cable from the damper to the female outlet, making sure cable is secured and cannot be pulled out of the terminal.

f. Coordinate power requirements with electrician.

H. Automatic Dampers: Install automatic dampers furnished under Automatic Temperature Control Paragraph of this Section, as shown on Drawings, and as specified. Provide sealed wall penetrations for Seal Class A ductwork.

I. Diffusers, Registers and Grilles:

1. Provide diffusers, registers and grilles for supply, return and exhaust outlets, of size, type and design shown on Drawings. Acceptable manufacturers shall be Anemostat, Krueger, Metal*Aire, Price, or Titus.

2. Equipment shall be tested and rated per ASHRAE 91-70.

3. Equipment shall handle air quantities at operating velocities:

a. With maximum diffusion within space supplied or exhausted.

b. Without objectionable air movement as determined by Architect.

c. With sound pressure level not to exceed NC 30.

4. Supply, return and exhaust outlets shall have opposed blade volume dampers operable from front.

5. Supply registers shall have two (2) sets of directional control blades.

6. Diffusers within same room or area shall be of same type and style to provide Architectural uniformity.

7. Diffusers, registers and grilles shall be furnished with gaskets and installed with faces set level and plumb, tightly against mounting surface.

8. Finish shall be as directed by the Architect.

9. Coordinate diffusers, registers and grilles with ceiling and wall construction. Refer to Architectural Drawings for exact lengths and for framing and mitering arrangements that may differ from those shown on HVAC Drawings.

J. Branch Duct Take-off Fittings:

1. Contractor shall provide bellmouth take-offs at all branch duct locations.
2. Bellmouth fitting shall be provided with damper.
3. Bellmouths shall be constructed of heavy-duty galvanized steel. Bellmouths shall include an airtight neoprene gasket to ensure a tight fitting with minimal leakage. Pre-drilled holes shall be provided for quick mounting.
4. Standard damper hardware to be constructed of 26-gauge galvanized material with a quadrant damper and tight-fitting gasketing to ensure minimal leakage at damper pivot points.
5. Optional heavy-duty hardware shall be provided at locations of higher static pressure where shown on the Drawings.
6. Ninety-degree (90°) take-offs are not permitted on this project.

## 2.2 ACOUSTICAL DUCT LINING

A. Provide 2” thick acoustical lining by Certain-teed, Knauf, Owens Corning or Manville for following ductwork:

1. Supply and return ductwork, including plenums for minimum of 20 feet from rooftop or air handling units (or to sound attenuator if attenuator is located further than 20 feet from fan). Exception: 3 feet before and 10 feet after humidifiers and dedicated life safety smoke exhaust systems.
2. Exhaust ductwork, including plenums, for minimum of 20 feet from fan inlet. Exceptions: kitchen hood, dishwasher and fume hood system.
3. Low-pressure duct downstream from variable and constant volume boxes.
4. Sound attenuation boots.
5. Other ductwork indicated as lined on Drawings.
6. Increase duct dimensions to accommodate lining while maintaining inside clear dimensions shown on the Drawings.
7. Lining shall be as follows:

| Lining for | Material | Minimum NRC | Maximum K-Factor At 75° F Mean |
|---|---|---|---|
| Low-pressure ductwork (below 4” S.P.) | Black, Matfaced, 2 lb. density, flexible glass | 0.75 | 0.24 |

8. For all lined ductwork at the inlets and outlets of fans over 1 HP, and for all lined medium and high pressure ductwork (including plenums) within 20 feet from RTU’s and AHU’s provide a perforated aluminum (24 gauge) or galvanized liner (minimum 28 gauge), with 28% minimum free area on the side of the liner exposed to the moving airstream. Metal liner shall be held in place by welded pins spaced no more than 12” O.C.

9. Materials and installation shall meet following standards, as applicable:
    a. NFPA-90A, UL723, NFPA-255.
    b. SMACNA Duct Liner Applications Standard.
    c. SMACNA Mechanical Fasteners Standard.
    d. Adhesive and Sealant Council: Adhesives Standard for Duct Liner – ASC-A-7001A
    e. ASTM E-84 fire hazard classifications of 25 flame spread, 50 smoke developed and 50 fuel contributed.
10. Duct liner shall be installed without interruptions or gaps, using 100% coverage of adhesive and mechanical fasteners. Mechanical fasteners shall be welded or secured mechanically to duct on 12" maximum centers.
11. Cut liner to ensure overlapped and compressed longitudinal joints at corners. Transverse joints in liner shall abut precisely. Seal joints against fiber entrainment with approved adhesive, as recommended by manufacturer. Use sheetmetal nosing at beginning of lining (in direction of flow) to prevent erosion.
12. The Contractor shall ensure the integrity of acoustical lining when slip-in duct heaters are installed; loose lining shall not flap about in the airstream. Secure edges of lining with sheetmetal nosing, where liner is interrupted to make room for slip in heaters.
13. Submit samples and catalog data for duct liner, mechanical fasteners and adhesives to Architect for approval.
14. Friction coefficient correction factor at 1000 FPM shall be no greater than 1.1. Liner shall be Certain-teed Ultra Liner, Knauf Duct Liner M or Johns Manville Linacoustic. Other liners from these manufacturers with friction coefficient correction factors greater than listed above, are not acceptable.
15. Mylar used for vapor barrier shall meet ASTM E-84 classification.
16. Any cut liner due to duct take-offs and branches shall be totally sealed at edges (with sheetmetal nose pieces) to prevent entrainment of loose fibers.
17. Do not insulate lined duct.

**2.3 DUCT INSULATION:**

A. General:

1. Insulation shall be Certain-Teed, Knauf, Manville or Owens Corning. Install insulation, mastics, adhesives, coatings, covers, weather-protection and other work exactly as required by manufacturer's recommendations. Materials shall meet requirements of Adhesive and Sealant Council Standards and SMACNA.
2. Apply insulation after systems have been tested, proved tight and approved by Architect. Remove dirt, scale, oil, rust and other foreign matter prior to installation of insulation.
3. Leaks in vapor barrier or voids in insulation will not be accepted.
4. ASTM E-84 minimum fire hazard ratings shall be 25 flame-spread, 50 fuel contributed and 50 smoke developed.
5. Where ducts are insulated, flexible connections to ducts shall be insulated.
6. Insulate standing seams with same material and thickness as duct.
7. Acoustically lined ductwork shall not be insulated externally, except as noted otherwise.
8. Return ductwork in ceiling plenums shall not be insulated.

9. Insulation shall be continuous through wall and ceiling openings and in sleeves.
10. Transmission rates of vapor barriers shall not exceed 0.02 perms.
11. Do not insulate fibrous glass duct.

B. Concealed Rectangular, Flat Oval and Circular Ductwork:

1. Insulate supply and outside air ductwork and plena in concealed spaces and return ductwork not in ceiling plenum with 2” thick glass duct wrap; with foil-Kraft flame-resistant vapor barrier.
2. Insulation shall provide a minimum R-8 value when located in unconditioned spaces and a minimum R-12 value when located outside the building.
3. If insulation does not have pre-cut lap, make lapped butt joints by cutting 2” strip of insulation away from vapor barrier. Apply 6” strips of approved adhesive on 16” centers and wrap duct with insulation. Staple lapped joint with outward-clinching staples. Seal stapled joints airtight with approved matching pressure-sensitive tape.
4. For rectangular duct 24” or larger in any dimension, augment application method specified in item 3 with approved mechanical fasteners, such as weld pins with speed washers, on 18” centers on bottom of duct.
5. Cover breaks in vapor material with patches of same material, secured with adhesive and staples. Seal staples with approved pressure sensitive tape.
6. Fill voids in insulation at jacket penetrations and seal with pressure sensitive tape.
7. Seal and flash terminations and punctures with fibrous glass cloth between two (2) coats of pressure sensitive tape.
8. Terminate vapor barrier and extend insulation at standoff brackets.

## 2.4 PIPING AND FITTINGS

A. General: Pipe materials and fitting materials shall be as indicated in Schedule of Pipe and Fitting Materials.

B. Schedule of Pipe and Pipe Fitting Materials:

| Service | Systems Description | Pipe Size | Pipe Material | Joints | Fitting Material | Fitting Rating PSI/Class/ Weight |
|---|---|---|---|---|---|---|
| Condensate Drain | CD | All | PVC. Schedule 40 Note 2 | Solvent Welded | PVC, Schedule 40 | Class 150 |
| Refrigerant | R | All | Copper, ACR | Silver Brazed | Wrought Copper | 200 PSI |
| Refrigerant Up to 5 tons | R (see Note 3.) | Up to 1-1/8” | PEX-AL-PEX Composite | Press | Brass | 650 PSI |

1. Note 1: Grooved piping systems may be used in lieu of welded piping for CHWS/R and CWS/R, HWS/R systems for sizes 2-1/2” and over subject to the requirements listed in the Grooved Piping Section and in PART 4 of the specification.
2. Note 2: Use copper for drain lines in plenums and through fire-rated walls. Copper tubing must be insulated for 12” from equipment.
3. Note 3: Refrigerant Line Sets – Composite:

a. At Contractor's option the use of "Multi-Flex Pipe" may be used for pipe up to 1-1/8" and units up to 5 tons. It shall be capable of a temperature range from -40 degrees F up to 220 degrees F and has a working pressure of 650 psi.

b. Pipe must carry the following approval: ICC-ES LC 1035–2013 Report PMG-1221.

c. Pipe shall carry a 25 year warranty against defects in material and workmanship. "Multi-Flex Pipe" is represented by Green Technology Associates of Hingham, MA.

C. Composite Pipe Options:

1. At Contractor's option the use of Ginde Multi Flex pipe or Aquatherm may be used for pipe up to 2-1/2". Constructed of five (5) layers consisting of HDPE, cross linked polyethylene and aluminum. Pipe must carry ANSI B31.5 approval and capable of a temperature range from -40 deg. F to 250 deg. F and a working pressure of 800 psi.

2. Heating and potable water pipe shall have the same performance characteristics. It shall carry the Mass Plumbing Board approval #P1-0712-16A and meet test standard NSF-ASTM F 1281. Manufactured in accordance with the ASTM guidelines and accredited with ICC –ES (International Code Council).

3. Note 3: Refrigerant Line Sets – Composite:

a. At Contractor's option the use of "Multi-Flex Pipe" may be used for pipe up to 1-1/8" and units up to 5 tons. It shall be capable of a temperature range from -40 degrees F up to 220 degrees F and has a working pressure of 650 psi.

b. Pipe must carry the following approval: ICC-ES LC 1035–2013 Report PMG-1221.

c. Pipe shall carry a 25 year warranty against defects in material and workmanship. "Multi-Flex Pipe" is represented by Green Technology Associates of Hingham, MA.

4. Gas piping is approved and can be applied for exterior use only.

5. Pipe shall carry a 25 year warranty against defects in material and workmanship. Ginde pipe is represented by Green Technology Associates of Hingham, MA.

D. Connections:

1. Provide dielectric fittings at connections of dissimilar materials.

2. Provide eccentric reducing couplings to bring pipes flush on top for water service and flush on bottom for steam service.

3. Branch lines in welded piping shall be made with welding tees except that branch lines less than one half diameter of main may be made with Weld-O-Lets or Sock-O-Lets.

4. Nipples shall be same material, make and thickness as pipe with which they are used. Close nipples shall not be used.

5. Make piping connections 2-1/2" diameter and larger to valves and equipment with welding neck flanges, ANSI B16.5, pressure rating to match system, flat or raised face as required.

6. Make piping connections 2" diameter and smaller to valves and equipment with steel body, 300 psi brass seat unions on steel piping and with heavy semi-finished brass unions on copper tubing.

7. Fit flanged joints with Johns-Manville or approved equal full-face gaskets. Flanges shall be faced and drilled to ASA standards and fitted with semi-finished hexagon machine bolts and nuts of proper number and size.

8. Make screw joints tight with Teflon (polytetrafluoroethylene) tape or litharge-glycerin mixture applied to male threads. Use tapered threads.

9. Make fusion welded joints as required by ANSI B31.1. Make changes in direction of pipe with welded fittings only. Bevel connections before welding, mechanically or by flame cutting.

## 2.5 VARIABLE REFRIGERANT FLOW (VRF) SYSTEMS

A. General:

1. VRF systems shall be sourced from a single manufacturer specializing in the technology with a minimum of 10 years' experience of installation of systems of the type described herein.
2. Basis of Design shall be Mitsubishi City Multi.
    a. Acceptable equals provided they meet the full intent of the design scheme and can provide the required heating and cooling delivery at the specified design temperatures:
        1) Mitsubishi
        2) Carrier
        3) Daikin
        4) Others: no others will be accepted.

B. SYSTEM DESCRIPTION R2-SERIES (SIMULTANEOUS HEAT/COOL)

1. Per the equipment schedule, the variable capacity, heat pump heat recovery air conditioning system basis of design is Mitsubishi Electric CITY MULTI VRF (Variable Refrigerant Flow) zoning system(s).
2. Acceptable alternative manufacturers, assuming compliance with these equipment specifications, are Daikin, Panasonic, and Hitachi. Contractor bidding an alternate manufacturer does so with full knowledge that that manufactures product may not be acceptable or approved and that contractor is responsible for all specified items and intents of this document without further compensation.
3. Simultaneous heating/cooling (heat recovery) systems shall consist of an outdoor unit, BC (Branch Circuit) Controller (or comparable branch devices), multiple indoor units, and an integral DDC (Direct Digital Controls) system. Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units or groups. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. To ensure owner comfort, each indoor unit or group of indoor units shall be independently controlled and capable of changing mode automatically when zone temperature strays 1.8 degrees F from set point for ten minutes.
4. No additional branch circuit controllers (or comparable branch devices) than shown on the drawings/schedule may be connected to any one outdoor unit. Contractors proposing alternate systems requiring more branch devices than those included as the basis of design are responsible for additional piping & electrical costs and are required to identify additional costs & installation time required of other trades with their bid.

C. SYSTEM DESCRIPTION Y-SERIES RAPID CHANGEOVER

1. Per the equipment schedule, the variable capacity, heat pump or heat recovery air conditioning system basis of design is Mitsubishi Electric CITY MULTI VRF (Variable Refrigerant Flow) zoning system(s). In order to maintain optimal tenant comfort during periods when both heating and cooling may be desired, systems must be capable of heat recovery (simultaneous heating and cooling) operation or rapid changeover. Rapid changeover option allows automatic and alternating mode switching between heating and cooling mode during owner-defined and adjustable ambient temperature ranges. Changeover sequences such as weighted voting—or similar sequences which might result in more than a one hour delay for the desired heating or cooling during the owner-defined

shoulder seasons—are not allowed.

2. Acceptable alternative manufacturers, assuming compliance with these equipment specifications, are Daikin, Panasonic, and Hitachi. Contractor bidding an alternate manufacturer does so with full knowledge that that manufactures product may not be acceptable or approved and that contractor is responsible for all specified items and intents of this document without further compensation.

D. QUALITY ASSURANCE

1. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.
2. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
3. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
4. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 1230.
5. System start-up supervision shall be a required service to be completed by the manufacturer or a duly authorized, competent representative that has been factory trained in system configuration and operation. The representative shall provide proof of manufacturer certification indicating successful completion within no more than two (2) years prior to system installation. This certification shall be included as part of the equipment and/or controls submittals.

E. DELIVERY, STORAGE AND HANDLING

1. Unit shall be stored and handled according to the manufacturer’s recommendation.

F. Warranty

1. The CITY MULTI units shall be covered by the manufacturer’s limited warranty for a period of one (1) year parts and seven (7) year compressor to the original owner from date of installation.
2. Installing contractor shall meet manufacturer requirements to obtain extended manufacturer’s limited parts and compressor warranty for a period of ten (10) years to the original owner from date of installation. This warranty shall not include labor.
3. Manufacturer shall have a minimum of fifteen (15) years continuous experience providing VRF systems in the U.S. market.
4. All manufacturer technical and service manuals must be readily available for download by any local contractor should emergency service be required. Registering and sign-in requirements which may delay emergency service reference are not allowed.
5. The CITY MULTI VRF system shall be installed by a contractor with extensive CITY MULTI install and service training. The mandatory contractor service and install training should be performed by the manufacturer.

G. Outdoor Units

1. R2-SERIES HIGH EFFICIENCY (HEAT RECOVERY), AIR COOLED OUTDOOR UNITS
   a. General:
      1) The outdoor unit modules shall be air-cooled, direct expansion (DX), multi-zone units used specifically with VRF components described in this section and Part 5

(Controls). The outdoor unit modules shall be equipped with a single compressor which is inverter-driven and multiple circuit boards—all of which must be manufactured by the branded VRF manufacturer. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.

2) Outdoor unit systems may be comprised of multiple modules with differing capacity if a brand other than basis of design is proposed. All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor. Contractor responsible for ensuring alternative brand compatibility in terms of availability, physical dimensions, weight, electrical requirements, etc.

3) Outdoor unit shall have a sound rating no higher than 68 dB(A) individually or 70 dB(A) twinned. Units shall have a sound rating no higher than 52 dB(A) individually or 55 dB(A) twinned while in night mode operation. Units shall have 5 levels sound adjustment via dip switch selectable fan speed settings. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.

4) Refrigerant lines from the outdoor unit to the indoor units shall be insulated in accordance with the installation manual.

5) The outdoor unit shall have the capability of installing the main refrigerant piping through the bottom of the unit.

6) The outdoor unit shall have an accumulator with refrigerant level sensors and controls. Units shall actively control liquid level in the accumulator via Linear Expansion Valves (LEV) from the heat exchanger.

7) The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.

8) VRF system shall meet performance requirements per schedule and be within piping limitations & acceptable ambient temperature ranges as described in respective manufacturers' published product catalogs. Non-published product capabilities or performance data are not acceptable.

9) The outdoor unit shall be capable of operating in heating mode down to -25F ambient temperatures or cooling mode down to 23F ambient temperatures, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.

10) The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained. Oil return sequences must be enabled only during extended periods of reduced refrigerant flow to ensure no disruption to correct refrigerant flow to individual zones during peak loads. Systems which might engage oil return sequence based on hours of operation risk oil return during inopportune periods are not allowed. Systems which rely on sensors (which may fail) to engage oil return sequence are not allowed.

11) Unit must defrost all circuits simultaneously in order to resume full heating more quickly during extreme low ambient temperatures (below 23F). Partial defrost, also known as hot gas defrost which allows reduced heating output during defrost, is permissible only when ambient temperature is above 23F.

12) While in hot gas defrost the system shall slow the indoor unit fan speed down to maintain a high discharge air temperature, systems that keep fan running in same state shall not be allowed as they provide an uncomfortable draft to the indoor zone

due to lower discharge air temperatures.

13) In reverse defrost all refrigerant shall be bypassed in the main branch controller and shall not be sent out to the indoor units, systems that flow refrigerant through indoor units during reverse defrost shall not be allowed.

14) The outdoor unit shall be capable of operating in cooling mode down to -10□F with optional manufacturer supplied low ambient kit.

15) Low ambient kit shall be provided with predesigned control box rated for outdoor installation and capable of controlling kit operation automatically in all outdoor unit operation modes.

16) Low ambient kit shall be listed by Electrical Laboratories (ETL) and bear the ETL label.

17) Low ambient kit shall be factory tested in low ambient temperature chamber to ensure operation. Factory performance testing data shall be available when requested.

18) The outdoor unit shall be provided with a manufacturer supplied 20 gauge hot dipped galvanized snow /hail guard. The snow/hail guard protects the outdoor coil surfaces from hail damage and snow build-up in severe climates.

19) VRF four-legged outdoor unit mounting systems shall be provided by manufacturer. Stand shall be made from 7 gauge plate steel with thermally fused polyester powder coat finish that meets ASTM D3451-06 standards. Stands shall be provided with galvanized mounting hardware and meets all ASCE 7 overturning safety requirement.

2. Unit Cabinet:

   a. The casing(s) shall be fabricated of galvanized steel, bonderized and finished.

   b. Outdoor unit components shall be coated with the Seacoast Protection Coating (Brine Spray – BS coating) to protect components from premature corrosion due to a seacoast environment. Coating shall be applied to components before original outdoor unit assembly to ensure manufacturer quality standards are not compromised and shall meet the following minimum requirements:

   c. ≥85μm thermoset polyester-resin powder coating on External Front Panel

   d. ≥70μm thermoset polyester-resin powder coating on External Panel Base, Pillar, Compressor Cover, Fan Motor Support, Electrical Box

   e. ≥1μm cellulose and polyurethane-resin coating on heat exchanger fins

   f. ≥10μm polyurethane coating on printed circuit boards

   g. The outdoor unit shall be tested in compliance with ISO9277 such that no unusual rust shall develop after 960 hours of salt spray testing.

   h. Panels on the outdoor unit shall be scratch free at system startup. If a scratch occurs the salt spray protection is compromised and the panel should be replaced immediately.

3. Fan:

   a. Each outdoor unit module shall be furnished with direct drive, variable speed propeller type fan(s) only. Fans shall be factory set for operation at 0 in. WG. external static pressure, but capable of normal operation with a maximum of 0.32 in. WG. external static pressure via dipswitch.

   b. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.

c. All fans shall be provided with a raised guard to prevent contact with moving parts.

4. Refrigerant and Refrigerant Piping:
   a. R410A refrigerant shall be required for systems.
   b. Polyolester (POE) oil—widely available and used in conventional domestic systems—shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.
   c. Refrigerant piping shall be phosphorus deoxidized copper (copper and copper alloy seamless pipes) of sufficient radial thickness as defined by the VRF equipment manufacturer and installed in accordance with manufacturer recommendations.
   d. All refrigerant piping must be insulated with ½" closed cell, CFC-free foam insulation with flame-Spread Index of less than 25 and a smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102. R value of insulation must be at least 3.
   e. Refrigerant line sizing shall be in accordance with manufacturer specifications. Future changes to indoor unit styles or sizes must be possible without resizing/replacing refrigerant piping to any other branch devices or indoor units.
5. Coil:
   a. Outdoor Coil shall be constructed to provide equal airflow to all coil face surface are by means of a 4-sided coil
   b. Outdoor Coil shall be elevated at least 12" from the base on the unit to protect coil from freezing and snow build up in cold climates. Manufacturer's in which their coil extends to within a few inches from the bottom of their cabinet frame shall provide an additional 12" of height to their stand or support structure to provide equal protection from elements as Mitsubishi Electric basis of design. Any additional support costs, equipment fencing, and tie downs required to meet this additional height shall be responsibility of Mechanical Contractor to provide.
   c. The outdoor heat exchanger shall be of zinc coated aluminum construction with turbulating flat tube construction. The coil fins shall have a factory applied corrosion resistant finish. Uncoated aluminum coils/fins are not allowed.
   d. The coil shall be protected with an integral metal guard.
   e. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
   f. Unit shall have prewired plugs for optional panel heaters in order to prevent any residual ice buildup from defrost. Panel heaters are recommended for operating environments where the ambient temperature is expected to stay below -1F for 72 hours.
   g. Condenser coil shall have active hot gas circuit direct from compressor discharge on lowest coil face area to shed defrost condensate away from coil and protect from Ice formation after returning to standard heat pump operation. While in Heat Pump operation this lower section of the Outdoor Evaporator coil shall continually run hot gas from the compressor discharge to protect the coil from ice buildup and coil rupture. Manufacturers who do not have an active hot gas circuit in the lower section of the Outdoor coil to protect coil from freezing shall not be allowed to bid on project in markets where the outdoor unit will see temperatures below freezing.
6. Compressor:
   a. Each outdoor unit module shall be equipped with only inverter driven scroll hermetic

compressors. Non inverter-driven compressors, which may cause inrush current (demand charges) and require larger generators for temporary power shall not be allowed.

b. Each compressor shall be equipped with a multi-port discharge mechanism to eliminate over compression at part load. Manufacturer's that rely on a single compressor discharge port and provide no means of eliminating over compression and energy waste at part load shall not be allowed.

c. Crankcase heat shall be provided via induction-type heater utilizing eddy currents from motor windings. Energy-wasting "belly-band" type crankcase heaters are not allowed. Manufacturers that utilize belly-band crankcase heaters will be considered as alternate only.

d. Compressor shall have an inverter to modulate capacity. The capacity for each compressor shall be variable with a minimum turndown not greater than 15%.

e. The compressor shall be equipped with an internal thermal overload.

f. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.

g. Manufacturers that utilize a compressor sump oil sensor to equalize compressor oil volume within a single module shall not be allowed unless they actively shut down the system to protect from compressor failure.

7. Controls:

a. Outdoor unit shall include Variable Evaporator Temperature or comparable method of varying system evaporator (refrigerant) temperature in order to reduce compression ratio and power consumption during light load or mild ambient temperatures. Multiple evaporator refrigerant temperature settings shall be required in order to optimize efficiency within required system-specific performance and installation constraints. System shall reduce compression ratio only when/if all indoor units are within 1.8F of setpoint; reducing compression ratio based solely on ambient temperature risks discomfort and is not allowed. Variable Evaporator Temperature or comparable method shall incorporate override or disable capability based on external signal to allow for space humidity control or load demand. The unit shall be an integral part of the system & control network described in Part 5 (Controls) and react to heating/cooling demand as communicated from connected indoor units over the control circuit. Required field-installed control voltage transformers and/or signal boosters shall be provided by the manufacturer.

b. Each outdoor unit module shall have the capability of 4 levels of demand control based on external input.

8. Electrical:

a. The outdoor unit electrical power shall be 208/230 volts, 3-phase, 60 hertz or 460 volts, 3-phase, 60 hertz per equipment schedule.

b. The outdoor unit shall be controlled by integral microprocessors.

c. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

H. BRANCH CIRCUIT (BC) CONTROLLERS AS REQUIRED FOR SIMULTANEOUS HEAT/COOL SYSTEMS

1. General
    a. BC (Branch Circuit) Controllers (or comparable branch devices) shall include multiple branches to allow simultaneous heating and cooling by allowing either hot gas refrigerant to flow to indoor unit(s) for heating or subcooled liquid refrigerant to flow to indoor unit(s) for cooling. Refrigerant used for cooling must always be subcooled for optimal indoor unit LEV performance; alternate branch devices which do not include controlled refrigerant subcooling risk bubbles in liquid supplied to indoor unit LEVs and are not allowed.
    b. BC Controllers (or comparable branch devices) shall be equipped with a circuit board that interfaces to the controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish and be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. BC Controllers (or comparable branch devices) shall be suitable for use in plenums in accordance with UL1995 ed 4.
2. BC Unit Cabinet:
    a. The casing shall be fabricated of galvanized steel.
    b. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.
    c. The unit shall house two tube-in-tube heat exchangers.
3. Refrigerant Piping (specifications in addition to those for outdoor unit):
    a. All refrigerant pipe connections shall be brazed.
    b. Future changes to indoor unit quantities or sizes served by BC Controller or comparable branch device must be possible with no piping changes except between the branch device and indoor unit(s) changing. Systems which might require future piping changes between branch device and outdoor unit—if changes to indoor unit quantities or sizes are made—are not considered equal and are not allowed.
4. Refrigerant Valves:
    a. Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.
5. Future Use Branch:
    a. Each VRF system shall include at least one (1) unused branch or branch device for future use. Future-use branches or branch devices shall be fully installed & wired in central location with capped service shutoff valve & service port.
6. Condensate Management:
    a. BC Controller (or comparable branch device) must have integral resin drain pan or insulate refrigeration components with removable insulation that allows easy access for future service needs. Cabinets filled with solid foam insulation do not allow for future service and are not allowed.
7. Electrical:
    a. The unit electrical power shall be 208/230 volts, 1 phase, 60 Hertz. The unit shall be capable of satisfactory operation within voltage limits of 187-228 (208V/60Hz) or 207-253 (230/60Hz).
    b. The BC Controller shall be controlled by integral microprocessors
    c. The control circuit between the indoor units and outdoor units shall be 24VDC completed

using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

I. Y-SERIES HIGH EFFICIENCY RAPID CHANGEOVER (HEAT PUMP), AIR-COOLED OUTDOOR UNITS

1. General:

a. The outdoor unit modules shall be air-cooled, direct expansion (DX), multi-zone units used specifically with VRF components described in this section and Part 5 (Controls). The outdoor unit modules shall be equipped with a single compressor which is inverter-driven and multiple circuit boards—all of which must be manufactured by the branded VRF manufacturer. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.

b. Outdoor unit systems may be comprised of multiple modules with differing capacity if a brand other than basis of design is proposed. All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor. Contractor responsible for ensuring alternative brand compatibility in terms of availability, physical dimensions, weight, electrical requirements, etc.

c. Outdoor unit shall have a sound rating no higher than 64.5 dB(A) individually or 69.5 dB(A) twinned. Units shall have a sound rating no higher than 52 dB(A) individually or 54.5 dB(A) twinned while in night mode operation. Units shall have 5 levels sound adjustment via dip switch selectable fan speed settings. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.

d. The outdoor unit shall have the capability of installing the main refrigerant piping through the bottom of the unit.

e. The outdoor unit shall have an accumulator with refrigerant level sensors and controls. Units shall actively control liquid level in the accumulator via Linear Expansion Valves (LEV) from the heat exchanger.

f. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.

g. VRF system shall meet performance requirements per schedule and be within piping limitations & acceptable ambient temperature ranges as described in respective manufacturers' published product catalogs. Non-published product capabilities or performance data are not acceptable.

h. The outdoor unit shall be capable of guaranteed operation in heating mode down to -25F ambient temperatures and cooling mode up to 126□F without additional restrictions on line length & vertical separation beyond those published in respective product catalogs. Models with capacity data for required temperature range published as "for reference only" are not considered capable of guaranteed operation and are not acceptable. If an alternate manufacturer is selected, any additional material, cost, and labor to meet ambient operating range and performance shall be incurred by the contractor.

i. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained. Oil return sequences must be enabled only during extended periods of reduced refrigerant flow to ensure no disruption to correct refrigerant flow to individual zones during peak loads. Systems which might engage oil return sequence based on hours of operation risk oil return during inopportune periods are not allowed. Systems which rely on sensors (which may fail) to engage oil return sequence are not allowed.

j. Unit must defrost all circuits simultaneously in order to resume full heating more quickly during extreme low ambient temperatures (below 23F). Partial defrost, also known as hot gas defrost which allows reduced heating output during defrost, is permissible only when ambient temperature is above 23F.

k. While in hot gas defrost the system shall slow the indoor unit fan speed down to maintain a high discharge air temperature, systems that keep fan running in same state shall not be allowed as they provide an uncomfortable draft to the indoor zone due to lower discharge air temperatures.

l. The outdoor unit shall be capable of operating in cooling mode down to -10□F with optional manufacturer supplied low ambient kit.

m. Low ambient kit shall be provided with predesigned control box rated for outdoor installation and capable of controlling kit operation automatically in all outdoor unit operation modes.

n. Low ambient kit shall be listed by Electrical Laboratories (ETL) and bear the ETL label.

o. Low ambient kit shall be factory tested in low ambient temperature chamber to ensure operation. Factory performance testing data shall be available when requested.

p. The outdoor unit shall be provided with a manufacturer supplied 20 gauge hot dipped galvanized snow /hail guard. The snow/hail guard protects the outdoor coil surfaces from hail damage and snow build-up in severe climates.

q. VRF four-legged outdoor unit mounting systems shall be provided by manufacturer. Stand shall be made from 7 gauge plate steel with thermally fused polyester powder coat finish that meets ASTM D3451-06 standards. Stands shall be provided with galvanized mounting hardware and meets all ASCE 7 overturning safety requirement.

2. Unit Cabinet:

a. The casing(s) shall be fabricated of galvanized steel, bonderized and finished.

b. Outdoor unit components shall be coated with the Seacoast Protection Coating (Brine Spray – BS coating) to protect components from premature corrosion due to a seacoast environment. Coating shall be applied to components before original outdoor unit assembly to ensure manufacturer quality standards are not compromised and shall meet the following minimum requirements:

c. ≥85µm thermoset polyester-resin powder coating on External Front Panel

d. ≥70µm thermoset polyester-resin powder coating on External Panel Base, Pillar, Compressor Cover, Fan Motor Support, Electrical Box

e. ≥1µm cellulose and polyurethane-resin coating on heat exchanger fins

f. ≥10µm polyurethane coating on printed circuit boards

g. The outdoor unit shall be tested in compliance with ISO9277 such that no unusual rust shall develop after 960 hours of salt spray testing.

h. Panels on the outdoor unit shall be scratch free at system startup. If a scratch occurs the salt spray protection is compromised and the panel should be replaced immediately.

3. Fan:

a. Each outdoor unit module shall be furnished with direct drive, variable speed propeller type fan(s) only. Fans shall be factory set for operation at 0 in. wg external static pressure, but capable of normal operation with a maximum of 0.32 in. WG external static pressure via dipswitch.

b. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.

c. All fans shall be provided with a raised guard to prevent contact with moving parts.

4. Refrigerant and Refrigerant Piping

a. R410A refrigerant shall be required for systems.

b. Polyolester (POE) oil—widely available and used in conventional domestic systems—shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.

c. Refrigerant piping shall be phosphorus deoxidized copper (copper and copper alloy seamless pipes) of sufficient radial thickness as defined by the VRF equipment manufacturer and installed in accordance with manufacturer recommendations.

d. All refrigerant piping must be insulated with ½" closed cell, CFC-free foam insulation with flame-Spread Index of less than 25 and a smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102. R value of insulation must be at least 3.

e. Refrigerant line sizing shall be in accordance with manufacturer specifications.

5. Coil:

a. Outdoor Coil shall be constructed to provide equal airflow to all coil face surface are by means of a 4-sided coil.

b. Outdoor Coil shall be elevated at least 12" from the base on the unit to protect coil from freezing and snow build up in cold climates. Manufacturer's in which their coil extends to within a few inches from the bottom of their cabinet frame shall provide an additional 12" of height to their stand or support structure to provide equal protection from elements as Mitsubishi Electric basis of design. Any additional support costs, equipment fencing, and tie downs required to meet this additional height shall be responsibility of Mechanical Contractor to provide.

c. The outdoor heat exchanger shall be of zinc coated aluminum construction with turbulating flat tube construction. The coil fins shall have a factory applied corrosion resistant finish. Uncoated aluminum coils/fins are not allowed.

d. The coil shall be protected with an integral metal guard.

e. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.

f. Unit shall have prewired plugs for optional panel heaters in order to prevent any residual ice buildup from defrost. Panel heaters are recommended for operating environments where the ambient temperature is expected to stay below -1F for 72 hours.

g. Condenser coil shall have active hot gas circuit direct from compressor discharge on lowest coil face area to shed defrost condensate away from coil and protect from Ice formation after returning to standard heat pump operation. While in Heat Pump operation this lower section of the Outdoor Evaporator coil shall continually run hot gas from the compressor discharge to protect the coil from ice buildup and coil rupture. Manufacturers who do not have an active hot gas circuit in the lower section of the Outdoor coil to protect coil from freezing shall not be allowed to bid on project in markets where the outdoor unit will see temperatures below freezing.

6. Compressor:

a. Each compressor shall be equipped with a multi-port discharge mechanism to eliminate over compression at part load. Manufacturer's that rely on a single compressor discharge port and provide no means of eliminating over compression and energy waste at part load shall not be allowed.

b. Each outdoor unit module shall be equipped with only inverter driven scroll hermetic compressors. Non inverter-driven compressors, which may cause inrush current (demand charges) and require larger generators for temporary power shall not be allowed.

c. Crankcase heat shall be provided via induction-type heater utilizing eddy currents from motor windings. Energy-wasting "belly-band" type crankcase heaters are not allowed. Manufacturers that utilize belly-band crankcase heaters will be considered as alternate only.

d. Compressor shall have an inverter to modulate capacity. The capacity for each compressor shall be variable with a minimum turndown not greater than 15%.

e. The compressor shall be equipped with an internal thermal overload.

f. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.

g. Manufacturers that utilize a compressor sump oil sensor to equalize compressor oil volume within a single module shall not be allowed unless they actively shut down the system to protect from compressor failure.

7. Controls:

a. Outdoor unit shall include Variable Evaporator Temperature or comparable method of varying system evaporator (refrigerant) temperature in order to reduce compression ratio and power consumption during light load or mild ambient temperatures. Multiple evaporator refrigerant temperature settings shall be required in order to optimize efficiency within required system-specific performance and installation constraints. System shall reduce compression ratio only when/if all indoor units are within 1.8F of setpoint; reducing compression ratio based solely on ambient temperature risks discomfort and is not allowed. Variable Evaporator Temperature or comparable method shall incorporate override or disable capability based on external signal to allow for space humidity control or load demand.

b. The unit shall be an integral part of the system & control network described in Part 5 (Controls) and react to heating/cooling demand as communicated from connected indoor units over the control circuit. Required field-installed system controllers, control voltage transformers and/or signal boosters shall be provided by the manufacturer.

c. The outdoor unit shall have the capability of 4 levels of demand control for each refrigerant system based on external input.

8. Electrical:

a. The outdoor unit electrical power shall be 208/230 volts, 3-phase, 60 hertz or 460 volts, 3-phase, 60 hertz per equipment schedule.

b. The outdoor unit shall be controlled by integral microprocessors.

c. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

J. Indoor Units: WALL MOUNTED INDOOR UNIT

1. General:
    a. The wall-mounted indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
2. Unit Cabinet:
    a. All casings, regardless of model size, shall have the same white finish
    b. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining are required.
    c. There shall be a separate back plate which secures the unit firmly to the wall.
3. Fan:
    a. The indoor fan shall be statically and dynamically balanced to run on a single motor with permanently lubricated bearings.
    b. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
    c. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.
4. Filter:
    a. Return air shall be filtered by means of an easily removable, washable filter.
5. Coil:
    a. Basis of design indoor units include factory-installed LEV/EEV. Alternative brands which require field-installed, accessory LEV or EEV kits are permissible only with written Engineer and Architect approval for the location of kits being submitted two weeks prior to bid date. EEV kits mounted in cavities inside fire-rated interior walls shall be mounted inside three hour fire rated enclosures with access panels supplied by the manufacturer. Enclosure type and placement require prior approval.
    b. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.
    c. The coils shall be pressure tested at the factory.
6. Electrical:
    a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
    b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz)
7. Controls:
    a. The unit shall include an IR receiver for wireless remote control flexibility
    b. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
    c. Control board shall include contacts for control of external heat source. External heat

may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.

d. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

e. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

K. 4-WAY CEILING-RECESSED CASSETTE WITH GRILLE INDOOR UNIT

1. General:

a. The ceiling-recessed indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function, a test run switch, and the ability to adjust airflow patterns for different ceiling heights. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.

2. Unit Cabinet:

a. The cabinet panel shall have provisions for a field installed filtered outside air intake.

b. Branch ducting shall be allowed from cabinet.

c. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

d. The grille vane angles shall be individually adjustable from a wired remote controller to customize the airflow pattern for the conditioned space

3. Fan:

a. The indoor fan shall be an assembly with a statically and dynamically balanced turbo fan direct driven by a single motor with permanently lubricated bearings.

b. The indoor unit shall include an AUTO fan setting capable of maximizing energy efficiency by adjusting the fan speed based on the difference between controller set-point and space temperature. The indoor fan shall be capable of five (5) speed settings, Low, Mid1, Mid2, High and Auto.

c. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.

d. The indoor unit fan logic must include multiple setting that can be changed to provide optimum airflow based on ceiling height and number of outlets used.

e. The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.

f. The vanes shall have an Auto-Wave selectable option in the heating mode that shall randomly cycle the vanes up and down to evenly heat the space.

g. Grille shall include a factory-installed “3D i-see” sensor, or equal, to work in conjunction with indoor unit control sequence to prevent unnecessary cooling or heating in unoccupied areas of the zone without decreasing comfort levels. Sensor must detect occupancy (not simply motion) and location of occupants by measuring size & temperature of objects within a 39’ detecting diameter (based on 8.8ft mounting height) with 1,856 or more measuring points.

4. Filter:

a. Return air shall be filtered by means of a long-life washable filter

5. Coil:
   a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.
   b. The coils shall be pressure tested at the factory.
   c. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 33 inches above the condensate pan.
6. Electrical:
   a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
   b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
7. Controls:
   a. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
   b. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
   c. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
   d. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.
   e. A factory-installed drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.

L. 4-WAY CEILING-RECESSED CASSETTE WITH GRILLE FOR 2X2 GRID INDOOR UNIT
1. General:
   a. The indoor unit shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.
2. Unit Cabinet:
   a. The cabinet shall be a compact 22-7/16” wide x 22-7/16” deep so it will fit within a standard 24” square suspended ceiling grid.
   b. The cabinet panel shall have provisions for a field installed filtered outside air intake.
   c. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

3. Fan:
    a. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
    b. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
    c. The indoor fan shall be capable of three (3) speed settings, Low, Mid, and High.
    d. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
    e. The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.
    f. Grille shall include an optional “3D i-see” sensor, or equal, to work in conjunction with indoor unit control sequence to prevent unnecessary cooling or heating in unoccupied areas of the zone without decreasing comfort levels. Sensor must detect occupancy (not simply motion) and location of occupants by measuring size & temperature of objects within a 39’ detecting diameter (based on 8.8ft mounting height) with 1,856 or more measuring points.
4. Filter:
    a. Return air shall be filtered by means of a long-life washable filter.
5. Coil:
    a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.
    b. The coils shall be pressure tested at the factory.
    c. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 19-3/4” inches above the condensate pan.
6. Electrical:
    a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
    b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
7. Controls:
    a. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
    b. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
    c. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
    d. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.
    e. A factory-installed drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur, the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be

produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.

M. MEDIUM STATIC CEILING-CONCEALED DUCTED INDOOR UNIT

1. General:
    a. The ceiling-concealed ducted indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.
2. Unit Cabinet:
    a. The unit shall be ceiling-concealed, ducted—with a 2-position, field adjustable return and a fixed horizontal discharge supply.
    b. The cabinet panel shall have provisions for a field installed filtered outside air intake.
3. Fan:
    a. Indoor unit shall feature multiple external static pressure settings ranging from 0.14 to 0.60 in. WG.
    b. The indoor unit fan shall be an assembly with statically and dynamically balanced Sirocco fan(s) direct driven by a single motor with permanently lubricated bearings.
    c. The indoor fan shall consist of three (3) speeds, High, Mid, and Low plus the Auto-Fan function
4. Filter:
    a. Return air shall be filtered by means of a standard factory installed return air filter.
    b. Optional return filter box (rear or bottom placement) with high-efficiency filter as noted on equipment schedule.
5. Optional Filter Frame and Filter:
    a. Filter frame shall be constructed of 20 gauge G-60 galvanized steel. Knurled thumb screws on access door allow filter replacement. Foam gasket provides air-tight connection to indoor unit and access door. Filter frame shall be configurable for rear or bottom return.
    b. Filter shall be rated MERV 13 when tested in accordance with ANSI/ASHRAE 52.2 Standard Rated Class 2 under U.L. Standard 900.
6. Coil:
    a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.
    b. The coils shall be pressure tested at the factory.
    c. Coil shall be provided with a sloped drain pan. Units without sloped drain pans which must be installed cockeyed to ensure proper drainage are not allowed.
    d. The unit shall be provided with an integral condensate lift mechanism able to raise drain water 27 inches above the condensate pan.
7. Electrical:

a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.

b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

8. Controls:

a. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.

b. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.

c. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

d. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

e. Control board shall include contacts for control of no less than two stages of external heat. The first stage of external heat may be energized when the space temperature is 2.7°F from set point for between 10-25 minutes (user adjustable). The second stage of external heat may be energized when the first stage has been active for no less than 5 minutes and the space temperature has not risen by more than 0.9°F.

f. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

g. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

N. CEILING-SUSPENDED INDOOR UNIT

1. General:

a. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. The unit shall have an auto-swing function for the horizontal vane. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

2. Unit Cabinet:

a. The casing shall have a white finish.

3. Fan:

a. The indoor unit fan shall be an assembly with two, three, or four Sirocco fan(s) direct driven by a single motor.

b. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

c. The indoor fan shall consist of four (4) speeds, Low, Mid1, Mid2, and High, and Auto fan function.

4. Filter:

a. Return air shall be filtered by means of an easily removable, washable filter.

5. Coil:
    a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.
    b. The coils shall be pressure tested at the factory.
6. Electrical:
    a. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
    b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz)
7. Controls:
    a. Units shall have the ability to control supplemental heat via connector CN24 and a 12 VDC output.
    b. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
    c. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
    d. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.
    e. Manufacturer to provide drain pan level sensor powered by a 20-year life lithium battery. Sensor shall require no external power for operation and shall have an audible indication of low battery condition.
    f. The drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.

O. CONTROLS
1. Overview
    a. The control system shall consist of a low voltage communication network and a web-based interface. The controls system shall gather data and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.
    b. Furnish energy conservation features such as optimal start, request-based logic, and demand level adjustment of overall system capacity as specified in the sequence.
    c. System shall be capable of email generation for remote alarm annunciation.

P. ELECTRICAL CHARACTERISTICS
1. General:
    a. Controller power and communications shall be via a common non-polar communications bus and shall operate at 30VDC.
2. Wiring:
    a. Control wiring shall be installed in a daisy chain configuration from indoor unit to indoor unit, to the BC controller (main and subs, if applicable) and to the outdoor unit. Control

wiring to remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.

b. Control wiring for centralized controllers shall be installed in a daisy chain configuration from outdoor unit to outdoor unit, to the system controllers (centralized controllers and/or integrated web based interface), to the power supply.

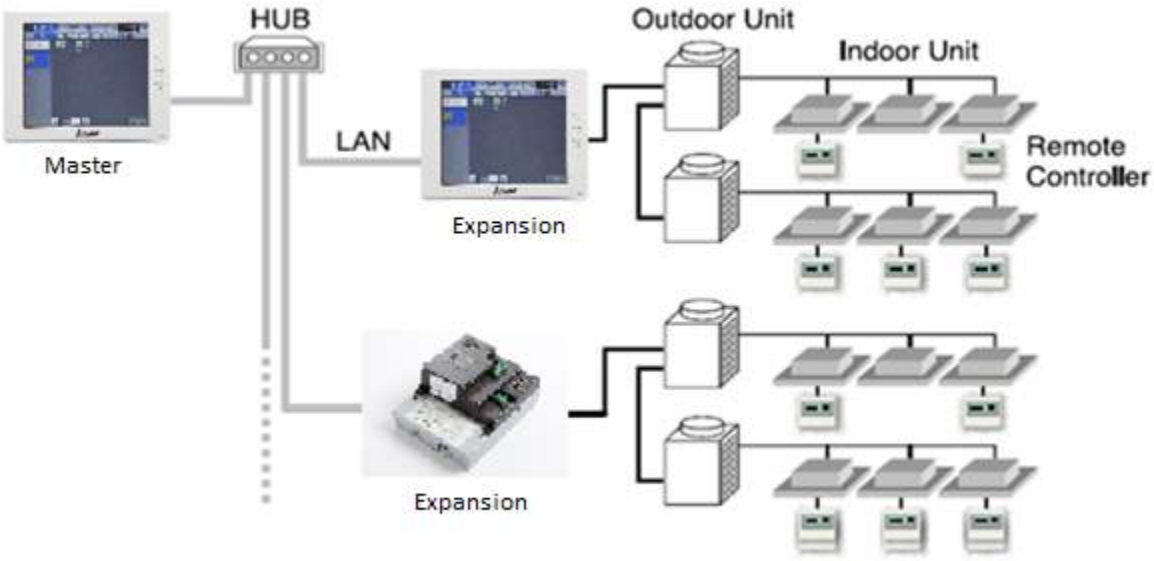
3. Wiring type:

a. Wiring shall be 2-conductor (16 AWG), twisted, stranded, shielded wire as defined by the Diamond System Builder output.

b. Network wiring shall be CAT-5 with RJ-45 connection.

Q. CITY MULTI CONTROLS NETWORK

1. The CITY MULTI Controls Network (CMCN) consists of remote controllers, centralized controllers, and/or integrated web based interface communicating over a high-speed communication bus. The CITY MULTI Controls Network shall support operation monitoring, scheduling, occupancy, error email distribution, personal web browsers, tenant billing, online maintenance support, and integration with Building Management Systems (BMS) using either LonWorks® or BACnet® interfaces. The below figure illustrates a sample CMCN System Configuration.




CMCN System Configuration

R. REMOTE CONTROLLERS

1. Simple MA Remote Controller:

a. The Backlit Simple MA Remote Controller shall be capable of controlling up to 16 indoor units (defined as 1 group).

b. The Backlit Simple MA Remote Controller shall only be used in same group with Wireless MA Remote Controllers or with other Backlit Simple MA Remote Controllers, with up to two remote controllers per group.

| Simple MA Remote Controller | | | |
|---|---|---|---|
| **Item** | **Description** | **Operation** | **Display** |
| ON/OFF | Run and stop operation for a single group | Each Group | Each |

| Simple MA Remote Controller | | | |
|---|---|---|---|
| **Item** | **Description** | **Operation** | **Display** |
| | | | Group |
| Operation Mode | Switches between Cool/Drying/Auto/Fan/Heat/Setback. Operation modes vary depending on the air conditioner unit. Auto and Setback mode are available for the R2/WR2-Series only. | Each Group | Each Group |
| Temperature Setting | Sets the temperature from 40°F – 95°F depending on operation mode and indoor unit.<br><br>Separate COOL and HEAT mode set points available depending on central controller and connected mechanical equipment. | Each Group | Each Group |
| Fan Speed Setting | Available fan speed settings depending on indoor unit. | Each Group | Each Group |
| Air Flow Direction Setting | Air flow direction settings vary depending on the indoor unit model. | Each Group | Each Group |
| Permit / Prohibit Local Operation | Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Reset filter).<br>*1: Centrally Controlled is displayed on the remote controller for prohibited functions. | N/A | Each Group *1 |
| Display Indoor Unit Intake Temp | Measures and displays the intake temperature of the indoor unit when the indoor unit is operating. | N/A | Each Group |
| Display Backlight | Pressing the button lights up a backlight. The light automatically turns off after a certain period of time. (The brightness settings can be selected from Bright, Dark, and Light off.) | N/A | Each Unit |
| Error | When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed | N/A | Each Unit |
| Test Run | Operates air conditioner units in test run mode.<br>*2 The display for test run mode will be the same as for normal start/stop (does not display “test run”). | Each Group | Each Group *2 |
| Ventilation Equipment | Up to 16 indoor units can be connected to an interlocked system that has one LOSSNAY unit. | Each Group | N/A |
| Set Temperature Range Limit | Set temperature range limit for cooling, heating, or auto mode. | Each Group | Each Group |

S. CENTRALIZED CONTROLLER (WEB-ENABLED)

1. Master Centralized Controller:

   a. The Master Centralized Controller shall be capable of controlling a maximum of two hundred (200) indoor units across multiple CITY MULTI outdoor units with the use of three expansion controllers. The Master Centralized Controller shall be approximately 11-5/32” x 7-55/64” x 2-17/32” in size and shall be powered with an integrated 100-240 VAC power supply. The Master Centralized Controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, night setback settings, free contact interlock configuration and malfunction monitoring. When being used alone without the expansion controllers, the Master Centralized Controller shall have five basic operation controls which can be applied to an individual indoor unit, a collection of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the Master Centralized Controller shall include on/off, operation

mode selection (cool, heat, auto (R2/WR2-Series only), dry, setback (R2/WR2-Series only) and fan), temperature setting, fan speed setting, and airflow direction setting. Since the master provides centralized control it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the Master Centralized Controller shall allow the user to define both daily and weekly schedules (up to 24 scheduled events per day) with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane) direction, fan speed, and permit/prohibit of remote controllers.

| **Master Centralized Controller** | | | |
|---|---|---|---|
| **Item** | **Description** | **Operation** | **Display** |
| ON/OFF | Run and stop operation. | Each Block, Group or Collective | Each Group or Collective |
| Operation Mode | Switches between Cool/Dry/Auto/Fan/Heat.<br>(Group of Lossnay unit: automatic ventilation/vent-heat/interchange/normal ventilation)<br>Operation modes vary depending on the air conditioner unit.<br>Auto mode is available for the R2/WR2-Series only. | Each Block, Group or Collective | Each Group |
| Temperature Setting | Sets the temperature from 57°F – 87°F depending on operation mode and indoor unit. | Each Block, Group or Collective | Each Group |
| Fan Speed Setting | Available fan speed settings depending on indoor unit. | Each Block, Group or Collective | Each Group |
| Air Flow Direction Setting | Air flow direction settings vary depending on the indoor unit model.<br>*1. Louver cannot be set. | *1 Each Block, Group or Collective | Each Group |
| Schedule Operation | Annual/weekly/today schedule can be set for each group of air conditioning units. Optimized start setting is also available.<br>*1. The system follows either the current day, annual schedule, or weekly, which are in the descending order of overriding priority.<br>Twenty-four events can scheduled per day, including ON/OFF, Mode, Temperature Setting, Air Direction, Fan Speed and Operation Prohibition.<br>Five types of weekly schedule (seasonal) can be set.<br>Settable items depend on the functions that a given air conditioning unit supports. | *2 Each Block, Group or Collective | Each Group |
| Optimized Start | Unit starts 5 - 60 minutes before the scheduled time based on the operation data history in order to reach the scheduled temperature at the scheduled time. | Each Block, Group or Collective | Each Block, Group or Collective |
| Night Setback Setting | The function helps keep the indoor temperature in the temperature range while the units are stopped and during the time this function is effective. | Each Group | Each Group |
| Permit / Prohibit Local | Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set | Each Block, | *3 Each Group |

| Master Centralized Controller | | | |
|---|---|---|---|
| **Item** | **Description** | **Operation** | **Display** |
| Operation | temperature, Reset filter).<br>*3. Centrally Controlled is displayed on the remote controller for prohibited functions. | Group or Collective | |
| Room Temp | Displays the room temperature of the group. Space temperature displayed on the indoor unit icon on the touch screen interface. | N/A | Each Group |
| Error | When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed<br>*4. When an error occurs, the LED flashes. The operation monitor screen shows the abnormal unit by flashing it. The error monitor screen shows the abnormal unit address, error code and source of detection. The error log monitor screen shows the time and date, the abnormal unit address, error code and source of detection | N/A | *4 Each Unit or Collective |
| Outdoor Unit Status | Compressor capacity percentage and system pressure (high and low) pressure (excludes S-Series) | Each ODU | Each ODU |
| Connected Unit Information | MNET addresses of all connected systems | Each IDU, ODU and BC | Each IDU, ODU and BC |
| Ventilation Equipment | This interlocked system settings can be performed by the master system controller.<br>When setting the interlocked system, use the ventilation switch the free plan LOSSNAY settings between “Hi”, “Low” and “Stop”.<br>When setting a group of only free plan LOSSNAY units, you can switch between “Normal ventilation”, “Interchange ventilation” and “Automatic ventilation”. | Each Group | Each Group |
| Multiple Language | Other than English, the following languages can be selected: Spanish, French, Japanese, Dutch, Italian, Russian, Chinese, and Portuguese. | N/A | Collective |
| External Input / Output | By using accessory cables you can set and monitor the following.<br>Input<br>By level: “Batch start/stop”, “Batch emergency stop”<br>By pulse: “batch start/stop”, “Enable/disable remote controller”<br>Output: “start/stop”, “error/Normal”<br>*5. Requires the external I/O cables (PAC-YG10HA-E) sold separately. | *5 Collective | *5 Collective |

b. All Master Centralized Controllers shall be equipped with two RJ-45 Ethernet ports to support interconnection with a network PC via a closed/direct Local Area Network (LAN) or to a network switch for IP communication to up to three expansion controllers for display of up to two hundred (200) indoor units on the main master centralized controller interface.

c. The Master Centralized Controller shall be capable of performing initial settings via the high-resolution, backlit, color touch panel on the controller or via a PC browser using the initial settings.

d. Standard software functions shall be available so that the building manager can securely log into each master centralized controller via the PC’s web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics.

Additional optional software functions of personal browser for PCs and MACs and Energy shall be available but are not included. The Energy Apportionment function shall require a LIC-Charge software license

2. Expansion Controller:

   a. The Expansion Controller shall serve as a standalone centralized controller or as an expansion module to the Master Centralized Controller for the purpose of adding up to 50 indoor units to either the main touch screen interface of the master centralized controller. Up to three (3) expansion controllers can be connected to the master via a local IP network (and their IP addresses assigned on the master) to the master to allow for up to two hundred (200) indoor units to be monitored and controlled from the master interface.

   b. The expansion controllers have all of the same capabilities to monitor and control their associated indoor units as the features specified above. Even when connected to the master and configured to display their units on the main controller, the individual indoor units connected to the expansion can still be monitored and controlled from the interface of the expansion. The last command entered will take precedence, whether at the wall controller, the expansion or the master Centralized Controller.

3. Non Touch Screen, Networked Centralized Controller:

   a. The Non Touch Screen, Networked Centralized Controller shall be capable of controlling a maximum of 50 indoor units across multiple CITY MULTI outdoor units. The controller shall be approximately 8-1/2”x10” in size and shall be powered by its internal power supply. The controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, free contact interlock configuration and malfunction monitoring. The controller shall have five basic operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the controller shall include on/off, operation mode selection (cool, heat, auto (R2/WR2-Series only), dry, temperature setting, fan speed setting, and airflow direction setting. Since the controller provides centralized control it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the controller shall allow the user to define both daily and weekly schedules with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane) direction, fan speed, and permit/prohibit of remote controllers.

| **Non Touch Screen, Networked Centralized Controller** | | | |
|---|---|---|---|
| **Item** | **Description** | **Operation** | **Display** |
| ON/OFF | Run and stop operation. | Each Block, Group or Collective | Each Group or Collective |
| Operation Mode | Indoor unit modes: COOL/DRY/FAN/AUTO/HEAT.<br>Lossnay unit modes:<br>HEAT RECOVERY/BYPASS/AUTO<br>Air to water (PWFY) modes:<br>HEATING/HEATING ECO/HOT WATER/ANTI-FREEZE/COOLING<br>*Operation modes vary depending on the unit model connected.<br>** Auto mode is available for the R2/WR2-Series only. | Each Block, Group or Collective | Each Group |
| Temperature Setting | Sets the temperature from 40°F – 95°F depending on operation mode and indoor unit model.<br><br>Separate COOL and HEAT mode set points available | Each Block, Group or Collective | Each Group |

| Non Touch Screen, Networked Centralized Controller | | | |
|---|---|---|---|
| **Item** | **Description** | **Operation** | **Display** |
| | depending on remote controller and connected mechanical equipment. | | |
| Set Temperature Range Limit | The range of room temperature setting can be limited by the initial setting depending on the indoor unit connected. | Each Group | Each Group |
| Fan Speed Setting | Available fan speed settings depend on indoor unit model. | Each Block, Group or Collective | Each Group |
| Air Flow Direction Setting | *Air flow direction settings vary depending on the indoor unit model.<br>*1. Louver cannot be set. | *1 Each Block, Group or Collective | Each Group |
| Schedule Operation | Annual/weekly/today schedule can be set for each group of air conditioning units. Optimized start setting is also available.<br>*2. The system follows either the current day, annual schedule, or weekly, which are in the descending order of overriding priority.<br>Twenty-four events can scheduled per day, including ON/OFF, Mode, Temperature Setting, Air Direction, Fan Speed and Operation Prohibition.<br>Five types of weekly schedule (seasonal) can be set.<br>Settable items depend on the functions that a given air conditioning unit supports. | *2 Each Block, Group or Collective | Each Group |
| Hold | Disables scheduled functions for indoor unit groups and their associated remote controller timers.<br>*not available for general equipment | Each Block, Group or Collective | Each Group |
| Optimized Start | Unit starts 5 - 60 minutes before the scheduled time based on the operation data history in order to reach the scheduled temperature at the scheduled time. | Each Block, Group or Collective | Each Block, Group or Collective |
| Permit / Prohibit Local Operation | Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Fan Speed, Air Direction and Reset filter).<br>*3. Centrally Controlled is displayed on the remote controller for prohibited functions. | Each Block, Group or Collective | *3 Each Group |
| Room Temp | Displays the room temperature of the group. | N/A | Each Group |
| Room Humidity | Displays the percent relative humidity in the space as sensed by the Smart ME Remote Controller | N/A | Each Group |
| Occupancy Sensor | Displays the occupancy icon on the group icon in the condition list page when the room is occupied (blue) or vacant (gray).<br>*The Smart ME Remote Controller Occupancy sensor is required. | N/A | Each Group |
| Brightness Sensor | Displays the brightness icon on the group icon in the condition list when the space is determined to be bright (yellow) or dark (gray). | N/A | Each Group |

| Non Touch Screen, Networked Centralized Controller | | | |
|---|---|---|---|
| **Item** | **Description** | **Operation** | **Display** |
| | *The Smart ME Remote Controller Brightness sensor is required. | | |
| Error | When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed<br>*4. When an error occurs, the LED flashes. The operation monitor screen shows the abnormal unit by flashing it. The error monitor screen shows the abnormal unit address, error code and source of detection. The error log monitor screen shows the time and date, the abnormal unit address, error code and source of detection | N/A | *4 Each Unit or Collective |
| Ventilation Equipment | This interlocked system settings can be performed by the master system controller.<br>When setting the interlocked system, use the ventilation switch the free plan LOSSNAY settings between “Hi”, “Low” and “Stop”.<br>When setting a group of only free plan LOSSNAY units, you can switch between “Normal ventilation”, “Interchange ventilation” and “Automatic ventilation”. | Each Group | Each Group |
| Multiple Language | Other than English, the following languages can be selected: Spanish, French, Japanese, German, Italian, Russian, Chinese, and Portuguese. | N/A | N/A |
| External Input / Output | By using accessory cables you can set and monitor the following.<br>Input: By level: “Batch start/stop”, “Batch emergency stop”; By pulse: “batch start/stop”, “Enable/disable remote controller”<br>Output: “start/stop”, “error/Normal”<br>*5. Requires the external I/O cables (PAC-YG10HA-E) sold separately. | *5 Collective | *5 Collective |
| M-Net | The "M-NET" LED lights, when AC power supply is turned ON.<br>The LED blinks while M-NET is communicating. | N/A | Each Group (LED) |
| Collective ON/OFF | All the units can be operated / stopped with a DIP switch. | Collective | N/A |
| Measurement | Displays the Temperature and Humidity inputs of the AI Board. Supports graph display and data export. | N/A | Each Unit |
| AHC Status | Displays the status of the of the inputs and outputs of each Advanced HVAC Controller (DC-A2IO) | N/A | Each Unit |
| Free Contact Status | Displays the input/output status of the Free Contacts on the indoor units | N/A | Each Unit |
| Free Contact Interlock Control | Operation of indoor groups, general equipment or free contact outputs based on group(s) conditions or free contact(s) input states. | Each Group, Output or Collective | N/A |
| Data Back-up (PC) | Initial setting data can be exported to a PC. | Collective | N/A |

T. GRAPHICAL USER INTERFACE

1. The Graphical User Interface (Integrated Centralized Control Web) shall require a field

supplied PC or Tablet.

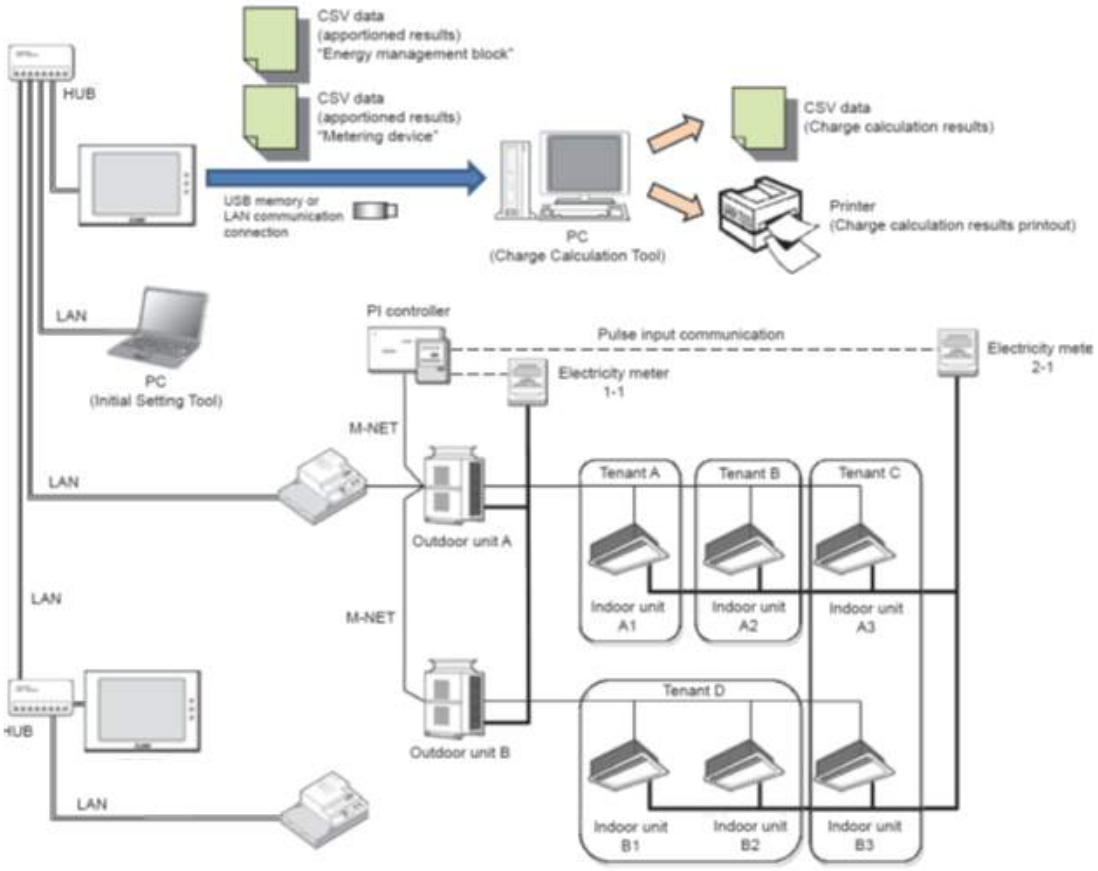
2. ICCW

   a. The Integrated Centralized Control Web System (ICCW) interface shall enable the user to control multiple networked central controllers and shall provide additional functions such as energy apportionment from a single network PC configured with the Charge Calculation Tool. The ICCW shall be capable of controlling up to forty networked Centralized Controllers with a maximum of 2,000 indoor units across multiple CITY MULTI outdoor units. The ICCW shall be required if the user wants to simultaneously control more than 1 Centralized Controllers from a single PC or tablet using a single web browser session. Licensing per function, per Centralized Controller shall be required for the ICCW. Optional software features shall be available through the ICCW including energy apportionment and personalized web. These optional software features shall require the ICCW, advance purchase from the customer, and licensing from ICCW.

| **ICCW (Integrated System Software)** | |
|---|---|
| **Item** | **Details** |
| ON/OFF | The units can turn ON and OFF for all floors or in a block, floor, or group of units. |
| Operation Modes | The operation mode can be switched between COOL, DRY, FAN, AUTO, and HEAT for all floors or in a block, floor, or group of units |
| Temperature Setting | Sets the temperature for a single group. Range of Temperature setting from 57°F – 87°F depending on operation mode and indoor unit model. Separate COOL and HEAT mode set points available depending on remote controller and connected mechanical equipment. |
| Fan Speed | The fan speed can be set to four stages for all floors or in a block, floor, or group of units |
| Air Direction | The air direction can be set in four vertical directions or to swing for all floors or in block, floor, or group of units. (The selectable air direction differs according to the model.) |
| Interlocked Unit ON/OFF LOSSNAY | If there is an interlocked unit (LOSSNAY), then the unit can be turned ON (strong/weak) or OFF for all floors or in a block, floor, or group of units. (Note that the ventilation mode cannot be selected for interlocked units.) |
| Local Operation Prohibit | The items for which operation with the local remote controller are to be prohibited can be selected for all floors or in a block, floor, or group of units. (The items that can be prohibited are ON/OFF, operation mode, set temperature and filter sign reset.) |
| Annual / Weekly Schedule | The annual/weekly schedule function can be used by registering the license. Two settings, such as seasonal settings for summer and winter, can be saved. |
| Power Rate Apportionment Charging | A watt-hour meter (WHM) with kWH pulse output is connected to calculate the air conditioning charges based on the amount each tenant's air-conditioner has operated. Five charging rates can be applied per day. ***OPTIONAL ENERGY APPORTIONMENT SOFTWARE (LIC-CHARGE) and PI Controller (PAC-Y60MCA) REQUIRED |
| History | Up to 3,000 items for the error history and up to 10,000 items for operation history can be saved. Each history file can be output as a daily report or monthly report in CSV format. (The operation history consists only of the operations carried out with the ICCW and is limited to some limited operation items.) |
| Operation Time Monitor | The cumulative operation time of each indoor unit can be viewed or output as a CSV format file. (This function is valid only when the charging function license is registered.) |
| Filter Sign | The filter sign display at the remote controllers can be disabled. |

| ICCW (Integrated System Software) | |
|---|---|
| **Item** | **Details** |
| Display Mask | |
| Set Temperature Limit | The set temperature lower limit can be set for cooling and the upper limit for heating. (ME remote controller required) |

U. ENERGY APPOINTMENT METHOD FOR CITY MULTI CENTRALIZED CONTROLLERS




CMCN System Configuration

1. System Overview
    a. For centralized systems serving multiple tenants for which one-to-one electricity metering is not possible, an apportioned electricity billing function that attributes just the electrical energy consumed by each individual tenant's air conditioner is required. The Energy Apportionment function takes the information on the electrical energy usage gathered from Watt Hour Meters (WHM) connected to dedicated breaker panels serving the system's outdoor units and synthesizes it with the information on the operating status of the indoor units that is collected by the CITY MULTI centralized controller(s).
2. Watt Hour Meters
    a. Requirements:
        1) The Watt Hour Meters (WHMs) to be used to read the electrical energy consumption of the outdoor units must be capable of a pulse output, which would be configured

based on the current rating of the units. The associated current transformers/ transducers (CTs) must also be sized based on the current rating of either the individual outdoor units or the dedicated air conditioning electrical panels they are to be reading. The proper quantity of meters for a particular sized system must be selected in order to ensure sufficient resolution and hysteresis in the unit pulse output of the meters so as to ascribe an acceptable level of accuracy to the apportionment of energy usage for each tenant's system. The system is designed to work with any WHM capable of a pulse output that meets ANSI C12.20 class 0.2% or 0.5% accuracy standards.

b. Connection:

1) The WHMs are to be physically connected to the integrated pulse input module or an external Mitsubishi Electric PI Controller if such an input is not available or if there is a wiring length limitation or installation hardship. The cable type of the interconnecting wiring shall be according to the wiring specifications of the WHM manufacturer.

3. CITY MULTI Centralized Controller Requirements

a. Licensing:

1) Each centralized controller to which units are assigned that require the energy apportionment function must have the "LIC-Charge" software license purchased and properly unlocked in order to enable the operating status of the indoor units to be passed to the energy apportionment tool. The procedure for licensing the centralized controllers with this function and the necessary forms can be found on Mitsubishi Electric's technical documentation repository, mylinkdrive.com. Purchase Order information for the licenses will be required at the time of submission of the licensing request forms.

b. Dedicated master centralized controller for apportionment (no MNET connection)

1) A dedicated master centralized controller, for which the LIC-Charge license is purchased and the energy apportionment function enabled, must be provided in order to serve as the portal for exporting metering device and energy management data to a USB drive or to a PC via LAN connection. This means that by virtue of selecting this master centralized controller to serve this function, the MNET capability of this particular centralized controller will be disabled. All indoor units must be physically wired via MNET to other expansion centralized controllers, which must be physically wired via LAN with Static IP addresses and a network hub or switch to the master apportionment controller.

4. PC for collecting charge calculation results

a. A networked PC, which does not necessarily have to be dedicated to the task of collecting energy apportionment data, can be provided and loaded with the Charge Calculation Tool software for exporting data necessary to generate billing documentation to be performed by a third party. The system requirements of the PC are as follows:

| Item | Requirements |
|---|---|
| CPU | 1 GHz or better (at least 2 GHz recommended) |
| Memory | 2GB or more |
| Screen Resolution | 1024 x 768 or better |

| | |
|---|---|
| OS | Windows 7, Windows 8.1 (32bit/64bit) |
| System requirements | The system should meet the minimum requirement for Windows 7 or Windows 8.1<br>• Net Framework 4.5 or later |
| Internal LAN port or LAN card | 100 BASE-TX or better |
| Porting device | Mouse, etc. |

V. CENTRAL CONTROLLER (NON-WEB)

1. Non-Networked Touch Controller:

a. The Non-Networked Touch Controller features a 5 inch wide color LCD touch panel. The settings for air conditioning units can be changed by touching the corresponding icons on the display. There are 3 buttons on the panel of the controller; ON/OFF, SET BACK and HOLD enabling simple and quick batch operation. One controller can control up to 24 groups/units of air conditioners. Operation status is displayed on easy-to-read LCD. The group currently operating can be seen at a glance with the operation status display. The controller can perform functions such as ON/OFF, Operation mode changeover, temperature setting and prohibit operation by local remote controller. Up to 12 patterns of weekly schedule can be set. “ON/OFF”, “Operation mode”, “Set Temperature”, “Fan speed”, “Air flow direction” and “Permit / Prohibit local operation” can be scheduled with up to 16 settings in one pattern. Up to 5 patterns of today’s schedule can be set. Independent LOSSNAY operation is possible. Automatic ventilation, Normal ventilation and Ventilation with heat exchanger can be switched from the system controller. The controller is equipped with a system changeover function which an operation mode can be switched to an optimal mode depending on indoor temperature setting and target temperature of each group or a representative indoor unit.

| **Non-Networked Touch Controller:** | | | |
|---|---|---|---|
| **Item** | **Description** | **Operation** | **Display** |
| ON/OFF | ON and OFF operation for the air conditioner units.<br>Even when only a single indoor unit connected to the group remote controller will operate and collective ON/OFF lamp will light up. | Group or Collective | Group or Collective |
| Operation Mode Switching | Switches between Cool / Dry / Auto / Fan / Heat / Setback.<br>Operation modes vary depending on the air conditioner unit.<br>Auto mode is for CITY MULTI R2 and WR2 series only. | Group or Collective | Group or Collective |
| Temperature Setting | Set temperature from 57˚ F - 87˚ F depending on operation mode and indoor unit.<br><br>Separate COOL and HEAT mode set points available depending on remote controller and connected mechanical equipment. | Group or Collective | Group or Collective |
| Fan Speed Setting | Available fan speed settings depending on indoor unit. | Group or Collective | Group or Collective |
| Air Flow Direction Setting | Air flow direction angles 4-angle or 5-angle, Swing, Auto<br>Louver ON/OFF<br>* Air flow direction settings vary depending on the indoor unit model. | Group or Collective | Group or Collective |
| Hold | Hold Prohibits the scheduled operation from being executed.<br>a. ON/OFF timer<br>b. Auto-OFF timer<br>c. Weekly timer | Group or Collective | Group or Collective |

| Non-Networked Touch Controller: | | | |
|---|---|---|---|
| **Item** | **Description** | **Operation** | **Display** |
| | d. Automatic return to the preset temperature<br>* While an operation is prohibited by Hold function, the operation icon lights up. | | |
| Permit / Prohibit | When set as the master, the ON/OFF, operation mode, setting temperature and filter sign reset operations using the local remote controllers can be prohibited.<br>Only ON/OFF and filter reset can be prohibited for the LOSSNAY group. | Group or Collective | Group or Collective |
| Operation Lock | (ON/OFF, operation mode, setting temperature, fan speed, Air flow direction) | Group or Collective | Group or Collective |
| Room Temp Display | The room temperature can be displayed. | N/A | Each Group |
| Error | When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed.<br>* When an error occurs, the "ON/OFF" LED flashes. The operation monitor screen show abnormal icon over the unit. The error monitor screen shows the abnormal unit address, error code and source of detection. The error log monitor screen shows the time and date, the abnormal unit address, error code and source of detection. | N/A | Each Unit, Group, or Collective |
| Schedule Operation | Weekly schedule setting up to 12 patterns is available.<br>In one pattern, up to 16 setting of "ON/OFF", "Operation mode", "Set Temperature", "Fan speed", "Air flow direction" and "Permit / Prohibit local operation" can be scheduled. Today's schedule setting up to 5 pattern in available.<br>*Time setting unit: 5 minute /unit | Each Group | Each Group |
| Ventilation Operation (Independent) | Group operation of only the free plan LOSSNAY is possible.<br>The operation mode of these groups is automatic ventilation, ventilation with heat exchanger and normal ventilation. | Group or Collective | Group or Collective |
| Ventilation Operation (Interlocked) | The LOSSNAY will run in interlock with the operation of indoor unit. The mode cannot be changed. The LED will turn ON during operation after interlocking. | Group or Collective | Group or Collective |
| Set Temperature Range Limit | The range of room temperature setting can be limited by the initial setting. The lowest limit temperature can be made higher than the usual (67°F) in cool/dry mode, while the upper limit temperature lower than the usual (83°F) in heat mode. | Group or Collective | Group or Collective |
| External Input / Output | By using accessory cables you can set and monitor the following.<br>Input<br>By level: “Batch start/stop”, “Batch emergency stop”<br>By pulse: “batch start/stop”, “Enable/disable remote controller”<br>Output: “start/stop”, “error/Normal”<br>*5: Requires the external I/O cables (PAC-YG10HA-E) sold separately. | *5 Collective | *5 Collective |

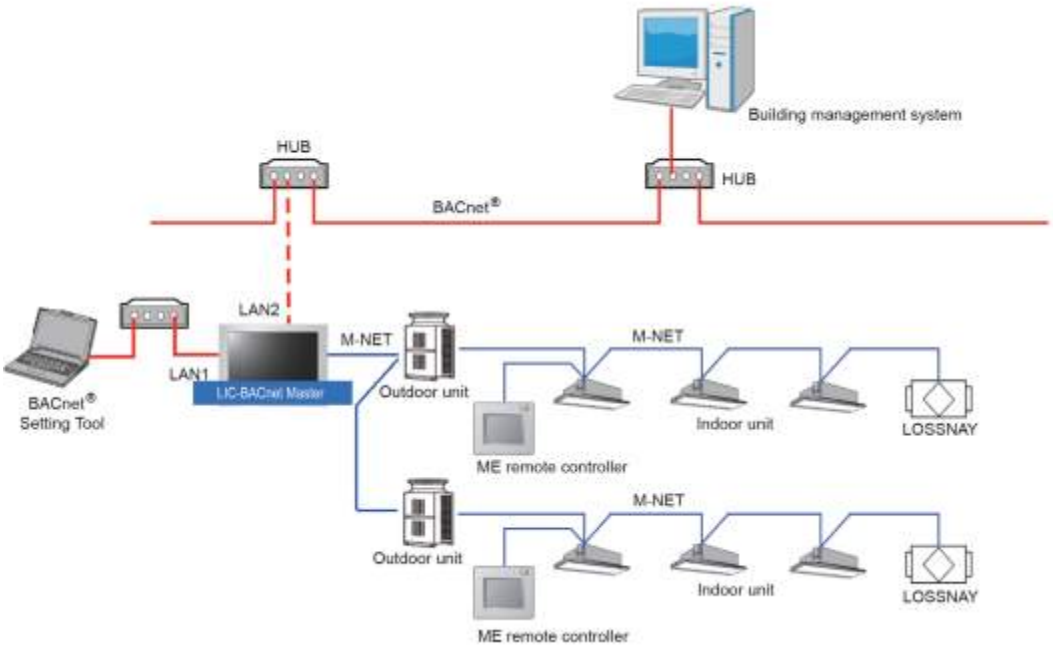
W. CMCN: SYSTEM INTEGRATION

1. BACnet® Integration:

   a. The Mitsubishi Electric Cooling & Heating BACnet® hardware, which is built into all networked central controllers, shall be compliant with BACnet® Protocol (ANSI/ASHRAE 135-2010) and be Certified by the (BTL) BACnet® Testing Laboratories. The BACnet® interface shall support BACnet Broadcast Management (BBMD). The BACnet® interface shall support a maximum of 50 indoor units. Operation and monitoring points include, but are not limited to, on/off, operation mode, fan speed, prohibit remote controller, filter sign

reset, alarm state, error code, and error address.

2. Licenses:
   a. LIC-BACnet Master: Master Controller license for Master Centralized Controller and Non Touch Screen, Networked Centralized Controller
   b. LIC-BACnet Expansion: Expansion Controller license for Expansion Controller and Non Touch Screen, Networked Centralized Controller
3. LIC-BACnet Specifications:
   a. Control up to 50 groups
   b. 1 to 16 indoor units can be collectively controlled in a group
   c. Supports dual set point functionality (connected model dependent)
   d. BTL Compliant
   e. BACnet communication specifications are based on ANSI/ASHRAE Standards 135-2010
4. PC Requirements:
   a. CPU: 1GHz or higher
   b. Memory: 1GB or more
   c. HDD Space: 100 MB or more
   d. Screen Resolution: 1024 x 768 or higher
   e. OS: Microsoft Windows 7 32-bit/64-bit, Microsoft 8.1 32-bit/64-bit. Not compatible with Windows Vista
   f. Execution Environment: Microsoft .NET Framework 4.5 or later
   g. Others: Pointing device such as a mouse, internet connection (required when installing a .NET Framework)
5. LIC-BACnet – System Example




BACnet Point List

| **Object List** |
|---|
| On Off Setup |
| On Off State, Number of ON/OFF, Cumulative operation time |
| Alarm Signal (4-digit error code) |
| Error Code |
| Operational Mode Setup |
| Operational Mode State |
| Fan Speed Setup |
| Fan Speed State |
| Room Temp [Water Temp] |
| Set Temp [Set Water Temp] |
| Set Temp Cool |
| Set Temp Heat |
| Set Temp Auto |
| Filter Sign [Circulating Water Exchange Sign] |
| Filter Sign Reset [Circulating Water Exchange Sign Reset] |
| Prohibition On Off |
| Prohibition Mode |
| Prohibition Filter Sign Reset [Prohibition Circulating Water Exchange Sign Reset] |
| Prohibition Set Temperature |
| M-NET Communication State |
| System Forced Off |
| Air Direction Setup |
| Air Direction State |
| Set High Limit Setback Temp |
| Set Low Limit Setback Temp |
| Ventilation Mode Setup |
| Ventilation Mode State |

| |
|---|
| Air To Water Mode Setup |
| System Alarm Signal (4-digit error code) |
| PI Controller Alarm Signal (4-digit error code) |
| Group Apportioned Electric Energy |
| Interlocked Units Apportioned Electric Energy |
| PI controller Electric Energy 1–4 |
| Pulse Input Electric Energy 1–4 |
| Group Apportionment Parameter |
| Interlocked Units Apportionment Parameter |
| Night Purge State |
| Thermo On Off State |
| Trend Log Room Temp |
| Trend Log Group Apportioned Electric Energy |
| Trend Log Interlocked Units Apportioned Electric Energy |
| Trend Log PI controller Electric Energy 1–4 |
| Trend Log Pulse Input Electric Energy 1–4 |
| Trend Log Group Apportionment Parameter |
| Trend Log Interlocked Units Apportionment Parameter |

X. Building Connect+

1. The Building Connect+ cloud based control application shall be connected to one networked centralized controller and be able to control up to 50 CITY MULTI indoor units. Additionally, the unit will include BACnet MSTP and BACnet IP control integration for up to 5 units of 3rd party equipment via installer configurable networks. Each BACnet connected device can integrate up to 10 installer selected points. The system also provides for hardwired digital I/O points including an Alarm, Status and Start/Stop for 8 additional devices such as fans or motors. A panel router is included to allow for Internet connectivity as well as 4G cellular access through the building WAN or secure VPN. The Building Connect+ cloud based user interface will be two factor authentication enabled using Google authentication. The system will provide for mobile device remote access through the cloud connection. Remote users will be able to access equipment on any and all Building Connect+ instances that are assigned to that user, regardless of geophysical location. An unlimited number of users can connect to the Building Connect+ cloud without the need for additional user licenses needed to connect remote users.
2. The platform will provide for a configuration wizard that will enable the installer to auto-discover all the connected VRF and BACnet devices. A user management function will allow the installer to set up 4 user groups consisting of Admin, Manager, Operator and user. The Admin user type will be able to configure the permissions of each user type as well as assign the equipment and points for that user type. The Admin user type will be able to add new users and manage existing users. The Admin user will configure the system access levels to be View Only, View and Control, and Hidden.
3. The CITY MULTI control points include On/off, mode, set point, air direction and fan speed. The CITY MULTI monitor only points include the full suite of available Maintenance Tool Data as well as zone temperature and error codes. User configurable functions for Alarm Management, Equipment Scheduling, Trend Building and Data management are provided with the cloud server. A Maintenance Tool data view is provided to allow the user to remotely access the data and use as a diagnostic tool in real time. Pre-programmed applications such as Auto Changeover are provided to manage automatic heat pump switching without additional equipment or programming.

Y. HVAC Equipment Alternate (General Information)

1. The alternate equipment supplier shall provide to the bidding mechanical contractor a

complete equipment data package. This package shall include, but is not limited to, equipment capacities at the design condition, power requirements, indoor units CFM/static pressures, fan curves, installation requirements, and physical dimensions. Nominal performance data is not acceptable.

2. The mechanical contractor shall request and receive the equipment data package 15 days prior to bid date and submit this package with the alternate bid.
3. The mechanical contractor shall list the equipment supplier and submit the required data package with the bid detailing a complete comparison of the proposed alternate equipment to the specified equipment and the associated cost reduction of the alternate equipment. The contractor bids an alternate manufacturer with full knowledge that that manufactures product may not be acceptable or approved.
4. The alternate equipment supplier shall furnish a complete drawing package to the mechanical contractor 15 days prior to bid day for bidding and installation. The drawing format shall be .dxf or equivalent, on 30"x42" sheets. The HVAC and electrical series design documents will be made available in electronic format for use by the equipment supplier in preparing their drawings. The alternate equipment supplier shall prepare the following drawings:
   a. XXX HVAC Floor Plan
   b. XXX HVAC Refrigerant Piping Plan
   c. XXX HVAC Refrigerant Piping/Controls Details
   d. XXX HVAC Details
   e. XXX HVAC Schedules
5. The alternate equipment supplier shall draft all piping circuits, components, overall building control schematic, detailed control wiring diagrams, system details and schedules for their system. The drawings shall convey all requirements to successfully install the alternate equipment suppliers system.
6. Provide (2) drawing package sets plotted on 20 lb. vellum. Provide (1) drawing package in electronic format (.dxf files) on CD.
7. The submitted documents shall be complete system designs and show no less information than the HVAC equipment/controls contract bid documents.
8. Provide the following scorecard(s) with the bid proposal for review by the bid selection committee for their respective system(s).

Z. R2-SERIES, HIGH EFFICIENCY, N-GENERATION

| Item # | Item Description | Manufacturer Response | Response Date |
|---|---|---|---|
| 1 | # compressors overall<br># non-inverter compressors | | |
| 2 | Statistical probability of warranty period compressor failure based on # compressors above and 1% warranty failure rate for each compressor for all manufacturers. | | |
| 3 | # VRF systems as proposed | | |
| 4 | # Branch devices included | | |

| | | | |
|---|---|---|---|
| 5 | Can additional units be added or existing indoor units be replaced with units of a different size without piping changes between the branch device and outdoor unit? | | |
| 6 | How is condensate formation in the branch device managed? (provide photos of branch device interior showing serviceable components) | | |
| 7 | List heating/cooling performance derate factors applied to systems performance for:<br>Ambient Temperature<br>Indoor Temperature<br>Piping Length & Vertical Separation<br>Defrost | | |
| 8 | Heating amount & percentage delivered during defrost | | |
| 9 | Total refrigerant charge of systems provided | | |
| 10 | Is commonly available polyolester (POE) used in the system? | | |
| 11 | # manufacturer (or respective US division) employees based within 200 miles of job site | | |
| 12 | # local distributors stocking parts within 200 mile radius | | |
| 13 | # years local supplier has been selling VRF brand | | |

AA. Y-SERIES HIGH EFFICIENCY, N-GENERATION, RAPID CHANGEOVER

| Item # | Item Description | Manufacturer Response | Response Date |
|---|---|---|---|
| 1 | # compressors overall<br># non-inverter compressors | | |
| 2 | Statistical probability of warranty period compressor failure based on # compressors above and 1% warranty failure rate for each compressor for all manufacturers. | | |
| 3 | Minimum compressor speed (MBH) of each system compared to the basis of design system (list each system separately) | | |
| 4 | # VRF systems as proposed | | |
| 5 | # Branch devices included | | |

| | | | |
|---|---|---|---|
| 6 | Can additional units be added or existing indoor units be replaced with units of a different size without piping changes between the branch device and outdoor unit? | | |
| 7 | How is condensate formation in the branch device managed? (provide photos of branch device interior showing serviceable components) | | |
| 8 | List heating/cooling performance derate factors applied to systems performance for:<br>Ambient Temperature<br>Indoor Temperature<br>Piping Length & Vertical Separation<br>Defrost | | |
| 9 | Heating amount & percentage delivered during defrost | | |
| 10 | Total refrigerant charge of systems provided | | |
| 11 | Is commonly available polyolester (POE) used in the system? | | |
| 12 | # manufacturer (or respective US division) employees based within 200 miles of job site | | |
| 13 | # local distributors stocking parts within 200 mile radius | | |
| 14 | # years local supplier has been selling VRF brand | | |

## 2.6 VALVES AND STRAINERS

A. Valves on condenser water, chilled water, hot water and fuel oil services shall be 125 psi unless noted otherwise. Pressure ratings of valves for steam and condensate services shall be as specified. Provide balancing valves where shown on Drawings.

B. Valves shall have name of manufacturer and guaranteed working pressure cast or stamped on bodies. Valves of similar type shall be by single manufacturer. Provide chain operators for valves 7 feet and higher above floor.

1. Valves shall be rated 175 psi maximum working pressure, iron body, threaded-lug with resilient EPDM seats, bronze disc and 416 stainless stem by Centerline, DeZurik, Keystone or Bray.

2. Test valves at 110% of rated pressure.

C. Provide bronze-body ball valves with reinforced Teflon seats, seals, bearings and packing. Ball valves shall be used for chilled, hot, and condenser water services in sizes 2” and smaller. Do not use ball valves for balancing service. Valves on insulated piping shall have 2” extended stems. Valves shall be as manufactured by Apollo, Cannon, Nibco, Milwaukee or Watts. Valves shall be rated 600 psi W.O.G.

D. Provide globe valves for balancing and throttling steam and medium pressure condensate

services as manufactured by Crane, Jenkins, Milwaukee, Stockham or Walworth as follows:

1. Valves 2” and smaller shall be bronze body, screwed ends, bronze trim.
2. Valves shall be ANSI B16.5 rated for (150) (300) pound service.

E. Provide gate valve for shut-off on steam and steam condensate services as manufactured by Crane, Jenkins, Milwaukee, Stockham or Walworth as follows:

1. 125 psi steam working pressure valves shall have iron bodies and silicon brass stems. Valves 3” and smaller shall have solid bronze wedges. Valves larger than 3” shall have solid iron wedges with bronze face rings. Valves 2” and under shall be threaded; valves 2-1/2” and over shall be flanged.
2. 250 psi steam working pressure valves 2” and under shall be bronze body with silicon brass stems and solid bronze wedges. Valves shall have threaded connections. 250 psi SWP valves 2-1/2” and over shall be iron body, iron wedges with bronze face rings and have flanged connections.
3. Packing materials shall be non-asbestos.

F. Provide unions for threaded end valves to facilitate removal from pipe.

## 2.7 PIPE INSULATION

A. Insulation shall be fibrous glass insulation with factory-applied fire retardant vapor barrier jacket by Owens Corning, Certain-Teed, Manville or Knauf, installed as required by manufacturer. ASTM E-84 fire hazard ratings shall be 25 flame spread, 50 smoke developed and 50 fuel contributed.

B. Apply insulation after systems have been tested, proved tight and approved by the Architect. Remove dirt, scale, oil, rust and foreign matter prior to installation of insulation.

C. Provide fibrous dual temperature insulation with factory applied vapor barrier jacket on condensate drain piping, unless noted otherwise.

D. Drain piping shall have 1/2" thick insulation.

E. Insulation Table:

TABLE C403.2.8

Minimum Pipe Insulation Thickness (thickness in inches)[a]

| Fluid Operating Temperature Range and Usage (°F) | Insulation Conductivity | | Nominal Pipe or Tube Size (Inches) | | | | |
|---|---|---|---|---|---|---|---|
| | Conductivity Btu – In./(h . ft$^2$ . °F)[b] | Mean Rating Temperature, °F | <1 | 1 to <1½ | 1½ to < 4 | 4 to < 8 | < 8 |
| > 350 | 0.32 – 0.34 | 250 | 4.5 | 5.0 | 5.0 | 5.0 | 5.0 |
| 251 – 350 | 0.29 – 0.32 | 200 | 3.0 | 4.0 | 4.5 | 4.5 | 4.5 |
| 201 – 250 | 0.27 – 0.30 | 150 | 2.5 | 2.5 | 2.5 | 3.0 | 3.0 |
| 141 – 200 | 0.25 – 0.29 | 125 | 1.5 | 1.5 | 2.0 | 2.0 | 2.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 105 - 140 | 0.21 – 0.28 | 100 | 1.0 | 1.0 | 1.5 | 1.5 | 1.5 |
| 40 – 60 | 0.21 – 0.27 | 75 | 0.5 | 0.5 | 1.0 | 1.0 | 1.0 |
| <40 | 0.20 – 0.26 | 75 | 0.5 | 1.0 | 1.0 | 1.0 | 1.5 |

1. For piping smaller than 1½ inch (38 mm) and located in partitions within conditioned spaces, reduction of these thicknesses by 1 inch (25 mm) shall be permitted (before thickness adjustment required in footnote b) but not to a thickness less than 1 inch (25 mm).
2. For insulation outside the stated conductivity range, the minimum thickness (T) shall be determined as follows:
    a. $T = r (1 + t/r)K/k – 1)$ where:
        1) T = minimum insulation thickness,
        2) r = actual outside radius of pipe,
        3) t = insulation thickness listed in the table for applicable fluid temperature and pipe size,
        4) K = conductivity of alternate material at mean rating temperature indicated for the applicable fluid temperature (Btu x in/h x ft 2 x °F) and
        5) k = the upper value of the conductivity range listed in the table for the applicable fluid temperature.

F. Insulation for prefabricated piping specified in Pre-insulated Piping Paragraph shall be cellular glass of 1-1/2” thickness for chilled water and 2-1/2” for hot water, Foamglas by Pittsburgh Corning or approved equal, with maximum K-factor of 0.35. Insulation shall meet applicable requirements of this paragraph.

G. Provide longitudinal lap and 6” wide vapor barrier joint seal strips secured with approved adhesive.

H. Seal ends of pipe insulation and seal insulation to pipe with approved fire retardant vapor barrier, at flanges, valves and fittings and at intervals of no more than 21 feet on continuous runs of piping.

I. Secure covers on concealed pipe with metal bands at least 3/4" wide and no more than 18” apart, spaced to hold ends and center of each section.

J. Insulation on Fittings, Valves and Flanges:
    1. Fittings, valves and flanges shall be insulated with pre-cut, factory-supplied fibrous glass, by Certain-Teed, Knauf, Owens Corning or Manville.
    2. Fittings, valves and flanges shall be insulated with same material and to same thickness as adjoining pipe insulation.
    3. Pipe fittings shall be pre-tested, clean and dry before insulation.
    4. Installation of insulation on fittings shall be as follows, in order:
        a. Wrap insulation around fitting and tuck ends into fitting throat.
        b. Edges of adjacent insulation shall be tufted and tucked in, to fully insulate fitting to thickness of adjacent pipe insulation. Use two or more thicknesses if necessary.
        c. If two layers of insulation are used on fittings, wrap and secure first layer with twine before applying second layer.
        d. Top layer of insulation shall be covered with one (1) piece PVC, Zeston molded fitting

cover. Secure cover with stainless steel tack fasteners inserted into jacket thread overlap seam.

e. Tape joints with pressure-sensitive vapor barrier tape; tape shall extend 2” on either side of joint.

5. For strainers and other valves or fittings which need maintenance, provide preformed removable insulation section.

K. Refrigeration Line Insulation:

1. Suction lines, hot bypass lines and outdoor liquid lines shall be insulated with 3/4" thick rigid closed cell foam insulation. Armstrong Rigid Armaflex, Manville, Owens Corning or Halstead/Nomaco (Insultube), except in computer room plena.

2. Installation shall meet manufacturer’s recommendations. Seal butt joints with insulation manufacturers approved adhesive.

3. Outside above ground insulation shall be protected with two (2) coats of approved vinyl lacquer coating over woven glass mesh adhered to insulation with Insulcolor or approved equal lagging adhesive, as recommended by manufacturer.

4. Refrigerant piping in hung ceiling and under floor supply and return plena shall be insulated with 1” thick fibrous glass insulation that meets applicable requirements of this paragraph.

5. VRF systems require all refrigerant lines to be insulated from the outdoor unit to the indoor terminal units.

## 2.8 PIPE HANGERS AND SUPPORTS

A. Provide pipe stands, supports, hangers and other supporting devices in accordance with ANSI B31.9 and MSS-69, as necessary to support work required by Contract Documents.

B. Secure vertical piping to building construction to prevent sagging or swinging.

C. Space hangers for horizontal piping as follows:

| Pipe Size | Rod Diameter | Maximum Spacing |
|---|---|---|
| Up to 1-1/4” | 3/8” | 8 ft.-0” |
| 1-1/2” and 2” | 3/8” | 10 ft.-0” |
| 2-1/2” and 3” | 1/2" | 10 ft.-0” |
| 4” and 5” | 5/8” | 12 ft.-0” |
| 6” | 3/4" | 12 ft.-0” |
| 8” and over | 7/8” | 12 ft.-0” |

D. Horizontal copper tubing shall have maximum hanger spacing of 5 ft. for tubing 1-1/4” diameter and smaller and 10’ for tubing 1-1/2” and larger. Maximum spacing for PVC pipe hanger shall be 4”.

E. Reduce spacing to a maximum of 10’-0” apart, regardless of pipe size, as necessary for fittings,

valves and other concentrated loads.

F. Support piping 4” diameter and larger from structure with pipe roll hangers with adjustable steel rod hangers, sized to accommodate insulation.

G. Support piping 3” diameter and under from structure with Carpenter and Patterson Fig. 100 clevis hangers or approved equal.

H. Hangers shall be as manufactured by Carpenter and Patterson, F&S or Grinnell Co. Figure numbers of Carpenter and Patterson are specified to establish standards of quality for performance and materials.

I. Provide spring hangers with travel stops as specified in Vibration Isolation Paragraph, where necessary and where shown on Drawings.

J. Pipe supports for 4” and larger pipe and insulated high-temperature piping shall have welded inserts of equal thickness to insulation to prevent compression of insulation. Other insulated pipe shall have 12”, 14 ga. shields at hangers, composed of 180° coverage of galvanized sheetmetal and high density, preformed rigid insulation. Where rollers are required, shield shall be steel pipe.

K. Hangers for horizontal lines shall be vertically adjustable to obtain pitch requirements of Piping Paragraph.

## 2.9 SLEEVES AND PENETRATIONS

A. Pipe Sleeves:

1. Sleeves through floors and through exterior, structural and fire-rated construction shall be hot-dipped galvanized Schedule 40 steel pipe.

2. Sleeves through partitions and non-rated construction shall be 26-gauge galvanized steel with lock longitudinal seams, or approved plastic pipe.

3. Provide waterproofing membrane locking devices at floors. Provide 150 lb. slip-on welding flanges at exterior wall penetrations.

B. Duct Sleeves and Openings:

1. Sleeves through floors, through exterior structure, through fire-rated construction and through smoke partitions that require smoke dampers shall be Schedule 40 galvanized steel pipe for round duct and shall meet the SMACNA Fire Damper and Heat Stop Guide for rectangular ducts. Fireproof packing shall be applied to seal any openings between sleeve and wall. Materials shall maintain the fire rating of the wall, and shall be installed in accordance with the SMACNA Fire Damper and Heat Stop Guide.

2. Openings in walls, partitions and other fire-rated construction that do not require smoke dampers shall meet NFPA 90A, Section 3-3.8.

3. Materials for prepared openings in partitions shall match construction penetrated.

C. Pipe Sleeve Packing:

1. Packing between the pipe and the sleeve (or wall or slab opening) in fire-rated walls or slabs shall be a combination of fireproof insulation and fireproof caulk. The combination of materials shall have the same fire rating, in hours, as the wall or slab, as tested in accordance with the latest edition of ASTME-814 (UL 1479). The combination of materials shall be classified by UL, (fill, void or cavity materials) for the fire rating required and shall be listed as a numbered system in the UL Fire Resistance Director. Fiberglass shall not be used as the insulation material.

2. Acceptable fireproof insulation materials shall be: Kaolin (Kaowool by Babcock and Wilcox);

ceramic fiber blanket (Fiberfrax by Standard Oil) or fire-rated material wool (Thermafiber by USG). Acceptable fireproof caulks shall be: Silicone (Firestop by Dow Corning, Hilti CS240); ceramic fiber (Fyreputty by Standard Oil) or intumescent synthetic elastomer (Fire Barrier Caulk by 3M, Hilti CS2420).

3. Packing for sleeves that do not require maintenance of fire rating shall be oakum, silicate foam, ceramic fiber or mineral fiber with approved sealant. Pack or foam to within 1" of both wall surfaces. Seal penetration packing with approved caulking and paintable waterproof mastic surface finish or silicone caulking.
4. All materials must be installed in accordance with manufacturer' instructions; all gaps must be sealed. Finish caulk flush with wall or slab surface if piping runs exposed.

D. Other Waterproof Pipe Penetrations:

1. Modular mechanical penetration seals shall be interlocking synthetic rubber links shaped to fill annular space continuously, with galvanized carbon steel bolts, nuts and pressure plates to expand rubber seal between pipe and sleeve. Sleeve seal shall be watertight.
2. Prefabricated modular sleeves shall be Mason Industries (SWS) or approved equal stiffened galvanized steel sleeves with preformed closed-cell elastomeric seal (non-fire-rated) or preformed mineral fiber or silicone seal (fire-rated).
3. Provide waterproof 1" single ring set in silicone and bolted to floor or wall at chipped and drilled penetrations of existing slabs-on-grade and existing walls-below-grade.

## 2.10 ESCUTCHEONS AND DUCT COLLARS

A. Provide adjustable escutcheons on exposed piping that passes through finished floors, walls and ceilings. Escutcheons shall be chromium-plated cast brass, sized to cover sleeve opening and to accommodate pipe and insulation.

B. Provide 4" wide, 20 gauge galvanized sheetmetal collars at sleeves and prepare openings, sized to cover entire duct penetration including sleeve and seal, and to accommodate duct and insulation as necessary. Edges shall have milled lips ground smooth. Paint to match finish of duct or as directed by the Architect.

C. Provide #316 stainless steel/No. 4 finish collar for emergency generator exhaust piping which passes through exterior wall.

## 2.11 MOTORS, STARTERS AND WIRING

A. Provide motors and controls, and furnish starters for HVAC equipment, except units served by MCC provided under Section 16100 – ELECTRICAL WORK. Provide control and other related wiring including interlocks. Power wiring (to panelboards, disconnect switches, starters and motors) will be provided under Section 16100 – ELECTRICAL WORK. Starters that are not integral to equipment will be furnished, installed and wired under Section 16100 – ELECTRICAL WORK.

B. Unless otherwise specified, motors shall be NEMA Design B, constant speed, self-ventilated squirrel cage induction. Motors shall have 1.15-service factor unless totally enclosed. Motors shall have Class B insulation.

1. Motors 1/2HP and over shall be as required in schedules.

C. All motors shall be high or premium efficiency type. They shall conform to NEMA Standard MG-1-12.53a and shall have their efficiencies determined in accordance with IEEE Standard 112 Method B. The NEMA nominal efficiency shall be listed on the motor nameplate. Minimum nominal efficiencies shall be as follows:

| Size (HP) | Nominal Efficiency (Minimum) |
|---|---|
| 1 – 3 | 84% |
| 5 – 7-1/2 | 88.5% |
| 10 – 25 | 90% |
| 30 –100 | 93% |
| 100+ | 95% |

D. Starters that require interlocks or remote control shall be magnetic with HAND-OFF-AUTOMATIC switch in cover. Provide magnetic starters as necessary, with auxiliary contacts, buttons and switches in required configurations. Refer to paragraph AUTOMATIC TEMPERATURE CONTROLS and to Drawings for interlock requirements. Starters shall be as manufactured by one of the following manufacturers: Cutler-Hammer, Clark, Arrow Hart, or Square D.

1. Each 3-phase, 60 Hz motor shall be provided with magnetic starter with either ON-OFF push button or hand-off-automatic switch.
2. Other motors shall be provided with a manual starter with ON-OFF switch.
3. Control relay for each starter shall be for operation on 120 V, single-phase, and transformer of sufficient capacity within starter case shall be furnished for this purpose.
4. Provide inverse time limit overload and under voltage protection in each leg and with pilot lights. Provide “red” and “green” On-Off pilot lights.
5. Provide nameplates with engraved “white” lettering to designate area and equipment served.
6. Starters for refrigeration machines shall be furnished by Unit Manufacturer.
7. Provide starters for two-speed motors with deceleration relay.
8. Furnish for all single speed motors, 25 HP and above, 95% power factor correction capacitors. Capacitors shall be in NEMA enclosure of the same rating as the motor’s starter.

## 2.12 PACKAGED, AIR COOLED, DX ROOFTOP UNIT

A. General Requirements:

1. Provide where shown on Drawings, a completely factory assembled, piped, wired and tested, rooftop heating and cooling unit. Unit shall have a full charge of refrigerant, and compressor oil. The rooftop unit shall be shipped in one (1) piece and shall have a single point power connection.
2. Acceptable Manufacturers shall be: Carrier, McQuay, Trane, York. Provided that they meet the requirements of this specification and the performance requirements listed in the equipment schedules. Note particularly the following items.
    a. The submitted rooftop unit must produce the CFM listed in the schedule, at the static pressure, external to the unit, listed in the schedule. This performance must
    b. be accomplished using equal or less fan horsepower than the scheduled unit and at an evaporator coil face velocity equal or less than the scheduled unit.
    c. The discharge air temperatures listed in the schedule are at the discharge of the unit into the supply ductwork, NOT the discharge temperatures at the evaporator coil. These temperatures must be produced by the submitted unit. Draw through rooftop

manufacturers must fully account for fan heat gain in determining their discharge temperatures.

d. The scheduled sensible and total loads, listed in the schedules, are base on actual calculation, not manufacturer's catalog data. Both loads must be met at the outdoor air and return air temperature, to the unit, listed in the schedules.

e. The rooftop unit shown on the Drawings has been coordinated with architectural and structural elements, and with electrical service requirements. If a different unit is submitted, ALL mechanical, electrical, architectural and structural modifications which are required shall be performed by the Mechanical Contractor, under the work of the mechanical section, under the original contract price.

B. Submittal Requirements: This paragraph supplements the "Submittals" paragraph in PART 1 of these Specifications. In addition to complying with all submittal requirements contained in PART 1, the rooftop unit submittal shall contain ALL performance and other items listed in the schedule, as well as:

1. The air temperatures, entering and leaving the evaporator coil.
2. The temperature gain in degrees, due to the return (or exhaust) and supply fan.
3. The component pressure drops of all items internal to the unit – i.e. coils, filters, dampers, furnaces, etc.

C. Quality Assurance:

1. Rooftop unit shall be rated in accordance with ARI Standard 360. Unit shall be capable of starting and running at 115° F ambient outdoor temperature per the maximum load criteria of ARI Standard 360. Unit shall be capable of mechanical cooling down to 55° F ambient temperature.
2. Gas fired units shall be certified by AGA or UL as a total package.
3. Unit shall be designed to conform to ANSI B9.1 Safety Code and the National Electrical Code.
4. Unit casing shall be capable of withstanding Federal Test Method Standard 141 (Method 6061) 500 hour salt spray test.
5. Air cooled condenser coils shall be factory leak tested at minimum of 150 psig and pressure tested at 450 psig. Evaporator coils shall be factory pressure and leak tested at minimum 300 psig.
6. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
7. All fan shaft bearings shall have a life of 200,000 hours at design operating conditions in accordance with ANSI B3.15.

D. Equipment Requirements:

1. Unit Casing:

a. Unit casing shall be constructed of galvanized steel, and be protected against corrosion to such an extent that salt spray test, referenced in the Quality Assurance paragraph above can be passed.

b. Casing shall be weatherproof. If rooftop unit casing is found to leak after it is installed, within the guarantee period, then whatever modifications to the unit are required to make the casing watertight shall be made, under the work of the mechanical section, within the original contract price.

c. Hinged, insulated, man-size access doors, which are capable of being secured and locked in the open position, shall be provided on both sides of the casing, to allow access to all fans and drives, coils and all filters. It shall not be necessary to remove any bolts to open the access doors. A hinged, lockable panel shall also be provided for the control cabinet. If this cabinet is external to the unit casing it shall be NEMA 3R (rainproof). All hinged panels shall be provided with suitable gasketing to prevent moisture leakage. Easily removable man-sized access panels shall also be provided for the condensing unit section and the gas furnace (if provided).

d. All interior surfaces exposed to the moving airstream shall be coated with insulation having R-Value equivalent to 3/4" glass fiber insulation. On units without internal casing sheetmetal liner, the glass fiber insulation shall be coated on the airstream side to minimize erosion. Insulation adhesive shall maintain satisfactory adhesion over a range of –20 to 180° F.

e. Unit casing shall be equipped with lifting lugs to facilitate overhead rigging.

2. Fans:

a. Evaporator and Return/Exhaust Fans:

1) Evaporator and return/exhaust fans shall be statically and dynamically balanced.

2) Provide fixed pitch fan pulley and variable pitch motor pulley. The Mechanical Contractor shall provide, under the work of the mechanical section, a fixed pitch motor pulley. Pulley size shall be determined when balancing is complete. Pulley shall replace the variable pitch pulley, when balancing is complete. Provide fan and motor structural steel sled, such that motor position may be altered to adjust fan belt tension. Fan drive shall have a service factor of 150%.

3) Provide spring-type vibration isolators under the fan sled with a minimum of 90% isolation efficiency.

4) Fan shaft bearings shall be self-aligning, pillow-block type.

5) Condenser Fans: Condenser fans shall be direct-drive propeller type, statically and dynamically balanced with 3-phase motors. Fans shall discharge air vertically upwards and be protected by PVC coated steel wire safety guards.

3. Compressors and Refrigeration Components:

a. Compressors shall be reciprocating and shall be located for easy servicing. Compressors shall be equipped with cylinder unloading (minimum of 4 steps) and factory pre-piped hot gas bypass system to maintain capacity control at minimum cooling loads.

b. Semi-hermetic compressors shall be mounted on spring type isolators with a minimum isolation efficiency of 95%.

c. Each compressor shall be equipped with an automatically reversible oil pump, insert type crankcase heaters and suction and discharge service valves.

d. Unit shall be equipped with dual refrigeration circuits each containing, liquid line service valve, filter drier, sight glass, thermal expansion valve and fusible plug.

e. Maximum compressor operating speed shall be 1800 rpm.

f. Provide the following safety controls and equipment over-temperature, over-current, oil equalizer lines on circuits on dual compressors, high pressure and low pressure switches. Provide manufacturer’s recommended time delay, to prevent compressor short cycling. Provide any additional safety controls recommended by manufacturer for proper operation, in addition to those listed above. See temperature control Drawings for any requirements for provision of auxiliary contacts.

4. Evaporator and Condenser Coils:
    a. Evaporator coil shall be constructed of aluminum fins mechanically bonded to seamless copper tubes. Coils shall be full-face active type during full and part load conditions.
    b. Condenser coils shall be constructed of aluminum fins mechanically bonded to seamless copper tubes.
5. Heating Section:
    a. Gas Furnace:
        1) The burner shall be factory fired and adjusted for proper combustion.
        2) All gas piping shall enter the unit cabinet at single location. Provide ignition system, gas train and safety controls. Safety controls shall include: loss of airflow switch, temperature limit switches, flame rollout switch and pilot flame proving switches and any other controls required for proper system operation and code compliance. Provide redundant main gas valves and any other gas train components required by Owner's Insurer.
6. Filter Section: Filter section shall be MERV-13.
7. Automatic Temperature Controls:
    a. For constant volume systems, provide electronic, programmable heating/cooling room thermostat with sub-base.
    b. Equipment manufacturer's responsibilities for provision of automatic temperature control components and interface to ATC provided components are detailed on the Control Drawings which accompany these Specifications.
    c. Control dampers shall be low leakage type with leakage not to exceed 3% leakage at 3" WC differential pressure when fully closed. Smoke dampers are to be supplied with seals which will withstand temperatures of 400° F.
    d. The means of supply fan capacity control shall not be discharge dampers. If two (2) motor combinations or two (2) speed motors are provided for the supply fans, they shall not be used without an additional means of capacity control such as inlet vanes.
8. Motors and Electrical Requirements:
    a. All unit power wiring shall enter the casing at a single location.
    b. Electrical control cabinet shall include the following items:
        1) Power terminal block.
        2) Power transformer switch 115 volt secondary and 115 volt control fuse.
        3) 24 volt control transformer and fuse.
        4) All necessary relays.
        5) 115 volt terminal strip.
        6) 24 volt terminal strip containing wired terminals for all controls, numbered in accordance with the wiring diagram.
        7) An isolated 24 volt field wiring terminal strip.
        8) An electrical print pocket which shall contain the electrical print and maintenance instructions.
    c. All fan motors shall be high efficiency type – see "Motor and Starter" paragraph of these Specifications for requirements.

d. All power wiring shall be in conduit – no exposed wiring shall be permitted. All power or control wiring within the condenser section and any other wiring exposed to the elements shall be in vapor tight conduit.

E. Execution:

1. Startup of the rooftop unit shall be performed under the direct on-site supervision of a factory trained
2. manufacturer's representative. Startup shall not be performed exclusively by the Mechanical Contractor. See further requirements for startup under the Startup, Testing and Balancing Paragraph in PART 3 of these Specifications.
3. The Startup, Testing and Balancing paragraph in PART 3 of these Specifications contains requirements for two (2) meetings to be held in the Engineer's Office between the Mechanical Contractor, the Balancing Contractor and the Automatic Temperature Control Contractor. The rooftop unit's manufacturer's representative shall attend both meetings.
4. The Startup, Testing and Balancing paragraph of PART 3 of these Specifications requires that the rooftop unit's manufacturer's representative be on-site during the time when those parts of the air system balancing and temperature control testing, which effect the rooftop unit takes place. See "PART 3" of these Specifications for specific requirements.

## 2.13 CABINET UNIT HEATERS (HOT WATER)

A. General: Provide hot water cabinet style fan-forced unit heaters in the sizes and capacities listed on the drawings scheduled. Units shall be as manufactured by Sterling, Trane, Airedale, or an approved equal.

B. Typical Construction:

1. All units shall be complete with 16 gauge front panel, 18 gauge ends, tops and internal casing of electo-galvanneal steel.
2. Hot water coil shall have 1-1/4" copper tube stub ends.
3. Permanent split capacitor type motor shall be rated for 115 volts, 1-phase at the horsepower's indicated on the schedules.
4. Blowers shall be centrifugal type forward curved double width with galvanized fan wheel and galvanized fan housing.
5. Variable speed fan control via a solid state speed control switch shall be standard.
6. Completely removable and washable aluminum mesh screen filter shall be standard.
7. Piping and valve compartments shall be fully accessible through front of each unit by removing the front cover. Inlet and outlet grilles shall be stamped/louvered style.
8. A baked enamel eggshell finish shall be suitable of field re-painting. Units shall be provided with a color to be selected by the architect through the submittal process.

## 2.14 LOUVERS

A. General: Provide stationary drainable blade style architectural louvers as shown on the drawings and based on the drawing schedules as manufactured by Greenheck, Ruskin, or an approved equal. All louvers shall be designed to protect air intake and exhaust openings in building exterior walls. Design shall incorporate a drainable head member and stationary horizontal blades to channel water to the jambs and guide water through vertical downspouts to escape at the sill. All louver finishes shall be coordinated with the Project Architect

B. or Building Owner prior to final submittal to the Engineer.

C. Construction:

1. Frame: Heavy gauge extruded 6063-T5 aluminum, 4 inch by 0.081 inch nominal wall thickness.
2. Blades: Drainable design, heavy gauge extruded 6063-T5 aluminum, 0.081 inch nominal wall thickness, positioned at 37 degree and 45 degree angles on approximately 4 inch centers.
3. All components mechanically fastened.
4. Birdscreen: 3/4 inch by 0.051 inch flattened expanded aluminum in removable frame, inside mount.

D. Performance: Based on testing in standard air conditions – 0.075 lb./cubic foot, beginning point of water penetration shall be no less than 1007 feet/minute free air velocity. Individual louver panels shall be capable of withstanding a 25 pound/square foot wind load.

E. Certifications: All louvers shall be AMCA certified and may bear the AMCA Seal for air performance and water penetration ratings in accordance with AMCA publication 511.

F. Options: Where shown or scheduled, provide the following options or accessories.

1. Insect screens.
2. Blank-off panels.
3. Extended sills.
4. Filter racks.
5. Flanged frames.
6. Hinged frames.
7. Security bars.
8. Welded construction.
9. 0.125 inch nominal thick louver walls.
10. Architectural Finishes:
    a. Clear anodized.
    b. Integral color anodized.
    c. Baked enamel paint.
    d. Kynar paint.

## 2.15 FIN TUBE RADIATION

A. Provide hot water fin-tube heating elements and enclosures, where, and of capacities shown on Drawings, by Vulcan, Standard, Sterling.

B. Heating elements shall consist of 0.012” thick aluminum plate fins permanently bonded to seamless copper tube and guaranteed for working pressure of 300° F of 150 psi for 1” tube. Fins shall be bonded to copper tube by mechanical expansion.

C. Enclosures shall be galvanized steel with 18 gauge front panels.

D. Provide end trims with roll-flanged edges between ends of enclosures and walls on wall-to-wall applications, attached without visible fasteners and flush with enclosures.

E. Enclosure brackets and element hangers shall be no further than 4 feet apart. Brackets shall be die-formed from 16 gauge stock, 1-1/2” wide.

1. Secure enclosures to brackets with set-screws operated from beneath enclosures.
2. Insert brackets in pre-punched slots in mounting channel to ensure correct alignment and secure to wall at bottom.
3. Support heating element with sliding saddles and provide positive positioning of element in enclosure. Fins shall not impinge on brackets or enclosure joints during expansion or contraction.
4. Element supports shall be 16 gauge galvanized steel. Saddle shall slide freely on saddle support arm bolted to support bracket.
   a. Support arm shall allow 1-1/2” height adjustment.
   b. Element support saddle shall allow 1-5/8” lateral movement.
5. Provide tamper-proof modulating output control damper.

F. Provide hinged access doors with tamper-proof operators.

G. Provide expansion compensators every 20 feet on straight runs.

## 2.16 INLINE CENTRIFUGAL FANS

A. Provide where shown on Drawings of capacities as shown on schedules, inline centrifugal fan(s). All fans shall have their air performance rated by AMCA and shall bear the AMCA seal. Acceptable manufacturers, provided they meet the requirements of this specification and the performance and pressure class requirements shown on the schedules, shall be: Barry, Cook, Twin City, Greenheck.

B. Tubular housing shall be heavy gauge steel, all welded construction. Provide bolted and gasketed access door to permit inspection of fan impeller.

C. Fan wheel and drive assembly shall be statically and dynamically balanced at the factory. V-belt capacity shall be 150% of motor horsepower rating. Fan motor pulley shall be adjustable pitch type. Provide an adjustable motor base. Provide OSHA approved belt guard for drive components which are located outside of fan housing. Provide ports for tachometer speed measurements at motor shaft. Motors shall be high or premium efficiency type. See “Motors and Starters” paragraph of this specification for required efficiencies and other requirements.

D. Provide self-aligning bearings with minimum L-10 life of 200,000 hours. Provide extended lubrication lines.

## 2.17 VIBRATION ISOLATION AND SEISMIC RESTRAINTS FOR HVAC SYSTEMS

A. General:

1. Intent:
   a. All mechanical equipment, piping and ductwork as noted on the equipment schedule or in the specification shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonably uniform deflections.
   b. All isolators and isolation materials shall be of the same manufacturer and shall be certified by the manufacturer.
   c. It is the intent of the seismic portion of this specification to keep all mechanical and electrical building system components in place during a seismic event.
   d. All such systems must be installed in strict accordance with seismic codes, component manufacturer's recommendations and building construction standards. Whenever a

conflict occurs between the manufacturer's recommendations or construction standards, the most stringent shall apply.

e. This specification is considered to be minimum requirements for seismic consideration and is not intended as a substitute for legislated, more stringent, national,

f. state or local construction requirements (i.e. California Title 24, California OSHPD, Canadian Building Codes, or other requirements).

g. Any variance or non-compliance with these specification requirements shall be corrected by the contractor in an approved manner.

2. The work of this section includes but is not limited to the following:

   a. Vibration isolation elements.

   b. Equipment isolation bases.

   c. Piping flexible connections.

   d. Seismic restraints for isolated and non-isolated mechanical and electrical items.

   e. Certification of seismic restraint designs and installation supervision.

   f. Certification of seismic attachment of housekeeping pads.

   g. All Mechanical and Electrical systems. Equipment buried underground is excluded but entry of services through the foundation wall is included.

3. Qualifications:

   a. Only firms having five years' experience designing and manufacturing seismic devices shall be capable of work in this specification.

4. Definitions:

   a. Life Safety Systems:

      1) All systems involved with fire protection including sprinkler piping, fire pumps, jockey pumps, fire pump control panels, service water supply piping, water tanks, fire dampers and smoke exhaust systems.

      2) All systems involved with and/or connected to emergency power supply including all generators, transfer switches, transformers and all flow paths to fire protection and/or emergency lighting systems.

      3) All medical and life support systems.

      4) Fresh air relief systems on emergency control sequence including air handlers, conduit, duct, dampers, etc.

   b. Positive Attachment:

      1) A positive attachment is defined as a cast-in anchor, a drill-in wedge anchor, a double sided beam clamp loaded perpendicular to a beam, or a welded or bolted connection to structure. Single sided "C" type beam clamps for support rods of overhead piping, ductwork, fire protection, electrical conduit, bus duct, or cable trays, or any other equipment are not acceptable on this project as seismic anchor points.

   c. Transverse Bracing:

      1) Restraint(s) applied to limit motion perpendicular to the centerline of the pipe, duct or conduit.

   d. Longitudinal Bracing:

1) Restraint(s) applied to limit motion parallel to the centerline of the pipe, duct or conduit.

e. Failure:

1) For the purposes of this project, failure is defined as the discontinuance of any attachment point between equipment or structure, vertical permanent deformation greater than 1/8" (3mm) and/or horizontal permanent deformation greater than 1/4" (6mm).

5. Submittals:

a. Submittal material shall include copies of descriptive data for all products and materials including but not limited to the following:

1) Descriptive Data:

a) Catalog cuts or data sheets on vibration isolators and specific restraints detailing compliance with the specification.

b) An itemized list showing the items to be isolated and/or seismically restrained, product type or model number to be used and loading and deflection data.

2) Shop Drawings:

a) Submit fabrication details for equipment bases including dimensions, structural member sizes and support point locations.

b) Provide Drawings showing methods of suspension and support guides for conduit, piping, ductwork and ceiling hung equipment.

c) Where walls, floors, slabs or supplementary steel work are used for seismic restraint locations, details of acceptable attachment methods for ducts, conduit and pipe must be included and approved before the condition is accepted for installation. Restraint manufacturers' submittals must include spacing, static loads and seismic loads at all attachment and support points.

d) Provide specific details of seismic restraints and anchors; include number, size and locations for each piece of equipment.

e) Drawings showing methods for isolation of conduits, pipes and ductwork penetrating walls and floor slabs.

f) Specific details of restraints including anchor bolts for mounting and maximum loading at each location, for each piece of equipment and/or pipe and duct locations.

3) Seismic Certification and Analysis:

a) Seismic restraint calculations must be provided for all connections of equipment to the structure. Calculations must be stamped by a registered professional engineer with at least five years of seismic design experience, licensed in the state of the job location.

b) All restraining devices shall have a preapproval number from California OSHPD or some other recognized government agency showing maximum restraint ratings. Preapprovals based on independent testing are preferred to preapprovals based on calculations. Where preapproved devices are not available, submittals based on independent testing are preferred.

c) Calculations (including the combining of tensile and shear loadings) to support seismic restraint designs must be stamped by a registered professional engineer with at least five years of seismic design experience and licensed in the state of

the job location. Testing and calculations must include both shear and tensile loads as well as one test or analysis at 45 degrees to the weakest mode.

d) Analysis must indicate calculated dead loads, static seismic loads and capacity of materials utilized for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameter, embedment and/or welded length. All seismic restraint devices shall be designed to accept, without failure, the forces detailed in section 1.06 acting through the equipment center of gravity. Overturning moments may exceed forces at ground level.

6. Contractor's Responsibilities:
   a. Contractor to have the following responsibilities:
      1) Determine vibration isolation and seismic restraint sizes and locations per specifications.
      2) Provide and install isolation systems and seismic restraints as scheduled or specified.
      3) Guarantee specified isolation system deflection.
      4) Provide installation instructions, drawings and field supervision to assure proper installation and performance.
      5) Provide installation instructions, drawings and trained field supervision to insure proper installation and performance.
      6) Substitution of "Internally Isolated" mechanical equipment in lieu of the specified isolation of this section is acceptable.
7. Seismic Force Levels:
   a. Installations shall be designed to safely accept external forces determined in accordance with the International Building Code –2009, Section 16 in any direction for all rigidly supported equipment without failure and permanent displacement of the equipment. Seismic restraints shall not short circuit vibration isolation systems or transmit objectionable vibration or noise.
8. Project Record Documents:
   a. Submit under provision of Division 1.
   b. Record actual locations and installation of vibration isolators and seismic restraints including attachment points.

B. Products:
1. Manufacturers:
   a. Mason Industries Inc. (basis for model numbers listed below).
   b. Vibration Eliminator Co.
   c. Amber/Booth Co.
2. Product Descriptions:
   a. Vibration Isolators and Seismic Restraint Specifications:
      1) Specification 1 – Neoprene Pad:
         a) Two layers of 3/4" (19mm) thick neoprene pad consisting of 2" (50mm) square waffle modules separated horizontally by a 16 (1.5mm) gauge galvanized shim. Load distribution plates shall be used as required.

b) Pads shall be Type Super "W" as manufactured by Mason Industries, Inc.

2) Specification 2 – Bridge-Bearing Neoprene Mountings:

a) Bridge-bearing neoprene mountings shall have a minimum static deflection of 0.2" (5mm) and all directional seismic capability. The mount shall consist of a ductile iron casting containing two separated and opposing molded neoprene elements. The elements shall prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation. The shock absorbing neoprene materials shall be compounded to bridge-bearing specifications. Mountings shall have an Anchorage Preapproval "R" Number from OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings.

b) Mountings shall be Type BR as manufactured by Mason Industries, Inc.

3) Specification 3 – Bushing Assemblies:

a) Sheet metal panels shall be bolted to the walls or supporting structure by assemblies consisting of a neoprene bushing cushioned between 2 steel sleeves. The outer sleeve prevents the sheet metal from cutting into the neoprene. Enlarge panel holes as required. Neoprene elements pass over the bushing to cushion the back panel horizontally. A steel disc covers the inside neoprene element and the inner steel sleeve is elongated to act as a stop so tightening the anchor bolts does not interfere with panel isolation in 3 planes. Bushing assemblies can be applied to the ends of steel cross members where applicable. All neoprene shall be bridge bearing quality.

b) Bushing assemblies shall be type PB as manufactured by Mason Industries, Inc.

4) Specification 4 - Neoprene Bushing:

a) A one piece molded bridge bearing neoprene washer/bushing. The bushing shall surround the anchor bolt and have a flat washer face to avoid metal to metal contact.

b) Neoprene bushings shall be type HG as manufactured by Mason Industries, Inc.

5) Specification 5 – Spring Isolators:

a) Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cup or 1/4" (6mm) neoprene acoustical friction pad between the baseplate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height.

b) Mountings shall be Type SLF as manufactured by Mason Industries, Inc.

6) Specification 6 – Restrained Spring Mountings:

a) Restrained spring mountings shall have an SLF mounting as described in Specification 5, within a rigid housing that includes vertical limit stops to prevent spring extension when weight is removed. The housing shall serve as blocking during erection. A steel spacer shall be removed after adjustment. Installed and operating heights are equal. A minimum clearance of 1/2" (12mm) shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring action. Limit stops shall be out of contact during normal operation. Since housings

b) will be bolted or welded in position there must be an internal isolation pad. Housing shall be designed to resist all seismic forces. Mountings shall have Anchorage Preapproval "R" Number from OSHPD in the state of California certifying the maximum certified horizontal and vertical load ratings.

c) Mountings shall be SLR as manufactured by Mason Industries, Inc.

7) Specification 7 – Spring Mountings:

a) Spring mountings as in specification 5 built into a ductile iron or steel housing to provide all directional seismic snubbing. The snubber shall be adjustable vertically and allow a maximum of 1/4" (6mm) travel in all directions before contacting the resilient snubbing collars. Mountings shall have an Anchorage Preapproval "R" number from OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings.

b) Mountings shall be SSLFH as manufactured by Mason Industries, Inc.

8) Specification 8 – Air Springs:

a) Air Springs shall be manufactured with upper and lower steel sections connected by a replaceable flexible nylon reinforced neoprene element. Air spring configuration shall

b) be multiple bellows to achieve a maximum natural frequency of 3 Hz. Air Springs shall be designed for a burst pressure that is a minimum of three times the published maximum operating pressure. All air spring systems shall be connected to either the building control air or a supplementary air supply and equipped with three leveling valves to maintain leveling within plus or minus 1/8" (3mm). Submittals shall include natural frequency, load and damping tests performed by an independent lab or acoustician.

c) Air Springs shall be Type MT and leveling valves Type LV as manufactured by Mason Industries, Inc.

9) Specification 9 – Restrained Air Springs:

a) Restrained air spring mountings shall have an MT air spring as described in Specification 8, within a rigid housing that includes vertical limit stops to prevent air spring extension when weight is removed. The housing shall serve as blocking during erection. A steel spacer shall be removed after adjustment. Installed and operating heights are equal. A minimum clearance of 1/2" (12mm) shall be maintained around restraining bolts and between the housing and the

b) minimum clearance of 1/2" (12mm) shall be maintained around restraining bolts and between the housing and the air spring so as not to interfere with the air spring action. Limit stops shall be out of contact during normal operation. Housing shall be designed to resist all seismic forces.

c) Mountings shall be SLR-MT as manufactured by Mason Industries, Inc.

10) Specification 10 – Hangers:

a) Hangers shall consist of rigid steel frames containing minimum 1 1/4" (32mm) thick neoprene elements at the top and a steel spring with general characteristics as in specification 5 seated in a steel washer reinforced neoprene cup on the bottom. The neoprene element and the cup shall have neoprene bushings projecting through the steel box. To maintain stability the boxes shall not be articulated as clevis hangers nor the neoprene element stacked on top of the spring. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30o arc from side to side before

contacting the rod bushing and short circuiting the spring. Submittals shall include a hanger drawing showing the 30o capability.

b) Hangers shall be type 30N as manufactured by Mason Industries, Inc.

11) Specification 11 – Hangers:

a) Hangers shall be as described in 10, but they shall be pre-compressed and locked at the rated deflection by means of a resilient seismic upstop to keep the piping or equipment at a fixed elevation during installation. The hangers shall be designed with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. Deflection shall be clearly indicated by means of a scale. Submittals shall include a drawing of the hanger showing the 30o capability.

b) Hangers shall be type PC30N as manufactured by Mason Industries, Inc.

12) Specification 12 - Seismic Cable Restraints:

a) Seismic Cable Restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint. Cables must be pre-stretched to achieve a certified minimum modulus of elasticity. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement. Cables must not be allowed to bend across sharp edges. Cable

b) Seismic Cable Restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint. Cables must be pre-stretched to achieve a certified minimum modulus of elasticity. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement. Cables must not be allowed to bend across sharp edges. Cable assemblies shall have an Anchorage Preapproval "R" Number from OSHPD in the State of California verifying the maximum certified load ratings.

c) Cable assemblies shall be Type SCB at the ceiling and at the clevis bolt, SCBH between the hanger rod nut and the clevis or SCBV if clamped to a beam all as manufactured by Mason Industries, Inc.

13) Specification 13 – Seismic Solid Braces:

a) Seismic solid braces shall consist of steel angles or channels to resist seismic loads with a minimum safety factor of 2 and arranged to provide all directional restraint. Seismic solid brace end connectors shall be steel assemblies that swivel to the final installation angle and utilize two through

b) bolts to provide proper attachment. Seismic solid brace assembly shall have anchorage preapproval "R" number from OSHPD in the state of California verifying the maximum certified load ratings.

c) Solid seismic brace assemblies shall be type SSB as manufactured by Mason Industries, Inc.

14) Specification 14 – Rod Clamp Assemblies:

a) Steel angles, sized to prevent buckling, shall be clamped to pipe or equipment rods utilizing a minimum of three ductile iron clamps at each restraint location when required. Welding of support rods is not acceptable. Rod clamp assemblies shall have an Anchorage Preapproval "R" Number from OSHPD in

the State of California.

b) Rod clamp assemblies shall be Type SRC as manufactured by Mason Industries, Inc.

15) Specification 15 – Clevis Hanger Cross Brace:

a) Pipe clevis cross bolt braces are required in all restraint locations. They shall be special purpose preformed channels deep enough to be held in place by bolts passing over the cross bolt. Clevis cross braces shall have an Anchorage Preapproval "R" Number from OSHPD in the State of California.

b) Clevis cross brace shall be type CCB as manufactured by Mason Industries, Inc.

16) Specification 16 - All-Directional Seismic Snubbers:

a) All-directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene. Bushing shall be replaceable and a minimum of 1/4" (6mm) thick. Rated loadings shall not exceed 1000 psi (.7kg/mm2). A minimum air gap of 1/8" (3mm) shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces. Snubber end caps shall be removable to allow inspection of internal clearances. Neoprene bushings shall be rotated to insure no short circuits exist before systems are activated. Snubbers shall have an Anchorage Preapproval "R" Number from OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings.

b) Snubber shall be Type Z-1225 as manufactured by Mason Industries, Inc.

17) Specification 17 - All-Directional Seismic Snubbers:

a) All directional seismic snubbers shall consist of interlocking steel members restrained by shock absorbent rubber materials compounded to bridge bearing specifications. Elastomeric materials shall

b) be replaceable and a minimum of 3/4" (19mm) thick. Rated loadings shall not exceed 1000 psi (.7kg/mm2). Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8" (3mm) nor more than 1/4" (6mm). Snubbers shall be installed with factory set clearances. The capacity of the seismic snubber at 3/8" (9mm) deflection shall be equal or greater than the load assigned to the mounting grouping controlled by the snubber multiplied by the applicable "G" force. Submittals shall include the load deflection curves up to 1/2" (12mm) deflection in the x, y and z planes. Snubbers shall have an anchorage preapproval "R" number from OSHPD in the state of California verifying the maximum certified horizontal and vertical load ratings.

c) Snubbers shall be series Z-1011 as manufactured by Mason Industries, Inc.

18) Specification 18 – Stud Wedges:

a) Stud wedge anchors shall be manufactured from full diameter wire, not from undersized wire that is "rolled up" to create the thread. The stud anchor shall also have a safety shoulder which fully supports the wedge ring under load. The stud

b) anchors shall have an evaluation report number from the I.C.B.O Evaluation Service, Inc. verifying its allowable loads.

c) Drill-in stud wedge anchors shall be type SAS as manufactured by Mason Industries, Inc.

19) Specification 19 – Female Wedge Anchors:

    a) Female wedge anchors are preferred in floor locations so isolators or equipment can be slid into place after the anchors are installed. Anchors shall be manufactured from full diameter wire, and shall have a safety shoulder to fully support the wedge ring under load. Female wedge anchors shall have an evaluation report number from the I.C.B.O Evaluation Service, Inc. verifying to its allowable loads.

    b) Drill-in female wedge anchors shall be type SAB as manufactured by Mason Industries, Inc.

20) Specification 20 – Equipment Bases:

    a) Vibration isolation manufacturer shall furnish integral structural steel bases. Rectangular bases are preferred for all equipment. Centrifugal refrigeration machines and pump bases may be T or L shaped where space is a problem. Pump bases for split case pump shall include supports for suction and discharge elbows. All

    b) perimeter members shall be steel beams with a minimum depth equal to 1/10 of the longest dimension of the base. Base depth need not exceed 14" (350mm) provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer. Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1" (25mm).

    c) Bases shall be type WF as manufactured by Mason Industries, Inc.

21) Specification 21 – Inertia Foundations:

    a) ibration isolation manufacturer shall furnish rectangular steel concrete pouring forms for floating and inertia foundations. Bases for split case pumps shall be large enough to provide for suction and discharge elbows. Bases shall be a minimum of 1/12 of the longest dimension of the base but not less than 6" (150mm). The base depth need not exceed 12" (300mm) unless specifically recommended by the base manufacturer for mass or rigidity. Forms shall include minimum concrete reinforcing consisting of 1/2" (12mm) bars welded in place on 6" (150mm) centers running both ways in a layer 1 1/2" (38mm) V above the bottom. Forms shall be furnished with steel

    b) templates to hold the anchor bolts sleeves and anchors while concrete is being poured. Height saving brackets shall be employed in all mounting locations to maintain a 1" (25mm) clearance below the base. Wooden formed bases leaving a concrete rather than a steel finish are not acceptable.

    c) Base shall be type BMK or K as manufactured by Mason Industries, Inc.

22) Specification 22 – Curbs:

    a) Curb mounted rooftop equipment shall be mounted on spring isolation curbs. The lower member shall consist of a sheet metal Z section containing adjustable and removable steel springs that support the upper floating section. The upper frame must provide continuous support for the equipment and must be captive so as to resiliently resist wind and seismic forces. All directional neoprene snubber bushings shall be a minimum of 1/4" (6mm) thick. Steel springs shall be laterally stable and rest on 1/4" (6mm) thick neoprene acoustical pads. Hardware must be plated and the springs provided with a rust resistant finish. The curbs waterproofing shall consist of a continuous galvanized flexible counter flashing

    b) nailed over the lower curbs waterproofing and joined at the corners by EPDM bellows. All spring locations shall have access ports with removable waterproof

covers. Lower curbs shall have provision for 2" (50mm) of insulation. The roof curbs shall be built to seismically contain the rooftop unit. The unit must be solidly fastened to the top floating rail, and the lower Z section anchored to the roof structure. Curb shall have anchorage preapproval "R" from OSHPD in the state of California attesting to the maximum certified horizontal and vertical load ratings.

c) Curb shall be type RSC as manufactured by Mason Industries, Inc.

23) Specification 23 – Expansion Joints:

a) 3/4" (19mm) to 1 2" (38mm) may have threaded two piece bolted flange assemblies, one sphere and cable retention. Connectors shall be rated at 250 psi (1.72MPa) up to 170o F (77oC) with a uniform drop in allowable pressure to 215 psi (1.48MPa)at 250o F (121oC) in sizes through14"(350mm). 16" (400mm) through 24" (600mm) single sphere minimum ratings are 180 psi (1.24MPa) at 170o

b) F (77oC) and 150 psi (1.03 MPa) at 250o F (121oC). Higher rated connectors may be used to accommodate service conditions. All expansion joints must be factory tested to 150% of rated pressure for 12 minutes before shipment. Safety factors to burst and flange pullout shall be a minimum of 3/1. Concentric reducers to the above ratings may be substituted for equal ended expansion joints.

c) Expansion joints shall be installed in piping gaps equal to the length of the expansion joints under pressure. Control rods need only be used in unanchored piping locations where the manufacturer determines the installation exceeds the pressure requirement without control rods. If control rods are used, they must have 2" (12mm) thick Neoprene washer bushings large enough in diameter to take the thrust at 1000 psi (.7 kg/mm2) maximum on the washer area.

d) Submittals shall include two test reports by independent consultants showing minimum reductions of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies on this or a similar product by the same manufacturer. All expansion joints shall be installed on the equipment side of the shut off valves.

e) Expansion joints shall be SAFEFLEX SFDEJ, SFEJ, SFDCR or SFU and Control Rods CR as manufactured by Mason Industries, Inc.

24) Specification 24 – Flexible Stainless Steel Hoses

a) Flexible stainless steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3" (75mm) and larger shall be flanged. Smaller sizes shall have male nipples. Minimum lengths shall be as tabulated:

| Flanged | | Male Nipples | |
|---|---|---|---|
| 3 x 14 | 10 x 26 | 1/2 x 9 | 1 1/2 x 13 |
| 4 x 15 | 12 x 28 | 3/4 x 10 | 2 x 14 |
| 5 x 19 | 14 x 30 | 1 x 11 | 2 1/2 x 18 |
| 6 x 20 | 16 x 32 | 1 1/4 x 12 | |
| 8 x 22 | | | |

b) Hoses shall be installed on the equipment side of the shut-off valves horizontally

and parallel to the equipment shafts wherever possible.

c) Hoses shall be type BSS as manufactured by Mason Industries, Inc.

25) Specification 25 - All-Directional Acoustical Pipe Anchor:

a) All-directional acoustical pipe anchor, consisting of two sizes of steel tubing separated by a minimum 1/2" (12mm) thick 60 durometer neoprene. Vertical restraint shall be provided by similar material arranged to prevent vertical travel in either direction.

b) Allowable loads on the isolation material should not exceed 500 psi (.35 kg/mm2) and the design shall be balanced for equal resistance in any direction.

c) All-directional anchors shall be type ADA as manufactured by Mason Industries, Inc.

26) Specification 26 – Pipe Guides:

a) Pipe guides shall consist of a telescopic arrangement of two sizes of steel tubing separated by a minimum 1/2" (12mm) thickness of 60 durometer neoprene. The height of the guides shall be preset with a shear pin to allow vertical motion due to pipe expansion or contraction. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of + 1 5/8" (41mm) motion, or to meet location requirements.

b) Pipe guides shall be type VSG as manufactured by Mason Industries, Inc.

27) Specification 27 - Split Wall Seals:

a) Split Wall Seals consist of two bolted pipe halves with minimum 3/4" (19mm) thick neoprene sponge bonded to the inner faces. The seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping. Concrete may be packed around the seal to make it integral with the floor, wall

b) or ceiling if the seal is not already in place around the pipe prior to the construction of the building member. Seals shall project a minimum of l" (25mm) past either face of the wall. Where temperatures exceed 240o F (115oC), 10# (4.5kg) density fiberglass may be used in lieu of the sponge.

c) Seals shall be Type SWS as manufactured by Mason Industries, Inc.

28) Specification 28 - Horizontal Thrust Restraint:

a) The horizontal thrust restraint shall consist of a spring element in series with a neoprene molded cup as described in specification 5 with the same deflection as specified for the mountings or hangers. The spring element shall be designed so it can be preset for thrust at the factory and adjusted in the field to allow for a maximum of 1/4" (6mm) movement at start and stop. The assembly shall be furnished with 1 rod and angle brackets for attachment to both the equipment and the duct work or the equipment and the structure. Horizontal restraints shall be attached at the centerline of thrust and symmetrical on either side of the unit.

b) Horizontal thrust restraints shall be type WBI/WBD as manufactured by Mason Industries, Inc.

C. Execution:

1. General:

a. Vibration isolators and seismic restraint systems shall control excessive noise and vibration in the buildings due to the operation of machinery or equipment, and/or due to

interconnected piping, ductwork, or conduit. [The installation of all vibration isolators and seismic restraint units, and associated hangers and bases, shall be under the direct supervision of the vibration isolation manufacturer's representative.]

b. All vibration isolators and seismic restraint systems must be installed in strict accordance with the manufacturers written instructions and all certified submittal data.

c. Installation of vibration isolators and seismic restraints must not cause any change of position of equipment, piping or ductwork resulting in stresses or misalignment.

d. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.

e. The contractor shall not install any equipment, piping, duct or conduit that makes rigid connections with the building unless isolation is not specified. "Building" includes, but is not limited to, slabs, beams, columns, studs and walls.

f. Coordinate work with other trades to avoid rigid contact with the building.

g. Any conflicts with other trades that will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions should be

h. brought to the architects/engineers attention prior to installation. Corrective work necessitated by conflicts after installation shall be at the responsible contractor’s expense.

i. Bring to the architects/engineers attention any discrepancies between the specifications and the field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the responsible contractor’s expense.

j. Correct, at no additional cost, all installations that are deemed defective in workmanship and materials at the contractor’s expense.

k. Overstressing of the building structure must not occur because of overhead support of equipment. Contractor must submit loads to the structural engineer of record for approval. Generally bracing may occur from:

   1) Flanges of structural beams.

   2) Upper truss cords in bar joist construction.

   3) Cast in place inserts or wedge type drill-in concrete anchors.

l. Specification 12 cable restraints shall be installed slightly slack to avoid short circuiting the isolated suspended equipment, piping or conduit.

m. Specification 12 cable assemblies are installed taut on non-isolated systems. Specification 13 seismic solid braces may be used in place of cables on rigidly attached systems only.

n. At locations where specification 12 or 13 restraints are located, the support rods must be braced when necessary to accept compressive loads with specification 14 braces.

o. At all locations where specification 12 or 13 restraints are attached to pipe clevis's, the clevis cross bolt must be reinforced with specification type 15 braces.

p. Drill-in concrete anchors for ceiling and wall installation shall be specification type 18, and specification type 19 female wedge type for floor mounted equipment.

q. Vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not permitted on this project. Each fan and motor assembly shall be supported on a single structural steel frame.

r. Hand built elastomeric expansion joints may be used when pipe sizes exceed 24" or specified movements exceed specification 23 capabilities.

s. Where piping passes through walls, floors or ceilings the vibration isolation manufacturer shall provide specification 27 wall seals.

t. Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust in relation to the equipment weight. Horizontal thrust restraint shall be specification type 28 (see selection guide).

u. Locate isolation hangers as near to the overhead support structure as possible.

v. [Provide resiliently mounted equipment, piping, and ductwork with seismic snubbers. Each inertia base shall have minimum of four seismic snubbers located close to isolators. Snub equipment designated for post disaster use to 0.05 inch (1.5 mm) maximum clearance. Other snubbers shall have clearance between 0.15 inch (4 mm) and 0.25 inch (7 mm).]

2. Vibration Isolation and Seismic Restraint Installation:

a. Horizontal pipe isolation: The first three pipe hangers in the main lines near the mechanical equipment shall be as described in specification 11. Specification 11 hangers must also be used in all transverse braced isolated locations. Brace hanger rods with SRC clamps specification 14. Horizontal runs in all other locations throughout the building shall be isolated by hangers as described in specification 10. Floor supported piping shall rest on isolators as described in specification 6. Heat exchanger's and expansion tanks are considered part of the piping run. The first three isolators from the isolated equipment will have the same static deflection as specified for the mountings under the connected equipment. If piping is connected to equipment located in basements and hangs from ceilings under occupied spaces the first three hangers shall have 0.75" (19mm) deflection for pipe sizes up to and including 3" (75mm), 1 1/2" (38mm) deflection for pipe sizes up to and including 6" (150mm), and 2 1/2" (64mm) deflection thereafter. Hangers shall be located as close to the overhead structure as practical. Where piping connects to mechanical equipment install specification 23 expansion joints or specification 24 stainless hoses if 23 is not suitable for the service.

b. Riser isolation: Risers shall be suspended from specification 10 hangers or supported by specification 5 mountings, anchored with specification 25 anchors, and guided with specification 26 sliding guides. Steel springs shall be a minimum of 0.75" (19mm) except in those expansion locations where additional deflection is required to limit load changes to + 25% of the initial load. Submittals must include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on the building structure, spring deflection changes and seismic loads. Submittal data shall include certification that the riser system has been examined for excessive stresses and that none will exist in the proposed design.

c. [Building expansion joints: Install swing joints at piping crossing expansion joints and brace piping either side of the expansion joint.]

d. Seismic Restraint of Piping:

1) Seismically restrain all piping listed as a, b or c below. Use specification 12 cables if isolated. Specification 12 or 13 restraints may be used on unisolated piping.

a) Fuel oil piping, gas piping, medical gas piping, and compressed air piping that is 1" (25mm) I.D. or larger.

b) Piping located in boiler rooms, mechanical equipment rooms, and refrigeration equipment rooms that is 1 1/4" (32mm) I.D. and larger.

c) All other piping 2 1/2" (64mm) diameter and larger.

2) Transverse piping restraints shall be at 40' (12m) maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.

3) Longitudinal restraints shall be at 80' (24m) maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.

4) Where thermal expansion is a consideration, guides and anchors may be used as transverse and longitudinal restraints provided they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion or contraction.

5) For fuel oil and all gas piping transverse restraints must be at 20' (6m) maximum and longitudinal restraints at 40' (12m) maximum spacing.

6) Transverse restraint for one pipe section may also act as a longitudinal restraint for a pipe section of the same size connected perpendicular to it if the restraint is installed within 24" (600m) of the elbow or TEE or combined stresses are within allowable limits at longer distances.

7) Hold down clamps must be used to attach pipe to all trapeze members before applying restraints in a manner similar to clevis supports.

8) Branch lines may not be used to restrain main lines.

9) Cast iron pipe of all types, glass pipe and any other pipes joined with a four band shield and clamp assembly in Zones 2B, 3 and 4 shall be braced as in sections 3.2.D.2 and 3. For Zones 0, 1 and 2A, 2 band clamps may be used with reduced spacings of 1/2 of those listed in sections 3.2.D.2 and 3.

e. Vibration Isolation of Ductwork:

1) All discharge runs for a distance of 50' (15m) from the connected equipment shall be isolated from the building structure by means of specification 10 hangers or specification 5 floor isolators. Spring deflection shall be a minimum of 0.75" (19mm).

2) All duct runs having air velocity of 1000 fpm (5 m/s) or more shall be isolated from the building structure by specification 11 hangers or specification 5 floor supports. Spring deflection shall be a minimum of 0.75" (19mm).

3) Flexible duct connections shall be provided at inlet and discharge ducts. Refer to Section 15910.

f. Seismic Restraint of Ductwork:

1) Seismically restrain all duct work with specification 12 or 13 restraints as listed below:

a) Restrain rectangular ducts with cross sectional area of 6 sq.ft. (.5 m2) or larger.

b) Restrain round ducts with diameters of 28" (700mm) or larger.

c) Restrain flat oval ducts the same as rectangular ducts of the same nominal size.

2) Transverse restraints shall occur at 30' (9mm) intervals or at both ends of the duct run if less than the specified interval. Transverse restraints shall be installed at each duct turn and at each end of a duct run.

3) Longitudinal restraints shall occur at 60' (18m) intervals with at least one restraint per duct run. Transverse restraints for one duct section may also act as a longitudinal restraint for a duct section connected perpendicular to it if the restraints are installed within 4' (1.2m) of the intersection of the ducts and if the restraints are sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.

4) The ductwork must be reinforced at the restraint locations. Reinforcement shall

consist of an additional angle on top of the ductwork that is attached to the support hanger rods. Ductwork is to be attached to both upper angle and lower trapeze.

5) A group of ducts may be combined in a larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.

6) Walls, including gypsum board non-bearing partitions, which have ducts running through them may replace a typical transverse brace. Provide channel framing around ducts and solid blocking between the duct and frame.

7) Chimneys and stacks passing through floors are to be bolted at each floor level or secured above and below each floor with riser clamps and specification type 13 for seismic solid brace restraints.

8) Chimneys and stacks running horizontally to be braced every 30’ with specification type 12 seismic cable restraints or specification type 13 for seismic solid brace restraints.

g. Seismic Restraint of Electrical Services:

1) All electrical conduit 2 1/2" (64mm) in diameter and larger shall be restrained with specification type 12 seismic cable restraints or specification type 13 for seismic solid brace restraints.

2) All electrical bus ducts, cable trays and ladder trays shall be restrained with specification type 12, seismic cable restraints or specification 13 seismic solid brace restraints.

3) Transverse restraints shall occur at 30' (9m) intervals or both ends if the electrical run is less than the specified interval. Transverse restraints shall be installed at each electrical services turn and at each end of the electric run.

4) Longitudinal restraints shall occur at 60' (9m) intervals with at least one restraint per electric run. Transverse restraints for one electric section may also act as a longitudinal restraint for a duct for an electric section connected perpendicular to it if the restraints are installed within 4' (1.2m) of the intersection of the electric run and if the restraints are sized for the larger electric run.

5) All rigid floor mounted equipment must have a resilient media between the equipment mounting hole and the anchor bolt. Anchor bolts shall be designed in accordance with section 1.9 seismic forces. Neoprene bushings shall be specification type 4 and anchor bolts shall be specification type 18 or 19.

6) Wall mounted panels shall be mounted with specification type 3 bushings. Floor mounted panels shall be mounted on specification type 4 bushings. Anchor bolts shall be specification type 18 or 19.

h. All fire protection piping shall be braced in accordance with NFPA 13 and 14.

i. Vibration Isolation and Seismic Restraint of Mechanical Equipment

1) All mechanical equipment shall be vibration isolated and seismically restrained as per the schedules in part 3.5 of this specification.

2) Equipment mounted on housekeeping pads: Pads shall be properly doweled or expansion shielded to deck to meet acceleration criteria.

3) Requirements for installation on concrete inertia bases shall be as follows:

a) Minimum operating clearance between concrete inertia and base and housekeeping pad or floor shall be 2".

b) The equipment structural steel or concrete inertia base shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the machine or isolators.

c) The isolators shall be installed without raising the machine and frame assembly.

d) After the entire installation is complete and under full operational load, the isolators shall be adjusted so that the load is transferred from the blocks to the isolators. When all isolators are properly adjusted, the blocks or shims shall be barely free and shall be removed.

e) Install equipment with flexibility in wiring connection.

f) Verify that all installed isolator and mounting systems permit equipment motion in all directions. Adjust or provide additional resilient restraints to flexibly limit start-up equipment lateral motion to 1/4".

g) Prior to start-up, clean out all foreign matter between bases and equipment. Verify that there are no isolation short circuits in the base, isolators, or seismic restraints.

3. Seismic Restraint Exclusions:

a. General: All mechanical and electrical components and systems that are considered exempt from the requirement for seismic restraint, in accordance with The International Building Code – 2003, Section 1621, shall not require seismic restraint.

b. Piping:

1) Piping in boiler and mechanical rooms less than 1 1/4" (32mm) inside diameter.

2) All other piping less than 2 1/2" (64mm) inside diameter.

3) All piping suspended by individual hangers 12" (300mm) or less as measured from the top of the pipe to the bottom of the support where the hanger is attached. However, if the 12" (300mm) limit is exceeded by any hanger in the run, seismic bracing is required for the run.

4) The 12" (300mm) exemption applies for trapeze supported systems if the top of each item supported by the trapeze qualifies.

c. Ductwork:

1) Rectangular and square and ducts that are less than 6 square feet in cross sectional area.

2) Oval ducts that are less than 6 square feet (.5m2) in cross sectional area based on nominal size.

3) Round duct less than 28" (.5m2) in diameter.

4) All duct suspended by hangers 12" (300mm) or less in length as measured from the top of the duct to the point of attachment to the structure. Hangers must be attached within 2" (50mm) of the top of the duct with a minimum of two #10 sheet metal screws. If the 12" (300mm) limit is exceeded by any hanger in the run, seismic bracing is required for the run.

d. Electrical:

1) All conduit less than 2 1/2" (64mm) diameter suspended by individual hanger rods.

2) All conduits suspended by individual hangers 12" (300mm) or less as measured from the top of the conduit to the bottom of the support where the hanger is a attached. However, if the 12" (300mm) limit is exceeded by any hanger in the run, seismic

bracing is required for the run.

3) The 12" (300mm) exemption applies for trapeze supported systems if the top of each item supported by the trapeze qualifies.

4. Inspection:

   a. Examine systems under provisions of Division 1.

   b. On completion of installation of all vibration isolation devices herein specified, the local representative shall inspect the completed system and report in writing any installation error, improperly elected isolation devices, or other faults in the system that could affect the performance of the system. Contractor shall submit a report to the Owner, including the manufacturers representatives' final report, indicating all isolation reported as properly installed or requiring correction, and include a report by the Contractor on steps taken to properly complete the isolation work.

5. Schedules:

| SPECIFICATION SELECTION GUIDE | ISOLATION, DEFLECTION AND SEISMIC RESTRAINT CRITERIA FOR SOLID CONCRETE FLOORS 4" AND THICKER (NOTE 7) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Ground Supported Slab or Basement | | 20' Floor Span Possible Floor Defl. – 0.67" | | 30' Floor Span Possible Floor Defl. – 1.0" | | 40' Floor Span Possible Floor Defl. – 1.33" | | 50' Floor Span Possible Floor Defl. – 1.67" | |
| | Isol. & Seismic Spec. | Isol. Defl. | Isol. & Seismic Spec. | Isol. Defl. | Isol. & Seismic Spec. | Isol. Defl. | Isol. & Seismic Spec. | Isol. Defl. | Isol. & Seismic Spec. | Isol. Defl. |
| REFRIG. MACHINES | | | | | | | | | | |
| Absorption Machines | 2-23 | 0.35 | 6-23 | 0.75 | 6-23 | 0.75 | 6-23 | 1.5 | 6-23 | 1.5 |
| Centrifugal Chillers or Heat Pumps | | | | | | | | | | |
| Cooler Condenser Mounted Hermetic Compressors | 2-20-23 | 0.35 | 6-20-23 | 0.75 | 6-20-23 | 1.5 | 6-23 | 1.5 | 6-20-23 | 2.5 |
| Cooler Condenser Alongside Hermetic Compressor | 2-23 | 0.35 | 6-23 | 0.75 | 6-23 | 1.5 | 6-23 | 1.5 | 6-23 | 2.5 |
| Open Type Compressor (note 3) | 2-23 | 0.35 | 6-23 | 0.75 | 6-23 | 1.5 | 6-20-23 | 1.5 | 6-20-23 | 2.5 |
| Refrig. Reciprocating Compressors | | | | | | | | | | |
| 500 rpm to 750 rpm | 6-23 | 0.75 | 6-23 | 1.5 | 6-23 | 1.5 | 6-20-23 | 2.5 | 6-20-23 | 3.5 |

| SPECIFICATION SELECTION GUIDE | ISOLATION, DEFLECTION AND SEISMIC RESTRAINT CRITERIA FOR SOLID CONCRETE FLOORS 4" AND THICKER (NOTE 7) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Ground Supported Slab or Basement | | 20' Floor Span Possible Floor Defl. – 0.67" | | 30' Floor Span Possible Floor Defl. – 1.0" | | 40' Floor Span Possible Floor Defl. – 1.33" | | 50' Floor Span Possible Floor Defl. – 1.67" | |
| | Isol. & Seismic Spec. | Isol. Defl. | Isol. & Seismic Spec. | Isol. Defl. | Isol. & Seismic Spec. | Isol. Defl. | Isol. & Seismic Spec. | Isol. Defl. | Isol. & Seismic Spec. | Isol. Defl. |
| 751 rpm and Over | 6-23 | 0.75 | 6-23 | 0.25 | 6-23 | 1.5 | 6-20-23 | 2.5 | 6-20-23 | 3.5 |
| Reciprocating Chillers or Heat Pumps | | | | | | | | | | |
| 500 rpm to 750 rpm | 6-23 | 0.75 | 6-23 | 1.5 | 6-23 | 1.5 | 6-20-23 | 2.5 | 6-20-23 | 3.5 |
| 751 rpm and Over | 6-23 | 0.75 | 6-23 | 0.75 | 6-20-23 | 1.5 | 6-20-23 | 2.5 | 6-20-23 | 3.5 |
| PACKAGED STEAM GENERATIONS (Boilers) | 2-24 | 0.35 | 6-24 | 0.75 | 6-24 | 0.75 | 6-24 | 1.5 | 5,23,24 | 2.5 |
| PUMPS | | | | | | | | | | |
| Closed Coupled | | | | | | | | | | |
| Thru 5 hp | 2-21-23 | 0.35 | 5-16-21-23 | 0.75 | 5-16-21-23 | 0.75 | 5-16-21-23 | 1.5 | 5-16-21-23 | 1.5 |
| 7 ½ hp and Larger | 5-16-21-23 | 0.75 | 5-16-21-23 | 0.75 | 5-16-21-23 | 1.5 | 5-16-21-23 | 1.5 | 5-16-21-23 | 2.5 |
| Base Mounted (note 2) | | | | | | | | | | |
| Thru 60 hp | 5-16-21-23 | 0.75 | 5-16-21-23 | 0.75 | 5-16-21-23 | 1.5 | 5-16-21-23 | 1.5 | 5-16-21-23 | 2.5 |
| 75 hp and Larger | 5-16-21-23 | 0.75 | 5-16-21-23 | 1.5 | 5-16-21-23 | 2.5 | 5-16-21-23 | 2.5 | 5-16-21-23 | 3.5 |
| FACTORY ASSEMBLED H & V UNITS | | | | | | | | | | |
| Curb Mounted Roof Top Units | | | 22 | 1.0 | 22 | 2.5 | 22 | 2.5 | 22 | 2.5 |
| Suspended Units (for Fan Heads see Blowers Guide) | | | | | | | | | | |
| Thru 5 hp | 10-12 | 1.0 | 10-12 | 1.0 | 10-12 | 1.0 | 10-12 | 1.0 | 10-12 | 1.0 |
| 7 ½ hp and Larger – 275 rpm to 400 rpm | 10-12 | 1.5 | 10-12 | 1.5 | 10-12 | 1.5 | 10-12 | 1.5 | 10-12 | 1.5 |

| SPECIFICATION SELECTION GUIDE | ISOLATION, DEFLECTION AND SEISMIC RESTRAINT CRITERIA FOR SOLID CONCRETE FLOORS 4" AND THICKER (NOTE 7) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Ground Supported Slab or Basement | | 20' Floor Span Possible Floor Defl. – 0.67" | | 30' Floor Span Possible Floor Defl. – 1.0" | | 40' Floor Span Possible Floor Defl. – 1.33" | | 50' Floor Span Possible Floor Defl. – 1.67" | |
| | Isol. & Seismic Spec. | Isol. Defl. | Isol. & Seismic Spec. | Isol. Defl. | Isol. & Seismic Spec. | Isol. Defl. | Isol. & Seismic Spec. | Isol. Defl. | Isol. & Seismic Spec. | Isol. Defl. |
| 7 ½ hp and Larger – 401 rpm and Over | 10-12 | 1.0 | 10-12 | 1.0 | 10-12 | 1.0 | 10-12 | 1.5 | 10-12 | 2.5 |
| Floor Mounted Units (for Fan Heads see Blowers Guide) | | | | | | | | | | |
| Thru 5 hp | 2 | 0.35 | 7 | 0.75 | 7 | 0.75 | 7 | 0.25 | 7 | 0.75 |
| 7 ½ hp and Larger – 275 rpm to 400 rpm | 2 | 0.35 | 7 | 1.5 | 7 | 1.5 | 7 | 1.5 | 7 | 1.5 |
| 7 ½ hp to 40 hp – 401 rpm and Over | 2 | 0.35 | 7 | 0.75 | 7 | 0.75 | 7 | 1.5 | 5-16-20 | 2.5 |
| 50 hp and Larger – 401 rpm and Over | 2 | 0.35 | 7 | 0.75 | 7 | 1.5 | 5-16-20 | 2.5 | 5-16-20 | 3.5 |
| AIR COMPRESSOR | | | | | | | | | | |
| Tank Mounted Type | 5-16-21-24 | 0.75 | 5-16-21-24 | 0.75 | 5-16-21-24 | 1.5 | 5-16-21-24 | 2.5 | 5-16-21-24 | 3.5 |
| V – W Type | 5-16-21-24 | 0.75 | 5-16-21-24 | 0.75 | 5-16-21-24 | 1.5 | 5-16-21-24 | 2.5 | 5-16-21-24 | 3.5 |
| Horz, Vert, 1 or 2 Cylinders | | | | | | | | | | |
| 275 rpm to 499 rpm | 5-16-21-24 | 2.5 | 5-16-21-24 | 2.5 | 5-16-21-24 | 2.5 | 5-16-21-24 | 3.5 | 5-16-21-24 | 3.5 |
| 500 rpm to 800 rpm | 5-16-21-24 | 1.5 | 5-16-21-24 | 1.5 | 5-16-21-24 | 2.5 | 5-16-21-24 | 3.5 | 5-16-21-24 | 3.5 |

| SPECIFICATION SELECTION GUIDE | DEFLECTION AND MOUNTING CRITERIA FOR SOLID CONCRETE FLOORS 4" OR THICKER (NOTE 7) | | | | | |
|---|---|---|---|---|---|---|
| | Ground Supported Slab or Basement | | 20' Floor Span Possible Floor Defl. – 0.67" | 30' Floor Span Possible Floor Defl. – 1.0" | 40' Floor Span Possible Floor Defl. – 1.33" | 50' Floor Span Possible Floor Defl. – 1.67" |
| | Engr Spec | Min Static Defl (in) (note 1) | Engineer Specifications and Minimum Static Deflection as tabulated below (note 1) | | | |
| **Blowers** | | | | | | |
| Utilities Set | | | | | | |
| Floor Mounted (note 5) | 2 | 0.35 | Spec 7 for 0.75" and 1/5" deflection and Spec 5-20-16 for over 1.5" deflection with deflection from Blower Minimum Deflection Guide, but not to exceed 2.5" | | | |
| Roof Mounted | | | Spec 5-21-16 with deflection from Blower Minimum Deflection Guide. If roof will not handle concrete base load use Spec 6 for 0.75 and 1.5" deflection and Spec 6-20 for over 1.5" deflection | | | |
| Suspended Unit (note 5) | | | Spec 10-12 with deflection from Blower Minimum Deflection Guide, not to exceed 2.5" deflection | | | |
| Centrifugal Blowers (note 6) | 2-21 | 0.35 | Spec 5-21-16 with deflection from Blower Minimum Deflection Guide | | | |
| Fan Heads | | | | | | |
| Floor Mounted | 2-28 | 0.35 | Spec 7-28 if 0.75" or 1.5" deflection or Spec 5-20-16-28 for deflection over 1.5" to 4.5" from Blower Minimum Deflection Guide. | | | |
| Suspended Units | | | Spec 10-12-28 with deflection from Blower Minimum Deflection Guide | | | |
| **Tubular Centrifugal and Axial Fans** | | | | | | |
| **Suspended Units** | | | **Spec 10-12 with deflection from Blower Minimum Deflection Guide, Spec 10-12-28 for over 4" static pressure** | | | |
| Floor Mounted with Motor on/in Fan Casing | 2 | 0.35 | Spec 7 for 0.75" to 1.5" deflection and Spec 5-20-16 for over 1/5" deflection with deflection from Blower Minimum Deflection Guide, Spec 5-21-16 or 5-16-28 for over 4" static pressure | | | |
| Floor Mounted Arrangement 1 or any Separately Mounted Motor | 2-21 | 0.35 | Spec 5-21-16 with deflection from Blower Minimum Deflection Guide | | | |

| | DEFLECTION AND MOUNTING CRITERIA FOR SOLID CONCRETE FLOORS 4" OR THICKER (NOTE 7) | | | | | |
|---|---|---|---|---|---|---|
| | Ground Supported Slab or Basement | | 20' Floor Span Possible Floor Defl. – 0.67" | 30' Floor Span Possible Floor Defl. – 1.0" | 40' Floor Span Possible Floor Defl. – 1.33" | 50' Floor Span Possible Floor Defl. – 1.67" |
| SPECIFICATION SELECTION GUIDE | Engr Spec | Min Static Defl (in) (note 1) | Engineer Specifications and Minimum Static Deflection as tabulated below (note 1) | | | |
| **Cooling Towers & Condensing Units** | 2 | 0.35 | Spec 6 with deflection from Blower Minimum Deflection Guide | | | |

| **Blower Minimum Deflection Guide** | | | | | |
|---|---|---|---|---|---|
| **Fan Speed RPM** | **Required Deflection for Ground Supported Slab or Basement** | **Required Deflection for 20' Floor Span** | **Required Deflection for 30' Floor Span** | **Required Deflection for 40' Floor Span** | **Required Deflection for 50' Floor Span** |
| 500 and up | 0.35" | 0.75" | 1.5" | 2.5" | 3.5" |
| 375-499 | 0.35" | 1.5" | 2.5" | 3.5" | 3.5" |
| 300-374 | 0.35" | 2.5" | 2.5" | 3.5" | 3.5" |
| 225-299 | 0.35" | 3.5" | 3.5" | 3.5" | 3.5" |
| 175-225 | 0.35" | 3.5" | 4.5" | 4.5" | 4.5" |
| When blowers are 60 HP or larger, select deflection requirements for next larger span. A minimum of 2.5" should be used unless larger deflections are called for on the chart or these fans are located in the lowest sub-basement or on a slab on grade. | | | | | |

6. Notes:
   a. Minimum deflection called for in this specification are not 'nominal' but certifiable minimums. The 0.75", 1.5", 2.5", 3.5", and 4.5" minimums should be selected from manufacturer's nominal 1", 2", 3", 4" and 5" series respectively. Air spring isolation specifications 8 & 9 may be substituted for steel springs above in highly sensitive noise free locations.
   b. Vacuum, Condensate or Boiler Feed Pumps shall be mounted with their tanks on a common spec. 21 base with deflections as specified for base mounted pumps.
   c. The base described in specification 20 is used under the drive side. Individual mountings as described in specification 6 are used under the Cooler and Condenser.
   d. This type of compressor is highly unbalanced and sometimes requires inertia bases weighing 5 to 7 times equipment weight to reduce running motion.
   e. Limit deflection f or utility sets 18" wheel diameter and smaller to 1 1/2".
   f. FLOATING CONCRETE INERTIA BASES. Floating concrete inertia bases do not reduce vibration transmitted to the structure through the mountings. These bases will reduce vibratory motion, provide a very rigid machine base and minimize spring reactions to fan

thrust. Engineers preferring steel bases rather than the concrete mentioned above in specification 5-21 should change the designation to 5-20. Concrete is preferred for all fans operating at static pressure above 4" and on roof tops.

g. LIGHT FLOOR CONSTRUCTION. When floors or roofs are lighter than 4" solid concrete a localized mass shall be introduce under the vibration mountings in the form of a sub-base. This sub-base should be 12" thick and 12" longer and wider than the mechanical equipment above it. When this mass is provided the 30' minimum static deflection requirements will suffice even in longer bays. The mass is also useful for unusually large bays over 50'. When floors are lighter than the 4" concrete or the location is in a particularly sensitive area and the mass described above cannot be introduced, select deflection requirements for the next larger span.

h. For equipment where increased resiliency and decreased accelerations are required change specification 16 snubbers to specification 17 snubbers.

## 2.18 SPLIT SYSTEM DIRECT EXPANSION AIR CONDITIONING

A. Provide complete DX system for central station air conditioning units of types, sizes and capacities shown on schedules. System shall consist of matching air cooled condensing units, compressors, piping, controls, wiring and other accessories and appurtenances necessary to provide fully automatically functioning system.

B. Condenser coil shall be aluminum plate fins, mechanically bonded to seamless copper tubes, circuited for sub-cooling. Provide propeller fans arranged for vertical discharge. Condenser fan motors shall have inherent protection and shall be permanently-lubricated and resiliently-mounted. Fans shall have safety guards. Provide controls for cycling fans.

C. Compressors shall be serviceable hermetic with external spring isolators and automatically reversible oil pump.

D. Compressor shall unload in response to suction pressure in steps for partial load operation. Compressor shall be separated from condenser fans and coil.

E. Multiple compressor units shall have stop-start fans and coils. Compressor motors shall have part-winding start.

F. Provide factory-wired controls in separate enclosure. Safety devices shall consist of high and low pressure switching and compressor overload devices. Wiring shall incorporate positive acting timer to prevent short cycling of compressor if power is interrupted. Time shall prevent compressor from restarting for approximately 5 minutes after shutoff. Units shall have transformer control circuit.

G. Casing shall be galvanized steel finished with baked enamel. Provide service access panel.

H. Provide openings for power and refrigerant connections.

I. DX air conditioning system be capable of starting and operating down to 0° F ambient. Low ambient operation shall be accomplished by varying the speed of condenser fan based on sensing of head pressure in refrigerant liquid line, by modulating damper in condenser fan discharge based on refrigerant head pressure sensing, or by flooding the condenser coil with liquid refrigerant to maintain the desired condenser pressure. Low ambient systems with cycle fans or modulate dampers based on ambient temperature exclusively, are unacceptable.

J. Provide time delay rate for timed bypass of the low pressure switch or other means to start condensing at 0° F without nuisance safety trip units. Any field installation and control wiring of low ambient operation components shall be performed under the work of the mechanical section according to equipment manufacturer's instructions. If condensing unit does not come with hot gas bypass pre-piped, provide under the work of the mechanical section all components necessary for hot gas bypass operation. Hot gas system shall be piped in strict accordance with

recommendations of condensing unit manufacturer. Submit with Shop Drawings showing refrigerant piping, hot gas piping layout including bypass pipe sizes and connection locations, hot gas bypass valve and solenoid valves manufacturers and model numbers, sensing capillary bulb locations, control wiring of solenoid and details of any other components. Adjust hot gas bypass in field, as required, to maintain proper system operation.

K. Provide refrigerant piping between air-cooled condensing unit and AC unit. Provide necessary auxiliaries and appurtenances, such as strainer, sight glass, oil trap, scale trap and other devices, to make system complete and operable under fully automatic control. Refrigeration piping shall be ACR copper tubing made up with wrought copper fittings using silver solder, installed with nitrogen charge while soldering; of sizes as recommended by manufacturer of air conditioning unit and matching air-cooled unit. Piping shall meet requirements of Piping and Valves paragraphs of this Section.

L. Provide back-seating globe stop valve, winged and sealed. Cap valves 1” and under shall be diaphragm setting.

M. Tests as specified in PART 3.

N. Provide supports, hangers and other appliances necessary to support refrigeration system and air-cooled units.

## 2.19 AUTOMATIC TEMPERATURE CONTROLS (DIRECT DIGITAL CONTROL)

A. General:

1. Related Documents:

   a. All work of this Division shall be coordinated and provided by the single Building Management System (BMS) Contractor.

   b. The work of this Division shall be scheduled, coordinated, and interfaced with the associated work of other trades. Reference the Division 15 Sections for details.

   c. The work of this Division shall be as required by the Specifications, Point Schedules and Drawings.

   d. If the BMS Contractor believes there are conflicts or missing information in the project documents, the Contractor shall promptly request clarification and instruction from the design team.

2. Definitions:

   a. Analog: A continuously variable system or value not having discrete levels. Typically exists within a defined range of limiting values.

   b. Binary: A two-state system where an “ON” condition is represented by one discrete signal level and an “OFF” condition is represented by a second discrete signal level.

   c. Building Management System (BMS): The total integrated system of fully operational and functional elements, including equipment, software, programming, and associated materials, to be

   d. provided by this Division BMS Contractor and to be interfaced to the associated work of other related trades.

   e. BMS Contractor: The single Contractor to provide the work of this Division. This Contractor shall be the primary manufacturer, installer, commissioner and ongoing service provider for the BMS work.

   f. Control Sequence: A BMS pre-programmed arrangement of software algorithms, logical computation, target values and limits as required to attain the defined operational control

objectives.

g. Direct Digital Control: The digital algorithms and pre-defined arrangements included in the BMS software to provide direct closed-loop control for the designated equipment and controlled variables. Inclusive of Proportional, Derivative and Integral control algorithms together with target values, limits, logical functions, arithmetic functions, constant values, timing considerations and the like.

h. BMS Network: The total digital on-line real-time interconnected configuration of BMS digital processing units, workstations, panels, sub-panels, controllers, devices and associated elements individually known as network nodes. May exist as one or more fully interfaced and integrated sub-networks, LAN, WAN or the like.

i. Node: A digitally programmable entity existing on the BMS network.

j. BMS Integration: The complete functional and operational interconnection and interfacing of all BMS work elements and nodes in compliance with all applicable codes, standards and ordinances so as to provide a single coherent BMS as required by this Division.

k. Provide: The term “Provide” and its derivatives when used in this Division shall mean to furnish, install in place, connect, calibrate, test, commission, warrant, document and supply the associated required services ready for operation.

l. PC: Personal Computer from a recognized major manufacturer

m. Furnish: The term “Furnish” and its derivatives when used in this Division shall mean supply at the BMS Contractor’s cost to the designated third party trade contractor for installation. BMS Contractor shall connect furnished items to the BMS, calibrate, test, commission, warrant and document.

n. Wiring: The term “Wiring” and its derivatives when used in this Division shall mean provide the BMS wiring and terminations.

o. Install: The term “Install” and its derivatives when used in this Division shall mean receive at the jobsite and mount.

p. Protocol: The term “protocol” and its derivatives when used in this Division shall mean a defined set of rules and standards governing the on-line exchange of data between BMS network nodes.

q. Software: The term “software” and its derivatives when used in this Division shall mean all of programmed digital processor software, preprogrammed firmware and project specific digital process programming and database entries and definitions as generally understood in the BMS industry for real-time, on-line, integrated BMS configurations.

r. The use of words in the singular in these Division documents shall not be considered as limiting when other indications in these documents denote that more than one such item is being referenced.

s. Headings, paragraph numbers, titles, shading, bolding, underscores, clouds and other symbolic interpretation aids included in the Division documents are for general information only and are to assist in the reading and interpretation of these Documents.

3. Quality Assurance:

a. General:

1) This Section shall be provided by a qualified Automatic Temperature Control (ATC) and Building Automation System (BAS) Systems Contractor:

a) Johnson Controls Branch Office

2) Provide a SEAMLESS tie-in to the existing BMS. The tie-in shall include Direct Digital Control (DDC), historical data collection, archiving and alarm, energy and information management for all control points specified herein.

3) The Building Management System Contractor shall be the primary manufacturer-owned branch office that is regularly engaged in the engineering, programming, installation and service of total integrated Building Management Systems.

4) The BMS Contractor shall be a recognized national manufacturer, installer and service provider of BMS.

5) The BMS Contractor shall have a branch facility within a 100-mile radius of the job site supplying complete maintenance and support services on a 24 hour, 7-day-a-week basis. The BMS Contractor shall have at this facility at least eight (8) factory trained, directly employed and full time technical staff, spare parts inventory, and all necessary test and diagnostic equipment.

6) As evidence and assurance of the contractor's ability to support the Owner's system with service and parts, the contractor must have been in the BMS business for at least the last ten (10) years and have successfully completed total projects of at least 10 times the value of this contract in each of the preceding five years.

7) The Building Management System architecture shall consist of the products of a manufacturer regularly engaged in the production of Building Management Systems, and shall be the manufacturer's latest standard of design at the time of bid.

b. Workplace Safety and Hazardous Materials:

1) Provide a safety program in compliance with the Contract Documents.

2) The BMS Contractor shall have a corporately certified comprehensive Safety Certification Manual and a designated Safety Supervisor for the Project.

3) The Contractor and its employees and subtrades shall comply with federal, state and local safety regulations.

4) The Contractor shall ensure that all subcontractors and employees have written safety programs in place that covers their scope of work, and that their employees receive the training required by the OSHA rules that have jurisdiction for at least each topic listed in the Safety Certification Manual.

5) Hazards created by the Contractor or its subcontractors shall be eliminated before any further work proceeds.

6) Hazards observed but not created by the Contractor or its subcontractors shall be reported to either the General Contractor or the Owner within the same day. The Contractor shall be required to avoid the hazard area until the hazard has been eliminated.

7) The Contractor shall sign and date a safety certification form prior to any work being performed, stating that the Contractors' company is in full compliance with the Project safety requirements.

8) The Contractor's safety program shall include written policy and arrangements for the handling, storage and management of all hazardous materials to be used in the work in compliance with the requirements of the AHJ at the Project site.

9) The Contractor's employees and subcontractor's staff shall have received training as applicable in the use of hazardous materials and shall govern their actions accordingly.

c. Quality Management Program:

1) Designate a competent and experienced employee to provide BMS Project Management. The designated Project Manager shall be empowered to make technical, scheduling and related decisions on behalf of the BMS Contractor. At minimum, the Project Manager shall:
    a) Manage the scheduling of the work to ensure that adequate materials, labor and other resources are available as needed.
    b) Manage the financial aspects of the BMS Contract.
    c) Coordinate as necessary with other trades.
    d) Be responsible for the work and actions of the BMS workforce on site.

4. References:
    a. All work shall conform to the following Codes and Standards, as applicable:
        1) National Fire Protection Association (NFPA) Standards.
        2) National Electric Code (NEC) and applicable local Electric Code.
        3) Underwriters Laboratories (UL) listing and labels.
        4) UL 864 UUKL Smoke Control
        5) UL 268 Smoke Detectors.
        6) UL 916 Energy Management
        7) NFPA 70 - National Electrical Code.
        8) NFPA 90A - Standard For The Installation Of Air Conditioning And Ventilating Systems.
        9) NFPA 92A and 92B Smoke Purge/Control Equipment.
        10) Factory Mutual (FM).
        11) American National Standards Institute (ANSI).
        12) National Electric Manufacturer's Association (NEMA).
        13) American Society of Mechanical Engineers (ASME).
        14) American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
        15) Air Movement and Control Association (AMCA).
        16) Institute of Electrical and Electronic Engineers (IEEE).
        17) American Standard Code for Information Interchange (ASCII).
        18) Electronics Industries Association (EIA).
        19) Occupational Safety and Health Administration (OSHA).
        20) American Society for Testing and Materials (ASTM).
        21) Federal Communications Commission (FCC) including Part 15, Radio Frequency Devices.
        22) Americans Disability Act (ADA)
        23) ANSI/EIA 909.1-A-1999 (LonWorks)
        24) ANSI/ASHRAE Standard 195-2008 (BACnet)

b. In the case of conflicts or discrepancies, the more stringent regulation shall apply.

c. All work shall meet the approval of the Authorities Having Jurisdiction at the project site.

5. Submittals:

a. Shop Drawings, Product Data, and Samples:

1) The BMS contractor shall submit a list of all shop drawings with submittals dates within 30 days of contract award.

2) Submittals shall be in defined packages. Each package shall be complete and shall only reference itself and previously submitted packages. The packages shall be as approved by the Architect and Engineer for Contract compliance.

3) Allow 15 working days for the review of each package by the Architect and Engineer in the scheduling of the total BMS work.

4) Equipment and systems requiring approval of local authorities must comply with such regulations and be approved. Filing shall be at the expense of the BMS Contractor where filing is necessary. Provide a copy of all related correspondence and permits to the Owner.

5) Prepare an index of all submittals and shop drawings for the installation. Index shall include a shop drawing identification number, Contract Documents reference and item description.

6) The BMS Contractor shall correct any errors or omissions noted in the first review.

7) At a minimum, submit the following:

a) BMS network architecture diagrams including all nodes and interconnections.

b) Systems schematics, sequences, and flow diagrams.

c) Points schedule for each point in the BMS, including: Point Type, Object Name, Expanded ID, Display Units, Controller type, and Address.

d) Samples of Graphic Display screen types and associated menus.

e) Detailed Bill of Material list for each system or application, identifying quantities, part numbers, descriptions, and optional features.

f) Control Damper Schedule including a separate line for each damper provided under this section and a column for each of the damper attributes, including: Code Number, Fail Position, Damper Type, Damper Operator, Duct Size, Damper Size, Mounting, and Actuator Type.

g) Room Schedule including a separate line for each VAV box and/or terminal unit indicating location and address

h) Control Valve Schedules including a separate line for each valve provided under this section and a column for each of the valve attributes: Code Number, Configuration, Fail Position, Pipe Size, Valve Size, Body Configuration, Close-off Pressure, Capacity, Valve CV, Design Pressure, and Actuator Type.

i) Details of all BMS interfaces and connections to the work of other trades.

j) Product data sheets or marked catalog pages including part number, photo and description for all products including software.

6. Record Documentation:

a. Operation and Maintenance Manuals:

1) Three (3) copies of the Operation and Maintenance Manuals shall be provided to the Owner's Representative upon completion of the project. The entire Operation and Maintenance Manual shall be furnished on Compact Disc media, and include the following for the BMS provided:
    a) Table of contents.
    b) As-built system record drawings. Computer Aided Drawings (CAD) record drawings shall represent the as-built condition of the system and incorporate all information supplied with the approved submittal.
    c) Manufacturer’s product data sheets or catalog pages for all products including software.
    d) System Operator’s manuals.
    e) Archive copy of all site-specific databases and sequences.
    f) BMS network diagrams.
    g) Interfaces to all third-party products and work by other trades.

7. Warranty:
    a. Standard Material and Labor Warranty:
        1) Provide a one-year labor and material warranty on the BMS.
        2) If within twelve (12) months from the date of acceptance of product, upon written notice from the owner, it is found to be defective in operation, workmanship or materials, it shall be replaced, repaired or adjusted at the option of the BMS Contractor at the cost of the BMS Contractor.

B. General Description:
1. The Building Management System (BMS) shall use an open architecture and fully support a multi-vendor environment. To accomplish this effectively, the BMS shall support open communication protocol standards and integrate a wide variety of third-party devices and applications. The system shall be designed for use on the Internet, or intranets using off the shelf, industry standard technology compatible with other owner provided networks.
2. The Building Management System shall consist of the following:
    a. Standalone Network Automation Engine(s)
        1) Field Equipment Controller(s)
        2) Input/Output Module(s)
        3) Local Display Device(s)
        4) Portable Operator's Terminal(s)
        5) Distributed User Interface(s)
        6) Network processing, data storage and communications equipment
        7) Other components required for a complete and working BMS
3. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, controllers and operator devices, while re-using existing controls equipment.
4. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.

a. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

b. The System shall maintain all settings and overrides through a system reboot.

5. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.

C. BMS Architecture:

1. Automation Network:

a. The automation network shall be based on a PC industry standard of Ethernet TCP/IP. Where used, LAN controller cards shall be standard “off the shelf” products available through normal PC vendor channels.

b. All BMS devices on the automation network shall be capable of operating at a communication speed of 100 Mbps, with full peer-to-peer network communication.

c. Network Automation Engines (NAE) shall reside on the automation network.

d. The automation network will be compatible with other enterprise-wide networks. Where indicated, the automation network shall be connected to the enterprise network and share resources with it by way of standard networking devices and practices.

2. Control Network

a. Network Automation Engines (NAE) shall provide supervisory control over the control network and shall support all three (3) of the following communication protocols:

1) BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9

a) The NAE shall be BACnet Testing Labs (BTL) certified and carry the BTL Label.

b) The NAE shall be tested and certified as a BACnet Building Controller (B-BC).

2) LonWorks enabled devices using the Free Topology Transceiver (FTT-10a).

3) The Johnson Controls N2 Field Bus.

b. Control networks shall provide either “Peer-to-Peer,” Master-Slave, or Supervised Token Passing communications, and shall operate at a minimum communication speed of 9600 baud.

c. DDC Controllers shall reside on the control network.

d. Control network communication protocol shall be BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135.

e. A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus.

f. The PICS shall be submitted 10 days prior to bidding.

3. Integration

a. BACnet Protocol Integration – BACnet:

1) The neutral protocol used between systems will be BACnet over Ethernet and comply with the ASHRAE BACnet standard 135-2008.

2) A complete Protocol Implementation Conformance Statement (PICS) shall be provided for all BACnet system devices.

3) The ability to command, share point object data, change of state (COS) data and

schedules between the host and BACnet systems shall be provided.

D. User Interface:

1. Dedicated Web Based User Interface:

a. Where indicated on plans the BMS Contractor shall provide and install a personal computer for command entry, information management, network alarm management, and database management functions. All real-time control functions, including scheduling, history collection and alarming, shall be resident in the BMS Network Automation Engines to facilitate greater fault tolerance and reliability.

b. Dedicated User Interface Architecture – The architecture of the computer shall be implemented to conform to industry standards, so that it can accommodate applications provided by the BMS Contractor and by other third party applications suppliers, including but not limited to Microsoft Office Applications. Specifically it must be implemented to conform to the following interface standards.

1) Microsoft Internet Explorer for user interface functions

2) Microsoft Office Professional for creation, modification and maintenance of reports, sequences other necessary building management functions

3) Microsoft Outlook or other e-mail program for supplemental alarm functionality and communication of system events, and reports

4) Required network operating system for exchange of data and network functions such as printing of reports, trends and specific system summaries.

2. Site Management User Interface Application Components

a. Operator Interface:

1) An integrated browser based client application shall be used as the user operator interface program.

2) The System shall employ an event-driven rather than a device polling methodology to dynamically capture and present new data to the user.

3) All Inputs, Outputs, Setpoints, and all other parameters as defined within Part 3, shown on the design drawings, or required as part of the system software, shall be displayed for operator viewing and modification from the operator interface software.

4) The user interface software shall provide help menus and instructions for each operation and/or application.

5) The system shall support customization of the UI configuration and a home page display for each operator.

6) The system shall support user preferences in the following screen presentations:

a) Alarm

b) Trend

c) Display

d) Applications

7) All controller software operating parameters shall be displayed for the operator to view/modify from the user interface. These include: setpoints, alarm limits, time delays, PID tuning constants, run-times, point statistics, schedules, and so forth.

8) The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:

a) User access for selective information retrieval and control command execution

b) Monitoring and reporting

c) Alarm, non-normal, and return to normal condition annunciation

d) Selective operator override and other control actions

e) Information archiving, manipulation, formatting, display and reporting

f) BMS internal performance supervision and diagnostics

g) On-line access to user HELP menus

h) On-line access to current BMS as-built records and documentation

i) Means for the controlled re-programming, re-configuration of BMS operation and for the manipulation of BMS database information in compliance with the prevailing codes, approvals and regulations for individual BMS applications

9) The system shall support a list of application programs configured by the users that are called up by the following means:

a) The Tools Menu

b) Hyperlinks within the graphics displays

c) Key sequences

10) The operation of the control system shall be independent of the user interface, which shall be used for operator communications only. Systems that rely on an operator workstation to provide supervisory control over controller execution of the sequences of operations or system communications shall not be acceptable.

b. Navigation Trees:

1) The system will have the capability to display multiple navigation trees that will aid the operator in navigating throughout all systems and points connected. At minimum provide a tree that identifies all systems on the networks.

2) Provide the ability for the operator to add custom trees. The operator will be able to define any logical grouping of systems or points and arrange them on the tree in any order. It shall be possible to nest groups within other groups. Provide at minimum 5 levels of nesting.

3) The navigation trees shall be “dockable” to other displays in the user interface such as graphics. This means that the trees will appear as part of the display, but can be detached and then minimized to the Windows task bar. A simple keystroke will reattach the navigation to the primary display of the user interface.

c. Alarms:

1) Alarms shall be routed directly from Network Automation Engines to PCs and servers. It shall be possible for specific alarms from specific points to be routed to specific PCs and servers. The alarm management portion of the user interface shall, at the minimum, provide the following functions:

a) Log date and time of alarm occurrence.

b) Generate a “Pop-Up” window, with audible alarm, informing a user that an alarm has been received.

c) Allow a user, with the appropriate security level, to acknowledge, temporarily silence, or discard an alarm.

d) Provide an audit trail for alarms by recording user acknowledgment, deletion, or disabling of an alarm. The audit trail shall include the name of the user, the alarm, the action taken on the alarm, and a time/date stamp.

e) Provide the ability to direct alarms to an e-mail address or alphanumeric pager. This must be provided in addition to the pop up window described above. Systems that use e-mail and pagers as the exclusive means of annunciating alarms are not acceptable.

f) Configuration of which NAE offline alarms are seen by each user

g) Any attribute of any object in the system may be designated to report an alarm.

2) The BMS shall annunciate diagnostic alarms indicating system failures and non-normal operating conditions.

3) The BMS shall allow a minimum of 4 categories of alarm sounds customizable through user defined wav.files.

4) The BMS shall annunciate application alarms at minimum, as required by Part 3.

d. Reports and Summaries:

1) Reports and Summaries shall be generated and directed to the user interface displays, with subsequent assignment to printers, or disk. As a minimum, the system shall provide the following reports:

a) All points in the BMS

b) All points in each BMS application

c) All points in a specific controller

d) All points in a user-defined group of points

e) All points currently in alarm

f) All points locked out

g) All user defined and adjustable variables, schedules, interlocks and the like.

2) Summaries and Reports shall be accessible via standard UI functions and not dependent upon custom programming or user defined HTML pages.

3) Selection of a single menu item, tool bar item, or tool bar button shall print any displayed report or summary on the system printer for use as a building management and diagnostics tool.

4) Provide the capability to view, command and modify large quantities of similar data in tailored summaries created online without the use of a secondary application like a spreadsheet. Summary definition shall allow up to seven user defined columns describing attributes to be displayed including custom column labels. Up to 100 rows per summary shall be supported. Summary viewing shall be available over the network using a standard Web browser.

e. Schedules:

1) A graphical display for time-of-day scheduling and override scheduling of building operations shall be provided. At a minimum, the following functions shall be provided:

a) Weekly schedules

b) Exception Schedules

c) Monthly calendars

2) Weekly schedules shall be provided for each group of equipment with a specific time use schedule.

3) It shall be possible to define one or more exception schedules for each schedule including references to calendars

4) Monthly calendars shall be provided that allow for simplified scheduling of holidays and special days for a minimum of five years in advance. Holidays and special days shall be user-selected with the pointing device or keyboard, and shall automatically reschedule equipment operation as previously defined on the exception schedules.

5) Changes to schedules made from the User Interface shall directly modify the Network Automation Engine schedule database.

6) Schedules and Calendars shall comply with ASHRAE SP135/2008 BACnet Standard.

7) The Calendar object supports an option to add a reference to another Calendar Object that is designated to be the master for the facility. Any Supervisory and BAC calendars can be configured to reference a single master Global Calendar.

8) Changes to the master global calendar are automatically synced with all calendars that are referenced.

9) Selection of a single menu item or tool bar button shall print any displayed schedule on the system printer for use as a building management and diagnostics tool.

10) Software shall be provided to configure and implement optimal start and stop programming based on existing indoor and outdoor environmental conditions as well as equipment operating history

11) The system Solar Clock shall support the scheduling and energy management functions. The Solar Clock will calculate the sunrise, sunset, and sun angle values for a specified latitude and longitude. A time offset can also be specified. An example would be to use the Solar Clock object as a master to an interlock to turn lights on 30 minutes after sunset and off 30 minutes before sunrise.

f. Security/Passwords:

1) Multiple-level passwords access protection shall be provided via roles and permissions. The feature will allow the system to base access on a user's job title or role and allow the user/manager access interface control, display, and database manipulation capabilities based on an assigned password.

2) Roles may be copied and altered to meet specific roles and permissions based on the particular policies.

3) Each user shall have the following: a (Metasys Local) user account name (with a maximum of 30 characters), a complex password or passphrase (with a min of 8 characters and a max of 50 characters), other user account policies (such as session timeout), timesheet access based on day of the week and time of day, and specific user view.

4) The system shall allow each user to change his or her password at will.

5) When entering or editing passwords, the system shall not echo the actual characters for display on the monitor.

6) A maximum of 150 categories may be used to determine or assign areas of responsibilities to each user account. A maximum of 13 (of the 150) named categories which are specifics such as "No Access, View, Advanced Review, Operate, Intervene, Diagnostic, Manage Item Events, Manage Every, and Configure Items".

7) A minimum of 100 unique passwords shall be supported.

8) Operators shall be able to perform only those commands available for their respective passwords. Display of menu selections shall be limited to only those items defined for the access level of the password used to log-on.

9) Operators shall be further limited to only access, command, and modify those buildings, systems, and subsystems for which they have responsibility. Provide a

10) minimum of 100 categories of systems to which individual operators may be assigned.

11) The system shall automatically generate a report of log-on/log-off and system activity for each user. Any action that results in a change in the operation or configuration of the control system shall be recorded, including: modification of point values, schedules or history collection parameters, and all changes to the alarm management system, including the acknowledgment and deletion of alarms.

12) The system shall have the ability to provide a Department of Defense (DoD) specific warning banner for applicable sites that warns the user they are accessing a restricted site.

13) After successful login to the Site Management Portal (SMP) the last time and date that user name was previously logged in is shown on the screen.

14) Each login attempt is recorded in the system Audit Log with the option to record the IP address of the PC that made the login.

g. Screen Manager:

1) The system will allow a customized image on the login screen (i.e. organization name, logo).

2) User View navigations can be displayed as either a set of tabs or a drop down list.

3) Allows user preference for assigning of a background color for when an object is Out of Service which will enable the operator to quickly distinguish points that have been commanded to this state.

4) The User Interface shall be provided with screen management capabilities that allow the user to activate, close, and simultaneously manipulate a minimum of 4 active display windows plus a network or user defined navigation tree.

h. Historical Trending and Data Collection:

1) Each Automation Engine shall store trend and point history data for all analog and digital inputs and outputs, as follows:

a) Any point, physical or calculated, may be designated for trending. Two methods of collection shall be allowed:

(1) Defined time interval

(2) Upon a change of value

b) Each Automation Engine shall have the capability to store multiple samples for each physical point and software variable based upon available memory, including an individual sample time/date stamp. Points may be assigned to multiple history trends with different collection parameters.

2) The system shall provide data to enable optimization capabilities including fault detection and diagnostics, advanced analytics and central plant optimization without the need of a gateway or additional hardware.

i. Trend Data Viewing and Analysis:

1) Provide a trend viewing utility that shall have access to all database points.

2) It shall be possible to retrieve any historical database point for use in displays and reports by specifying the point name and associated trend name.

3) The trend viewing utility shall have the capability to define trend study displays to include multiple trends

4) Displays shall be able to be single or stacked graphs with on-line selectable display characteristics, such as ranging, color, and plot style.

5) Display magnitude and units shall both be selectable by the operator at any time without reconfiguring the processing or collection of data. This is a zoom capability.

6) Display magnitude shall automatically be scaled to show full graphic resolution of the data being displayed.

7) The Display shall support the user's ability to change colors, sample sizes, and types of markers.

E. Network Automation Engines (NAE):

1. Network Automation Engine (NAE 35XX):

a. The Network Automation Engine (NAE) shall be a fully user-programmable, supervisory controller. The NAE shall monitor the network of distributed application-specific controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Automation Engines.

b. Automation network – The NAE shall reside on the automation network and shall support a subnet of system controllers.

c. User Interface – Each NAE shall have the ability to deliver a web based User Interface (UI) as previously described. All computers connected physically or virtually to the automation network shall have access to the web based UI.

1) The web based UI software shall be imbedded in the NAE. Systems that require a local copy of the system database on the user's personal computer are not acceptable.

2) The NAE shall support a minimum of two (2) concurrent users.

3) The web based user shall have the capability to access all system data through one NAE.

4) Remote users connected to the network through an Internet Service Provider (ISP) or telephone dial up shall also have total system access through one NAE.

5) Systems that require the user to address more than one NAE to access all system information are not acceptable.

6) The NAE shall have the capability of generating web based UI graphics. The graphics capability shall be imbedded in the NAE.

7) Systems that support UI Graphics from a central database or require the graphics to reside on the user's personal computer are not acceptable.

8) The web based UI shall support the following functions using a standard version of Microsoft Internet Explorer:

a) Configuration

b) Commissioning

c) Data Archiving

d) Monitoring

e) Commanding

f) System Diagnostics

9) Systems that require workstation software or modified web browsers are not acceptable.

10) The NAE shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems.

d. Processor – The NAE shall be microprocessor-based with a minimum word size of 32 bits. The NAE shall be a multi-tasking, multi-user, and real-time digital control processor. Standard operating systems shall be employed. NAE size and capability shall be sufficient to fully meet the requirements of this Specification.

e. Memory – Each NAE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.

f. Hardware Real Time Clock – The NAE shall include an integrated, hardware-Based, real-time clock.

g. The NAE shall include troubleshooting LED indicators to identify the following conditions:

1) Power - On/Off:

2) Ethernet Traffic – Ethernet Traffic/No Ethernet Traffic

3) Ethernet Connection Speed – 10 Mbps/100 Mbps

4) FC Bus – Normal Communications/No Field Communications

5) Peer Communication – Data Traffic between NAE Devices

6) Run – NAE Running/NAE in Startup/NAE Shutting Down/Software Not Running

7) Bat Fault – Battery Defective, Data Protection Battery Not Installed

8) Fault – General Fault

h. Communications Ports – The NAE shall provide the following ports for operation of operator Input/Output (I/O) devices, such as industry-standard computers, modems, and portable operator's terminals.

1) USB port

2) URS-232 serial data communication port

3) RS-485 port

4) Ethernet port

i. Diagnostics – The NAE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Automation Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.

j. Power Failure – In the event of the loss of normal power, The NAE shall continue to operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.

1) During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.
2) Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.

k. Certification – The NAE shall be listed by Underwriters Laboratories (UL).

l. Controller Network – The NAE shall support the following communication protocols on the controller network:

1) The NAE shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9 on the controller network.
   a) The NAE shall be BACnet Testing Labs (BTL) certified and carry the BTL Label.
   b) The NAE shall be tested and certified as a BACnet Building Controller (B-BC).
   c) A BACnet Protocol Implementation Conformance Statement shall be provided for the NAE.
   d) The Conformance Statements shall be submitted 10 days prior to bidding.
   e) The NAE shall support a minimum of 50 control devices.
2) The NAE shall support LonWorks enabled devices using the Free Topology Transceiver FTT10.
   a) All LonWorks controls devices shall be LonMark certified.
   b) The NAE shall support a minimum of 64 LonWorks enabled control devices.
3) The NAE shall support the Johnson Controls N2 Field Bus.
   a) The NAE shall support a minimum of 50 N2 control devices.
   b) The Bus shall conform to Electronic Industry Alliance (EIA) Standard RS-485.
   c) The Bus shall employ a master/slave protocol where the NAE is the master.
   d) The Bus shall employ a four (4) level priority system for polling frequency.
   e) The Bus shall be optically isolated from the NAE.
   f) The Bus shall support the Metasys Integrator System.

F. Network Control Engine (NCE 25XX):

1. The Network Control Engine (NCE) shall be a fully user-programmable, supervisory controller. The NCE shall monitor the network of distributed application-specific controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Automation Engines.
2. The Network Control Engine (NCE) shall be a fully user-programmable, digital controller that includes a minimum of 33 I/O points.
3. Automation Network – The NCE shall reside on the automation network and shall support a subnet of 32 Field controllers.
4. User Interface – Each NCE shall have the ability to deliver a web based User Interface (UI) as previously described. All computers connected physically or virtually to the automation network shall have access to the web based UI.
   a. The web based UI software shall be imbedded in the NCE. Systems that require a local copy of the system database on the user's personal computer are not acceptable.

b. The NCE shall support a minimum of two (2) concurrent users.

c. The NCE shall have the capability of generating web based UI graphics. The graphics capability shall be imbedded in the NCE.

d. Systems that support UI Graphics from a central database or require the graphics to reside on the user's personal computer are not acceptable.

e. The web based UI shall support the following functions using a standard version of Microsoft Internet Explorer:

1) Configuration

2) Commissioning

3) Data Archiving

4) Monitoring

5) Commanding

6) System Diagnostics

f. Systems that require workstation software or modified web browsers are not acceptable.

g. The NCE shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems.

5. The NCE shall employ a finite state control engine to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals.

6. The NCE shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only, shall not be acceptable.

7. The NCE shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.

8. The NCE shall support the following number and types of inputs and outputs:

a. Ten Universal Inputs - shall be configured to monitor any of the following:

1) Analog Input, Voltage Mode

2) Analog Input, Current Mode

3) Analog Input, Resistive Mode

4) Binary Input, Dry Contact Maintained Mode

5) Binary Input, Pulse Counter Mode

b. Eight Binary Inputs - shall be configured to monitor either of the following:

1) Dry Contact Maintained Mode

2) Pulse Counter Mode

c. Four Analog Outputs - shall be configured to output either of the following

1) Analog Output, Voltage Mode

2) Analog Output, Current Mode

d. Seven Binary Outputs - shall output the following:

1) 24 VAC Triac

e. Four Configurable Outputs - shall be configured to output either of the following:
   1) Analog Output, Voltage Mode
   2) Binary Output, 24 VAC Triac Mode

f. The NCE shall have the ability to monitor and control a network of sensors and actuators over a Sensor-Actuator Bus (SA Bus).
   1) The SA Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard protocol SSPC-135, Clause 9.
   2) The SA Bus shall support a minimum of 10 devices.
   3) The SA Bus shall operate at a maximum distance of 1,200 Ft. between the NCE and the furthest connected device.

g. The NCE shall have the capability to execute complex control sequences involving direct wired I/O points as well as input and output devices communicating over the Field Trunk or the SA Bus.

h. The NCE shall support, but not be limited to, the following applications:
   1) Central Equipment including chillers and boilers
   2) Lighting and electrical distribution
   3) Built-up air handling units for special applications
   4) Power generation and energy monitoring equipment
   5) Interfaces to security and fire detection systems

i. The NCE shall support a Local Controller Display (DIS-1710) either as an integral part of the NCE or as a remote device communicating over the SA Bus.
   1) The Display shall use a BACnet Standard SSPC-135, clause 9 Master-Slave/Token-Passing protocol.
   2) The Display shall allow the user to view monitored points without logging into the system.
   3) The Display shall allow the user to view and change setpoints, modes of operation, and parameters.
   4) The Display shall provide password protection with user adjustable password timeout.
   5) The Display shall be menu driven with separate paths for:
      a) Input/Output
      b) Parameter/Setpoint
      c) Overrides
   6) The Display shall use easy-to-read English text messages.
   7) The Display shall allow the user to select the points to be shown and in what order.
   8) The Display shall support a back lit Liquid Crystal Display (LCD) with adjustable contrast and brightens and automatic backlight brightening during user interaction.
   9) The display shall be a minimum of 4 lines and a minimum of 20 characters per line
   10) The Display shall have a keypad with no more than 6 keys.

11) The Display shall be panel mountable.
12) The NCE shall be microprocessor-based with a minimum word size of 32 bits. The NAE shall be a multi-tasking, multi-user, and real-time digital control processor. Standard operating systems shall be employed. NCE size and capability shall be sufficient to fully meet the requirements of this Specification.
13) The NCE shall employ an industrial single board computer.
14) Each NCE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.
15) The NCE shall include an integrated, hardware-based, real-time clock.
16) The NCE shall employ nonvolatile Flash memory to store all programs and data. The NCE shall employ a data protection battery to save data and power the real time clock when primary power is interrupted.
17) The NCE shall provide removable, color coded, screw terminal blocks for 24 VAC power, communication bus and I/O point field wiring.
18) The NCE shall include troubleshooting LED indicators to identify the following conditions:
    a) Power
    b) Fault
    c) SA Bus
    d) FC Bus
    e) Modem RX
    f) Battery Fault
    g) Ethernet
    h) 10 LNK
    i) 100 LNK
    j) Run
    k) Peer Com
19) Communications Ports – The NCE shall provide the following ports for operation of operator Input/Output (I/O) devices, such as industry-standard computers, modems, and portable operator's terminals.
    a) USB port
    b) RS-232 serial data communication port
    c) RS-485 port
    d) RJ-45 Ethernet port
    e) RJ-12 jack
20) Diagnostics – The NCE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Control Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.
21) Power Failure – In the event of the loss of normal power, The NCE shall continue to

operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.

22) During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.

23) Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.

j. Certification – The NCE shall be listed by Underwriters Laboratories (UL).File E107041, CCN PAZX, UL 916, Energy Management Equipment. FCC Compliant to CFR47, Part 15, Subpart B, Class A

k. Field Controller Bus – The NCE shall support the following communication protocols on the Field Controller Bus:

1) The NCE shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9 on the controller network.

a) The NCE shall be BACnet Testing Labs (BTL) certified and carry the BTL Label.

b) The NAE shall be tested and certified as a BACnet Building Controller (B-BC).

c) A BACnet Protocol Implementation Conformance Statement shall be provided for the NCE.

d) The Conformance Statements shall be submitted 10 days prior to bidding.

e) The NCE shall support a minimum of 32 control devices.

2) The NCE shall support LonWorks enabled devices using the Free Topology Transceiver FTT10 on the Field Controller Bus (LonWorks Network).

a) All LonWorks controls devices shall be LonMark certified.

b) The NCE shall support a minimum of 32 LonWorks enabled control devices.

3) The NCE shall support the N2 devices on the Field Controller Bus (Johnson Controls N2 Bus).

a) The NCE shall support a minimum of 32 N2 control devices.

b) The Bus shall conform to Electronic Industry Alliance (EIA) Standard RS-485.

c) The Bus shall employ a master/slave protocol where the NCE is the master.

d) The Bus shall employ a four (4) level priority system for polling frequency.

e) The Bus shall be optically isolated from the NCE.

f) The Bus shall support the Metasys Integrator System.

G. DDC System Controllers:

1. Field Equipment Controller (FEC X611):

a. The Field Equipment Controller (FEC) shall be a fully user-programmable, digital controller that communicates via BACnet MS/TP protocol or optionally via N2Open.

1) The FEC shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9 on the controller network.

a) The FEC shall be BACnet Testing Labs (BTL) certified and carry the BTL Label.

b) The FEC shall be tested and certified as a BACnet Application Specific Controller

(B-ASC).

c) A BACnet Protocol Implementation Conformance Statement shall be provided for the FEC.

d) The Conformance Statement shall be submitted 10 days prior to bidding.

b. The FEC shall employ a finite state control engine to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals.

c. Controllers shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable. The FEC shall be

d. assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.

e. The FEC shall include troubleshooting LED indicators to identify the following conditions:

1) Power On

2) Power Off

3) Download or Startup in progress, not ready for normal operation

4) No Faults

5) Device Fault

6) Field Controller Bus - Normal Data Transmission

7) Field Controller Bus - No Data Transmission

8) Field Controller Bus - No Communication

9) Sensor-Actuator Bus - Normal Data Transmission

10) Sensor-Actuator Bus - No Data Transmission

11) Sensor-Actuator Bus - No Communication

f. The FEC shall accommodate the direct wiring of analog and binary I/O field points.

g. The FEC shall support the following types of inputs and outputs:

1) Universal Inputs - shall be configured to monitor any of the following:

a) Analog Input, Voltage Mode

b) Analog Input, Current Mode

c) Analog Input, Resistive Mode

d) Binary Input, Dry Contact Maintained Mode

e) Binary Input, Pulse Counter Mode

2) Binary Inputs - shall be configured to monitor either of the following:

a) Dry Contact Maintained Mode

b) Pulse Counter Mode

3) Analog Outputs - shall be configured to output either of the following

a) Analog Output, Voltage Mode

b) Analog Output, current Mode

4) Binary Outputs - shall output the following:

a) 24 VAC Triac

5) Configurable Outputs - shall be capable of the following:

a) Analog Output, Voltage Mode

b) Binary Output Mode

h. The FEC shall have the ability to reside on a Field Controller Bus (FC Bus).

1) The FC Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard protocol SSPC-135, Clause 9.

2) The FC Bus shall support communications between the FECs and the NAE.

3) The FC Bus shall also support Input/Output Module (IOM) communications with the FEC and with the NAE.

4) The FC Bus shall support a minimum of 100 IOMs and FECs in any combination.

5) The FC Bus shall operate at a maximum distance of 15,000 Ft. between the FEC and the furthest connected device.

i. The FEC shall have the ability to monitor and control a network of sensors and actuators over a Sensor-Actuator Bus (SA Bus).

1) The SA Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard Protocol SSPC-135, Clause 9.

2) The SA Bus shall support a minimum of 10 devices per trunk.

3) The SA Bus shall operate at a maximum distance of 1,200 Ft. between the FEC and the furthest connected device.

j. The FEC shall have the capability to execute complex control sequences involving direct wired I/O points as well as input and output devices communicating over the FC Bus or the SA Bus.

k. The FEC shall support a Local Controller Display (DIS-1710) either as an integral part of the FEC or as a remote device communicating over the SA Bus.

1) The Display shall use a BACnet Standard SSPC-135, clause 9 Master-Slave/Token-Passing protocol.

2) The Display shall allow the user to view monitored points without logging into the system.

3) The Display shall allow the user to view and change setpoints, modes of operation, and parameters.

4) The Display shall provide password protection with user adjustable password timeout.

5) The Display shall be menu driven with separate paths for:

a) Input/Output

b) Parameter/Setpoint

c) Overrides

6) The Display shall use easy-to-read English text messages.

7) The Display shall allow the user to select the points to be shown and in what order.
8) The Display shall support a back lit Liquid Crystal Display (LCD) with adjustable contrast and brightens and automatic backlight brightening during user interaction.
9) The display shall be a minimum of 4 lines and a minimum of 20 characters per line
10) The Display shall have a keypad with no more than 6 keys.
11) The Display shall be panel mountable.

H. Field Devices:
1. Input/Output Module (IOM X711):
a. The Input/Output Module (IOM) provides additional inputs and outputs for use in the FEC.
b. The IOM shall communicate with the FEC over the FC Bus or the SA Bus.
c. The IOM shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9 on the controller network.
1) The IOM shall be BACnet Testing Labs (BTL) certified and carry the BTL Label.
2) The IOM shall be tested and certified as a BACnet Application Specific Controller (B-ASC).
3) A BACnet Protocol Implementation Conformance Statement shall be provided for the FEC.
4) The Conformance Statement shall be submitted 10 days prior to bidding.
d. The IOM shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.
e. The IOM shall have a minimum of 4 points to a maximum of 17 points.
f. The IOM shall support the following types of inputs and outputs:
1) Universal Inputs - shall be configured to monitor any of the following:
a) Analog Input, Voltage Mode
b) Analog Input, Current Mode
c) Analog Input, Resistive Mode
d) Binary Input, Dry Contact Maintained Mode
e) Binary Input, Pulse Counter Mode
2) Binary Inputs - shall be configured to monitor either of the following:
a) Dry Contact Maintained Mode
b) Pulse Counter Mode
3) Analog Outputs - shall be configured to output either of the following
a) Analog Output, Voltage Mode
b) Analog Output, current Mode
4) Binary Outputs - shall output the following:
a) 24 VAC Triac
5) Configurable Outputs - shall be capable of the following:
a) Analog Output, Voltage Mode

b) Binary Output Mode

6) The IOM shall include troubleshooting LED indicators to identify the following conditions:

a) Power On

b) Power Off

c) Download or Startup in progress, not ready for normal operation

d) No Faults

e) Device Fault

f) Normal Data Transmission

g) No Data Transmission

h) No Communication

2. Networked Thermostat (TEC):

a. The networked thermostat shall be capable of controlling two- or four-pipe fan coils, cabinet unit heaters or other similar equipment.

b. The TEC shall communicate over the Field Controller Bus using BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9.

c. The TEC shall be BACnet Testing Labs (BTL) certified and carry the BTL Label.

1) The TEC shall be tested and certified as a BACnet Application Specific Controller (B-ASC).

2) A BACnet Protocol Implementation Conformance Statement shall be provided for the TEC.

3) The Conformance Statement shall be submitted 10 days prior to bidding.

d. The Networked Thermostat shall support remote read/write and parameter adjustment from the web based User Interfaceable through a Network Automation Engine.

e. The Networked Thermostat shall include an intuitive User Interface providing plain text messages.

1) Two line, 8 character backlit display

2) LED indicators for Fan, Heat, and Cool status

3) Five (5) User Interface Keys

a) Mode

b) Fan

c) Override

d) Degrees C/F

e) Up/Down

4) The display shall continuously scroll through the following parameters:

a) Room Temperature

b) System Mode

c) Schedule Status – Occupied/Unoccupied/Override

d) Applicable Alarms

5) The Networked Thermostat shall provide the flexibility to support any one of the following inputs:
   a) Integral Indoor Air Temperature Sensor
   b) Duct Mount Air Temperature Sensor
   c) Remote Indoor Air Temperature Sensor with Occupancy Override and LED Indicator
   d) Two configurable binary inputs
6) The Networked Thermostat shall provide the flexibility to support any one of the following outputs:
   a) Three Speed Fan Control
   b) Two On/Off
   c) Two Floating
   d) Two Proportional (0 to 10V)
7) The Networked Thermostat shall provide a minimum of six (6) levels of keypad lockout.
8) The Networked Thermostat shall provide the flexibility to adjust the following parameters:
   a) Adjustable Temporary Occupancy from 0 to 24 hours
   b) Adjustable heating/cooling deadband from 2º F to 5º F
   c) Adjustable heating/cooling cycles per hour from 4 to 8
9) Where required by application and indicated on plans or room schedules provide the Networked Thermostat with an integral Passive Infra-Red (PIR) occupancy sensor.
10) The Networked Thermostat shall employ nonvolatile electrically erasable programmable read-only memory (EEPROM) for all adjustable parameters.

I. Miscellaneous Devices:

1. Local Control Panels:

   a. All control panels shall be factory constructed, incorporating the BMS manufacturer's standard designs and layouts. All control panels shall be UL inspected and listed as an assembly and carry a UL 508 label listing compliance. Control panels shall be fully enclosed, with perforated sub-panel, hinged door, and slotted flush.

   b. In general, the control panels shall consist of the DDC controller(s), display module as specified and indicated on the plans, and I/O devices—such as relays, transducers, and so forth—that are not required to be located external to the control panel due to function. Where specified the display module shall be flush mounted in the panel face unless otherwise noted.

   c. All I/O connections on the DDC controller shall be provide via removable or fixed screw terminals.

   d. Low and line voltage wiring shall be segregated. All provided terminal strips and wiring shall be UL listed, 300-volt service and provide adequate clearance for field wiring.

   e. All wiring shall be neatly installed in plastic trays or tie-wrapped.

f. A 120 volt convenience outlet, fused on/off power switch, and required transformers shall be provided in each enclosure.

2. Power Supplies:
   a. DC power supplies shall be sized for the connected device load. Total rated load shall not exceed 75% of the rated capacity of the power supply.
   b. Input: 120 VAC +10%, 60Hz.
   c. Output: 24 VDC.
   d. Line Regulation: +0.05% for 10% line change.
   e. Load Regulation: +0.05% for 50% load change.
   f. Ripple and Noise: 1 mV rms, 5 mV peak to peak.
   g. An appropriately sized fuse and fuse block shall be provided and located next to the power supply.
   h. A power disconnect switch shall be provided next to the power supply.
3. BMS Specific Requirements:
   a. Custom Reports: Provide custom reports as required for this project
   b. Primary Equipment:
      1) Controls shall be provided by equipment manufacturer as specified herein.
      2) All damper and valve actuation shall be electric.
   c. Air Handling Equipment
      1) All air handlers shall be controlled with a HVAC-DDC Controller
      2) All damper and valve actuation shall be electric.
   d. Terminal Equipment:
      1) Terminal Units (VAV, UV, etc.) shall have electric damper and valve actuation.
      2) All Terminal Units shall be controlled with HVAC-DDC Controller).
4. Installation Practices:
   a. BMS Wiring:
      1) All conduit, wiring, accessories and wiring connections required for the installation of the Building Management System, as herein specified, shall be provided by the BMS Contractor unless specifically shown on the Electrical Drawings under Division 16 Electrical. All wiring shall comply with the requirements of applicable portions of Division 16 and all local and national electric codes, unless specified otherwise in this section.
      2) All BMS wiring materials and installation methods shall comply with BMS manufacturer recommendations.
      3) The sizing, type and provision of cable, conduit, cable trays, and raceways shall be the design responsibility of the BMS Contractor. If complications arise, however, due to the incorrect selection of cable, cable trays, raceways and/or conduit by the BMS Contractor, the Contractor shall be responsible for all costs incurred in replacing the selected components.
      4) Class 2 Wiring:

a) All Class 2 (24VAC or less) wiring shall be installed in conduit unless otherwise specified.

b) Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5' from the building structure utilizing metal hangers designed for this application. Wiring shall be installed parallel to the building structural lines. All wiring shall be installed in accordance with local code requirements.

5) Class 2 signal wiring and 24VAC power can be run in the same conduit. Power wiring 120VAC and greater cannot share the same conduit with Class 2 signal wiring.

6) Provide for complete grounding of all applicable signal and communications cables, panels and equipment so as to ensure system integrity of operation. Ground cabling and conduit at the panel terminations. Avoid grounding loops.

b. BMS Line Voltage Power Source:

1) 120-volt AC circuits used for the Building Management System shall be taken from panel boards and circuit breakers provided by Division 16.

2) Circuits used for the BMS shall be dedicated to the BMS and shall not be used for any other purposes.

3) DDC terminal unit controllers may use AC power from motor power circuits.

c. BMS Raceway:

1) All wiring shall be installed in conduit or raceway except as noted elsewhere in this specification. Minimum control wiring conduit size 1/2".

2) Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.

3) All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the surface to which they are attached.

4) Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 feet in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls. Flexible Metal Conduit shall be UL listed.

d. Penetrations:

1) Provide fire stopping for all penetrations used by dedicated BMS conduits and raceways.

2) All openings in fire proofed or fire stopped components shall be closed by using approved fire resistive sealant.

3) All wiring passing through penetrations, including walls shall be in conduit or enclosed raceway.

4) Penetrations of floor slabs shall be by core drilling. All penetrations shall be plumb, true, and square.

5) BMS Identification Standards

6) Node Identification. All nodes shall be identified by a permanent label fastened to the enclosure. Labels shall be suitable for the node location.

7) Cable types specified in Item A shall be color coded for easy identification and troubleshooting.

e. BMS Panel Installation:

1) The BMS panels and cabinets shall be located as indicated at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer's recommendations.

2) The BMS contractor shall be responsible for coordinating panel locations with other trades and electrical and mechanical contractors.

f. Input Devices:

1) All Input devices shall be installed per the manufacturer recommendation

2) Locate components of the BMS in accessible local control panels wherever possible.

g. HVAC Input Devices – General:

1) All Input devices shall be installed per the manufacturer recommendation

2) Locate components of the BMS in accessible local control panels wherever possible.

3) The mechanical contractor shall install all in-line devices such as temperature wells, pressure taps, airflow stations, etc.

4) Input Flow Measuring Devices shall be installed in strict compliance with ASME guidelines affecting non-standard approach conditions.

h. Outside Air Sensors:

1) Sensors shall be mounted on the North wall to minimize solar radiant heat impact or located in a continuous intake flow adequate to monitor outside air conditions accurately.

2) Sensors shall be installed with a rain proof, perforated cover.

i. Space Sensors:

1) Shall be mounted per ADA requirements.

2) Provide lockable tamper-proof covers in public areas and/or where indicated on the plans.

j. Low Temperature Limit Switches:

1) Install on the discharge side of the first water or steam coil in the air stream.

2) Mount element horizontally across duct in a serpentine pattern insuring each square foot of coil is protected by 1 foot of sensor.

3) For large duct areas where the sensing element does not provide full coverage of the air stream, provide additional switches as required to provide full protection of the air stream.

k. Air Differential Pressure Status Switches:

1) Install with static pressure tips, tubing, fittings, and air filter.

l. Water Differential Pressure Status Switches:

1) Install with shut off valves for isolation.

m. HVAC Output Devices:

1) All output devices shall be installed per the manufacturer's recommendation. The mechanical contractor shall install all in-line devices such as control valves, dampers, airflow stations, pressure wells, etc.

2) Actuators: All control actuators shall be sized capable of closing against the maximum system shut-off pressure. The actuator shall modulate in a smooth fashion

through the entire stroke. When any pneumatic actuator is sequenced with another device, pilot positioners shall be installed to allow for proper sequencing.

3) Control Dampers: Shall be opposed blade for modulating control of airflow. Parallel blade dampers shall be installed for two position applications.

4) Control Valves: Shall be sized for proper flow control with equal percentage valve plugs. The maximum pressure drop for water applications shall be 5 PSI. The maximum pressure drop for steam applications shall be 7 PSI.

5) Electronic Signal Isolation Transducers: Whenever an analog output signal from the Building Management System is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input a signal from a remote system, provide a signal isolation transducer. Signal isolation transducer shall provide ground plane isolation between systems. Signals shall provide optical isolation between systems

J. Training:

1. The BMS contractor shall provide the following training services:

a. One day of on-site orientation by a system technician who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings, the BMS software layout and naming conventions, and a walk through of the facility to identify panel and device locations.

b. Commissioning:

1) Fully commission all aspects of the Building Management System work.

c. Acceptance Check Sheet:

1) Prepare a check sheet that includes all points for all functions of the BMS as indicated on the point list included in this specification.

2) Submit the check sheet to the Engineer for approval

3) The Engineer will use the check sheet as the basis for acceptance with the BMS Contractor.

d. Promptly rectify all listed deficiencies and submit to the Engineer that this has been done.

K. Actuators and Operators:

1. General Requirements:

a. Damper and valve actuators shall be electronic and/or pneumatic, as specified in the System Description section.

b. The manufacturer shall be ISO 9001 certified.

2. Electronic Damper Actuators:

a. Spring Return Actuators:

1) Manufactured, brand labeled or distributed by Johnson Controls, Inc. or approved equivalent.

2) Regulatory Agency Listing: cULus ,CSA C22.2 No. 24-93, and CE marked

3) Direct-Coupled Design: Requires no crankarm or linkage for mounting to a shaft.

4) Coupling: toothed V-bolt clamp and nuts with toothed cradle.

5) Reversible Mounting: Provides either clockwise or counterclockwise operation.

6) Power Failure Operation: Mechanical spring return system drives load to the home position. Other forms of internal energy storage for power failure operation are not acceptable.
7) Motor Technology:
    a) Modulating Types: Microprocessor-controlled Brushless DC motor
    b) On/Off Types: DC brush motor.
8) Overload Protection: Electronic stall detection protects from overload at all angles of rotation without the use of end switches.
9) Enclosure Ratings: NEMA type 2 / IP54 mounted in any orientation.
10) Double-Insulated construction: Eliminate the need for electrical ground wires.
11) Wiring: Integral cables with colored and numbered conductors.
12) Sized for torque required to seal damper at load conditions
13) Parallel Operation: Actuators shall be available that are capable of being mechanically or electrically paralleled.
14) Proportional actuators shall be user configurable without the use of external computer software or programming tools. Calibration, input signal range selection, and control logic reversal shall be selectable with an external mode selection switch.
15) Operating Temperature Range:
    a) 70 lb·in. Torque and Below: -40°F to 140°F
    b) 71 lb·in. Torque and above: -40°F to 131°F
16) Power Requirements:
    a) Modulating Types:
        (1) 27 lb·in. Torque and Below: 5VA maximum
        (2) 70 lb·in. to 19 lb·in.Torque: 8VA maximum
        (3) 89 lb·in. to 71 lb·in.Torque: 10VA maximum
        (4) 90 lb·in. to 177 lb·in.Torque: 16VA maximum
    b) 2-Position Types:
        (1) 27 lb·in. Torque and Below: 5VA maximum
        (2) 70 lb·in. to 19 lb·in.Torque: 7VA maximum
        (3) 71 lb·in. to 177 lb·in.Torque: 25VA maximum

3. Non-Spring Return Actuators:
    a. Manufactured, brand labeled or distributed by Johnson Controls, Inc. or approved equivalent.
    b. Regulatory Agency: UL Listed ,CSA Certified, and CE marked
    c. Direct-Coupled Design: Requires no crankarm or linkage for mounting to a shaft.
    d. Coupling:
        1) Above 80 lb.·in.: toothed V-bolt clamp and nuts with toothed cradled
        2) 80 lb.·in.and below: single cup-point set screw and toothed cradle.

e. Overload Protection: Electronic stall detection or magnetic slip clutch protects from overload at all angles of rotation without the use of end switches.

f. Minimum Enclosure Ratings:

1) Types with covered wiring terminals: NEMA type 2 / IP42 mounted in any orientation.

2) Types without covered wiring terminals: NEMA type 1 / IP30 or IP40.

3) Types with integrated cables: NEMA 2 / IP42 mounted in any orientation.

g. Sized for torque required to seal damper at load conditions

h. Parallel Operation: Actuators shall be available that are capable of being mechanically or electrically paralleled.

i. Proportional actuators shall be user configurable without the use of external computer software or programming tools.

j. Operating Temperature Range: -4°F to 122°F except for VAV and similar indoor applications in which case 32°F to 122°F is acceptable.

k. Power Requirements: 24 V with models available for both 24 VAC and 24 VDC operation, maximum

1) Above 80 lb.·in.: 7.5 VA at 24 VAC

2) 80 lb.·in.and below: 3.5 VA at 24VAC

l. The manufacturer shall provide 5-year limited warranty from the date of sale covering defects in material or workmanship.

L. Sensors and Transmitters:

1. General Requirements:

a. Installation, testing, and calibration of all sensors, transmitters, and other input devices shall be provided to meet the system requirements.

2. Temperature Sensors

a. General Requirements:

1) Sensors and transmitters shall be provided, as outlined in the input/output summary and sequence of operations.

2) The temperature sensor shall be of the resistance type, and shall be either two-wire 1000 ohm nickel RTD, or two-wire 1000 ohm platinum RTD.

3) The following point types (and the accuracy of each) are required, and their associated accuracy values include errors associated with the sensor, lead wire, and A to D conversion:

| Point Type | Accuracy |
|---|---|
| Chilled Water | + .5°F. |
| Room Temp | + .5°F. |
| Duct Temperature | + .5°F. |
| All Others | + .75°F. |

b. Room Temperature Sensors:
   1) Room sensors shall be constructed for either surface or wall box mounting.
   2) Room sensors shall have the following options when specified:
      a) Setpoint warmer/cooler dial or reset slide switch providing a +3 degree (adjustable) range.
      b) Individual heating/cooling setpoint slide switches.
      c) A momentary override request push button for activation of after-hours operation.
      d) Analog thermometer.
   3) Room Temperature Sensors with Integral Display:
      a) Room sensors shall be constructed for either surface or wall box mounting.
      b) Room sensors shall have an integral LCD display and four button keypad with the following capabilities:
         (1) Display room air temperatures.
         (2) Display and adjust room comfort setpoint.
         (3) Display and adjust fan operation status.
      c) Timed override request push button with LED status for activation of after-hours operation.
      d) Display controller mode.
      e) Password selectable adjustment of setpoint and override modes.

c. Thermo Wells:
   1) Thermowell manufacturer shall have models available in stainless steel, brass body, and copper bulb.
   2) When thermo wells are required, the sensor and well shall be supplied as a complete assembly, including wellhead and sensor.
   3) Thermo wells shall be pressure rated and constructed in accordance with the system working pressure.
   4) Thermo wells and sensors shall be mounted in a direct mount (no adapter) offering faster installation or 1/2” NFT saddle and allow easy access to the sensor for repair or replacement.
   5) Thermo wells constructed of 316 stainless steel shall comply with Canadian Registration Number (CRN) pressure vessel rating.

d. Outside Air Sensors:
   1) Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall also be provided with a solar shield.
   2) Sensors exposed to wind velocity pressures shall be shielded by a perforated plate that surrounds the sensor element.
   3) Temperature transmitters shall be of NEMA 3R (IP54) or NEMA 4 (IP65) construction and rated for ambient temperatures.
   4) The outdoor sensor can be easily mounted on a roof, pole or side of a building utilizing its already assembled mounting bracket.

5) Outside Relative Humidity sensors 0-100% full range of accurate measurement. Operating temperature -4 to 140F (-20 to 60C).

6) Outside temperature sensors operating temperature range is -40 to 140F, +/- .55F (+/- .3C).

e. Duct Mount Sensors:

1) Duct mount sensors shall mount in an electrical box through a hole in the duct, and be positioned so as to be easily accessible for repair or replacement.

2) Duct sensors shall be insertion type and constructed as a complete assembly, including lock nut and mounting plate.

3) For outdoor air duct applications, a weatherproof mounting box with weatherproof cover and gasket shall be used.

f. Acceptable Manufacturers: Johnson Controls, Minco.

3. Smoke Detectors: Ionization type air duct detectors shall be furnished as specified elsewhere in Division 16 for installation under Division 15. All wiring for air duct detectors shall be provided under Division 16, Fire Alarm System.

4. Status and Safety Switches:

a. General Requirements: Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the BMS when a failure or abnormal condition occurs. Safety switches shall be provided with two sets of contacts and shall be interlock wired to shut down respective equipment.

b. Current Sensing Switches:

1) The current sensing switch shall be self-powered with solid-state circuitry and a dry contact output. It shall consist of a current transformer, a solid state current sensing circuit, adjustable trip point, solid state switch, SPDT relay, and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over-current up to twice its trip point range.

2) Current sensing switches shall be used for run status for fans, pumps, and other miscellaneous motor loads.

3) Current sensing switches shall be calibrated to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.

4) Acceptable manufacturers: Johnson Controls

c. Water Flow Switches: Water flow switches shall be equal to the Johnson Controls P74.

d. Low Temperature Limit Switches:

1) The low temperature limit switch shall be of the manual reset type with Double Pole/Single Throw snap acting contacts rated for 16 amps at 120VAC.

2) The sensing element shall be a minimum of 15 feet in length and shall react to the coldest 18-inch section. Element shall be mounted horizontally across duct in accordance with manufacturers recommended installation procedures.

3) For large duct areas where the sensing element does not provide full coverage of the air stream, additional switches shall be provided as required to provide full protection of the air stream.

4) The low temperature limit switch shall be equal to Johnson Controls A70.

e. Control Relays:

1) Control Pilot Relays:

a) Control pilot relays shall be of a modular plug-in design with retaining springs or clips.

b) Mounting Bases shall be snap-mount.

c) DPDT, 3PDT, or 4PDT relays shall be provided, as appropriate for application.

d) Contacts shall be rated for 10 amps at 120VAC.

e) Relays shall have an integral indicator light and check button.

f) Acceptable manufacturers: Johnson Controls, Lectro

2) Thermostats: Electric room thermostats of the heavy-duty type shall be provided for unit heaters, cabinet unit heaters, and ventilation fans, where required. All these items shall be provided with concealed adjustment. Finish of covers for all room-type instruments shall match and, unless otherwise indicated or specified, covers shall be manufacturer's standard finish.

M. Control Valves:

1. Ball Valves, 1/2 through 2 in.:

a. Ball Valves shall have forged brass bodies.

b. Valves shall have available either Chrome Plated Brass Balls or 300 Series Stainless Steel Balls in all sizes.

c. Valves shall have available either Nickel Plated Brass Stems or 300 Series Stainless Steel Stems with a blow-out proof stem design in all sizes.

d. Valves shall have Graphite reinforced Polytetrafluoroethylene (PTFE) seats with Ethylene Propylene Diene Monomer (EPDM) O-ring backing.

e. Stem seals shall be double EPDM O-rings.

f. Flow Characterization Disk shall be manufactured from Amodel AS-1145HS Polyphthalamide Resin and rated for 50 psid maximum differential pressure and shall be inserted against the casting of the valve.

g. All ball valves with internal pipe thread end connections shall be rated to 580 psi maximum static pressure at 203°F (95°C) fluid temperature.

h. All ball valves with sweat end connections or press end connection shall be rated to 300 psig maximum static pressure at 203°F (95°C) fluid temperature

i. All valves shall be rated for service with hot water, chilled water and 50% glycol solutions.

j. Ball Valves with stainless steel balls and stems shall be rated for use with 15 psig saturated steam.

k. Flow Characteristics shall be equal percentage on the control port. Bypass port on three-way valves shall have linear flow characteristics.

l. Valves shall have a maximum leakage specification of 0.01% of maximum flow for the control port, ANSI/FCI 70-2, Class 4 and 1% of maximum flow, bypass port.

m. Valves shall be maintenance free

n. Valves shall be provided with a 5 year warranty.

o. Valves shall be rated for 200 psid closeoff pressure.

p. Valve actuators shall be UL-recognized or CSA-certified.

q. Valves shall be Johnson Controls VG1000 Series ball valves or approved equal.

2. Ball Valves, 2-1/2 through 4 in. Flanged:

a. Ball Valves shall have forged brass bodies with ASME Class 150 ductile iron flanges.

b. Valves shall have 300 Series Stainless Steel Balls.

c. Valves shall have 300 Series Stainless Steel Stems with a blow-out proof stem design.

d. Valves shall have Graphite reinforced Polytetrafluoroethylene (PTFE) seats with Ethylene Propylene Diene Monomer (EPDM) O-ring backing.

e. Stem seals shall be double EPDM O-rings.

f. Flow Characterization Disk shall be manufactured from Amodel AS-1145HS Polyphthalamide Resin and rated for 50 psid maximum differential pressure.

g. Flow Characteristics shall be equal percentage on the control port. Bypass port on three-way valves shall have linear flow characteristics.

h. Valves shall have a maximum leakage specification of 0.01% of maximum flow for the control port, ANSI/FCI 70-2, Class 4 and 1% of maximum flow, bypass port.

i. All valves shall be rated for service with hot water, chilled water, 50% glycol solutions and rated for use with 25 psig saturated steam.

j. Two-Way Valves shall be rated for 100 psid closeoff pressure and Three-Way Valves shall be rated for 50 psid closeoff pressure.

k. Valves shall be maintenance free.

l. Valves shall be provided with a 5 year warranty.

m. Valve actuators shall be UL-recognized or CSA-certified.

n. Valves shall be Johnson Controls VG1000 Series ball valves or approved equal.

3. Electric Zone Valves, 1/2 through 1-1/4 in.

a. Valves shall have bodies manufactured from Forged Brass.

b. Valves stems shall be brass (Hard Chrome Plated)

c. Valve Actuator shall be UL, cUL listed or CSA certified.

d. Valves shall be rated for service with hot water, chilled water and 50% glycol solutions.

e. Two Position valves shall have models available rated for use with 15 psig saturated steam.

f. Valve Actuator shall be replaceable without removing valve from the pipe.

g. Modulating Valves flow characteristics shall be equal percentage

h. Valves shall be provided with a 2 year warranty.

i. Valve actuators shall be UL-recognized or CSA-certified.

j. Valves shall be Johnson Controls J Series electric zone valves or approved equal.

4. The BMS Contractor shall furnish all automatic dampers. All automatic dampers shall be sized for the application by the BMS Contractor or as specifically indicated on the Drawings.

5. All dampers used for throttling airflow shall be of the opposed blade type arranged for normally open or normally closed operation, as required. The damper is to be sized so that,

when wide open, the pressure drop is a sufficient amount of its close-off pressure drop to shift the characteristic curve to near linear.

6. All dampers used for two-position, open/close control shall be parallel blade type arranged for normally open or closed operation, as required.
7. Damper frames and blades shall be constructed of either galvanized steel or aluminum. Maximum blade length in any section shall be 60”. Damper blades shall be 16-gauge minimum and shall not exceed eight (8) inches in width. Damper frames shall be 16-gauge minimum hat channel type with corner bracing. All damper bearings shall be made of reinforced nylon, stainless steel or oil-impregnated bronze. Dampers shall be tight closing, low leakage type, with synthetic elastomer seals on the blade edges and flexible stainless steel side seals. Dampers of 48”x48” size shall not leak in excess of 8.0 cfm per square foot when closed against 4” w.g. static pressure when tested in accordance with AMCA Std. 500.
8. Airfoil blade dampers of double skin construction with linkage out of the air stream shall be used whenever the damper face velocity exceeds 1500 FPM or system pressure exceeds 2.5” w.g., but no more than 4000 FPM or 6” w.g.
    a. Acceptable manufacturers are Johnson Controls VD-1250, VD1630, or VD-1330, Ruskin CD50 or CD60, and Vent Products 5650.
9. One piece rolled blade dampers with exposed or concealed linkage may be used with face velocities of 1500 FPM or below.
    a. Acceptable manufacturers are: Johnson Controls VD-1620, VD-1320, Ruskin CD36, and Vent Products 5800.
10. Multiple section dampers may be jack-shafted to allow mounting of piston pneumatic actuators and direct connect electronic actuators. Each end of the jackshaft shall receive at least one actuator to reduce jackshaft twist.

## 2.20 PACKAGED AIR-TO-AIR ENERGY RECOVERY WITH HEATING AND COOLING

A. Quality Assurance:
    1. Source Limitations: Obtain Packaged Air-to-Air Energy Recovery Unit with all appurtenant components or accessories from a single manufacturer.
    2. Product Options: Drawings must indicate size, profiles and dimensional requirements of Energy Recovery Units and are to be based on the specific system indicated. Refer to Division 1 Section "Product Requirements".
    3. Certifications
        a. Blowers shall be AMCA Certified for air flow.
        b. Entire unit shall be ETL Certified per U.L. 1995 and bear an ETL sticker.
        c. Energy Wheel shall be AHRI Certified, per Standard 1060.
        d. Coils shall be Recognized Components for ANSI/UL 1995, CAN / CSA C22.2 No 236.05. DX and water coils shall be AHRI Certified per standard 410-2001.
    4. Indirect gas-fired furnace shall be ETL Certified as a component of the ERU. Indirect gas-fired furnace shall be an ETL Recognized Component of the ERU per ANSI Z83.8.

B. Coordination:
    1. Coordinate size and location of all building penetrations required for installation of each Energy Recovery Unit and associated plumbing and electrical systems.
    2. Coordinate location of water system fittings to ensure correct positioning for connection to the

water coil and condensate drain pipe.

3. Coordinate sequencing of construction of associated plumbing, HVAC, electrical supply, roofing contractor.

C. Manufacturers: Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include:

1. Greenheck Fan Corporation
2. Aaon
3. Trane

D. Manufactured Units: Packaged Air-to-Air Energy Recovery Units shall be fully assembled at the factory and consist of an insulated metal cabinet, with engineered curb kit, motorized insulated low leakage intake damper, filter assemblies for both intake and exhaust air, energy wheel, airside coil, engineered P trap assembly with P trap, reheat coil, supply air blower assembly, indirect gas-fired furnace, insulated low leakage exhaust air damper, exhaust air blower assembly electrical control unit with all specified components and internal accessories factory installed and tested and prepared for single-point high voltage connection. Entire unit with the exception of field-installed components shall be assembled and test operated at the factory.

E. Cabinet:

1. Materials: Formed, insulated double wall construction, fabricated to permit access to internal components for maintenance.
    a. Outside casing: 18 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish.
    b. Internal assemblies: 20 gauge, galvanized (G90) steel except for motor supports which shall be 14 gauge galvanized (G90) steel.
2. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.
    a. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.
        1) Thickness: 1 inch (25 mm)
        2) Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.
        3) Location and application: Full coverage of entire cabinet exterior to include walls and roof of unit. Insulation shall be of semi-rigid type and installed between inner and outer shells of all cabinet exterior components.
    b. Materials: Rigid urethane foam
        1) Thickness: 1 inch (25 mm)
        2) Meets UL94HF-1 flame requirements.
        3) Location and application: Doors and the floor of the unit.
3. Access panels / doors: Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of 18 gauge galvanized G90 steel.
4. Condensate drain pan: Pan shall be formed of welded austenitic stainless steel sheet material and provided with a welded drain connection at the front for connection to a P trap.

Drain pan shall be sloped in two directions to provide positive draining.

5. P trap: An engineered P trap (condensate drain) assembly shall be provided for each unit, to include cleanout ports, cleanout tool, vacuum break device and see-through reservoir to permit visual verification of water or glycol solution levels.
6. Energy wheel: Energy wheel shall be of total enthalpy, rotary air-to-air type and shall be, an element of a removable energy wheel cassette. The cassette shall consist of a galvanized steel framework (designed to produce
7. laminar air flow through the wheel) an energy wheel as specified and a motor and drive assembly. The cassette shall incorporate, a pre-tensioned urethane drive belt with a five year warranty. The wheel media shall be a polymer film matrix in a stainless steel framework and be comprised of individual segments that are removable for servicing. Non-segmented energy wheels are not acceptable. The polymer film material shall be coated with silica gel desiccant and shall be designed and constructed to permit cleaning and servicing. The energy wheel is to have a five year warranty. Performance criteria are to be as specified in AHRI Standard 1060, complying with the Combined Efficiency data in the submittal.
8. Compressed refrigerant coils shall be AHRI Certified and shall be (silver) soldered or brazed into the compressed refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a galvanized steel frame. If two compressors are used as components of a packaged DX system in the ERU, then the evaporator coil shall be of "interlaced" configuration, permitting independent operation of either compressor without conflict with the other compressor.
9. Supply Air and Exhaust Air blower assemblies: Blower assemblies consist of an electric motor and a belt driven blower. Assembly shall be mounted on heavy gauge galvanized rails and further mounted on 1.125 inch thick neoprene vibration isolators.
10. Control panel / connections: Energy Recovery Unit shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections. Optional electric post heater shall have a separate electrical control center and separate high voltage power circuit as shown on the plans. Optional electric post heater shall have a separate electrical control center and separate high voltage power circuit as shown on the plans.
11. Reheat coil with factory installed modulating hot gas reheat valve.
12. Indirect Gas Furnace:
    a. Shall be ETL Certified as a component of the Energy Recovery Air Unit.
    b. Shall have an integral exhaust gas blower
    c. Shall be ETL Certified for installation downstream of a cooling coil.
    d. Shall have fault sensors to provide fault conditions to optional digital controller or building controls.
    e. Shall have 4-pass tubular heat exchangers, constructed of aluminized steel. Heat exchanger tubes shall be installed on the vest plate by means of swaged assembly, welded connections are not acceptable. Heat exchanger tubes shall be supported by a minimum of two fabricated assemblies that support the tubes and also permit expansion and contraction of the tubes.
13. Furnace control shall be 2 stage.
14. Shall be encased in a weather-tight metal housing with intake air vents. Large, metal lift-off or hinged door shall provide easy access to the enclosed vest plate, control circuitry, gas train, burner assembly, and exhaust blower.

15. Packaged DX System: Energy Recovery Air Unit shall have an integral compressor(s) and evaporator coil located within the weather-tight unit housing. Condenser coils and appurtenant condenser fan assemblies shall be factory installed as integral subassemblies of the ERU and mounted on the exterior of the ERU. Condenser fan motors shall be three phase, type 56 frame, Open Air Over and Shaft Up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. Motors shall be UL Recognized and CSA Certified. The refrigerant compressor(s) shall be hermetic scroll-type and shall be equipped with liquid line filter drier, thermal expansion valve (TXV), manual reset high pressure and low pressure cutouts and all appurtenant sensors, service ports and safety devices. Compressed refrigerant system shall be fully charged with R-410A refrigerant. Each compressor shall be factory-equipped with an electric crankcase heater to boil off liquid refrigerant from the oil. Hot gas bypass shall be provided on the lead circuit to prevent icing of the evaporator coil under low load conditions.
16. Motorized dampers / Exhaust Air, Intake Air, Motorized dampers of insulated low leakage type shall be factory installed.
17. Curb Assembly: Provide a seismic vibration isolation curb. Refer to Vibration Isolation specification section.

F. Blower Section:

1. Blower section construction, Supply Air and Exhaust Air: Belt drive motor and blower shall be assembled onto a 14 gauge galvanized steel platform and must have neoprene vibration isolation devices.
2. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.
3. Centrifugal blower housing: Formed and reinforced steel panels to make curved scroll housing with shaped cutoff.
4. Forward curved blower (fan) wheels: Galvanized or aluminum construction with inlet flange and shallow blades curved forward in direction of airflow. Mechanically attached to shaft with set screws.
5. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating".

G. Motors: General: Blower motors greater than 3/4 horsepower shall be "NEMA Premium" unless otherwise indicated. Compliance with EPAct minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure. Drives shall be sized for a minimum of 150% of driven horsepower and pulleys shall be fully machined cast-type, keyed and fully secured to the fan wheel and motor shafts. Electric motors of ten horsepower or less shall be supplied with an adjustable drive pulley. Comply with requirements in Division 23 05 13, matched with fan load.

1. Motors shall be 60 cycle, 3 phase 208 volts.

H. Unit Controls:

1. Sensors: Dirty filter sensor.

I. Filter Section: Energy Recovery Unit shall have permanent metal filters located in the outdoor air intake and shall be accessible from the exterior of the unit. MERV 8 pleated filters shall be provided in the intake air stream and MERV 8 filters in the exhaust air stream.

J. Examination:

1. Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance. See unit IOM.
2. Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements. See unit IOM.
3. Proceed with installation only after all unsatisfactory conditions have been corrected.

K. Installation: Installation shall be accomplished in accordance with these written specifications, project drawings, manufacturer's installation instructions as documented in manufacturer's IOM, Best Practices and all applicable building codes.

L. Connections:

1. In all cases, industry Best Practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.
2. Piping installation requirements are specified in Division 22 (Plumbing). Drawings indicate general arrangement of piping, fittings and specialties.
3. Duct installation and connection requirements are specified in Division 23 of this document.
4. Electrical installation requirements are specified in Division 26 of this document.

M. Field Quality Control: Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A / E in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM.

N. Start-up Service: Engage a factory authorized service representative to perform startup service. Clean entire unit, comb coil fins as necessary, and install clean filters. Verify water source for compliance with manufacturer's requirements for flow and temperature. Measure and record electrical values for voltage and amperage. Refer to Division 23 "Testing, Adjusting and Balancing" and comply with provisions therein.

O. Demonstration and Training: Engage a factory authorized service representative to train owner's maintenance personnel to adjust, operate and maintain the entire energy recovery unit. Refer to Division 01 Section Closeout Procedures and Demonstration and Training.

## 2.21 SEQUENCE OF OPERATIONS

A. Rooftop Air Handling Units: The controller will start and stop units based on a time of day schedule. On a call to start a unit, the outdoor air damper will open 100% and heating and cooling will be staged to maintain space temperature setpoint as sensed by space thermostat (user adjustable). If a unit fails to start, as sensed by a current sensor, an alarm will be generated. On detection of smoke in the supply duct, alarm will be generated. On detection of smoke in the supply duct, unit will be shut down by hardwired interlock. Filter differential pressure and smoke detector are monitored, and respective alarms will be generated on detection of excessive filter differential pressure or smoke detection.

B. Heat Recovery Units: The controller will start and stop units based on a time of day schedule. If a unit fails to start, as sensed by a current sensor, an alarm will be generated. On detection of smoke in the supply duct, alarm will be generated. On detection of smoke in the supply duct, unit will be shut down by hardwired interlock. Filter differential pressure and smoke detector are monitored, and respective alarms will be generated on detection of excessive filter differential pressure or smoke detection.

C. Miscellaneous Exhaust Fans: Exhaust fans are started and stopped based on a time of day schedule. On a call to start, respective dampers (where applicable) will open and fan will be

energized. If unit fails to start, as sensed by current sensor, an alarm will be generated.

D. Electric Unit Heaters: A local thermostat will cycle the fan and energize heating coil to maintain space temperature setpoint.

E. Combustion Air: On a call for heat from the boiler, the controller will open the combustion air damper.

F. Hot Water Unit Heaters: A local thermostat will open the heating coil control valve and cycle the fan to maintain space temperature setpoint.

G. Finned Tube Radiation: A wall-mounted thermostat maintains constant space temperature by opening/closing the 2-way heating control valve. Isolation control valves, on both the supply and return, are commanded closed during the cooling season by the BMS to isolate the finned tube and prevent condensation.

H. Hot Water Unit Heaters and Cabinet Heaters: A wall-mounted thermostat maintains constant space temperature by cycling the unit mounted fan. Isolation control valves, on both the supply return, are commanded closed during the cooling season by the BMS to isolate the finned tube and prevent condensation.

## PART 3 – EXECUTION

### 3.1 COMMISSIONING OF EQUIPMENT AND SYSTEMS

A. The Architect will check the completed installation either sequentially as different parts are completed, or when the entire installation is complete, at the sole option of the Architect.

B. Prior to the Architect's checking a part of the installation or the entire installation, this Contractor shall submit a letter signed by an Officer of this Contracting Company or an Officer of the General Contractor stating that:

1. He is an Officer of the Company.
2. He has personally inspected the installation to be checked.
3. The date of his inspection.
4. The installation is complete and tested and ready to be inspected by the Architect, and that all required test reports have been submitted.

C. This Contractor shall arrange that an Officer of this Contracting Company or of the General Contractor, as well as the Clerk of the Works, in addition to other test witnesses that may be specified, shall witness the below listed tests. At the conclusion of each such test this Contractor shall submit a letter signed by the Officer stating that:

1. He is an Officer of the Company.
2. He has personally witnessed the tests (giving the name of the tests).
3. The date of testing.
4. The results of testing, as compared to specified performance.
5. List the name, title and company affiliated to all those witnessing the tests.

### 3.2 SPECIAL RESPONSIBILITIES

A. Coordination: Cooperate and coordinate with work of other Sections in executing work of this Section.

1. Perform work such that progress of entire project including work of other Sections shall not be interfered with or delayed.

2. Provide information as requested on items furnished under this Section which shall be installed under other Sections.
3. Obtain detailed installation information from manufacturers of equipment provided under this Section.
4. Obtain final roughing dimensions or other information as needed for complete installation of items furnished under other Sections or by Owner.
5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other Sections. Give full information so that openings required by work of this Section may be coordinated with other work and other openings and may be provided for in advance. In case of failure to provide sufficient information in proper time, provide cutting and patching or have same done, at own expense and to full satisfaction of Architect.
6. Provide information as requested as to sizes, number and locations of concrete housekeeping pads necessary for floor-mounted vibrating and rotating equipment provided under this Section.
7. Notify Architect of location and extent of existing piping, ductwork and equipment that interferes with new construction. In coordination with and with approval of Architect, relocate piping, ductwork and equipment to permit new work to be provided as required by Contract Documents. Remove non-functioning and abandoned piping, ductwork and equipment as directed by Architect. Dispose of or store items as requested by Architect.

B. Installation Only Items:

1. Where this Contractor is required to install items which it does not purchase, it shall coordinate their delivery and be responsible for this unloading from delivery vehicles and for their safe handling and field storage up to the time of installation. This trade shall be responsible for:
    a. Any necessary field assembly and internal connections, as well as mounting in place of the items, including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural conditions.
    b. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building system.
2. This Contractor shall carefully examine such items upon delivery. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of work of this Contractor will be considered only if presented in writing within one (1) week of their date of delivery. Unless such claims have been submitted this Contractor shall be fully responsible for the complete reconditioning or replacement of the damaged items.

C. Maintenance of equipment and Systems: Maintain HVAC equipment and systems until Final Acceptance. Ensure adequate protection of equipment and material during delivery, storage, installation and shutdown delays pending final test of systems and equipment because of seasonal conditions. Do not use boilers before providing water treatment where required; this includes use of boilers for temporary heat or for testing.

D. Use of Premises: Use of premises shall be restricted as directed by Architect and as required below:

1. Remove and dispose of dirt and debris, and keep premises reasonably clean. Upon completion of work, remove equipment and unused material. Put building and premises in neat and clean condition and do cleaning and washing required to provide acceptable appearance and operation of equipment, to satisfaction of Architect and as specified under CLEANING paragraph.

2. It shall be this trade's responsibility to store his material in a manner that will maintain an orderly clean appearance. If stored on-site in open or unprotected areas, all equipment and material shall be kept off the ground by means of pallets or racks, and covered with tarpaulins.
3. Do not interfere with functions of existing sewers and gas mains. Extreme care shall be observed to prevent debris from entering ductwork. Confer with Architect as to disruption of heating services or other utilities due to testing or connection of new work to existing. Interruption of heating services shall be performed at time of day or night deemed by Architect to provide minimum interference with normal operation. Obtain Architect's approval of the method proposed for minimizing service interruption.

E. Surveys and Measurements:
1. Base measurements, both horizontal and vertical, on reference points established by Contractor and be responsible for correct laying out of work.
2. In event of discrepancy between actual measurements and those indicated, notify Architect in writing and do not proceed with work until written instructions have been issued by Architect.

F. Fireproofing:
1. Clips, hangers, clamps, supports and other attachments to surfaces to be fireproofed shall be installed, insofar as possible prior to start of spray fiber work.
2. Ducts, piping and other items, which would interfere with proper application of fireproofing, shall be installed after completion of spray fiber work.
3. Patching and repairing of spray fireproofing due to cutting or damaging to fireproofing during course of work specified under this Section shall be performed by installer of fireproofing and paid for by trade responsible for damage and shall not constitute grounds for an extra to Owner.

G. Airbound Coils: If, after plant is in operation, any coils or other apparatus are stratified or air bound (by vacuum or pressure), they shall be re-piped with new approved and necessary fittings, air vents or vacuum breakers at no extra cost. If connections are concealed in furring, floors or ceilings this trade shall bear all expenses of tearing up and refinishing construction and finish, leaving same in as good condition as before it was disturbed.

## 3.3 MATERIALS AND WORKMANSHIP

A. Work shall be neat and rectilinear. Ductwork and piping shall run concealed except in mechanical rooms and areas where no hung ceiling exists. Install material and equipment as required by manufacturers. Installation shall operate safely and without leakage, undue wear, noise, vibration, corrosion or water hammer. Work shall be properly and effectively protected, and pipe and duct openings shall be temporarily closed to prevent obstruction and damage before completion.
1. Except as specified otherwise, material and equipment shall be new. Provide supplies, appliances and connections necessary for complete and operational installation. Provide components required or recommended by OSHA and applicable NFPA documents.
2. References to manufacturers and to catalog designation are intended to establish standards of quality for materials and performance but imply no further limitation of competitive bidding.
3. Finish of materials, components and equipment shall be as approved by Architect and shall be resistant to corrosion and weather as necessary.
4. Owner will not be responsible for material and equipment before testing and acceptance.

## 3.4 CONTINUITY OF SERVICES

A. Do not interrupt existing service without Owner's approval.

B. Schedule interruptions in advance, according to Owner's instructions. Submit, in writing, with request for interruption, methods proposed to minimize length of interruption.

C. Interruptions shall be scheduled at such times of day and work so that they have minimal impact on Owner's operations.

### 3.5 TAGS

A. Upon completion of work, attach engraved laminated tags to all valves (listed in the valve directory called for in the "Bulletins, Manuals and Instructions" paragraph of these Specifications) and all pieces of HVAC equipment (including but not limited to pumps, fans, air handlers, coils and all other equipment listed in the HVAC Schedules). Valve tags shall have black characters on white face, consecutively numbered and prefixed by letter "V". Equipment tags shall have black characters on white face with labels corresponding to drawing schedule numbers.

B. Embossed or engraved aluminum or brass tags may be substituted if desired. Tags shall be at least 1/8" thick.

C. Valve tags shall be at least 1" in diameter with numerals at least 3/8" high and attached by "S" hooks or chains. Equipment tags shall be at least 2" diameter securely attached to apparatus.

D. Provide manufacturers equipment nameplates, catalog numbers and rating identification securely attached to electrical and mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.

### 3.6 PIPE AND DUCT IDENTIFICATION

A. Ductwork shall be stenciled at each junction or branch takeoff, at least once in each room, and at intervals not longer than 20 feet. Stencil shall clearly identify duct service ("S" for supply; "R" for return' "X" for exhaust), area served by branch, and arrow indicating direction of flow.

B. Provide color-coded pipe identification markers on piping installed under this Section. Pipe markers shall be snap-on laminated plastic protected by clear acrylic coating. Pipe markers shall be applied after architectural painting where such is required.

C. Provide arrow marker with each pipe content marker to indicate direction of flow. If flow can be in either direction, use double-headed arrow marker.

D. Mains shall be labeled at points of entrance and exit from mechanical room, adjacent to each valve, on each riser, at each tee fitting, at points of entrance and exit from building, at least once in each room and at intervals no longer than 20 feet.

E. Size of legend letters on markers and length of color field shall be per the latest edition of ANSI A13.1.

F. Markers shall be "Setmark" by Seton Name Plate Corp., or approved equal.

G. Following color-coding shall be used with names in black letters on background and while letters on green background:

| Service | Legend | Background Color |
|---|---|---|
| Hot Water Supply | HWS | Yellow |

| | | |
|---|---|---|
| Hot Water Return | HWR | Yellow |

H. Color banding shall meet latest edition of ANSI A13.1 and OSHA.

### 3.7 ACCESS AND ACCESS PANELS

A. Provide proper access to materials and equipment that require inspection, replacement, repair or service and coordinate their delivery with the installing Trade. If proper access cannot be provided, confer with Architect as to best method of approach for minimizing effect of reduced access which may result.

B. Coordinate and prepare a location, size and function schedule of access panels required to fully service equipment and deliver to a representative of the installing Trade. Furnish and install distinctively colored buttons (color as selected by Architect) in finished ceiling to identify all access panels.

C. Furnish access panels for installation under other Sections where fire dampers, volume dampers, controls, shut-off valves, control valves, check valves or other items installed under this Section require access and are concealed in floor, wall, furred space or above ceiling. Access panels shall be by Milcor, Knapp, Nystrom or Inland Steel; coordinate selection with other Sections supplying similar access panels.

D. Ceilings consisting of lay-in or removable splined tiles do not require access panels and dampers, splitters or test hole openings above ceiling shall have location marked with thumb tack on finished ceiling panel. Location shall be noted on record Drawings.

E. Access panels shall have same fire-rating classification as surface penetrated.

F. Panels shall be at least 12” x 12”; access panels at equipment (VAV boxes, fan boxes and others) shall be 18” x 18”.

### 3.8 PENETRATIONS AND SLEEVES

A. General:

1. Provide pipe and duct sleeves and packing materials as specified and as shown on Drawings at penetrations of foundations, walls, slabs (except on-grade), partitions and floors. Sleeves shall meet NFPA-101 requirements and materials requirements of PART 2 or this Section.

2. Coordinate work carefully with architectural and structural work. Set sleeves in forms before concrete is poured. Provide core drilling as necessary if walls are poured, or otherwise constructed, without sleeves and a wall penetration is required. Provide core drilling as required for penetrations of existing construction. Do not penetrate structural members without Architect’s approval.

3. Sleeves for insulated pipe and duct in non-fire rated construction shall accommodate continuous insulation without compression. Sleeves and/or penetrations in fire-rated construction shall be packed with fire-rated material which shall maintain the fire rating of the wall. Seal ends of penetrations to provide continuous vapor barrier where insulation is interrupted. See “PART 2” of these Specifications for requirements for packing materials.

4. Sleeves through floor shall be water-tight and shall extend 2” above floor surface.

B. Pipe Sleeves:

1. Annular space between pipe and sleeve shall be at least 1/4".

2. Sleeves are not required for slabs-on-grade unless specified otherwise.

3. Sleeves and packing materials, through rated fire walls and smoke partitions shall maintain

fire rating of construction penetrated.

4. Do not support piping risers on sleeves.

C. Duct Sleeves and Prepared Openings:

1. Provide duct sleeves for round ducts 15” and smaller; provide prepared, framed openings for round ducts larger than 15” and for square, rectangular and flat oval ducts, except as specified otherwise. Sleeves shall met SMACNA requirements.
2. Provide sleeves for ducts through 1, 2, or 3-hour fire-rated construction and smoke partitions, regardless of size and shape of ducts. Sleeves shall maintain fire rating of construction penetrated. Sleeve and seal materials, construction and clearances shall meet requirements of SMACNA Fire Damper and Heat Stop Guide for Air Handling Systems.
3. Prepared openings shall be framed to provide 1” clearance between framing and duct or duct insulation.

D. Installation Testing, Listings and Approvals:

1. Installation shall meet material manufacturer’s recommendations exactly, particularly as regarding safety, ventilation, removal of foreign materials and other details of installation. Dam openings as recommended. Remove flammable materials used for damming and forming seals in fire-rated construction.
2. Sleeve penetration methods shall be water and gas-tight and shall meet requirements of ASTM E-119 Standard Methods of Fire Tests of Building Construction and Materials.
3. Fire-stop penetration seal methods and materials shall be FM-approved and UL-listed as applicable.
4. Inspect foamed sealants to ensure manufacturer’s optimum cell structure and color ranges.

## 3.9 ANCHORS AND INSERTS

A. Inserts shall be iron or steel of type to receive machine bolt head or nut after installation. Inserts shall permit adjustment of bolt in one (1) horizontal direction and shall develop strength of bolt when installed in properly cured concrete.

B. Provide anchors as necessary for attachment of equipment supports and hangers.

## 3.10 INSTALLATION OF EQUIPMENT

A. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing doors and passageways to satisfaction of Architect and in accordance with code requirements. Installation shall permit clearance for access to equipment for repair, servicing and replacement.

B. Install equipment so as to properly distribute equipment loads on building structural members provided for equipment support under other Sections. Roof-mounted equipment shall be installed and supported on structural steel provided under other Sections.

C. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall or ceiling mounting of equipment provided under this Section (e.g. heating and ventilating units, fans, ducts and piping) as indicated on Drawings and in Specifications.

D. Provide steel supports and hardware for proper installation of hangers, anchors, guides, etc.

E. Provide cuts, weight and other pertinent data required for proper coordination of equipment support provisions and installation.

F. Structural steel and hardware shall conform to Standard Specifications of ASTM; use of steel and hardware shall conform to requirements of Section 5 of Code of Practice of American Institute of

Steel Construction.

G. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly which will void warrantee. Report in writing to Architect, prior to purchase or shipment of equipment involved, on conditions which may prevent proper installation.

### 3.11 PAINTING

A. Equipment installed under this Section shall have shop coat of non-lead gray paint. Hangers and supports shall have one (1) coat of non-lead red primer. Machinery such as pumps, fans, etc., shall be stenciled with equipment name. Stencil shall be at least 6" high for large equipment, 2" high for small equipment. Finish painting, including painting of various piping and duct systems, shall be done under other Sections.

B. Note requirements for Architect's approval invoked under paragraph 3.03 MATERIALS AND WORKMANSHIP regarding finish of material and equipment which are visible or subject to corrosive or atmospheric conditions.

### 3.12 CLEANING

A. Ductwork:

1. New ductwork shall be shipped from the shop to the job site with the ends of the ducts sealed tight with heavy duty plastic to prevent dirt, water or other elements from entering the ducts while in transport to the job site.
2. At the end of each working day all open ends of ducts that have been hung in place shall be re-covered with the plastic material to prevent the entry of foreign objects, dirt or debris into the ducts.
3. All ducts shall be cleaned of dirt and any other foreign matter if it should accumulate on or in the ducts prior to start-up and testing of the new HVAC systems. If the ducts do need to be blown clean, cheesecloth shall be placed over the outlet air openings, and the rooftop unit(s) serving the ducts shall be provided with temporary filters.

B. Piping:

1. Furnish pipe cleaning chemicals, chemical feed equipment, materials and labor necessary to clean piping.
2. Permanently install necessary chemical injection fittings complete with stop valves.
3. After chilled water, heating hot water, condenser water, steam and condensate piping have been pressure tested and approved for tightness, clean and flush piping specified under WATER TREATMENT paragraph.
4. Maintain continuous blow-down and make-up, as required during flushing operation.
5. Equipment: After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

### 3.13 STARTUP, TESTING, ADJUSTING AND BALANCING FOR HVAC

A. General:

1. References:
   a. AABC – National Standards for Total System Balance.
   b. ADC – Test Code for Grilles, Registers, and Diffusers.
   c. ASHRAE 111 – Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilating, Air Conditioning and Refrigeration Systems.

d. NEBB – Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

e. SMACNA – HVAC Systems Testing, Adjusting, and Balancing.

2. Qualifications:

a. Agency: Company specializing in the testing, adjusting, and balancing of systems specified in this section with minimum three years documented experience certified by AABC.

b. Perform work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor.

3. Pre-Balancing Conference:

a. Convene one week prior to commencing work of this section, under the provisions of Division 1.

B. Examination:

1. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

a. Systems are started and operating in a safe and normal condition.

b. Control systems are installed complete and operable.

c. Proper thermal overload protection is in place for electrical equipment.

d. Ductwork systems:

1) Final filters are clean and in place. If required, install temporary media in addition to final filters.

2) Duct systems are clean of debris.

3) Fans are rotating correctly.

4) Dampers are in place and open.

5) Air coil fins are cleaned and combed.

6) Access doors are closed and duct end caps are in place.

7) Air inlets and outlets are installed and connected.

8) Duct system leakage is minimized.

e. Piping systems:

1) Hydronic systems are flushed, filled, tested and vented.

2) Pumps are rotating correctly.

3) Proper strainer baskets are clean and in place.

4) Service and balance valves are open.

2. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.

3. Beginning of work means acceptance of existing conditions.

C. Preparation:

1. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Owner to facilitate spot checks during testing.

2. Provide additional balancing devices as required.

D. Installation Tolerances:

1. HVAC Systems: Adjust to within plus or minus 10 percent of design for supply and return systems and plus or minus 10 percent of design for exhaust systems.
2. Air Outlets and Inlets: Adjust outlets and inlets in space to within plus or minus 10 percent of design.
3. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

E. Adjusting:

1. Ensure recorded data represents actual measured or observed conditions.
2. Permanently mark settings of balancing devices allowing settings to be restored. Set and lock memory stops.
3. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
4. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

F. Sequencing:

1. All systems providing both heating and cooling shall be balanced in both modes of operation.
2. For all systems provide initial balancing to tolerances indicated in this section. After initial balancing readjust systems as directed by engineer and owner as necessary to achieve uniform space temperatures free from objectionable drafts and noises.

G. Air System Procedure:

1. Adjust equipment and distribution systems to provide required or design air quantities.
2. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
3. Measure and record air quantities at air inlets and outlets.
4. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Adjust air volume by adjusting duct internal devices such as dampers and splatters. Do not utilized opposed blade dampers at air inlets and outlets.
5. Vary total system air quantities by adjusting sheave position or replacing fixed sheaves with larger or smaller diameter sheaves at each fan. Provide replacement fixed ratio sheaves and belts after final balancing selected to achieve design airflows. Vary branch air quantities by damper regulation.
6. Measure and record static air pressure conditions at air supply and exhaust units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
7. Adjust settings and minimum setpoints for motorized and backdraft dampers to design conditions.
8. Measure and record temperature conditions across dampers to check leakage.
9. Where modulating dampers are provided, take measurements and balance at extreme conditions.
10. [Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air

flow rate, full heating.]

11. Measure and record building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches (12.5 Pa) positive static pressure near the building entries.
12. [For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.]
13. Measure and record inlet and outlet temperatures at each air supply unit at full cooling and heating capacity.
14. Prepare system pressure profiles: On schematic fan system diagrams, show STATIC pressure readings taken at following points.
    a. Fan discharge
    b. Fan discharge plenum or main duct in fan room
    c. Fan inlet plenum
    d. Inlet and outlet plenum space on each side of each heating coil, cooling coil and filter
    e. Return air/outside air mixing plenum
    f. Duct or plenum immediately behind outside air louver
    g. Return/exhaust fan inlet
    h. Return/exhaust fan outlet
    i. Each main branch duct takeoff at each floor
    j. Within 3 feet of last supply air outlet connection in most remote duct.
15. Check multi-zone units for cooling, then heating, then modulating.
16. On fan powered VAV boxes, adjust air flow switches for proper operation.

H. Water System Procedure:
1. Adjust water systems to provide required or design quantities.
2. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
3. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
4. Balance systems with automatic control valves fully open to heat transfer elements.
5. Balance water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point. Measure and record flows at each balancing device.
6. Measure and record inlet and outlet temperatures at heat transfer elements and at cooling and heating plants at full cooling and heating capacity.
7. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

I. Schedules:

1. Equipment requiring Testing, Adjusting, and Balancing including but not limited to:
    a. Pumps
    b. Boilers
    c. Air Cooled Refrigerant Condensers
    d. Packaged Roof Top Heating/Cooling Units
    e. Condensing units
    f. Fans

J. Report Forms:
1. Forms shall include the following:
    a. Title Page:
        1) Name of Testing, Adjusting, and Balancing Agency
        2) Address of Testing, Adjusting, and Balancing Agency
        3) Telephone number of Testing, Adjusting, and Balancing Agency
        4) Project name
        5) Project location
        6) Project Architect
        7) Project Engineer
        8) Project Contractor
        9) Project altitude
        10) Report date
    b. All equipment shall include:
        1) Manufacturer
        2) Model/Size
        3) Identification/Number
        4) Serial Number
    c. Summary Comments:
        1) Design versus final performance
        2) Notable characteristics of system
        3) Description of systems operation sequence
        4) Summary of outdoor and exhaust flows to indicated amount of building pressurization
        5) Nomenclature used throughout report
        6) Test conditions
    d. Instrument List:
        1) Instrument
        2) Manufacturer
        3) Model number

4) Serial number
5) Range
6) Calibration date

e. Electric Motors: (data for single and multispeed motors)
1) Manufacturer
2) Model/Frame
3) HP/BHP/efficiency
4) Phase, voltage, amperage; nameplate, actual, no load
5) RPM
6) Service factor
7) Starter size, rating, heater elements
8) Sheave Make/Size/Bore

f. V-Belt Drive:
1) Identification/location
2) Required driven RPM
3) Driven sheave, diameter and RPM
4) Belt, size and quantity
5) Motor sheave diameter and RPM
6) Center to center distance, maximum, minimum, and actual

g. Pump Data:
1) Impeller
2) Service
3) Design flow rate, pressure drop, BHP
4) Actual flow rate, pressure drop, BHP
5) Discharge pressure
6) Suction pressure
7) Total operating head pressure
8) Shut off, discharge and suction pressures
9) Shut off, total head pressure

h. Combustion Test:
1) Manufacturer
2) Model number
3) Firing rate
4) Over-fire draft
5) Gas meter timing dial size
6) Gas meter time per revolution

7) Gas pressure at meter outlet
8) Gas flow rate
9) Heat input
10) Oil flow rate
11) Burner manifold gas pressure
12) Percent carbon monoxide (CO)
13) Percent carbon dioxide (CO2)
14) Percent oxygen (O2)
15) Percent excess air
16) Flue gas temperature at outlet
17) Ambient temperature
18) Net stack temperature
19) Percent stack loss
20) Percent combustion efficiency
21) Heat output

i. Air Cooled Condensing Unit:
1) Location
2) Serial number
3) Entering DB air temperature, design and actual
4) Leaving DB air temperature, design and actual
5) Number of compressors.

### 3.14 VRF SYSTEM PROJECT SUPERVISION

A. General:

1. VRF Manufacturer shall provide on-site Project Supervision as outlined in this Specification section, providing: onsite technical review of installed VRF systems, review of activities related to the installation of the VRF system, VRF system components and associated controls.
2. All Project Supervision field activities shall be completed by an employee of the VRF manufacturer whose primary job responsibilities are to provide direct technical support of their product; sales staff or in-house support staff are not permitted to complete this scope of work.
3. A factory certified representative may assist the VRF manufacturer's personnel in the completion of certain elements of work contained within this Specification. Activities completed by a Factory Certified Representative shall be supervised onsite by the VRF manufacturer. Certified representatives shall not be used in lieu of the manufacturer's personnel.
4. The installing contractor shall assist the VRF manufacturer, in their completion of the system review and have available onsite a technician with appropriate diagnostic tools, materials and equipment, as required, for the duration of the inspection process. The technician assisting the VRF manufacturer shall be fully licensed and insured to complete necessary duties as

directed by the VRF manufacturer.

5. The installing contractor shall have been certified by the manufacturer to install VRF systems, having attended and successfully completed a minimum 3- day VRF Service & Installation course at an approved training facility. A copy of this certificate shall be presented to the VRF manufacturer prior to the commencement of installation activity.
6. VRF manufacturer shall provide [4] onsite visits during the course of the project's completion. Additional site visits, if requested, shall require approval by the Owner's Representative and will be billed accordingly.
7. Onsite visits shall be conducted at installation milestones noted below. The installing contractor is responsible to coordinate each visit at the appropriate milestone, giving the VRF manufacturer a minimum 2-week notice prior to each visit.
    a. Project milestones
        1) Project Kick Off meeting
        2) Site Visit at 25% project completion
        3) Site Visit at 50% project completion
        4) Final Inspection prior to Commissioning of the VRF System

B. Project Kick-Off:

1. A project kick-off meeting will be conducted with the installing contractor and appropriate parties with the sole purpose to review the installation of VRF systems being installed.
2. Kick-off meeting shall consisting of a single [4] hour meeting with the installing contractor. This meeting shall be completed at the project site and be executed at the beginning stages of the installation of VRF systems.
    a. Items to be reviewed during the Project kick-off meeting are:
        1) Presentation of Best Practices & Installation Requirements specific to the VRF system(s) being installed under this scope of work.
        2) Review of the project's mechanical design drawings related to the VRF systems being installed. Documents to be provided by the mechanical contractor.
        3) Review of VRF Manufacturers design selection software and system design schematic drawings for the system being installed Documents to be provided by the mechanical contractor.
        4) Discuss project activity related to the installation of VRF system components
        5) Establish clear path of communication and project support. Mechanical contractor shall designate an onsite point of contact for all field coordination activities.
3. The installing contractor shall obtain from the Engineer/Designer of the VRF system a copy of the most current electronic design file used in the design and engineering process of the VRF system being installed. This electronic design file shall have been completed on the VRF Manufacturers software and is the mechanical contractor's responsibility to provide the most current as-built version of this file during the course of the projects installation.
4. The installing contractor shall provide the VRF manufacturer, for their use, a complete set of HVAC mechanical plans prior to the Kick off meeting. The mechanical contractor is responsible to updates these plans during the course of the project.

C. Site Visit:

1. Each site visit shall consist of a single visit, not exceeding an [8] hour period. All visits shall

occur during regular business hours of 8:30AM-4PM, Monday thru Friday.

2. Activates to be completed during each Site-Visit are as follows:
    a. Meet with designated representative from the VRF installation contractor to discuss field activities and provide technical support related to the VRF systems.
    b. Review installed VRF systems for compliance with manufacturer's installation, service and engineering Specifications.
    c. Assist the contractor in updating the VRF Design software for as-built purposes and for calculating the appropriate refrigerant charge.
    d. Provide a field report identifying any installation issues requiring attention. Report shall provide detailed information containing:
        1) Issue reference number
        2) Priority Level of issue
        3) Equipment M# & Reference TAG#
        4) Status of issue
        5) Description of issue being identified
        6) Recommendation for corrective action
        7) Follow-up requirements, if required

D. Project Close Out Documents:
    1. Documents completed during the project Supervision process shall be compiled and presented to the Owner's Representative at the completion of field activities.
    2. Close out documentation shall include
        a. Project Supervision report outlining activities completed under this scope of work
        b. As-built VRF design file depicting Model numbers and BTU capacity ratings of equipment installed, refrigerant pipe size & connection lengths between each system component, calculated refrigerant charge.
        c. Issue report

E. Professional Solutions Contact information:
    1. Contact your regions [MANUFACTURER] VRF installation and service manager for information and pricing related to services required under this projects scope of work.

### 3.15 VRF SYSTEM COMMISSIONING

A. General:
    1. The VRF Manufacturer shall oversee and assist the installing contractor with the start-up and commissioning of VRF equipment as outlined below. This process will be completed in two phases. Phase one shall cover the Pre-Start-Up inspection process, Phase two will cover the Physical Start-Up & Commissioning of Equipment.
    2. All VRF System Commissioning activities shall be completed by an employee of the VRF manufacturer whose primary job responsibilities are to provide start up and commissioning of their products; sales staff or in-house support staffs are not permitted to complete this scope of work.
    3. A factory certified representative may assist the VRF manufacturer's personnel in the completion of certain elements of work contained within this Specification. Activities

completed by a Factory Certified Representative shall be supervised onsite by the VRF manufacturer. Certified representatives shall not be used in lieu of the manufacturer's personnel.

4. The installing contractor shall have been certified by the manufacturer to install VRF systems, having attended a minimum 3- day VRF Service & Installation course at an approved training center. A copy of this certificate shall be presented as part of the VRF equipment submittal process.
5. The installing contractor shall assist the VRF manufacturer in their completion of the system review and have available a technician with appropriate diagnostic tools, materials and equipment, as required, for the duration of the inspection process. The technician shall be fully licensed and insured to complete necessary duties as directed under the supervision of the VRF manufacturer.
6. Upon completion of the Equipment Start-Up & VRF Commissioning process, the VRF manufacturer shall provide a formal report outlining the status of the system, in electronic format only. Contained within this report shall be copies of all field inspection reports, required action items and status, Manufacturers design software As-Built, equipment model & serial numbers.
7. Completion of the Equipment Start-Up and VRF Commissioning process shall verify that the VRF system has been installed per the Engineer's design intent and complies with the VRF manufacturers engineering and installation Specifications related to their equipment.
8. Compliance with federal, state and local codes as well as other authorities having jurisdictions are not part of this process and are the responsibility of the installing contractor.
9. Contact your regions [MANUFACTURER] VRF installation and service manager for information and pricing related to services required under this projects scope of work.

B. Pre Start-up Inspection:

1. Contractor shall employ the services of the VRF manufacturer to provide a comprehensive field review of the completed VRF system installation, prior to the physical start up and operation of equipment. Upon satisfaction that the system meets the VRF manufacturer's installation requirements and Specifications, the contractor shall be allowed to proceed with the physical start up and operation of equipment.
2. Prior to the pre-start-up inspection, all systems components shall be in a final state of readiness having been fully installed and awaiting inspection.
3. The installing contractor shall provide the VRF manufacturer a copy of the electronic design file used in the design and engineering process of the system being inspected. This electronic design file shall have been completed on software approved by the specified VRF manufacturer and shall have been updated to reflect as-built conditions.
4. The installing contractor shall have prepared the refrigeration piping systems per equipment installation and service manuals. All refrigerant piping systems, upon completion of assembly, shall have been pressurized to a minimum 600 PSI, using dry nitrogen, and held for an uninterrupted 24HR period, with acceptable change due to atmospheric conditions.
    a. A record of the pressure check process shall be recorded and tagged at the outdoor unit. The tag shall contain the following information: date & time of pressure check start, fill pressure, outdoor temperature at start & stop, date & time of pressure check completion, and the person's full name & company information completing the pressure check.
    b. The installing contractor shall engage the General Contractor as a witness of the pressure check process, confirming that all steps and procedures related to the pressure check where properly followed and that the system held the holding pressure of 600PSI for a period of 24hr hours, with acceptable change due to atmospheric conditions.

Witness information, including full name, company name, title, phone number and signature shall be recorded on same pressure tag used by installing contractor.

5. Upon completion of the 600 PSI pressure check, the system shall be evacuated to a level of 500 microns, where it will be held for a period of 1HR with no deflection. The installing contractor shall utilize the triple evacuation method per the equipment install and service manuals.
    a. Evacuation start & stop dates, times, and persons involved shall be recorded and tagged at the outdoor equipment.
    b. Installing contractor shall digitally capture a photo of the micron gauge reading, at the conclusion of the 1hr holding period, for each system and provide a copy to the VRF manufacturer. Each photo shall contain a tag providing the outdoor units Serial number.
6. Upon the completion of the 500-micron hold, the calculated additional refrigerant charge can be added. The calculated refrigerant charge shall have been calculated using the VRF manufacturers design software.
    a. Total refrigerant charge of the system shall be recorded and displayed at the outdoor unit by permanent means.
7. A review of the equipment settings shall be completed, with recommendations provided to improve system performance, if applicable. Physical changes of system settings will be completed by the contractor. Electronic recording of final DIP switches shall be provided as part of the commissioning report.
8. A comprehensive review and visual inspection shall be completed for each piece of equipment following a detailed check list, specific to the equipment being reviewed. A copy of the inspection report shall be provided as part of the manufacturers close out documentation. Any deficiencies found during the inspection process shall be brought to the attention of the installing contractor for corrective action. Any system components that are not accessible for proper inspection shall be noted as such.
9. Indoor Equipment report shall contain
    a. Model & Serial Number
    b. Equipment location
    c. Equipment Tag/Identification number
    d. Network Address & Port Assignment
    e. Digital recording of equipment settings
    f. Mounting/support method
    g. Seismic restraints used
    h. Proper service clearance provided
    i. Wiring and connection points are correct
    j. High voltage reading(s) within acceptable range
    k. Low voltage reading(s) within acceptable range
    l. Type of Remote Controller used and its location
    m. Occupied space temperature sensing location
    n. Air temperature readings within acceptable range
    o. Condensate pump interlock method

p. Fan E.S.P. setting
q. Air Filter condition
r. Height differential setting in heat mode
s. Noise level acceptable
t. Refrigerant pipe connected and insulated properly
u. Condensate pipe connected and insulated properly
v. Condition of connected ductwork
w. Fresh air connected
x. Humidifier connected and checked
y. Review of air balance report complete
z. Other interlocked systems, i.e. baseboard heat, booster fan etc.

10. Outdoor Air Cooled equipment report shall contain:
    a. Model & Serial Number
    b. Equipment location
    c. Equipment Tag/Identification number
    d. Network Address & Port Assignment
    e. Digital recording of equipment settings
    f. Mounting/support method
    g. Seismic restraints used
    h. High Wind Tethering method
    i. Proper service clearance provided
    j. Defrost Condensate removal addressed
    k. Wiring and connection points are correct
    l. High voltage reading(s) within acceptable range
    m. Low voltage reading(s) within acceptable range
    n. Control Network settings
    o. Noise level setting
    p. Refrigerant pipe installed and insulated properly
    q. Low ambient operation settings

C. Physical Start-Up & Commissioning of Equipment:
    1. Upon proper equipment start up by the contractor, following the manufacturers guidelines and Specifications, an employee of the VRF manufacturer shall complete a review of the system performance and complete the following tasks:
        a. Check and confirm all communication addressing of system components.
        b. Check and confirm each indoor unit, individually, is properly piped and wired by commanding the indoor unit on, in either heat or cool mode and verifying proper response.

1) This process shall be digitally recorded and included as part of the close out documentation.

c. Electronically record a minimum of one-hour of operational data per refrigeration system.

d. Electronically record selector switch positions on all indoor and outdoor equipment.

e. The VRF manufacturer shall retain the electronically recorded data, collected during the start-up and equipment commissioning process, at a designated location within the US for future reference.

D. Close-Out Information:

1. The VRF manufacturer shall issue a System Performance report at the completion of all fieldwork. Contained within this report shall be an overview of the system performance, recommendations, field reports, all electronic data, and as-built design file.

E. VRF Equipment Warranty:

1. Having successfully completed the Pre-Inspection, Start-Up & Equipment Commissioning processes and fulfilling all requirements, as outlined in the VRF manufacturers Extended Warranty Process. Along with installing contractor being certified by the VRFR manufacturer to install VRF systems, having attended a minimum 3- day VRF Service & Installation course at an authorized training center.

2. The equipment shall be provided with the following warranty per the VRF manufacturer's warranty policy:

a. Compressor: 7-year part only

b. Parts: 5-years part only

c. Labor: no labor coverage provided by VRF Manufacturer.

## 3.16 VRF SYSTEM OWNER TRAINING AND TECHNICAL SUPPORT

A. The VRF manufacturer shall provide the Owner's Representative a minimum 16-hour VRF Operation and Maintenance training class covering systems installed under this scope of work.

B. Training program is to be provided at the time of Owner occupancy.

C. Owner shall provide a suitable location, onsite, to conduct the VRF Operation and Maintenance class.

D. Training material shall be provided to participants in electronic format.

E. Contact your region's [MANUFACTURER] VRF installation and service manager for information and pricing related to services required under this projects scope of work.

**END OF SECTION**

**SECTION 26 0000**

**ELECTRICAL TABLE OF CONTENTS**

**PART 1 – GENERAL ..... 1**

1.1 GENERAL REQUIREMENTS AND REFERENCES ..... 1
1.2 DEFINITIONS ..... 1
1.3 SCOPE ..... 1
1.4 RELATED WORK UNDER OTHER SECTIONS ..... 2
1.5 REGULATORY REQUIREMENTS ..... 3
1.6 SUBMITTALS ..... 4
1.7 SURVEYS AND MEASUREMENTS ..... 7
1.8 COORDINATION ..... 7
1.9 MECHANICAL AND ELECTRICAL COORDINATION ..... 7
1.10 MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS ..... 8
1.11 INSTALLATION REQUIREMENTS ..... 9
1.12 TYPICAL DETAILS ..... 9
1.13 SLEEVES, INSERTS ..... 9
1.14 CORING, DRILLING ..... 9
1.15 FIRESTOPPING, SMOKEPROOFING AND WATERPROOFING ..... 9
1.16 COMMISSIONING OF SYSTEMS ..... 9
1.17 ACCESSIBILITY ..... 9
1.18 SUPPLEMENTARY SUPPORTING STEEL ..... 10
1.19 TOOLS AND EQUIPMENT ..... 10
1.20 PORTABLE AND DETACHABLE PARTS ..... 10
1.21 RECORD DRAWINGS, PROJECT CLOSEOUT ..... 10
1.22 GUARANTEE/WARRANTY ..... 11
1.23 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS ..... 11
1.24 SERVICE CHARACTERISTICS ..... 12
1.25 QUALITY ASSURANCE ..... 12
1.26 DELIVERY, STORAGE AND HANDLING ..... 13
1.27 TEMPORARY POWER AND LIGHTING ..... 13
1.28 STAGING AND SCAFFOLDING ..... 14
1.29 EXTRA MATERIALS ..... 14
1.30 SEISMIC REQUIREMENTS ..... 14
1.31 PHASING, DEMOLITION AND MAINTAINING EXISTING SERVICES ..... 14

**PART 2 – PRODUCTS ..... 15**

2.1 GENERAL ..... 15
2.2 ARC-FLASH HAZARD WARNING ..... 16
2.3 RACEWAYS AND FITTINGS ..... 16
2.4 WIRING MATERIALS ..... 17
2.5 OUTLET, JUNCTION, PULL BOXES AND WIRING TROUGHS FOR ALL SYSTEMS ..... 18
2.6 WIRING DEVICES ..... 19
2.7 GROUNDING REQUIREMENTS ..... 20
2.8 PHASING AND COLOR CODING ..... 21
2.9 ENCLOSURES FOR INDIVIDUALLY MOUNTED OVERCURRENT AND SWITCHING DEVICES ..... 22
2.10 PANELBOARDS ..... 22
2.11 MOLDED CASE CIRCUIT BREAKERS ..... 23
2.12 CARTRIDGE FUSES ..... 24
2.13 MOTOR CONTROLS ..... 24
2.14 AUTOMATIC TRANSFER SWITCHES ..... 25

2.15 LIGHTING FIXTURES ..... 36
2.16 TELEPHONE/DATA EMPTY RACEWAYS AND OUTLETS SYSTEM ..... 37
2.17 COMPUTER EMPTY RACEWAYS AND OUTLETS SYSTEM ..... 38
2.18 FIRE ALARM SYSTEM ..... 38
2.19 SERVICE ENTRANCE SPD PROTECTION (LOW END) ..... 43
2.20 BRANCH PANEL SPD PROTECTION ..... 46
2.21 ACCESS PANELS ..... 48

**PART 3 – EXECUTION ..... 49**

3.1 BASIC REQUIREMENTS ..... 49
3.2 TESTING REQUIREMENTS & INSTRUCTIONS ..... 50
3.3 BRANCH CIRCUITRY ..... 56
3.4 REQUIREMENTS GOVERNING ELECTRICAL WORK IN DAMP OR WET LOCATIONS ..... 57
3.5 REQUIREMENTS GOVERNING ELECTRIC WORK IN AIR HANDLING SPACES ..... 58
3.6 UNDERGROUND CONDUIT BANKS ..... 58
3.7 IDENTIFICATION AND TAGGING ..... 59
3.8 LIMITING NOISE PRODUCED BY ELECTRICAL INSTALLATION ..... 60
3.9 SUPPORTS AND FASTENINGS ..... 61
3.10 SPLICING AND TERMINATING WIRES AND CABLES ..... 62
3.11 PULLING WIRES INTO CONDUITS AND RACEWAYS ..... 62
3.12 REQUIREMENTS FOR THE INSTALLATION OF JUNCTION BOXES, OUTLET BOXES AND PULL BOXES ..... 63
3.13 LOCATING AND ROUTING OF CIRCUITRY ..... 64
3.14 INSTALLING CIRCUITRY ..... 65
3.15 PHYSICAL SEPARATION OF NORMAL, OPTIONAL STANDBY, AND EMERGENCY SYSTEMS ..... 66

# SECTION 26 0000

# ELECTRICAL

## PART 1 – GENERAL

### 1.1 GENERAL REQUIREMENTS AND REFERENCES

A. Include “General Requirements” and applicable parts of Division 1 as part of this section.

B. Examine all other sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this section. Where paragraphs of this section conflict with similar paragraphs of Division 1, requirements of this section shall prevail.

C. Coordinate work with that of all other trades affecting, or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.

D. The Subcontractor shall be responsible for filing all documents, payment of all fees, and securing of all inspections and approvals necessary for the work of this section.

E. The Electrical Subcontractor shall carry in the Bid Price all Utility Company and Municipal back charges for all materials furnished and work performed by them in conjunction with this Contract and pay same to the respective agency upon demand. The Electrical Subcontractor shall not be entitled to additional compensation after the submittal of his bid price should he fail, for any reason, to obtain the total back charge costs to be incurred by the Local Utility Companies or Municipal Agencies.

### 1.2 DEFINITIONS

A. As used in this section, “provide” means “furnish and install”, and “POS” means “Provided Under Other Sections”.

B. As used in the Drawings and Specifications for Electrical work, certain non-technical words shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions of other documents governing the Electrical work.

1. “Furnish” means: Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the Electrical work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased item(s) are free of all liens, claims, or encumbrances.

2. “Install” means: Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the Electrical work.

3. “Provide” means: “Furnish” and “Install”.

4. “New” means: Manufactured within the past two (2) years and never before used.

C. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any electrical item in the Drawings or Specifications for Electrical work carries with it the instruction to furnish, install and connect the item as part of the Electrical work, regardless of whether or not this instruction is explicitly stated.

D. It shall be understood that the Specifications and Drawings for Electrical work are complimentary and are to be taken together for a complete interpretation of the Electrical work except that indications on the Drawings, which refer to an individual element of work, take precedence over the Specifications where they conflict.

### 1.3 SCOPE

A. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.

1. Interior secondary distribution systems including all distribution panelboards, motor controls, motor control centers, magnetic starters, overcurrent and switching devices, panelboards, raceways, cables, wiring, junction and pull boxes, wireways, and all other components required for complete electrical distribution system.
2. All lighting systems (indoor and outdoor, normal, night, emergency and exit) including all fixtures, lamps, mounting accessories, switches, controls, outlets, wiring, raceways, and all other components and fittings required for a complete lighting system.
3. Grounding and bonding of all electrical systems and equipment.
4. Fire alarm system complete with all devices and wiring including municipal connections.
5. Wiring devices (switches and receptacles) complete with associated wallplates.
6. Power wiring to HVAC, plumbing and fire protection equipment.
7. Testing of all electrical systems.
8. Access panels (furnish only).
9. Emergency distribution system including automatic transfer switch, panelboards, and all other components required for a complete system.
10. Coordination between electrical and other trades.
11. Power wiring for elevators and associated equipment.
12. All other systems hereinafter specified or indicated on the Contract Drawings, complete, leaving ready an electrical system in perfect operating condition.
13. All required staging and scaffolding of any height.
14. Lightning protection.

B. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.

C. Before submitting bid, visit and carefully examine site to identify existing conditions and difficulties that will affect work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions that are visible or readily construed by an experienced observer. Site visit is particularly important because this is renovation work.

D. Before starting work in a particular area of the project, visit site and examine conditions under which work must be performed including preparatory work done under other Sections or Contracts or by Owner. Report conditions that might affect work adversely in writing through Contractor to Architect. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing and preparatory work.

## 1.4 RELATED WORK UNDER OTHER SECTIONS

A. The following items are not included in this section and will be performed under the designated sections.

1. Temporary Facilities.

2. Earthwork: Excavation and backfill.
3. Concrete:
    a. Equipment foundations.
    b. Housekeeping pads.
    c. Concrete encasement for conduit banks.
    d. Light pole bases.
    e. Rebar for items “a, b, c & d” above.
4. Masonry: All openings in masonry walls.
5. Waterproofing, Dampproofing and Caulking.
6. Roofing and Flashing.
7. Painting: All painting except as specified herein.
8. Finish Carpentry and Millwork.
9. Steel Doors and Frames.
10. Finish Hardware.
11. Elevators and Lifts.
12. Fire Protection.
13. Plumbing.
14. HVAC.
15. Kitchen equipment.
16. Laboratory equipment.
17. Hospital equipment.
18. Irrigation equipment.

## 1.5 REGULATORY REQUIREMENTS

A. Comply with all applicable Federal and State laws, and all Local Codes, By-laws and Ordinances.

B. Where provisions of the Contract Documents conflict with any codes, rules or regulations, the latter shall govern. Where the contract requirements are in excess of applicable codes, rules or regulations, the contract provisions shall govern unless the Architect rules otherwise.

C. Request inspections from Authorities having jurisdiction, obtain all permits and pay for all fees and inspection certificates as applicable and/or required. All permits and certificates shall be turned over to the Owners at the completion of the work. Copies of permits shall be given to the resident engineer prior to the start of work.

D. Unless otherwise specified or indicated, materials and workmanship and equipment performance shall conform with the latest edition of the following standards, codes, Specifications, requirements and regulations:

1. State Building Code.
2. State Electrical Code.
3. National Fire Protection Association (NFPA).
4. Local Town Regulations and By-Laws.

5. Underwriter's Laboratories, Inc. (UL).
6. National Electrical Manufacturer's Association (NEMA).
7. American National Standards Institute (ANSI).

E. All Electrical work shall meet or exceed any other state and local codes and/or Authorities having jurisdiction including all other standards indicated herein.

## 1.6 SUBMITTALS

A. This paragraph shall supplement Division 1.

B. Definitions:

1. Shop Drawings: Information prepared by the Contractor to illustrate portions of the work in more detail than shown in the Contract Documents.
2. Coordination Drawings: Detailed, large-scale layout Shop Drawings showing HVAC, Electrical, Plumbing and Fire Protection work superimposed to identify conflicts and ensure inter-coordination of Mechanical, Electrical, Architectural, Structural and other work.
3. Manufacturer's Product Data: Information prepared by the manufacturer which depicts standard equipment.

C. Submittals, Procedures and Format:

1. Review submittal packages for compliance with Contract Documents and then submit to Architect for review. Submit transparency and two (2) blue or black-line reproductions of each Shop Drawing larger than 8-1/2" x 11". Submit eight (8) sets of each smaller shop drawing. After review, transparency original of each large Shop Drawing and six (6) sets of each small shop drawing will be returned with reviewer's marks. Electronically submitted shop drawings are acceptable.
2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:
    a. Title.
    b. Name and location of project.
    c. Names of Architect, Engineer, Contractor and Subcontractor(s).
    d. Names of Manufacturer, Supplier, Vendor, etc.
    e. Date of submittal.
    f. Whether original submittal or resubmitted.
3. Shop Drawings and/or Manufacturer's Product Data shall contain detailed dimensional Drawings, accurate and complete description of materials of construction, manufacturer's published performance characteristics and capacity ratings (performance data alone is not acceptable), electrical requirements and wiring diagrams. Drawings shall clearly indicate location (terminal block or wire number), voltage and function for all field terminations, and other information necessary to demonstrate compliance with all requirements of Contract Documents.

D. Acceptable Manufacturers:

1. The Architect's Mechanical/Electrical design for each project is based on the single manufacturer listed in the schedule or shown on the Drawings. In Division 16 of these Specifications certain "Alternate Manufacturers" are listed as being acceptable. These are acceptable only if, as a minimum, they:

a. Meet all performance criteria listed in the schedules and outlined in the Specifications.

b. Have identical operating characteristics to those called for in the Specifications.

c. Fit within the available space it was designed for, including space for maintenance and component removal, with no modifications to either the space or the product. Clearances to walls, ceilings and other equipment will be at least equal to those shown on the Contract Documents. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Architect has determined that the manufacturer's products will fit within the available space. This determination is solely the responsibility of the Contractor.

d. For equipment mounted in areas where structural matters are a consideration, the products must have a weight no greater than the product listed in the schedules or Specifications.

e. Products must adhere to all architectural considerations including, but not limited to, being the same size and of the same physical appearance as scheduled or specified products.

E. Substitutions: Substitution of products by manufacturers other than those listed shall only be done in accordance with subparagraph "F" "Substitutions and Deviations".

F. Substitutions and Deviations:

1. Deviations from the Contract Documents and the substitution of materials or equipment relative to the "Acceptable Manufacturers" referred to above shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the substitution or deviation to the attention of the Architect. The letter shall describe changes in the system shown and physical characteristics (connections to adjacent materials, electrical services, service access requirements, and other characteristics), and differences in operating characteristics or cycles.

2. Without letters flagging the substitution or deviation to the Architect, it is possible that the Architect may not notice such substitution or deviation or may not realize its ramifications. Therefore, if such letters are not submitted to the Architect, the Contractor shall hold the Architect and his consultants harmless for any and all adverse consequences resulting from the deviations being implemented. Adverse consequences shall include, but not be limited to, excessive noise, excessive maintenance, shortened longevity, spatial coordination problems, and inadequate performance versus scheduled design. This shall apply regardless of whether the Architect has reviewed or approved Shop Drawings containing the deviation, and will be strictly enforced.

3. Do not request substitute materials or equipment unless identical material or equipment has been operated successfully for at least three (3) consecutive years. Such materials and equipment shall be a regular cataloged item shown in the current catalog of the manufacturer. When deviation or substitution is permitted, coordinate fully with related changes to Architectural, Structural, Plumbing, Fire Protection, Mechanical, and other work. Ensure that related changes necessary for coordination of substituted items are made within the Contract Price. Assume full responsibility for safety, operation and performance of the altered system. Any extra costs incurred to the project based on the use of alternate manufacturers shall be borne by the Contractor who has requested the substitution.

4. Substitutions of equipment, systems, etc. requiring approval of local Authorities must comply with such regulations and be filed by the Contractor (should filing be necessary).

5. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance, as delineated in schedules and in the Specifications, shall be interpreted as minimum performance.

6. Approval of proposed deviations or substitutions, if any, will be made at discretion of Architect.
7. If equipment is proposed for substitution that is not tested and rated according to industry-wide standards, the Architect shall have the right to have performance tests completed, at the Contractor's expense, to confirm the manufacturer's performance claims.

G. Submittal Notations: Submittals will be returned from the Architect marked as illustrated below:

| | |
|---|---|
| □ NO EXCEPTION TAKEN | □ ACCEPTED AS NOTED |
| □ NOT ACCEPTED | □ REVISE AND RESUBMIT |

1. Checking is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Any action shown is subject to the requirements of the Drawings and Specifications. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site; fabrication process and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.

H. Schedule: Incorporate the Shop Drawing review period into the construction schedule so that work is not delayed. Contractor shall assume full responsibility for delays caused by not incorporating the following Shop Drawing review time requirements into his project schedule. Allow at least ten (10) working days, exclusive of transmittal time, for review each time Shop Drawing is submitted or resubmitted with the exception that fifteen (15) working days, exclusive of transmittal time, are required for the following:

1. Motor control wiring diagram submittals.
2. Short circuit and coordination studies.
3. Coordination Drawings, if required by this Specification.
4. If more than five (5) Shop Drawings of this trade are received in one (1) calendar week.

I. List of Proposed Equipment and Materials: Within four (4) weeks after Award of Contract and before ordering materials or equipment, submit a complete list of proposed materials and equipment and indicate manufacturer's names and addresses. No consideration will be given to partial lists submitted out of sequence.

J. Responsibility:

1. The intent of submittal review is to check for capacity, rating, and certain construction features. Contractor shall ensure that work meets requirements of the Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with submittals marked "REVIEWED" to extent that they agree with the Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the shop drawing errors or deviations from requirements of the Contract Documents. The Architect's noting of some errors while overlooking others will not excuse the Contractor for proceeding in error. Contract Document requirements are not limited, waived, nor superseded in any way by review.
2. Inform Subcontractors, Manufacturers, Suppliers, etc. of scope and limited nature of review process and enforce compliance with the Contract Documents.

K. Material and equipment requiring Shop Drawing and/or Manufacturer's Data Submittals shall include but not be limited to:

1. Light fixtures.

2. Panelboards.
3. Overcurrent and switching devices.
4. Wiring devices and wall plates.
5. Fire alarm system with wiring diagram and schedule.
6. Wiring and cables.
7. Conduit.
8. Boxes and fittings.
9. Safety switches.

## 1.7 SURVEYS AND MEASUREMENTS

A. Base all required measurements, both horizontal and vertical, on reference points established by the General Contractor and be responsible for the correct laying out of the Electrical work. In the event of a discrepancy between actual measurements and those indicated, notify the General Contractor in writing. Do not proceed with the work required until written instructions have been issued by the General Contractor.

## 1.8 COORDINATION

A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of Mechanical and Electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with Structural and other trades and to meet Architectural requirements.

B. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the work.

C. Furnish to other trades advance information on locations and sizes of all frames, boxes, sleeves and openings needed for their work. Furnish information and Shop Drawings necessary to allow trades affected by the work to install their work properly and without delay.

D. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Architect. Where the Electrical work shall interfere with the work of other trades, assist in coordinating the space conditions to make satisfactory adjustments before installation. Without extra cost to the Owners, make reasonable modifications to the work as required by normal Structural interferences. Pay the General Contractor for additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not properly coordinated. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.

E. If any Electrical work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the trades involved without extra cost to the Owners.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect for review and approval.

G. Protect all materials and work of other trades from damage which may be caused by the Electrical work, and repair all damages without extra cost to the Owners.

## 1.9 MECHANICAL AND ELECTRICAL COORDINATION

A. The HVAC Subcontractor shall furnish and install various electrical items relating to the heating

and ventilating equipment and control apparatus. The Electrical Subcontractor shall be required to connect power wiring to this equipment unless noted otherwise.

B. The HVAC and Electrical Subcontractors shall coordinate their respective portions of the work, as well as the electrical characteristics of the heating, ventilating and air conditioning equipment.

C. All power wiring and local disconnect switches will be provided by the Electrical Subcontractor for the line voltage power. All control and interlocking wiring shall be the responsibility of the HVAC Subcontractor.

D. 120V and above power wiring sources extended and connected to HVAC control panels, transformers and switches shall be the responsibility of the Electrical Subcontractor. All low voltage thermostat, and any switch wiring shall be the responsibility of the HVAC Subcontractor.

E. Temperature control and equipment wiring shall be installed by the Heating and Ventilating Subcontractor.

F. Pipe heat tracing shall be furnished and installed by the Electrical Subcontractor. Power connections shall be by the Electrical Subcontractor.

G. The Electrical Subcontractor will provide all magnetic starters except those furnished as an integral part of packaged equipment.

## 1.10 MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS

A. Coordination Drawings:

1. The Sheetmetal Subcontractor shall prepare a complete set of electronic type background Drawings at a scale not less than 1/8” equals 1’-0”, showing structure and other information as needed for coordination. He shall show sheetmetal layout thereon. These will be the Coordination Drawings.

2. The main paths of egress and for equipment removal, from main Mechanical and Electrical rooms must be clearly shown on the Coordination Drawings.

3. Each of the below specialty trades shall add its work to these background Drawings with appropriate elevations and grid dimensions. Specialty trade information is required for fan rooms and mechanical rooms, horizontal exits from duct shafts, crossovers, and for spaces in and above ceilings where congestion of work may occur such as corridors, and even entire floors. Drawings shall indicate horizontal and vertical dimensions, to avoid interference with structural framing, ceilings, partitions, and other services.

    a. Specialty Trades:

        1) Plumbing System.

        2) HVAC Piping and Associated Control System.

        3) Electrical.

        4) Sheet Metal Work.

        5) Sprinkler System.

4. Each specialty trade shall sign and date each Coordination Drawing. Return Drawings to the Sheetmetal Subcontractor, who shall route them sequentially to all specialty trades.

5. Where conflicts occur with placement of materials of various trades, the Sheetmetal Subcontractor will be responsible to coordinate the available space to accommodate all trades. Any resulting adjustments shall be initialed and dated by the specialty trade. The Sheetmetal Subcontractor shall then final date and sign each Coordination Drawing. If he cannot resolve conflicts, the decision of the General Contractor shall be final, subject to the approval of the Architect.

6. A Subcontractor who fails to promptly review and incorporate his work on the Drawings shall assume full responsibility of any installation conflicts affecting his work and of any schedule ramifications.
7. The Sheetmetal Subcontractor shall make copies of all coordination Drawings. Fabrication shall not start until such copies of completed Drawings are received by the Architect/Engineer and have been reviewed.
8. Review of Coordination Drawings shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with Architectural, Structural, Mechanical, and Electrical Contractors.

### 1.11 INSTALLATION REQUIREMENTS

A. The arrangement of all Electrical work shown on the Drawings is diagrammatic only and indicates the minimum requirements of the work. Conditions at the building including actual measurements shall determine the details of the installation. All work shall be laid out and installed so as to require the least amount of cutting and patching.

B. Review the Architectural Drawings and Specifications before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Architect for his determination prior to proceeding with the work.

### 1.12 TYPICAL DETAILS

A. Typical details where shown on the Drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the Drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the Contractor shall have the prior approval of the Architect.

### 1.13 SLEEVES, INSERTS

A. Furnish and install all sleeves, inserts, anchor bolts and similar items to be set into masonry or concrete, as required for Mechanical and Electrical work. Internal diameter of sleeve ball shall be 1/2" larger than the outside diameter of the pipe or insulation covered line passing through it.

### 1.14 CORING, DRILLING

A. Core, cut and/or drill all small holes 4.5” diameter or less in walls, floors and ceiling required for the installation of sleeves, supports, and conduit for the Electrical work.

### 1.15 FIRESTOPPING, SMOKEPROOFING AND WATERPROOFING

A. Provide firestop or smokestop between sleeves and conduit as manufactured by STI, Nelson, or Dow Corning Corp. Provide at all locations where conduits or electrical equipment penetrate fire/smoke walls or partitions.

B. Provide waterproofing of all materials which penetrate a floor, exterior wall, slab or roof. All sleeves shall extend a minimum of 3 inches above floor or roof. All penetrations thru building foundation walls shall utilize Link-Seal products or approved equal.

### 1.16 COMMISSIONING OF SYSTEMS

A. Provide the services of an authorized representative to instruct the Owner. The Electrical Contractor shall be available during the commissioning phase to demonstrate the operation of all systems.

### 1.17 ACCESSIBILITY

A. Install all work such that parts requiring periodic inspection, operation, maintenance and repair are readily accessible.

B. Furnish all access panels appropriate to particular conditions, to be installed by trades having responsibility for the construction of actual walls, floors or ceilings at required locations.

### 1.18 SUPPLEMENTARY SUPPORTING STEEL

A. Provide all supplementary (non-structural) steelwork required for mounting or supporting equipment and materials.

B. Steelwork shall be firmly connected to building construction as required. Locations and methods of attachment shall be approved by the Architect.

C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer's published requirements.

D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction: all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.

E. All manufactured steel parts and fittings shall be galvanized.

### 1.19 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the Mechanical and Electrical equipment at the site.

### 1.20 PORTABLE AND DETACHABLE PARTS

A. Contractors shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment, etc. necessary for the proper operation and maintenance of the Mechanical and Electrical systems until final completion of the work, at which time they shall be handed over to the Owners.

### 1.21 RECORD DRAWINGS, PROJECT CLOSEOUT

A. As work progresses and for the duration of Contract, maintain a complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design. Work shall be updated on a weekly basis and shall be made available for review by Architect. Failure to perform this work shall be reason for withholding requisition payments. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.

B. At completion of work prepare a complete set of Record Drawings utilizing AutoCAD produced drawings showing all systems as actually installed, including all fire alarm and electrical circuitry. Submit three (3) sets of prints to Architect for comments as to compliance with this section.

C. The Architect will not certify the accuracy of the Record Drawings. This is the sole responsibility of the Electrical Contractor.

D. This trade shall submit the Record Drawings for approval by the Fire and Building Departments in a form acceptable to the departments, when required by the jurisdiction.

E. Record Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer, make and model numbers of final equipment installation.

## 1.22 GUARANTEE/WARRANTY

A. Guarantee and 24 Hour Service:

1. Guarantee Work of this Section in writing for not less than one (1) year following the date of acceptance by the Owner. If the equipment is used for temporary power etc., prior to acceptance by the Owner, the bid price shall include an extended period of warranty covering the one (1) year of occupancy, starting from the date of acceptance by the Owner. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to the Architect's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.
2. In addition to guarantee requirements of Division 1 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's name.
3. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor without any reimbursement.
4. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Architect.
5. Provide 24 hour service beginning on the date the project is accepted by the Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the Owner. Service can be provided by this Contractor or a separate service organization. Choice of service organization shall be subject to Architect and Owner approval. Submit name and a phone number that will be answered on a 24 hour basis each day of the week, for the duration of the service.
6. Submit copies of equipment and material warranties to Architect before final payment.
7. At end of guarantee period, transfer manufacturer's equipment and material warranties still in force to Owner.
8. This paragraph shall not be interpreted to limit Owner's rights under applicable codes and laws and under this Contract.
9. PART 2 paragraphs of this Specification may specify warranty requirements that exceed those of this paragraph. Those paragraphs shall govern.
10. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of Work by Owner, and shall not initiate the guarantee period.
11. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to Owner's satisfaction, advise the Architect in writing, describe efforts to rectify situation, and provide analysis of cause of problem. The Architect and/or Engineer will direct course of action.

## 1.23 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

A. Refer to Section 01700 – CONTRACT CLOSEOUT for submittal procedures pertaining to operating and maintenance manuals.

B. Each copy of the approved operating and maintenance manual shall contain copies of approved Shop Drawings, equipment literature, cuts, bulletins, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed. Each manual shall have the following minimum contents:

1. Table of Contents.
2. Introduction:
    a. Explanation of manual and its purpose and use.
    b. Description of the electrical systems.
    c. Safety precautions necessary for equipment.
    d. Illustrations, schematics and diagrams.
    e. Installation drawing.
3. Maintenance:
    a. Maintenance and lubricating instructions.
    b. Replacement charts.
    c. Trouble-shooting charts for equipment components.
    d. Testing instructions for each typical component.
    e. Two (2) typed sets of instructions for ordering spare parts. Each set shall include name, price, telephone number and address of where they may be obtained.
4. Manufacturer's Literature:
    a. The equipment for which Shop Drawings have been submitted and approved.

**1.24 SERVICE CHARACTERISTICS**

A. Secondary Building Voltage: 120/208.

B. All equipment and wiring shall be suitable for the applied voltage.

**1.25 QUALITY ASSURANCE**

A. The requirements of the State Building Code and Local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.

B. All work shall comply with the latest editions of the codes as referenced herein.

C. Follow manufacturer's directions for articles furnished, in addition to directions shown on Drawings or specified herein.

D. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to the Owner.

E. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.

F. Equipment and materials shall:

1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed and labeled.
2. Be without blemish or defect.
3. Not be used for temporary light and power purposes.
4. Be in accordance with the latest applicable NEMA standards.
5. Buy products which will meet with the acceptance of all Authorities having jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested

and certified by Underwriters or other recognized testing laboratory, the product shall be so examined, tested and certified.

G. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.

H. For items which are to be installed but not purchased as part of the Electrical work, the Electrical work shall include:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into any point on the property line at grade level.
3. Their safe handling and field storage until the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement, if necessary, shall be coordinated with the Contractor who originally purchased the item.
5. Field erection and internal wiring as necessary for their proper operation.
6. Mounting in place, including the purchase and installation of all dunnage, supporting members, and fastenings, necessary to adapt them to architectural and structural conditions.

I. Items which are to be installed but not purchased as part of the electric work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one (1) week of the date of delivery to the project of the items in question. The electric work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

## 1.26 DELIVERY, STORAGE AND HANDLING

A. All materials for the work of this section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials shall be delivered and stored in their original containers, plainly marked with the products' and manufacturer's name. Materials in broken containers or in packages showing watermarks or other evidence of damage, shall not be used and shall be removed from the site.

## 1.27 TEMPORARY POWER AND LIGHTING

A. The Electrical Subcontractor shall furnish and install feeders of sufficient size from the Utility Company's power lines for the electric light and power requirements for the building while under construction and until the permanent feeders and related equipment have been installed and are in operation. Temporary lighting shall be based on a minimum of one watt per square foot covering each and every square foot of floor area in the building. Sufficient wiring, lamps, and outlets shall be installed to insure proper lighting in all rooms, space, stairwells, and corridors. Minimum sized lamp used shall be 100 watt. Where higher lighting intensities are required by Federal or State Standards of Laws or otherwise specified, the above specified wattage shall be increased to provide these increased intensities.

B. All necessary transformers, meters, cables, panelboards, switches, temporary lamp replacements and accessories required for the temporary light and power installation shall be provided by the Electrical Subcontractor.

C. The Electrical Subcontractor shall provide and maintain on each floor of the building, a feeder or feeders of sufficient capacity for the requirements of the entire floor and he shall provide a sufficient number of outlets, located at convenient points so that extension cords of not over 50 feet in length will reach all work requiring temporary light or power.

D. The Electrical Subcontractor shall install and maintain the wiring and accessories for the offices of the General Contractor and the Clerk of the Works as specified in the contract form.

E. All temporary Electrical work shall meet the requirements of the National Electrical Code Article 590 Temporary Wiring, the Local Utility Company, and all Federal Standards and Laws.

F. All temporary wiring and accessories thereto installed by the Electrical Subcontractor shall be removed after their purposes have been served.

G. The General Contractor will pay for the cost of electric energy consumed by himself and by all of his Subcontractors, unless otherwise indicated.

H. All lamps installed in permanent lighting fixtures and used for lighting during construction shall be replaced by the Electrical Subcontractor just prior to date of Use and Occupancy or Final Acceptance.

I. Provide all temporary lighting and power required above during the normal working hours of the project or a total of ten (10) hours per normal working day; Saturdays, Sundays and legal holidays are excluded. The ten hours per day shall include manning the temporary power and lighting 1/2 hour before and 1/2 hour after a normal eight (8) hour working day. In addition to the above, provide and maintain, to the satisfaction of the local Authorities having jurisdiction, all temporary lighting and power that may be required for safety purposes. The Electrical Subcontractor will be compensated by the General Contractor for any additional standby time, materials or equipment required by the General Contractor or other Subcontractors beyond the normal working hours, as defined above.

## 1.28 STAGING AND SCAFFOLDING

A. Provide staging and scaffolding for all the work of this section complying with Division 1 requirements.

## 1.29 EXTRA MATERIALS

A. Furnish extra materials as indicated below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

1. 10% of each total lamps installed.
2. 10% of each total circuit breakers installed.
3. 10% of each total fuses installed.
4. Ten (10) toggle switches and duplex receptacles.
5. 10% of total audio/visual appliances installed.
6. 10% of each total pull stations and smoke detectors installed.

## 1.30 SEISMIC REQUIREMENTS

A. Equipment and work shall meet the restraint requirements for the designated Seismic Design category. This shall include all installation and connections of material and equipment to the building structure. Refer to Structural Drawings for Seismic Design category and ASCE7 for electrical requirements.

## 1.31 PHASING, DEMOLITION AND MAINTAINING EXISTING SERVICES

A. During the execution of the work, required relocation, etc., of existing equipment and systems in the existing building areas where new work is to be installed or new connections are scheduled to be made, shall be performed by the Electrical Subcontractor, as required by job conditions and as determined by the Architect in the field, to facilitate the installation of the new system, while

demolition, relocation work or new tie ins will be performed. Outages required for construction purposes shall be scheduled for the shortest practical period of time, in coordination with the Owner's designated representative, for specified, mutually agreeable periods of time, after each of which the interruption shall cease and the service shall be restored. This procedure shall be repeated to suit the Owner's working schedule, as many times as required until all work is completed. Any outages of service shall be approved by the Owner, prior to commencing the work. No outages or shutdowns of service shall occur without the written authorization of the Owner prior to commencing the work. Give notice of any scheduled shutdowns, a minimum of two (2) weeks in advance. Owner shall make their best efforts to meet this request without adversely affecting the electric service to the existing building.

B. Prior to any deactivation and relocation or demolition work, consult the Drawings and arrange a conference with the Architect and Owner's representative in the field to inspect each of the items to be deactivated, removed or relocated. Care shall be taken to protect all equipment designated to be relocated and reused or to remain in operation and be integrated with the new systems.

C. All deactivation, relocation and temporary tie-ins of electrical systems and equipment shall be provided by the Electrical Subcontractor. All demolition and removal of electrical systems and equipment designed to be demolished shall be provided by the Electrical Subcontractor. Place all demolished electrical materials except hazardous materials (PCB lighting ballasts, fluorescent lamps, etc.) as determined by the Authority Having Jurisdiction in General Contractor's dumpster. All hazardous electrical materials shall be legally disposed of by the Electrical Subcontractor.

D. The Owner reserves the right to inspect the material scheduled for removal and salvage any items he deems usable as spare parts.

E. Phasing:

1. The Electrical Subcontractor shall construct the subject project in phases as directed by the Architect to suit the project progress schedule, as well as the completion date of the project.

2. For additional information related to phasing, review the General Conditions and Supplementary Conditions and the Architectural Drawings.

## PART 2 – PRODUCTS

### 2.1 GENERAL

A. Product Specifications are written in such a manner so as to specify what materials may be used in a particular location or application and therefore do not indicate what is not acceptable or suitable for a particular location or application. As an example: Non-metallic sheathed cable is not specified; therefore it is not acceptable.

B. For purpose of establishing a standard of quality and not for purposes of limiting completion, the basis of this Specification is upon specified models and types of equipment and materials, as manufactured by specified manufacturers.

C. In all cases, standard cataloged materials and systems have been selected. Materials such as lighting fixtures specially manufactured for this particular project, and not part of a manufacturer's standard product line, will not be acceptable. In the case of systems, the system components shall be from a single source regularly engaged in supplying such systems. A proposed system made up of a collection of various manufacturers products will be unacceptable.

D. Where Specifications list manufacturers names and/or "as approved" or "equal approved by Designer", other manufacturers equipment will be considered if equipment meets Specification requirements and has all features of the specified items as are considered essential by the Architect.

E. All materials shall be new and shall be UL listed.

## 2.2 ARC-FLASH HAZARD WARNING

A. In accordance with NFPA 110.16, all electrical equipment shall be provided with factory or field marking which will warn personnel of potential electric arc flash hazards.

## 2.3 RACEWAYS AND FITTINGS

A. Raceways – General:

1. No raceway shall be used smaller than 3/4" diameter. No conduit shall have more than three (3) 90° bends in any one run, and where necessary, pull boxes shall be provided.
2. Rigid metal conduit (RMC) conforming to, and installed in accordance with, Article 344 of NFPA 70 shall be heavy wall zinc coated steel conforming to American Standard Specifications C80-1 and may be used for service work, exterior work, slab work, and below grade level slab, wet locations, and in mechanical rooms and where raceway may be subjected to mechanical damage, i.e., loading docks, workshops, etc.
3. Intermediate metal conduit (IMC) conforming to, and installed in accordance with Article 342 of NFPA 70 shall be zinc coated steel and may be used in all areas similar to RMC.
4. Thin wall conduit (EMT), conforming to, and installed in accordance with, Article 358 of NFPA 70 shall be zinc coated steel, conforming to industry standards, may be used in masonry block walls, stud partitions, above furred ceilings where exposed but not subject to mechanical damage, and shall be used for fire alarm work.
5. Flexible metal conduit (FMC) conforming to, and installed in accordance with Article 348 of NFPA 70 shall be used for connections to recessed light fixtures, vibrating equipment and motors. All FMC shall be secured and supported in accordance with Article 348 of NFPA 70.
6. Liquidtight flexible metal conduit (LFMC) conforming to, and installed in accordance with Article 350 of NFPA 70 shall be used for connections to light fixtures, vibrating equipment and motors. All LFMC shall be secured and supported in accordance with Article 350 of NFPA 70. If used on roof applications, all LFMC shall be supported by sleepers approved by the Architect prior to installation.
7. Rigid non-metallic conduit may be used at the Contractor's option for underground electric and telephone services outside the foundation wall and shall be polyvinyl chloride (PVC) schedule 40 or 80, 90° C. If option of rigid non-metallic conduit is exercised, underground runs outside the foundation wall shall be concrete encased at Contractor's expense. Schedule 40/80 conduit shall be installed in conformance with Article 352 of NFPA 70. Use of type EB or A PVC conduit is not allowed.
8. PVC Schedule 40 may also be used for below grade slab circuits within building confines. Below slab rigid non-metallic conduits do not require concrete encasement. Rigid non-metallic conduits shall not be used in slabs. Rigid steel elbows or stubs shall be used for penetrations from below slab or through exterior walls into building. PVC shall not be installed within building. Raceways and fittings shall be produced by same manufacturer. All PVC conduit shall comply with ANSI/UL 651.
9. Where indicated on the project drawings provide color coded EMT as follows:
    a. Red – Fire and Emergency Systems.
    b. Blue – Video, Network and Data Communication.
10. Acceptable Manufacturers:
    a. Wheatland Tube Company
    b. Allied Tube

c. Western Tube & Conduit

d. Carlon

e. Perma-Cote Supreme

f. Cantex

11. Fittings:

a. Provide insulated bushings on all raceways that house conductors #4 AWG or larger at all threaded fittings no matter what the size of the conductor.

b. Manufacturer's standard fittings shall be used for raceway supports.

c. Expansion Fittings: Expansion fittings shall be used where structural and concrete expansion joints occur and shall include a ground strap.

d. Couplings for rigid metal conduit and IMC shall be threaded type. Provide insulated bushings.

e. All fittings for EMT conduit shall be steel. No die-cast fittings are allowed. Set screw and compression connectors are allowed.

f. Threadless fittings for EMT shall be watertight compression type. Set-screw type fittings are not acceptable. All fittings shall be concrete tight. No die-cast fittings allowed.

g. Cable supports in vertical raceways shall be of the split wedge type. Armored cable supports for vertical runs to be of wire mesh basket design.

h. Wall entrance seals shall be equal to O.Z. Gedney type "WSK" or Link-Seal.

i. Couplings, elbows and other fittings used with rigid nonmetallic raceways shall be of the solvent cemented type to secure a waterproof installation.

j. Acceptable manufacturers:

1) O.Z. Gedney

2) Crouse Hinds

3) American Fittings

4) Hubbell

5) Thomas & Betts

## 2.4 WIRING MATERIALS

A. Building Wire and Cable shall be copper with 600V insulation, THWN for branch circuitry and XHHW for feeders.

B. Conductors shall be of soft drawn 98% minimum conductivity properly refined copper, solid construction where No. 10 AWG and smaller, stranded construction where No. 8 AWG and larger.

C. Exterior of wires shall bear repetitive markings along their entire length indicating conductor size, insulation type and voltage rating.

D. Exterior of wires shall be color coded, so as to indicate a clear differentiation between each phase and between each phase and neutral. In all cases, grounded neutral wires and cables shall be identified by the colors "white" or "gray". In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made. Colored tape shall be applied for a distance of 6 inches along the wires and cables, or

along their entire extensions beyond raceway ends, whichever is less.

E. Final connections to motors shall be made with 18” of neoprene sheathed flexible conduit.

F. Minimum branch circuit conductor size shall be No. 12 AWG installed in conduit. Motor control circuit wiring shall be minimum No. 14 AWG installed in conduit.

G. Fire alarm and security system wiring shall be per manufacturer’s recommendations.

H. Other wires and cables required for the various systems described elsewhere in this section of the Specifications shall be as specified herein, as shown on the Contract Drawings, or as recommended by the manufacturer of the specific equipment for which they are used, all installed in conduit.

I. Metal clad sheathed cable NFPA 70, type MC may be used for branch circuitry where shown and where run concealed and not subject to physical damage. All type MC cable used shall contain a full size insulated ground conductor. All conductors shall be copper. All type MC cable insulation used shall have voltage rating of 600 volts, shall have a temperature rating of 75° C, and shall be thermoplastic material. Armor material shall be steel and armor design shall be interlocked metal tape. Fire alarm rated MC cable may be used for fire alarm work where concealed and acceptable to the Local Authority Having Jurisdiction.

J. Wiring materials shall be manufactured by Southwire, Prysmian, General Cable, or equal.

## 2.5 OUTLET, JUNCTION, PULL BOXES AND WIRING TROUGHS FOR ALL SYSTEMS

A. Outlets:

1. Each outlet in wiring or raceway systems shall be provided with an outlet box to suit conditions encountered. Boxes installed in normally wet locations shall be of cast-metal type having hubs. Concealed boxes shall be cadmium plated or zinc coated sheet metal type. Old work boxes with Madison clamps are not allowed in new construction.

2. Each box shall have sufficient volume to accommodate number of conductors in accordance with requirements of NFPA 70. Boxes shall not be less than 1-1/2” deep unless shallower boxes are required by structural conditions and are specifically approved by Architect. Ceiling and bracket outlet boxes shall not be less than 4” octagonal except that smaller boxes may be used where required by particular fixture to be installed. Flush or recessed fixtures shall be provided with separate junction boxes when required by fixture terminal temperature requirements. Switch and receptacle boxes shall be 4” square or of comparable volume.

3. Acceptable Manufacturers:

   a. Appleton

   b. Crouse Hinds

   c. Steel City

   d. RACO

B. Pull and Junction Boxes: Where necessary to terminate, tap off, or redirect multiple raceway runs or to facilitate conductor installation, furnish and install appropriately designed boxes. Boxes shall be fabricated from code gauge steel assembled with corrosion resistant machine screws. Box size shall be as required by Code. Where intermediate cable supports are necessary because of box dimensions, provide insulated removable core brackets to support conductors. Junction boxes are to be equipped with barriers to separate circuits. Where splices are to be made, boxes shall be large enough to provide ample work space. All conductors in boxes are to be clearly tagged to indicate characteristics. Boxes shall be supported independently of raceways. Junction boxes in moist or wet areas shall be galvanized type. Boxes larger than 4 inches square shall have hinged covers. Boxes larger than 12 inches in one dimension will be

allowed to have screw fastened covers, if a hinged cover would not be capable of being opened a full 90 degrees due to installation location.

## 2.6 WIRING DEVICES

A. Provide wiring device type plates for all wall-mounted devices. All wall plates shall be smooth high impact nylon for all areas, color as directed by the Architect. Provide galvanized steel for all Utility, Electric and Mechanical Rooms.

B. Wiring devices standard for the project (i.e., with no specific type indicated) shall conform to the following:

1. Visible part colors of wiring devices shall be as directed by the Architect for all areas. Provide brown devices for all Utility, Electrical and Mechanical rooms.

2. Exclude compact or “despard” type devices.

C. Wiring device switches shall be toggle type, A.C. quiet design, specification grade, 20 amps on 120 volt circuits. Switches shall be mounted 48” to center line above finished floor unless noted otherwise.

1. Single pole switch shall be equal to Hubbell No. 1221.

2. Double pole switch shall be equal to Hubbell No. 1222.

3. Three-way switch shall be equal to Hubbell No. 1223.

4. Four-way switch shall be equal to Hubbell No. 1224.

5. Single pole pilot light switch shall be equal to Hubbell No. HBL 1221PL.

6. Equivalent 277 volt 20 amp switches shall be used where required.

D. Standard duplex convenience receptacles shall be 125 volt, 20 amps, three wire (two circuit wires plus ground), “U-bar” ground NEMA slot configuration 5-20R, specification grade. Receptacles shall be mounted 18” to center line above finished floor unless noted otherwise.

1. Equal to Hubbell No. 5362.

2. Where indicated on plans provide receptacles with ground fault current interrupters, UL Class A; 20A, 125V to be equal to Hubbell No. GF5362. All GFI receptacles shall be self-testing type in compliance with UL 943.

E. Non-standard convenience receptacles and special purpose power supply receptacles shall be as listed on plans.

F. Devices and device plates for flush wall devices which are not integrally equipped with same, shall be as directed by the Architect.

G. For unfinished spaces, plates for surface-mounted wall devices which are not integrally equipped with same, shall be galvanized sheet steel, formed raised type which does not overlap box. Where for switches, such plates shall have toggle guards.

H. Where more than one wiring device is indicated in the same location, the devices shall be mounted in gang under a common wall plate.

I. Mount duplex convenience and power receptacles vertically with grounding posts at top of device unless otherwise indicated. Locate grounding post to left when horizontal mounting is indicated.

J. Wiring devices and associated hardware shall be manufactured by Leviton, Hubbell or Pass and Seymour.

K. Floor Outlets (Poke-Thru Type):

1. Thru-floor assembly of floor outlets for power and communications shall be UL listed and

have a two-hour fire rating. Core drilling shall be by Electrical Subcontractor.

2. Complete assembly shall consist of a flange assembly, slide holder assembly, and insert assembly.
3. Length of extension raceway shall be sufficient to penetrate bottom of slab. Coordinate ordering of raceway with type of slab.
4. Thru-floor assemblies shall be as manufactured by Raceway Components, Inc., or equal.

L. Dimmer Controls:

1. All devices shall be UL listed specifically for the required loads (i.e., incandescent, fluorescent, magnetic low voltage, electronic low voltage). Manufacturer shall provide file card upon request. Universal dimmers are not acceptable.
2. All dimmers and switches shall incorporate an air gap switch. The air gap switch shall be capable of meeting all applicable requirements of UL 20 for air gas switches in incandescent dimmers.
3. All dimmers and switches shall provide power failure memory. Should power be interrupted and subsequently returned, the lights will come back on to the same levels set prior to the power interruption. Restoration to some other default level is not acceptable.
4. Dimmers and switches shall meet ANSI/IEEE Std. C62.41-1980, tested to withstand voltage surges of up to 6000V and current surges of up to 200A without damage.
5. Dimmers and switches shall meet the UL 20 limited short circuit test requirement for snap switches.
6. Dimmer shall provide a smooth and continuous Square Law dimming curve.
7. Dimmers shall be voltage regulated so that + 10% variation in line voltage shall cause not more than +5% variation in load voltage when dimmer is operating at 40V (5% light output).
8. Dimmers shall be 2000 watt equal to Lutron Nova Series. Single pole dimmers shall be “slide to off” type. Three-way dimmers shall be “preset” type used with appropriate 3 or 4-way linear slide switches.

## 2.7 GROUNDING REQUIREMENTS

A. Ground all systems and equipment in accordance with best industry practice, the requirements of NFPA 70, Article 250 and the following:

1. The ground bus of the main switchboard shall be connected to the main grounding electrode specified below by means of insulated conductors run in conduit.
   a. Metal underground water pipes.
   b. Metal frame of building.
   c. Concrete encased electrode.
   d. Rod and pipe electrodes.
   e. Ground ring.
2. Provide grounding bonds between all metallic conduits of the light and power system which enter and leave cable chambers or other non-metallic cable pulling and splicing boxes. Accomplish this by equipping the conduits with bushings of the grounding type individually cross connected.
3. Bond metallic conduits containing grounding electrode conductors and main bonding conductors to the ground bus service enclosure and/or grounding electrode at both ends of

each run utilizing grounding bushings and jumpers.

4. Provide grounding bonds for all metallic conduits of the light and power system which terminate in pits below equipment for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually to the ground bus.
5. Provide supplementary ground bonding where metallic conduits terminate at metal clad equipment (or at the metal pull box of equipment) for which a ground bus is specified. Accomplish this be equipping the conduits with bushings of the grounding type connected individually by means of jumpers to the ground bus. Exclude the jumpers where directed. This exclusion will be required where an isolated ground for electronic equipment is to be maintained.
6. Each grounding type bushing shall have the maximum ground wire accommodation available in standard manufacture for the particular conduit size. Connection to bushing shall be with wire of this maximum size.
7. Bonding conductors on the load side of the service device and equipment grounding conductors shall be sized in relation to the fuses or trip size of the overcurrent device supplying the circuit.
8. The central equipment for the fire protective alarm system and telephone system shall have its grounding terminal connected to the grounding electrode by means of a No. 6 green coded insulated conductor, run in 3/4" conduit. Utilize a ground clamp of a type specifically manufactured for the purpose.

## 2.8 PHASING AND COLOR CODING

A. The insulation or covering of each wire or cable shall be color coded so as to provide for circuit identification as specified below:

| 120/208 V Circuits | Phase Circuits |
|---|---|
| Black | A |
| Red | B |
| Blue | C |
| White | Neutral |
| Green | Equipment Ground |

B. Color coding shall be achieved by one of the following methods:

1. The insulation or covering shall be coded during manufacture by use of one of the following methods:
   a. Colored compounds.
   b. Colored coatings.
2. In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made.

C. The same colored cable shall be connected to the same phase throughout the project.

D. In general, building load centers and panelboards shall be phased “A”, “B”, “C”, left to right. The neutral, although it may be in different locations for different equipment, shall be identified.

## 2.9 ENCLOSURES FOR INDIVIDUALLY MOUNTED OVERCURRENT AND SWITCHING DEVICES

A. Construction shall be NEMA Class I, where installed indoors.

B. Construction shall be NEMA Class IIIR, where installed outdoors, in mechanical rooms, in locations defined as damp or wet by NFPA 70 or where indicated as weatherproof.

C. Operating handles shall be front or side type to accommodate hand access space and flush or surface mounting requirements.

D. Each shall be equipped with padlock for locking operating handle in the open position.

## 2.10 PANELBOARDS

A. Panelboards shall consist of factory completed dead front assemblies of back pans, main busses, overcurrent and switching units, sheet metal cabinets and trims. They shall be so designed that switching and overcurrent devices can be replaced without disturbing adjacent units and without removing the main bus connectors, so that circuits may be changed without machine drilling or tapping.

B. Where indicated as power or distribution panels, they shall be as manufactured by Square D, Siemens, or Eaton.

C. Bus bars for their mains shall be of copper having current capacities as indicated and sized for such capacities in accordance with Underwriter Laboratory standards. Provide double size neutral bus bars and lugs for all 120/208 volt panelboards where fed from “K” rated transformers. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Bussing shall be braced throughout to conform to industry standard practice governing short circuit stresses in panelboards. Phase bussing shall be full height without reduction.

D. A ground bus shall be provided for each panel. Each ground bus shall be of the same material as the phase and neutral buses.

E. Cabinets shall be fabricated from industry standard gauge galvanized sheet steel with corners lapped and riveted, or fastened by approved methods.

F. The inside and outside of the trims shall be factory painted with one (1) rust proofing primer coat and one (1) finish coat. The finish paint shall be of a type to which field applied paint will bond. All trims shall be hinged.

G. Cabinets and trims shall be suitable for the required mounting. Trims shall be fastened to cabinets and shall be of a type that is self-supporting on cabinets. Trims for flush panels shall overlap cabinets by at least 3/4" all around. Where two section panels are required, cabinets shall be of equal height including those cases where there is one main for both sections.

H. Cabinets and trims for lighting and appliance panels shall accommodate and conform to the following limited dimensions:

1. Minimum wiring gutter width on each side: 5-3/4”.
2. Maximum overall width: 24”.
3. Maximum overall depth: 6”.

I. Where wires or cables are used within panelboards to make up internal connections (factory installed or otherwise) such wire or cable shall have copper conductors only.

J. Any cabinet for a power or distribution panel shall (regardless of the actual devices required to be

in it) have a width, depth and bussing adequate for a 3-pole branch device equal in rating to the panel mains. In no case shall the cabinet be wider than 42" or deeper than 18".

K. Hinged doors covering all switching device handles shall be included in all panel trims.

L. Doors in panelboard trims shall conform to the following:

1. In making switching device handles accessible, doors shall not uncover any live parts.
2. Doors shall have flush type paracentric cylinder locks and catches. Two (2) keys shall be supplied for each lock and each key shall open all panelboards. Locks and keys shall conform to a "standard keying policy" as directed.

M. Where "spaces only" for overcurrent protection and switching devices are called for in a panel, its main bus, and backpan, as well as its cabinet and trim, shall be extended to accommodate these spaces and shall include all necessary hardware including bus connectors to add future devices.

N. Panelboards shall comply with the following industry standards:

1. UL Standards:
   a. Panelboards – UL67.
   b. Cabinet & Boxes – UL50.
2. NEMA Standard – PB1.

O. Panelboards shall be labeled with UL short-circuit rating adequate for the available short-circuit and based on the lowest panel mounted circuit breaker available UL listed interrupting current rating, but in no case less than 65 ka for 480 volt and 22 ka for 240 volt panelboards.

P. Provide "lock on" clips for the toggle handles of certain branches serving the Fire Alarm System, security, etc.

Q. Panelboards shall be manufactured by Eaton, Siemens, or Square D.

## 2.11 MOLDED CASE CIRCUIT BREAKERS

A. Molded case type circuit breakers shall consist of manually operated quick-make quick-break mechanically trip free operating mechanisms for simultaneous operation of all poles, with contacts, arc interrupters and trip elements for each pole, all enclosed in molded phenolic plastic cases.

1. Their tripping units shall be of the "thermal magnetic" type having bimetallic elements for time delay overload protection and magnetic elements for short-circuit protection.
2. They shall be manually operable by means of toggle type operating handles having "tripped" position midway between the "ON/OFF" positions.
3. They shall each be contained in an individual case enclosing only the number of poles required for the particular breaker.
4. All panels and individually mounted circuit breakers shall have short circuit ratings exceeding the available short-circuit of the values indicated in the "Power System Studies" in this section by a factor of 1.2 with a minimum as follows:
   a. 240V class panels/breakers: 10 kAIC where shown fed by a 150 kVA or less transformer
      1) 10 kAIC where shown
      2) 22 kAIC where shown fed by a 300 kVA or less transformer.
5. They shall be of the "bolted-in" type.

a. Where necessary, to accommodate other requirements, their frame sizes shall be increased to conform to such requirements, frame sizes being indicated only as a reference to the minimum acceptable interrupting ratings noted above.

b. Where single pole in trip sizes 20 amps or less, they shall be rated for switching duty.

c. They shall be equipped with 5 milliamp sensitivity ground fault interrupting features where so indicated.

d. All circuit breakers connected to lighting branch circuits shall be high magnetic type breakers.

6. They shall be manufactured by Square D, Siemens, or Eaton.

## 2.12 CARTRIDGE FUSES

A. Cartridge fuses shall be as follows:

1. Provide a complete set of fuses for each item of fusible type equipment. Fusible equipment furnished by other contractors will be complete with fuses.

2. Secondary system fuses, rated at 600 volts or less, shall be UL listed and constructed in conformance with the applicable standards set forth by NEMA and ANSI. All fuses of a particular class shall be of same manufacturer.

3. Regardless of actual fault current, they shall, at full recovery voltage, be capable of safely interrupting fault currents of 200,000 amperes RMS symmetrical or 340,000 amperes RMS asymmetrical, deliverable at the line side of the fuse.

4. Circuits 0-600 amperes shall be protected by the equal of Bussman “Low Peak” current limiting fuses, LPN-RK (250 volts), LPS-RK (600 volts), UL class RK-1.

5. Fuses shall be suitable for application to fuse gaps which reject other types of fusing.

6. Supply 10% spare fuses of each size and type 60 amps and less. Supply three (3) spare fuses for each size and type over 60 amps.

B. Cartridge fuses shall be manufactured by Bussman, Gould or EFCO.

## 2.13 MOTOR CONTROLS

A. Motor Controls – Manual and Magnetic:

1. Individually-mounted magnetic starters shall be across-the-line type with thermal overload on each phase, single-speed, two-speed, or reduced voltage start as indicated. Check exact type of two-speed or part-winding motors to be furnished by other contractors, and provide proper starter.

2. Starters shall be of the replaceable contact double break type, of size and type required for particular motor horsepower and voltage. Minimum size starter to be size 1.

a. Starters shall have OL reset button, green pilot light to indicate “ON”, and “HAND-OFF-AUTO” switch in cover. Pilot lights shall be push-to-test type.

b. Starters to have 120 volt control transformers with fused output being provided for those units operating on 277/480 volt system.

c. Provide proper rating of thermal overloads. Replace any overloads found to be of an incorrect rating. Provide a spare set of three (3) thermal overloads for each starter.

d. Provide four (4) sets of auxiliary contacts of convertible type N.O. to N.C. for each starter.

e. Motor starters installed in dry locations shall have NEMA I enclosures. Those in wet locations shall have NEMA IV enclosures.

f. Acceptable Manufacturers:

1) Siemens

2) Eaton

3) Square D

3. Manual motor starters shall have pilot lights and shall be furnished with thermal overloads on each phase.

B. Motors: Each motor shall have disconnect switch and starter provided under this section. Starters which are a part of “factory assembled” control panel will be provided under section supplying equipment to be controlled but connected under this section.

C. Disconnect Switches:

1. Disconnect (safety) switches shall conform to industrial standards of NEMA, be UL listed and shall be heavy-duty type, quick-make, quick-break type with interlocking cover mechanism and provisions for padlocking switch handle in “OFF” position. Three (3) pole toggle switches are not acceptable as substitute for disconnect switches.

2. Disconnect switches shall be of fused or un-fused type as indicated with number of disconnecting poles indicated. The grounded conductor shall not be switched. Switches shall be for use with current limiting fuses with rejection type fuse clips and those shall be horsepower rated.

3. Enclosures shall be of proper NEMA type for the intended location and shall be phosphate coated or equivalent code gauge galvanized sheet steel with gray baked enamel finish.

4. Acceptable Manufacturers:

a. Eaton

b. Siemens

c. Square D

D. Combination Starter: Provide combination starters where indicated on the plans.

E. Motor Control Circuitry:

1. Except as noted below, select materials exactly as specified for feeders. Utilize No. 12 A.W.G. THWN conductors throughout minimum.

2. Motor control circuit wires may be run in the same conduit as the wires of motor power circuits; however, exclude motor control wires from enclosures (other than motor starter enclosures) which contain power circuit overcurrent protection and switching devices; also from pull boxes and junction boxes containing the wires of main and sub main feeders. Utilize auxiliary pull boxes to separate motor control wires from motor power circuit wires before the power circuit wires enter the items from which motor control wires are excluded.

3. Prior to installing any motor control circuitry for a particular motor, notify the Architect of any deviations between the control circuitry requirements of the trade supplying the motor and the indicated electric work.

## 2.14 AUTOMATIC TRANSFER SWITCHES

A. General:

1. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

2. Summary: This Section includes transfer switches rated 600 V and less, including the

following:

a. Automatic transfer switches.

3. Submittals:

a. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

1) Technical data on all major components of all transfer switches and other products described in this section. Data is required for the transfer switch mechanism, control system, cabinet, and protective devices specifically listed for use with each transfer switch. Include steady state and fault current ratings, weights, operating characteristics, and furnished specialties and accessories.

2) Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

b. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

1) Dimensioned outline drawings of assembly, including elevations, sections, and details including minimal clearances, conductor entry provisions, gutter space, installed features and devices and material lists for each switch specified.

2) Internal electrical wiring and control drawings.

3) Interconnection wiring diagrams, showing recommended conduit runs and point-to-point terminal connections to generator set.

4) Installation and mounting instructions, including information for proper installation of equipment to meet seismic requirements.

c. Manufacturer Seismic Qualification Certification: Submit certification that transfer switches accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:

1) Seismic certification, as required for site conditions. Seismic certifications shall be third-party certified, and based on testing. Certification based on calculations does not meet this requirement.

a) The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational both during and after the seismic event."

2) Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3) Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

d. Manufacturer and Supplier Qualification Data:

1) The transfer switch manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

2) The manufacturer of this equipment shall have produced similar equipment for a minimum period of 10 years. When requested, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

e. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1) Features and operating sequences, both automatic and manual.

2) List of all factory settings of relays, timers and protective devices; provide setting and calibration instructions where applicable.

f. Warranty documents demonstrating compliance with the project's contract requirements.

4. Quality Assurance:

a. Only approved bidders shall supply equipment provided under this contract.

b. Manufacturer Qualifications: The equipment supplier shall maintain a service center capable of providing training, parts, maintenance and emergency repairs to equipment, including transfer switch generator sets and remote monitoring equipment (if applicable) at the site within a response period of less than (eight hours or appropriate time period designated for Project) from time of notification.

1) The transfer switch shall be serviced by technicians employed by, and specially trained and certified by, the generator set supplier and the supplier shall have a service organization that is factory-certified in both generator set and transfer switch service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.

2) Submit names, experience level, training certifications, and locations for technicians that will be responsible for servicing equipment at this site.

3) The manufacturer shall maintain model and serial number records of each transfer switch provided for at least 20 years.

c. Source Limitations: All transfer switches are to be obtained through one source from a single manufacturer. The generator set manufacturer shall warrant transfer switches to provide a single source of responsibility for products provided.

d. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked as suitable for use in emergency, legally required or optional standby use as appropriate for the connected load.

e. The automatic transfer switch installation and application shall conform to the requirements of the following codes and standards:

1) Transfer switches and enclosures shall be UL 1008 listed and labeled as suitable for use in emergency, legally required, and optional standby applications.

2) CSA 282, Emergency Electrical Power Supply for Buildings, and CSA C22.2, No. 14-M91 Industrial Control Equipment

3) NFPA 70, National Electrical Code. Equipment shall be suitable for use in systems in compliance with Articles 700, 701 and 702.

4) Comply with NEMA ICS 10-1993 AC Automatic Transfer Switches

5) IBC 2006 – The transfer switch(es) shall be prototype-tested and third-party certified to comply with the requirements of IBC group III or IV, Category D/F. The equipment shall be shipped with the installation instructions necessary to attain installation compliance

6) IEEE 446 – Recommended Practice for Emergency and Standby Power Systems for

Commercial and Industrial Applications

7) EN55011, Class B Radiated Emissions and Class B Conducted Emissions
8) IEC 1000-4-5 (EN 61000-4-5); AC Surge Immunity
9) IEC 1000-4-4 (EN 61000-4-4) Fast Transients Immunity
10) IEC 1000-4-2 (EN 61000-4-2) Electrostatic Discharge Immunity
11) IEC 1000-4-3 (EN 61000-4-3) Radiated Field Immunity
12) IEC 1000-4-6 Conducted Field Immunity
13) IEC 1000-4-11 Voltage Dip Immunity
14) IEEE 62.41, AC Voltage Surge Immunity
15) IEEE 62.45, AC Voltage Surge Testing

f. Comply with NFPA 99 – Essential Electrical Systems for Healthcare Facilities
g. Comply with NFPA 110 – Emergency and Standby Power Systems. The transfer switch shall meet all requirements for Level 1 systems, regardless of the actual circuit level.
h. The manufacturer shall warrant the material and workmanship of the transfer switch equipment for a minimum of one (1) year from registered commissioning and start-up, or eighteen (18) months from date of shipment.
i. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, and etc. during the minimum noted warranty period described above.

5. Project Conditions: Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:
   a. Notify (Architect/Construction Manager/Owner) no fewer than (insert appropriate number) days in advance of proposed interruption of electrical service.
   b. Do not proceed with interruption of electrical service without (Architect/Construction Manager/Owner's) written permission.
   c. Do not energize any new service or distribution equipment without notification and permission of the (Architect/Construction Manager/Owner).
6. Coordination:
   a. Size and location of concrete bases and anchor bolt inserts shall be coordinated. Concrete, reinforcement and formwork must meet the requirements specified in Division 03. See section 3.1 for additional information on installation
   b. If Project calls for bypass switch(es) mounted on a concrete base, the base must be designed to accommodate the requirements of the drawout mechanism (extension rails and/or wheeled carriage) of the bypass switch.

B. Products:
1. Manufacturers:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Cummins Power Generation
      2) Russelectric

3) ASCO

b. Equipment specifications for this Project are based on automatic transfer switches manufactured by Cummins Power Generation. Switches manufactured by Russelectric or ASCO that meet the requirement of this specification are acceptable, if approved not less than two weeks before scheduled bid date. Proposals must include a line-by-line compliance statement based on this specification.

c. Transfer switches utilizing molded case circuit breakers do not meet the requirements of this specification and will not be accepted.

2. General Transfer-Switch Product Requirements:

a. Provide transfer switches in the number and ratings that are shown on the drawings. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer.

b. Fault-Current Closing and Withstand Ratings: UL 1008 WCR ratings must be specifically listed as meeting the requirements for use with protective devices at installation locations, under specified fault conditions. Withstand and closing ratings shall be based on use of the same set of contacts for the withstand test and the closing test.

c. Solid-State Controls: All settings should be accurate to +/- 2% or better over an operating temperature range of - 40 to + 60 degrees C (- 40 to + 140 degrees F).

d. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

e. Electrical Operation: Accomplished by a non-fused, momentarily energized solenoid or electric motor operator mechanism, mechanically and electrically interlocked in both directions (except that mechanical interlock is not required for closed transition switches).

f. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1) Switches using molded-case switches or circuit breakers, or insulated case circuit breaker components are not acceptable.

2) Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in the Source 1 and Source 2 positions.

3) Main switch contacts shall be high pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.

4) Contacts shall be operated by a high-speed electrical mechanism that causes contacts to open or close within three electrical cycles from signal.

5) The transfer switch operation shall include the ability to switch to an open position (both sources disconnected) for the purpose of load shedding from the generator set.

6) The power transfer mechanism shall include provisions for manual operation under load with the enclosure door closed. Manual operation may be electromechanical or mechanical, but must be coordinated with control function.

7) Transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with components that could be operating at line voltage levels.

8) The transfer switch shall include the mechanical and control provisions necessary to allow the device to be field-configured for operating speed. Transfer switch operation

with motor loads shall be as is recommended in NEMA MG1.

a) Phase angle monitoring/timing equipment is not an acceptable substitute for this functionality.

9) Transfer switches designated on the drawings as “4-pole” shall be provided with a switched neutral pole switched which is switched simultaneously with phase poles.

10) Transfer switches designated on the drawings as “3-pole” shall have a full current-rated neutral bar with lugs.

11) Transfer switches designated on the drawings as “isolation-bypass” switches shall meet the requirements of section 2.4 of this specification.

12) Transfer switches designated on the drawings as “non-automatic” switches shall meet the requirements of section 2.5 of this specification.

13) Transfer switches designated on the drawings as “closed transition” switches shall meet the requirements of section 2.6 of this specification.

14) Transfer switches designated on the drawings as “service entrance” switches shall meet the requirements of section 2.7 of this specification.

g. Control: Transfer switch control shall be capable of communicating with the genset control, other switches and remote programming devices over a high-speed network interface.

h. Factory wiring: Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism

i. Terminals: Terminals shall be pressure type and appropriate for all field wiring. Terminal arrangement and cabinet space must be such that feeder conductors can enter from the top, side or bottom of the switch, at the installer’s discretion. Control wiring shall be equipped with suitable lugs, for connection to terminal strips.

j. Enclosures: All enclosures shall be third-party certified for compliance to NEMA ICS 6 and UL 508, unless otherwise indicated:

1) The enclosure shall provide wire bend space in compliance to the latest version of NFPA70, regardless of the direction from which the conduit enters the enclosure.

2) Exterior cabinet doors shall provide complete protection for the system’s internal components. Doors must have permanently mounted key-type latches. Bolted covers or doors are not acceptable.

3) Transfer switches shall be provided in enclosures that are third party certified for their intended environment per NEMA requirements.

a) Transfer switches mounted in a controlled indoor environment shall be provided in NEMA Type 1 enclosures (IEC type IP30).

b) Transfer switches installed indoors shall be NEMA Type 12 (IEC type IP61) if the Project environment requires dust-proof and/or drip-proof equipment.

c) Transfer switches located outdoors shall be supplied in NEMA Type 3R (IEC IP34) when dust-proof and/or rain-proof enclosures are required.

d) Transfer switches that are installed outdoors or in any other uncontrolled environment shall be supplied with NEMA Type 4 or 4X (stainless steel) enclosures (IEC IP65).

3. Automatic Transfer Switches:
    a. Comply with requirements for Level 1 equipment according to NFPA 110.
    b. Indicated current ratings:
        1) Refer to the Project drawings for specifications on the sizes and types of transfer switch equipment, withstand and closing ratings, number of poles, voltage and ampere ratings, enclosure type, and accessories.
        2) Main contacts shall be rated for 600 VAC minimum.
        3) Transfer switches shall be rated to carry 100% of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60 degrees C (-40 to +140 degrees F), relative humidity up to 95% (non condensing), and altitudes up to 10,000 feet (3000 meters).
    c. Manual Switch Operation: The power transfer mechanism shall include provisions for manual operation under no load, de energized conditions. Manual operation may be electromechanical or mechanical, but must be coordinated with control function.
    d. Relay Signal: Control shall include provisions for addition of a pre-transfer relay signal, adjustable from 0 to 60 seconds, to be provided if necessary for elevator operation, based on equipment provided for the project.
    e. Control: Transfer switch control shall be provided with necessary equipment and software to communicate with the genset control, other transfer switches, remote annunciation equipment, and other devices over a high speed control network.
    f. Neutral Switching: Transfer switches designated on the drawings as 4-pole shall be provided with a switched neutral pole. The neutral pole shall be of the same construction and have the same ratings as the phase poles. All poles shall be switched simultaneously using a common crossbar. Substitute equipment using overlapping neutral contacts is not acceptable.
    g. Transfer switches that are designated on the drawings as 3-pole shall be provided with a neutral bus and lugs. The neutral bus shall be sized to carry 100% of the current designated on the switch rating.
    h. The transfer switch physically located closest to the generator and not more than 50 ft (15 meters) away, except those served by generator paralleling equipment, shall be provided with a battery charger suitable for the requirements of the application and in compliance with NFPA 110 requirements for Level 1 systems. If no transfer switch is located within this distance, a battery charger shall be installed on the generator set.
    i. Automatic Transfer Switch Control Features:
        1) The transfer switch control system shall be configurable in the field for any operating voltage level up to 600 VAC. Voltage sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions that are not field configurable are not acceptable.
        2) All transfer switch sensing shall be configurable from an operator panel or from a Windows XP or later PC-based service tool. Designs utilizing DIP switches or other electromechanical devices are not acceptable.
        3) The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device for load shedding purposes. On receipt of this signal, the transfer switch shall switch to a neutral position when connected to Source 2. If Source 1 is available when the load-shed signal is received, the transfer switch shall connect to Source 1.

4) The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device to prevent transfer to the generator service.

5) The transfer switch shall provide a relay contact signal prior to transfer or re-transfer. The time period before and after transfer shall be adjustable in a range of 0 to 50 seconds.

6) The control system shall be designed and prototype tested for operation in ambient temperatures from - 40 degrees C to + 60 degrees C (- 40 to +140 degrees F). It shall be designed and tested to comply with the requirements of the noted voltage and RFI/EMI standards.

7) The control shall have optically isolated logic inputs, high isolation transformers for AC inputs and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.

8) The transfer switch network monitoring equipment, when supplied, shall be provided with a battery-based auxiliary power supply to allow monitoring of the transfer switch when both AC power sources are non-operational. The battery power supply shall be monitored for proper condition, and the transfer switch shall include an alarm condition to indicate low battery condition.

j. Transfer Switch Control Panel: The transfer switch shall have a microprocessor-based control with a sealed membrane panel incorporating pushbuttons for operator-controlled functions, and LED lamps for system status indicators. The panel shall also include an alphanumeric display for detailed system information. Panel display and indicating lamps shall include permanent labels.

1) The indicator panel LEDs shall display:

a) Which source the load is connected to (Source 1 or Source 2).

b) Which source or sources are available.

c) When switch is not set for automatic operation, because the control is disabled or the bypass switch is in use.

d) When the switch is in test/exercise mode.

2) The indicator shall have pushbuttons that allow the operator to activate the following functions:

a) Activate pre-programmed test sequence.

b) Override programmed delays, and immediately go to the next operation.

c) Reset the control by clearing any faults.

d) Test all of the LEDs by lighting them simultaneously.

3) The alphanumeric digital display shall be vacuum fluorescent-type, clearly visible in both bright sunlight and no-light conditions over an angle of 120 degrees, and shall display the following:

a) AC voltage for all phases, normal and emergency.

b) Source status: connected or not connected.

c) Load data, including voltage, AC current, frequency, KW, KVA, and power factor.

4) The display panel shall be password-protected, and allow the operator to view and make adjustments:

a) Set nominal voltage and frequency for the transfer switch.

b) Adjust voltage and frequency sensor operation set points.

c) Set up time clock functions.

d) Set up load sequence functions.

e) Enable or disable control functions including program transition.

f) View real-time clock data, operation log (hours connected, times transferred, failures) and service history.

k. Control Functions: Functions managed by the control shall include:

1) Software adjustable time delays:

a) Engine start (prevents nuisance genset starts in the event of momentary power fluctuation): 0 to 120 seconds (default 3 sec).

b) Transfer normal to emergency (allows genset to stabilize before load is transferred): 0 to 120 seconds (default 3 sec).

c) Re-transfer emergency to normal (allows utility to stabilize before load is transferred from genset): 0 to 30 minutes (default 3 sec).

d) Engine cooldown: 0 to 30 minutes (default 10 min).

e) Programmed transition: 0 to 60 seconds (default 3 sec).

2) Undervoltage sensing: three-phase normal, three-phase emergency source.

a) Pickup: 85 to 98% of nominal voltage (default 90%).

b) Dropout: 75 to 98% of nominal voltage (default 90%).

c) Dropout time delay: 0.1 to 1.0 seconds (default 0.5 sec).

d) Accurate to within +/- 1% of nominal voltage.

3) Over-voltage sensing: three-phase normal, three-phase emergency source.

a) Pickup: 95 to 99% of dropout setting (default 95%).

b) Dropout: 105 to 135% of nominal voltage (default 110%).

c) Dropout time delay: 0.5 to 120 seconds (default 3 sec).

d) Accurate to within +/- 1% of nominal voltage.

4) Over/under frequency sensing:

a) Pickup: +/- 5 to +/-20% of nominal frequency (default 10%).

b) Dropout: +/-1% beyond pickup (default 1%).

c) Dropout time delay: 0.1 to 15.0 seconds (default 5 sec).

d) Accurate to within +/- 0.2%.

5) Voltage imbalance sensing:

a) Dropout: 2 to 10% (default 4%).

b) Pickup: 90% of dropout.

c) Time delay: 2.0 to 20 seconds (default 5 sec).

6) Phase rotation sensing: Time delay: 100 msec

7) Loss of single-phase detection: Time delay: 100 msec

l. Control features shall include:

1) Programmable genset exerciser: A field-programmable control shall periodically start the generator, transfer the load to generator for a preset time, then re-transfer and shut down the generator after a preset cool-down period.

a) Push-button programming control shall have a selection of eight different schedules for exercising generator, with or without load.

2) In event of a loss of power to the control, all control settings, real-time clock setting and the engine start-time delay setting will be retained.

3) The system continuously logs information including the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. An event recorder stores information, including time and date-stamp, for up to 50 events.

4) Transfer Override Switch: Overrides automatic re-transfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light to indicate override status.

m. Control Interface:

1) Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.

2) The transfer switch shall be provided with a network communication card, and configured to allow network-based communication with the transfer switch and other network system components, including the generator set(s) provided for the Project.

3) Unassigned Auxiliary Contacts: Two normally open, 1-pole, double-throw contacts for each switch position, rated 10A at 240 VAC.

n. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10A at 32 VDC minimum.

C. Execution:

1. Installation:

a. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

b. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.

c. Identify components according to Division 26 Section "Identification for Electrical Systems."

d. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

2. Connections:

a. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

b. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.

c. Transfer switch shall be provided with AL/CU mechanical lugs sized to accept the full output rating of the switch. Lugs shall be suitable for the number and size of conductors shown on the drawings.

d. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

e. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3. Source Quality Control:

   a. Prior to shipping, factory shall test and inspect components, assembled switches, and associated equipment to ensure proper operation.

   b. Factory shall check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements.

   c. Factory shall perform dielectric strength test complying with NEMA ICS 1.

4. Field Quality Control:

   a. Manufacturer's Field Service: The supplier of the transfer switch(es) and associated equipment shall inspect, test, and adjust components, assemblies, and equipment installations, including connections, and report results in writing.

   b. Manufacturer’s representative shall perform tests and inspections and prepare test reports.

   c. After installing equipment and after electrical circuitry has been energized, installer shall test for compliance with requirements.

      1) Perform recommended installation tests as recommended in manufacturer’s installation and service manuals.

      2) After energizing circuits, demonstrate interlocking sequence and operational function for each switch.

         a) Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.

         b) Verify time-delay settings.

         c) Verify that the transfer switch is accurately metering AC voltage and current (when provided).

         d) Test bypass/isolation unit functional modes and related automatic transfer-switch operations.

         e) Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

      3) Ground-Fault Tests (if integral to transfer switch): Coordinate with testing of ground-fault protective devices for power delivery from both sources.

         a) Verify grounding connections and locations and ratings of sensors.

   d. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, the contractor shall perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

      1) Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

      2) Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

3) Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

5. Demonstration:

a. After generator set installation, the generator and transfer switch supplier shall conduct a complete operation, basic maintenance, and emergency service seminar covering generator set and transfer switch equipment, for up to 10 people employed by the Owner.

1) The seminar shall include instruction on operation of the transfer equipment, normal testing and exercise, adjustments to the control system, use of the PC based service and maintenance tools provided under this contract, and emergency operation procedures.

2) The class duration shall be at least 8 hours in length, and include practical operation with the installed equipment.

## 2.15 LIGHTING FIXTURES

A. Lighting fixtures shall be in accordance with identifications on the Drawings and the following:

1. Finishes shall be as selected by the Architect or as indicated on the plans.
2. Any additional appurtenances required for installation and operation, where same are not covered by the identification used on the Drawings, shall be included.
3. Recessed fixtures shall be coordinated with ceiling construction.
4. Exact location of all fixtures shall be confirmed with Architect prior to rough-in.
5. Recessed fixtures throughout shall have their components, wiring and external connections coordinated for use in ceilings utilized as air handling plenums.
6. Fixtures for use outdoors or in areas designated as damp locations, shall be suitably gasketed and UL listed for such applications.
7. All ballasts or transformers for discharge type lamps shall be for 60 cycles operation.
8. All ballasts or transformers for discharge or fluorescent type lamps shall be high power factor type.
9. In-line fuses shall be provided for all ballast and transformers.
10. Ballasts for T5 and T8 fluorescent lamps shall be electronic high frequency electronic type (20 KHZ or greater) type “P”, class “A” sound-rated, instant start and parallel wired such that if one lamp burns out the remaining lamps stay lit. Electronic ballasts shall comply with UL 935, ANSI C82.1, CBM certified and meet FCC standards for EMI/RFI (FCC 47 CFR Part 18 non-consumer) with a total harmonic distribution of less than 20%. Ballasts shall carry a manufacturer’s warranty of five (5) years and be manufactured by Osram Sylvania, Magnetek, Advance, or approved equal.
11. Remote ballasts shall be standard core and coil type “P”, sound rating “A”.
12. All ballasts or transformers for discharge type lamps intended for use outdoors shall be of the low temperature type having the lowest temperature rating available in standard manufacture.
13. Ballasts and transformers shall be of the “low energy full light output” type where available. Each shall not exceed industry minimum rated input wattage by more than 8%.
14. All fixtures shall be UL approved with labels attesting thereto.
15. All lamps shall be included. Except where specifically noted otherwise all fluorescent lamps shall be as follows:

a. Fluorescent lamps of the proper wattage and voltage rating shall be provided in each fixture as indicated on the fixture schedule. All fluorescent lamps shall be manufactured to appropriate Specifications given in ANSI C78. Unless noted otherwise, fluorescent lamps shall be T8 3500K and have a minimum CRI of 82.

b. Unless otherwise noted, all compact fluorescent lamps shall be 3500K and have a minimum CRI of 82. The Contractor shall verify that the proper lamp type for the specified ballast type is furnished with the compact fluorescent fixture.

1) Compact fluorescent ballasts shall be UL listed, Class P, Type 1 and CBM Certified.

2) Where 4-pin electronic ballast compatible compact fluorescent lamps are specified, electronic ballasts shall include circuitry capable of sensing when lamp is approaching end of life and shut show the lamp circuit. This end of life sensing must be impervious to low/high line voltage conditions and result in no false tripping or overheating of lamp bases.

16. The Contractor shall obtain all information relative to the exact type of hung ceilings and suspension systems to be installed before ordering any recessed fixtures. This Contractor shall furnish the proper type fixtures applicable to the ceiling framing system. If, other than the type of fixtures specified are required for installation, due to the type of ceiling construction, this Contractor shall furnish and install the proper type fixtures and mounting appurtenances required at no extra charge.
17. The Contractor shall coordinate the exact locations of all lighting fixtures with the ceiling pattern during the construction period and before installation of the fixtures. Interferences between lighting fixtures, and other equipment, shall be brought to the attention of the General Contractor.
18. Include the aiming and/or adjustments of all lighting fixtures requiring same in accordance with instructions issued by the Architect in the field.
19. All lamp sockets in lighting fixtures shall be suitable for the indicated lamps and shall be set so that the lamps are positioned in optically correct relation to all lighting fixture components.
20. Lighting fixtures shall be supported from building structure only, not from hung or suspended ceiling, by means of chains, threaded rods or #14 gauge tie wire.
21. All fixtures shall include seismic clips and shall be supported to comply with seismic regulations.
22. Lamps shall be manufactured by Eaton, Phillips. OSRAM, or Sylvania.

## 2.16 TELEPHONE/DATA EMPTY RACEWAYS AND OUTLETS SYSTEM

A. The Electrical Contractor shall furnish and install, complete in every respect, a telephone empty raceway system, all interior raceways, pull boxes, plywood backboards, outlets, outlet cover plate, fittings, and all other appurtenances required, leaving the entire installation ready for installation of telephones, equipment and cables.

B. In general, the telephone system raceways, outlets and terminal backboard locations shall be as shown on the Drawings.

C. All work and the entire installation of same shall be coordinated with the Architectural/ Engineering Coordination Office of the Telephone Company and the Electrical Contractor before the start of the construction and shall be in full conformance with their requirements and recommendations.

D. The Electrical Contractor shall furnish a nylon pull cord in each raceway to facilitate the pulling of cables in the future.

E. All outlet cover plates shall be furnished by the Electrical Contractor. All telephone outlet cover plates shall be blank cover plates of the same finish and by the manufacturer furnishing all other devices and switch plates installed throughout the buildings.

F. Telephone terminal locations are existing and shall be expanded as required as designed on the Drawings. The Electrical Contractor shall furnish and install 3/4 inch thick sheet of plywood backboard for the mounting of equipment and cable terminators by the Telephone Company. The backboards shall be painted with two (2) coats of fire-retardant paint by the Electrical Contractor. Exact dimensions of the backboards shall be as indicated on the Drawings and as required by the Telephone Company.

G. Conduit from telephone outlets indicated on the Drawings shall be installed into the nearest partition, extend a minimum of 6 inches into nearest accessible ceiling space and left ready to be used by the Telephone Company for the installation of their cables.

## 2.17 COMPUTER EMPTY RACEWAYS AND OUTLETS SYSTEM

A. The Electrical Subcontractor shall furnish and install computer outlets including conduit, outlet box, outlet cover plate, fittings, and all other appurtenances required, leaving the entire installation ready for installation of equipment under a separate Contract.

B. In general, computer outlets and empty conduit locations shall be as shown on the Drawings.

C. The Electrical Subcontractor shall furnish a nylon pull cord in each conduit to facilitate the pulling of cables in the future.

D. All wall plates shall be furnished by the Electrical Contractor. All computer outlet cover plates shall be provided with a blank cover plate and be of the same finish and by the manufacturer furnishing all other device and switch plates installed throughout the renovation.

E. Conduit from computer outlets indicated on the Drawings shall be installed into the nearest partition, extended a minimum of 6 inches into nearest accessible ceiling space and left ready to use for the installation of cables under a separate Contract.

## 2.18 FIRE ALARM SYSTEM

A. Scope:

1. Provide complete networked analog/addressable fire detection, evacuation alarm and control network in compliance with all specifications, drawings and applicable code requirements.
2. System shall be a networked microprocessor based fire alarm system which will integrate peripheral devices onto system via digital data communications.
3. Each initiating device shall have full analog detection capabilities; identify its' exact location, and shall operate as described elsewhere in these specifications.
4. Work in this section, as shown or specified, shall be in accordance with related contract documents.
5. Provide automatic and manual, closed circuit, multiplex fire alarm communications according to contract documents, wired, connected and left in first class operating condition.
6. Final connections, testing, and adjusting of system shall be done under direct supervision of system supplier.
    a. System design and installation shall conform to following standards:
        1) Equipment shall be UL listed for its intended purpose, including UL 864 (UOJZ, UOXX, UOQY and UUKL), 1480 and 1971.
    b. NFPA standards 70, 72, 90A, 92A, and 101.

c. Current State Building, Electrical and Life Safety Codes.

d. Americans with Disabilities Act (ADA).

e. Requirements of local authorities having jurisdiction, including permitting and acceptance procedures.

7. Shop Drawings shall include:

a. Complete point-to-point riser diagram showing all equipment and size, type and number of conductors and devices.

b. Large scale drawings of control panels, annunciators, transponders, showing module placement and spare capacity allowances.

c. Complete, itemized bill of materials with quantities, descriptions.

d. Original catalog data sheets to assure compliance with these specifications. This equipment shall be subject to approval, and no equipment shall be ordered without prior approval.

e. Calculations to support size of standby batteries, notification appliance circuits (NAC) and audio amplifiers submitted. Circuit calculations shall demonstrate proper current draw, voltage drop, wire size considerations and spare capacity allowances. Calculations shall be based on UL nameplate RMS voltage ratings. NAC calculations shall demonstrate 25 percent spare capacity.

f. Copy of Original Equipment Manufacturer's Warranty Statement.

g. Complete description of system Sequence of Operation.

h. Details of any special installation procedures.

i. Complete floor plans showing network nodes and all device locations and corresponding addresses. Point identification lists shall be included to ensure proper coordination of alarm messages and shall include each device type address number and corresponding CCO text message.

j. Confirmation that equipment supplier will provide on-site project management and supervision during system installation, and perform system testing and instruction.

k. Operation and maintenance manuals.

8. Conform to UL and NFPA standards for testing of completed installation by UL approved testing company.

9. O & M Manuals shall include the following:

a. All information submitted in final reviewed shop drawings.

b. As-built documentation which incorporates all modifications to completed system, whether made as field change or by change order.

c. Include copy of final test report, Record of Completion, as-built documentation and Fire Alarm Support Contracts as described herein.

B. Sequence of Operation:

1. Operation of manual station or activation of any automatic alarm initiating device (system smoke, system heat detector, waterflow) shall initiate system-wide but only in respective building/ wing, response according to established response procedures and as follows:

a. Initiate transmission of alarm to Municipal Fire Station via on board dialer/DACT. Include the cost for monitoring at a UL listed central station for a period of one year.

b. Sound approved temporal code 3 horn signal over all audio circuits throughout entire building.

c. Upon any alarm condition, visual signals shall activate throughout the building. Visual notification shall be synchronized in accordance with applicable code requirements and latest NFPA 72 guidelines.

d. Flash an alarm LED and sound an audible signal at each FACP and the Fire Command Location. Upon Acknowledgment, the alarm LED shall light steadily and the audible shall silence. Subsequent alarms shall re-initiate this sequence.

e. Visually indicate alarm initiating device type and location via LCD display at all Fire Command Centers.

f. Operate prioritized outputs to release magnetically held smoke doors and magnetically locked doors throughout building.

g. Activate exterior W/P beacon.

h. Store system events in event history file.

i. Provide control signal to Lighting Control System to bring all lighting to full brightness.

2. In event of System Trouble condition such as device removed, loss of AC Power or wiring fault, system Trouble condition shall occur as follows:

a. Flash Trouble LED and sound audible tone at FACP and each network panel. Upon Acknowledgment, LED shall light steadily and the audible shall silence. Subsequent Trouble conditions shall re-initiate this sequence.

b. Initiate reporting of event to designated staff members via email notification as required and described herein.

c. Visually indicate device type and location via LCD display located at FACP and network annunciator panel.

d. Visually annunciate type of initiating device and its zone, floor or area as required on all system annunciators. In addition, Trouble LED and audible tone shall sound. Upon Acknowledgment, LED shall light steadily and audible shall silence. Subsequent Trouble conditions shall re-initiate this sequence.

e. Record event in event history log. Restorations shall likewise be recorded.

C. General Requirements:

1. Fire alarm system shall be designed and UL and FM approved for Fire, Audio Evacuation and Security applications. System operational characteristics shall be stored in non-volatile EEPROM memory, shall be field programmable and capable of being edited with no factory involvement.

2. System shall support analog sensing techniques to monitor individual devices which enables user to set sensitivity parameters. Inputs shall be subject to multi-level alarm verification. System shall be capable of reporting status and sensitivity of each device and vectoring this information to printer. System shall automatically identify any detector which becomes dirty (maintenance alert), prior to false alarming.

3. System shall be supported by standby batteries. In event of loss of primary power, batteries shall support 60 hours of full supervisory operation followed by 15 minutes of alarm.

4. System shall be capable of nine levels of alarm prioritization, and allow control by event, and may include cross zoning, stepping, and/or logic statement inputs.

5. Equipment shall be new and unused. Components and systems shall be designed for

uninterrupted duty. Equipment, materials and accessories covered by these requirements shall be provided by single manufacturer, or if provided by different manufacturers, recognized as compatible by both manufacturers.

6. Control equipment shall have transient protection devices to comply with UL 864 requirements.
    a. Isolated Loop Circuit Protector (ILCP): Provide isolated loop circuit protection device on all fire alarm circuits which extend beyond building by either aerial, underground or other methods (walkways, bridges or other above ground connectors).
    b. ILCP shall be located as close as practical to point at which circuits leave or enter building. Grounding conductor shall be No. 12 AWG wire having maximum length of 28 feet and connected to unified ground per NEC.
7. Circuiting Guidelines. Each initiating device and indicating circuit shall be electronically supervised and individually addressable. Wiring shall match existing conventions as follows:
    a. Individual Zone Addressable Modules shall be used to supervise and monitor waterflow, tamper, and status conditions from any related systems or devices.
    b. Zone Addressable Control Modules and/or programmable relays shall provide auxiliary control functions.
    c. Addressable loop wiring shall support all devices shown and allow for minimum of 25 percent spare capacity, and be wired in Class A, Style 7 fashion, with circuit isolation by floor and every 18 devices.
    d. Entire system shall allow minimum of 25 percent spare capacity. This shall apply to all aspects of system including CPU, cabinets, power supplies, amplifiers and batteries.
    e. Conventional Visual Appliance Circuits shall operate devices shown plus 25 percent spare capacity, and be wired in a Class A, Style Z fashion.

D. Fire Alarm Control Panel:

1. Provide a Fire Alarm Control System. System shall consist of the required Fire Alarm control and remote nodes, each sized to support a minimum of 1000 analog points, expandable to 2500 points. Panels shall be provided with programmable soft switches and associated LED's for panel silence, alarm silence, system reset and drill. Provide lamp test button. Provide individual LED's for power-on, common alarm, supervisory, fault. Adjacent to the fire control panel, provide passive graphic map depicting architectural layout of building with stairwells, elevators, major corridors and egress points shown.
2. Provide each panel with integral power supplies, amplifiers, addressable loop interface cards and standby batteries sized to serve building and/or space as shown. Panel shall have following functions:
    a. Monitor all initiating devices, report event to fire alarm network, annunciate alarmed device and its' location, capture elevators, conduct smoke control functions, and initiate audio/visual evacuation signaling and control sequences as described herein.
    b. Conduct municipal and off-site notification from main network panel as described herein.
    c. Initiating devices shall respond with their condition. Control relays shall be individually addressable by system to respond automatically in event of an alarm of related sensors. Manual override of control sequences and status feedback points shall be individually addressable.
3. Operator Controls: The control panel shall include an operator interface module consisting of 180 character backlit LCD display to display system wide alarm, trouble and supervisory conditions. Provide full system control from Fire Command Center, as well as control

switches for status message scrolling, event acknowledgment, System Reset, and Alarm Silence. Display shall have LED's to indicate Power On, Fire Alarm, Supervisory, Trouble and Alarm Silenced status.

4. Addressable Loop Interface: Provide addressable loop interface card for each floor in each building. Each interface card shall be integral to network panel and support digital communications. Each circuit shall support a total circuit capacity of up to 250 analog/addressable detectors and wiring of twisted unshielded pair with distances of up to 12,500 feet.
5. Auxiliary Control / Annunciation: Provide required auxiliary switch and LED modules for discreet LED annunciation, zone disconnect, HVAC override, or related monitoring and control functions integral to each FACP. As a minimum, provide a minimum of 64 Auxiliary Override and Audio Control switches with status LED's and 8 HOA switches with corresponding status inputs and LED indicators for auxiliary functions, or as required. These are intended for use by Fire Department during events, or by authorized personnel during testing periods. Keypad entered commands for these functions shall not be acceptable
6. Field Power Supplies: Provide Field power supplies with 24VDC operating and NAC Circuits for Visual signals, 6 amps minimum. Each power supply module shall have 4 dedicated Class A NAC outputs rated at 3 amps each and charging circuit that will support up to 12AH batteries. Provide necessary interface to synchronize all power supplies together and provide each power supply with independent monitor module for trouble supervision. Field Power Supplies shall be located on Floor/Section which they serve.
7. Provide hard copy printout of system program to be maintained on site.

E. Remote LCD Annunciator.

1. Each annunciator shall contain a supervised; back lit, liquid crystal with a minimum of 8 lines with 21 characters per line. Where required, the annunciator shall include additional zonal annunciation and manual control without additional enclosures. The annunciator shall support full ability to serve as the operating interface to the system and shall include the following features; Matched appearance with other system displays

F. Intelligent System Devices:

1. Provide intelligent analog addressable devices where shown and required. Analog devices shall utilize dual multi-color red/ green LED indicator which shall flash green to denote normal active communication and light red steadily to denote alarm condition. Devices shall be interchangeable with twist-lock bases that support discreet address-setting rotary decade switches. Each base shall support remote LED output, fault isolation circuitry, auxiliary relay contact, or sounder base with integral Piezo horn were such functions are required. Provide wire guards or other physical protection devices as shown on contract documents.
2. Photoelectric Smoke Detector: Provide analog addressable photoelectric smoke detectors with adjustable sensitivity range from 0.2 to 3.7 percent obscuration where shown and required. Detectors shall provide complete analog features including alarm verification, environmental compensation, and multi-stage operation, were required.
3. Analog Heat Detectors: Provide Analog Heat Detectors. Analog heat detectors shall be field selectable for fixed temperature rating of 135 or 190 degrees, rate of rise operation of 15 degrees/minute, and will also include a low temperature warning (Supervisory condition) when ambient temperature reaches 40 degrees F. Where otherwise required, provide conventional fixed temperature, weatherproof or explosion proof heat detectors in lieu of analog heat detectors. Conventional device shall be individually addressable via intelligent addressable module which shall be installed in heated, ventilated location.
4. Analog Duct Smoke Detector: Provide analog photoelectric duct-mounted smoke detectors mounted in air ducts where shown and required. Duct detectors shall be programmed for

alarm event sequencing or required by AHJ. Each detector shall be supplied with duct-mount housing, remote indicator/test station and sampling tubes sized according to duct width. Provide necessary auxiliary relay outputs via addressable relay control modules with each detector in order to ensure required HVAC control, override and status reporting functions.

5. Intelligent Manual Pull Stations: Provide intelligent addressable manual stations where shown. Station shall be double action with screw terminals, toggle switch, and integral addressable electronics w status LED. Station shall be constructed of red Lexan with white raised letters and key reset switch. Station shall be keyed alike to FACP. Where ambient conditions preclude use of addressable devices, conventional weatherproof pull stations shall be used. Each conventional device shall be individually addressable via intelligent addressable module which shall be installed in heated, ventilated location.
    a. Provide tamperproof clear Lexan covers with red frame and spacer, and audible trouble alarm, Stopper II or equal where shown.
6. Monitor Module: Provide Zone Addressable input Modules to enable monitoring and supervision of related systems and devices via SLC addressable loop.
7. Relay Module: Provide Addressable Relay to provide supervised control of auxiliary circuits (AHU's, door holders, etc.) via SLC addressable loop. Relay shall provide supervised output rated for 3 amps @ 30VDC or .5 amps at 120VAC. Where current exceeds limitations, provide isolation relay (PAM-1 or equal) rated for required load.
8. Isolation Modules: Where additional circuit isolation is required beyond isolation of the addressable loop interface, provide field-mounted Isolator Modules every 20 devices to protect circuit integrity in event of a wiring fault and ensure Style 6 wiring conventions.
9. Drill Switch: Provide a two position keyed Drill switch with addressable monitor module located as shown on contract drawings. Switch shall be fully programmable to initiate a drill of programmed areas with-out transmitting Municipal Signal. Restoration of key switch to “normal” shall return FACP and associated control equipment to normal with no other user interface to system.

G. Notification Appliances:

1. Provide flush mounted combination Audio/Visual signaling appliances. Stand alone devices may be used to augment combination units when necessary. Provide surface mount back boxes and alternate outdoor-rated appliances where ambient conditions dictate. Provide wire guards or other physical protection devices as shown on contract documents.
2. Provide synchronized xenon strobes in compliance with NFPA 72, and rated per UL 1971 testing criteria. Strobes shall have effective intensity field selectable by installer in the range of 15CD to 115 CD.
3. Provide audible detector mounting bases suitable for mounting on a 1-gang, 3½ or 4 inch octagon box and 4 inch square box at the locations shown on the drawings. The bases shall utilize a twist-lock design and provide screw terminals for all field wiring connections. Removal of the respective detector shall not affect communications with other detectors. The audible base shall support all detector types and shall be capable of single or group operation. The audible base shall emit a temporal 3-3-3 fire alarm tone when smoke or heat has been detected. The audible base shall emit a temporal 4-4-4-4 CO alarm tone when CO has been detected. The outputs shall be configurable for low or high output by moving a reversible jumper. The system shall be UL2017 listed for dual signaling for this purpose. The audible bases shall provide a UL-268 reverberant room sound output of 90.8 dBA at 10ft (3m) for temporal 3-3-3 fire alarm and 84.1 dBA at 10 ft.(3m) for temporal 4-4-4-4 CO alarm.

## 2.19 SERVICE ENTRANCE SPD PROTECTION (LOW END)

A. Summary: Section Includes: Provide surge protective device (SPD) external to main

switchboard for the protection of building electrical system.

B. References:
   1. ANSI/IEEE C.62.41 and C62.45.
   2. UL 1449 – 3rd Edition.
   3. UL 1283.
   4. NEC – NFPA 70.
   5. NEMA LS1.
   6. NFPA.
   7. OSHA.
   8. IEEE Std. 1100.

C. Submittals:
   1. Shop Drawings: Provide Shop Drawings with wiring diagrams, installation information, testing and maintenance procedures, and operational information for the transient protection system. Shop Drawings shall be submitted to Engineer for approval before starting actual fabrication.
   2. Submittal for Approval: Provide the following transient protection submittals:
      a. Dimensional Drawing of each SPD type, indicating proposed mounting arrangements.
      b. Written functional description of the transient protection circuit in terms of components, configuration, design approach, and performance capability per latest NEMA LS1.
      c. The means of connection of the SPD to the electrical distribution system per latest NEMA LS1.
      d. Manufacturer will provide UL-1449, Third Edition data card showing the Suppressed Voltage Rating (SVR) for the specific catalog number submitted. “Typical” UL 1449, Second Edition data is not acceptable.
      e. Per the requirements of NEC Article 285.6, the devices shall be marked with the short circuit current rating. This rating shall meet or exceed the available fault current. Test data from an independent testing laboratory shall be provided to demonstrate the short circuit current rating has been tested on a complete device.
      f. Submit test report data clearly demonstrating the maximum surge current rating has been tested on a COMPLETE SPD unit including all necessary fusing/overcurrent protection, thermal disconnects, integral disconnects and monitoring systems. Manufacturers who cannot provide this data will not be considered.
      g. Submit data demonstrating the SPD unit, including all overcurrent protection, is fully capable of a minimum repetitive surge current rating of 10,000 ANSI/IEEE C62.41, Category C3 (10kA) impulses without failure or a change in performance characteristics of more than 10%.
      h. Written detailed response to each paragraph of the specification indicating that the proposed product meets or exceeds this specification. If specific paragraphs are not met, provide written explanations as to why not.

D. Warranty: Description: Manufacturer shall provide a product warranty for a period of not less than 5 years from data of installation.

E. Manufacturers:

1. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufactures are as follows:
    a. Liebert
    b. Current Technology
2. Quality: The Manufacturer shall be ISO 9001 certified, demonstrating world-class quality systems for the design and manufacture of the SPD units.

F. Environmental:
1. General Requirements:
    a. No audible noise shall be generated.
    b. No appreciable magnetic fields shall be generated. System shall be capable of use directly in computer rooms in any location without danger to disc units, disk packs, or tapes.
    c. Operating Conditions:
        1) 30 – 130 Degrees F.
        2) 15 – 85 Percent Humidity Non-Condensing.
    d. Enclosure: The unit shall have a heavy duty NEMA 12 dust-tight, drip-tight enclosure.

G. Surge Suppressors:
1. General Requirements:
    a. Rated for a 208Y/120 volt, 60 Hertz, 3-phase, 4-wire switchboard.
    b. Surge suppressors shall be in accordance with the following requirements:
        1) Unit shall be parallel in design and connect in parallel to main switchboard. Each surge suppression element (MOV) shall be individually fused so that a failure of one element and/or fuse shall not affect other surge suppression elements.
        2) Unit shall be UL 1449, 3rd Edition Listed.
        3) Unit shall provide maximum UL 1449 2nd Edition Suppressed Voltage Rating (SVR) for 120, 120/208, or 120/240 volt system as follows:
            a) L-N = 400V.
            b) L-G = 400V.
            c) N-G = 400V.
            d) L-L = 700V.
        4) Unit shall provide maximum surge current rating of 100,000 amperes based on ANSI/IEEE C62.41 standard 8 by 20 microsecond current waveform.
        5) Unit shall have a short circuit current rating, which equals or exceeds that of the Main Switchboard.
        6) Unit shall be UL 1283 listed as an electromagnetic interference filter and provide 50 Ohm noise attenuation of at least 30 dB at 100 kHz, 50 dB at 1 MHz, 50 dB at 10 MHz, and 45 dB at 100 MHz.
        7) Unit shall include solid-state, long-life externally mounted LED visual status indicators that indicate the on-line status and operational integrity of each phase of the unit.
        8) Unit shall have a Form C summary alarm output contact rated for at least 1 amp at

120VAC for remote annunciation of SPD status.

9) Systems shall be provided with an integral, non-fused disconnect system which causes no interruption to the protected load for testing and maintenance. Disconnect system shall not require removal or replacement for warranty or other repairs.

10) Unit shall have an audible alarm with an alarm on/off switch to silence the alarm and a push-to-test switch to test the alarm function.

11) An adjustable (resettable) counter shall be provided to totalize transient voltage surges in both the normal and common mode. The readout shall be at least a seven-digit LCD located on the unit front cover and provided with a 10 year battery backup to maintain counts in the event of power loss.

H. Installation:

1. General Requirements:

a. Contractor shall install suppression system immediately next to or on top of service equipment where so approved by the Engineer.

b. Conductors between suppressor and point of attachment to service equipment shall be sized in accordance with Manufacturer's Shop Drawings and conductor lengths shall be as short as possible, preferably not to exceed 24". Manufacturers who offer an integrated SPD in the main service entrance equipment will provide information that clearly shows lead lengths, including the neutral and ground connections

c. Grounding: Suppressor ground shall be bonded to the equipment grounding conductor and service entrance ground.

## 2.20 BRANCH PANEL SPD PROTECTION

A. Summary: Section Includes: Provide surge protective devices for branch circuit panelboards as shown in Schedule in this Section or on the Drawings.

B. References:

1. ANSI/IEEE C62.41 and C62.45.
2. UL 1449 – 3rd Edition.
3. UL 1283.
4. NEC – NFPA 70.
5. NEMA LS1.
6. NFPA.
7. OSHA.
8. IEEE Std. 1100.

C. Submittals:

1. Shop Drawings: Provide Shop Drawings with wiring diagrams, installation information, testing and maintenance procedures, and operational information for the transient protection system. Shop Drawings shall be submitted to Engineer for approval before starting actual fabrication.

2. Submittal for Approval: Provide the following transient protection submittals:

a. Dimensional Drawings of each SPD type, indicating proposed mounting arrangements.

b. Written functional description of the transient protection circuit in terms of components,

configuration, design approach, and performance capability per latest NEMA LS1.

c. The means of connection of the SPD to the electrical distribution system per latest NEMA LS1.

d. Manufacturer will provide UL-1449, Third Edition data card showing the Suppressed Voltage Rating (SVR) for the specific catalog number submitted. "Typical" UL 1449, Second Edition data is not acceptable.

e. Per the requirements of NEC Article 285.6, the devices shall be marked with the short circuit current rating. This rating shall meet or exceed the available fault current. Test data from an independent testing laboratory shall be provided to demonstrate the short circuit current rating has been tested on a complete device.

f. Submit test report data clearly demonstrating the maximum surge current rating has been tested on a COMPLETE SPD unit, including all necessary fusing/overcurrent protection, thermal disconnects, integral disconnects and monitoring systems. Manufacturers who cannot provide this data will not be considered.

g. Submit data demonstrating the complete unit, including all overcurrent protection, is capable of a minimum repetitive surge current rating of 8,000 ANSI/IEEE C62.41, Category C3 (10kA) impulses without failure or performance degradation of more than 10%.

h. Written detailed response to each paragraph of the specification indicating that the proposed product meets or exceeds this specification. If specific paragraphs are not met, provide written explanation as to why not.

D. Warranty:

1. Description: Manufacturer shall provide a product warranty for a period of not less than 5 years from date of installation.

E. Manufacturers:

1. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows:

a. Liebert

b. Current Technology

2. Quality: The manufacturer shall be ISO 9001 certified, demonstrating world-class quality systems for the design and manufacture of the SPD units.

F. Environmental:

1. General Requirements:

a. No audible noise shall be generated.

b. No appreciable magnetic fields shall be generated. System shall be capable of use directly in computer rooms in any location without danger to disc units, disk packs, or tapes.

c. Operating Conditions:

1) 30 – 130 Degrees F.

2) 15 – 85 Percent Humidity Non-Condensing.

d. Enclosure: Unit shall have a NEMA 1 enclosure.

G. Electrical Requirements:

1. General Requirements:
    a. Rated for a 208Y/120 volt, 60 Hertz, 3 phase, 4 wire.
    b. Surge Suppressors shall be in accordance with the following requirements:
        1) Unit shall be parallel in design and connect in parallel to panelboard. Each surge suppression element (MOV) shall be individually fused so that a failure of one element and/or fuse shall not affect other surge suppression elements.
        2) Unit shall provide maximum UL 1449 Third Edition Suppressed Voltage Rating (SVR), for the 120/208V system:
            a) L-N = 400V.
            b) L-G = 400V.
            c) N-G = 400V.
            d) L-L = 800V.
        3) Unit shall provide maximum surge rating of 65,000 amperes based on ANSI/IEEE C62.41, standard 8 by 20 microsecond current waveform.
        4) Unit shall have a short-circuit current rating (amperes interrupting capacity) which equals or exceeds that of the panelboard.
        5) Unit shall include solid-state, long-life externally mounted LED visual status indicators that indicate the on-line status and operational integrity of each phase of the unit.
        6) Unit shall be UL 1283 listed as an electromagnetic interference filter and provide 50 Ohm noise attenuation of at least 30dB at 100 kHz, 50 dB at 1 MHz, 50 dB at 10 MHz, and 45 dB at 100 MHz.
        7) Unit shall have a Form C summary alarm output contact rated for at least 1 amp at 120VAC for remote annunciation of SPD status.

H. Installation:
    1. General Requirements:
        a. The SPD will be mounted internal/external to the panelboard as close as possible to the panelboard neutral lug and wired to the panelboard through a 30 amp, 3-pole breaker that will serve as a maintenance disconnect. Lead lengths shall be as short as possible, preferably less than 18”.
        b. System shall be installed in accordance with the manufacturer’s printed instruction to maintain warranty. All local and national codes shall be observed.

## 2.21 ACCESS PANELS

A. Provide access panels for access to concealed junction boxes and to other concealed parts of system that require accessibility for operation and maintenance. In general, electrical work shall be laid out so access panels are not required.

B. Access panels shall be located in a workmanlike manner in closets, storage rooms, and/or other non-public areas, positioned so that junction can be easily reached and size shall be sufficient for purpose (minimum size 12” x 16”). When access panels are required in corridors, lobbies, or other habitable areas, they shall be located as directed.

C. Access panels shall be prime-painted and equipped with screwdriver operated cam locks.

D. Acceptable Manufacturers:
    1. Inland Steel Products Company – Milcor

2. Miami Carey
3. Walsh-Hannon-Gladwin, Inc. – Way Locator
4. Specific Types:
    a. Acoustical Tile Ceiling “Milcor Type AT”
    b. Plastered Surfaces “Milcor Type K”
    c. Masonry Construction “Milcor Type M”
    d. Drywall Construction “Milcor Type DW”

E. Furnish access panel Shop Drawings.

**PART 3 – EXECUTION**

**3.1 BASIC REQUIREMENTS**

A. Adhere to best industry practice and the following:

1. All work shall be concealed.
2. Route circuitry runs embedded in concrete to coordinate with structural requirements.
3. Equip each raceway intended for the future installation of wire or cable with a nylon pulling cord 3/16” in diameter and clearly identify both ends of the raceway.
4. Provide all outlet boxes, junction boxes, and pull boxes for proper wire pulling and device installation. Include those omitted from the Drawings due to symbolic methods of notation.
5. Utilize lugs of the limited type to make connections at both ends of cables installed on the line side of main service overcurrent and switching devices. Provide cable limiters for each end of each service entrance cable.
6. Beyond the termination of raceways, fireproof the following:
    a. All wires and cables within pad-mounted transformer enclosure.
    b. All service feeder cables ahead of main service overcurrent protection devices, and elsewhere where not in raceways.
    c. Fireproofing of wires and cables shall be by means of a half-lapped layer of arc proof or by means of sleeving of a type specifically manufactured for the purpose. Ends of tape or sleeving shall be severed with twine. Fireproofing shall be extended up into raceways. After conductors have been finally shaped into their permanent configuration, fireproofing tape or sleeving shall be coated with silicate of soda (water glass). Fireproofing shall be applied in an overall manner to raceway groupings of conductors.
7. Provide all sleeves through fireproof and waterproof slabs, walls, etc., required for electric work.
    a. Provide waterproof sealing for the sleeves through waterproof slabs, walls, etc.
    b. Provide fireproof sealing for the sleeves through fireproof walls, slabs, etc.
    c. Provide fireproof sealing for the openings in fireproof walls, slabs, etc., resulting from removal of existing electrical sleeves, conduits, poke-thru’s etc.
8. No splicing of wires will be permitted in Fire Alarm System.
9. Bundle wiring passing through pull boxes and panelboards in a neat and orderly manner.
10. Turn branch circuits and auxiliary system wiring out of wiring gutters at 90 degrees to circuit breakers and terminal lugs.

11. In electric rooms with equipment rated 800 amps or more and over 6 feet wide that contains overcurrent devices, the Electrical Contractor shall provide a powered Exit sign at 18" AFF at each door.
12. All building mounted photovoltaic equipment shall be installed, tested and maintained in accordance with NFPA 1 Section 11.12.
13. All panelboards shall be labeled in accordance with NFPA 70 Article 408.

### 3.2 TESTING REQUIREMENTS & INSTRUCTIONS

A. The Electrical Subcontractor shall provide supervision, labor, materials, tools, test instruments and all other equipment or services and expenses required to test, adjust, set, calibrate, and operationally check work and components of the electrical systems and circuitry throughout Division 16 work.

B. The Electrical Subcontractor shall pay for all tests specified in Division 16, including expenses incident to retests occasioned by defects and failures of equipment to meet Specifications, at no additional cost to the Owner. Any defects or deficiencies discovered in any of the Electrical work shall be corrected.

1. The Electrical Subcontractor shall:
    a. Replace wiring and equipment found defective (defined as failing to meet specified requirements) at no additional cost to the Owner.
    b. Submit three (3) copies of test results to the Engineer.
2. Do not void equipment warranties or guarantees by testing and checkout work. Checks and tests shall be supplemental to and compatible with the Manufacturer's installation instructions. Where deviations are apparent, obtain the Manufacturer's approved review of procedures prior to testing. Where any repairs, modifications, adjustments, tests or checks are to be made, the Contractor shall contact the Engineer to determine if the work should be performed by or with the Manufacturer's Representative.
3. Tests are to:
    a. Provide initial equipment/system acceptance.
    b. Provide recorded data for future routine maintenance and trouble-shooting.
    c. Provide assurance that each system component is installed satisfactorily and can be expected to perform, and continue to perform its specified function with reasonable reliability throughout the life of the facility.
        1) At any stage of construction and when observed, any electrical equipment or system determined to be damaged, or faulty, is to be reported to the Engineer. Corrective action by the Contractor requires prior Engineer approval, retesting, and inspection.
        2) Prior to testing and start-up, equipment and wiring shall be properly and permanently identified with nameplates, and other identification as specified in Section 3.7. Check and tighten terminals and connection points, remove shipping blocks and thoroughly clean equipment, repair damaged or scratched finishes, inspect for broken and missing parts and review and collect Manufacturer's Drawings and instructions for delivery to the Engineer. Make routine checks and tests as the job progresses to ensure that wiring and equipment is properly installed.
        3) Testing and checkout work is to be performed with fully qualified personnel skilled in the particular tests being conducted. Personnel are to have at least five (5) years of experience with tests of same type and size as specified.
        4) Inspections and tests shall be in accordance with the following applicable codes and

standards as amended to date, unless otherwise specified.

a) National Electrical Manufacturer's Association – NEMA.
b) American Society for Testing and Materials _ ASTM.
c) Institute of Electrical and Electronic Engineers – IEEE.
d) National Electrical Testing Association – NETA.
e) American National Standards Institute – ANSI.
f) C2: National Electrical Safety Code.
g) Z244-1: American National Standard for Personnel Protection.
h) Insulated Cable Engineers Association – ICEA.
i) Association of Edison Illuminating Companies – AEIC.
j) Occupational Safety and Health Administration – OSHA.
k) OSHA Part 1910; Subpart S, 1910.308.
l) OSHA Part 1926; Subpart V, 1926.950 through 1926.960.
m) National Fire Protection Association – NFPA.
n) 70B: Electrical Equipment Maintenance.
o) 70E: Electrical Safety Requirements for Employer Workplaces.
p) 70: National Electrical Code.
q) 78: Lightning Protection Code.
r) 101: Life Safety Code.
s) Inspections and tests shall utilize the following references:
t) Contract Drawings and Specifications.
u) Contractor's Short Circuit and Construction Study, in accordance with Section 16100.
v) Manufacturer's printed test procedures for respective equipment.

4. Test Equipment:
   a. Test equipment used by the Contractor is to be inspected and calibrated.
   b. Perform calibration and setting checks with calibrated test instruments of at least twice that of the accuracy of the equipment, device, relay or meter under test. Dated calibration labels shall be visible on test equipment. Calibrations over six (6) months old are not acceptable on field test instruments. Inspect test instruments for proper operation prior to proceeding with the tests. Record serial and model numbers of the instruments used on the test forms.
5. Test Procedures:
   a. The Electrical Subcontractor is responsible for the preparation of the procedures and schedules for the work specified herein. This work is to be coordinated and compatible with both the work and schedule of the other crafts. Sequence the tests and checks so that the equipment can be energized immediately after the completion of the application tests.
   b. Submit proposed testing and checkout forms. The procedures shall provide specific instructions for the checking and testing of each electrical component of each system.

Schedule tests and inspections as the job progresses. Test procedures submitted shall include job safety rules.

c. After each electrical system installation is complete, perform the tests to determine that the entire system is in proper working order and in accordance with applicable codes, Manufacturer's instructions, Drawings, and Specifications. Tests are in addition to shop tests of individual items at the Manufacturer's plant. Perform insulation and ground resistance tests before operating tests.

d. Perform insulation tests on electrical equipment, apparatus, cables, motors, generators, transformers, circuit breakers and switches, switchgear, motor control centers, and similar electrical equipment, at the following items and conditions:

e. Prior to energization and/or placing into service.

f. When damage to the insulation is suspected or known to exist.

g. After repairs or modifications to the equipment affecting the insulation.

h. Where lightning or other surge conditions are known to have existed on the circuit.

i. Make openings in circuits for test instruments and place and connect instruments, equipment, and devices, required for the tests. Upon completion of tests, remove instruments and instrument connections and restore circuits to permanent condition.

j. List each circuit and measured resistance as test data. Maintain record of insulation resistance values. Identify conductor, or equipment, date that value was taken and resistance value. Arrange information in tabular form and submit to Engineer.

k. Report inspections, tests, and calibrations in writing on Engineer approved reports/forms. The recorded data form shall have the signatures of the persons conducting the tests, authorized witnesses and the Engineer. The forms shall serve as the test and inspection checklist.

l. When the electrical tests and inspections specified or required within Division 16 are completed and results reported, reviewed, and approved by the Engineer, the Contractor may consider that portion of the electrical equipment system or installation electrically complete. The Contractor will then affix appropriate, approved, and dated completion or calibration labels to the tested equipment and notify the Engineer of electrical completion. If the Engineer finds completed work unacceptable, he will notify the Contractor in writing of the unfinished or deficient work, with the reason for his rejection, to be corrected by the Contractor. The Contractor will notify the Engineer in writing when exceptions have been corrected. The Contractor will notify the Engineer in writing when exceptions have been corrected. The Contractor will prepare a "Notification or Substantial Electrical Completion" for approval by the Engineer following Engineer's acceptance of electrical completion. If later in-service operation or further testing identified problems attributable to the Contractor, these will be corrected by the Contractor, at no additional cost to the Authority.

C. Specific Tests: Perform the following specified tests. De-energize and isolate equipment and cable prior to performing the tests.

D. Motors:

1. Before energizing any machine, visually inspect for serviceability. Check Manufacturer's instruction manual for correct lubrication and ventilation. Align motor with driven equipment. Check nameplate for electrical power requirements.

2. Test run motors uncoupled or unloaded, before placing into operation. Check the motor for rotation, speed, current and temperature rise under normal load and record the results. Maintain the proper color codes for phase identifications. This may require swaps at the

motor for proper rotation. Use motor phase rotation meter prior to lead connection at motor in order to minimize later swaps.

E. Grounding Systems:

1. Test main building loops and major equipment grounds to remote earth, directly referenced to an extremely low resistance (approximately 1 ohm) reference ground benchmark. Perform a visual inspection of the systems, raceway and equipment grounds to determine the adequacy and integrity of the grounding. Ground testing results shall be recorded, witnesses, and submitted to the Engineer.
2. Perform ground tests using a low resistance, null-balance type ground testing ohmmeter, with test lead resistance compensated for. Use the type of test instrument which compensates for potential and current rod resistances.
3. Test each ground rod and measure ground resistance. If resistance is not 25 ohms or less, drive additional rods to obtain a resistance of 25 ohms or less. Submit tabulation of results to Engineer. Include identification of electrode, date of reading and ground resistance valve in the test reports.
4. Test each building and major equipment grounding system for continuity of connections and for resistance. Ground resistance of conduits, equipment cases, and supporting frames, shall not exceed 5 ohms to ground. Submit all readings to the Engineer.
5. Where ground test results identify the need for additional grounding conductors or rods that are not indicated or specified, design changes will be initiated to obtain the acceptable values. The Contractor is responsible for the proper installation of the grounding indicated and specified.
6. Wire and Cable: (All conductors originating from main switchboard and distribution panels).
    a. Before energizing any cable or wire, megger the insulation resistance of every external circuit wire to each other and to ground. Tests shall be conducted at voltages of 500 volts or lower. Continuity test each wire and cable to verify the field-applied tag per conductor. Continuity test each wire and cable to verify the field-applied tag per conductor. Minimum insulation resistance valves shall not be less than two (2) megohms.
    b. Take insulation resistance measurements for motor feeders. With motors disconnected, measure insulation resistance from load side of contactors or circuit breakers.
    c. Check cables and wires for the proper identification numbering and/or color coding.
    d. Inspect cables for physical damage and proper connection in accordance with single line diagram.

F. Power Distribution System:

1. Main Switchboard:
    a. Inspect for physical, electrical and mechanical condition.
    b. Compare equipment nameplate information with latest single-line diagram and report discrepancies in writing to Engineer within 24 hours.
    c. Check for proper anchorage, required area clearance, physical damage, and proper alignment.
    d. Inspect all doors, panels and sections for paint, dents, scratches, fit and missing hardware.
    e. Verify that fuse and/or circuit breaker sizes and types correspond to Drawings. Report deviations to Engineer in writing within 24 hours.

f. Inspect all bus connections for high resistance. Use low resistance ohmmeter, or check tightness of bolted bus joints by calibrated torque wrench method. Refer to manufacturer's instructions for proper torque levels.

g. Clean entire switchgear using manufacturer's approved methods and materials prior to energizing system and a second time just prior to turning over system to Owner.

h. Inspect insulators for evidence of physical damage or contaminated surfaces.

i. Verify proper barrier and shutter installation and operation.

j. Verify appropriate contact lubricant on moving current carrying parts.

k. Exercise all active components.

l. Inspect all indicating devices for proper operation.

m. Perform ground resistance tests.

n. Perform insulation resistance tests on each bus section, phase-to-phase and phase-to-ground for one (1) minute. Test voltage shall be 1000 volts minimum, and insulation resistance shall be 100 megohms minimum.

o. Perform an over-potential test on each bus station, each phase-to-ground, for five (5) minutes at manufacturer's recommended potential. Test results are evaluated on a go, no-go basis by slowly raising the test voltage to the required value. The final test voltage shall be applied for five (5) minutes for DC test potentials, and one (1) minute for AC test potentials.

2. Circuit Breakers – Molded Case:

a. Circuit breaker shall be checked for proper mounting, conductor size and feeder designation.

b. Operate circuit breaker to ensure smooth operation.

c. Inspect case for cracks or other defects.

d. Check tightness of connections with calibrated torque wrench. Refer to manufacturer's instruction for proper torque levels.

e. Perform a contract resistance test or measure millivolt drop at rated current.

f. Perform an insulation resistance test at 1000 volts DC for one (1) minute from pole-to-pole and from each pole-to-ground with breaker closed and across open contract in each phase – 500V DC if circuit breaker is solid state.

g. Adjustable trip breakers shall have minimum pickup current determined by primary current injection where applicable.

h. Perform long time delay time-current characteristic tests by passing 300% rated current through each pole separately. Determine trip time.

i. Determine short time pickup and delay by primary current injection if applicable to the particular breaker.

j. Determine ground fault pickup and time delay by primary current injection if applicable to the particular breaker.

k. Determine instantaneous pickup currently by primary injection using run-up or pulse method. Clearing times shall be within four (4) cycles.

l. Verify trip unit reset characteristics.

m. Perform adjustments for final settings in accordance with breaker setting sheet if

applicable to the particular breaker.

n. Compare contract resistance or millivolt drop valves to adjacent poles and similar breakers. Investigate deviations of more than 50%. Investigate any value exceeding Manufacturer's recommendations.

o. Insulation resistance shall not be less than 100 megohms.

p. Trip characteristics of adjustable trip breakers shall fall within Manufacturer's published time-current characteristic tolerance band.

q. All circuit breakers mounted in switchboards and distribution boards shall be time-current tested by primary current injection where possible, and also any remotely mounted breakers of frame size 400 ampere and larger.

r. Adjust settings and calibrate all circuit breakers as recommended in the short circuit analysis and coordination study.

3. Motor Control:

a. Inspect for physical damage, proper anchorage and grounding.

b. Compare equipment nameplate data with design plans or starter schedule.

4. Motor Running Protection:

a. Compare overload heater rating with motor full-load current rating to verify proper sizing

b. If motor running protection is provided by fuses, verify proper rating considering motor characteristics.

c. Check tightness of bolted connections.

d. Measure insulation resistance of each bus section phase-to-phase and phase-to-ground for one (1) minute.

e. Measure insulation resistance of each starter section phase-to-phase and phase-to-ground with the starter contacts closed and the protective device open.

f. Measure insulation resistance of each control circuit with respect to ground.

g. Test motor overload units by injecting primary current through overload unit and monitoring trip time at 300% of motor full-load current.

h. Perform operational tests by initiating control devices to affect proper operation.

i. Bolt torque levels shall be in accordance with Manufacturer's recommendations.

j. Perform insulation resistance test, 1000 VDC minimum test voltage and 100 megohms minimum insulation resistance.

k. Control wiring insulation test voltage shall be 1000 VDC. Manufacturer shall be consulted for test voltage where solid-state control devices are utilized.

l. Perform overload tests at 300% of motor full-load current. Trip times shall be in accordance with Manufacturer's tolerances. Investigate values in excess of 120 seconds.

5. Automatic Transfer Switch:

a. Inspect for physical damage.

b. Verify that the short circuit withstand rating exceeds the available short circuit duty.

c. Compare equipment nameplate information and connections with single-line diagram and report any discrepancies.

d. Check switch to ensure positive interlock between normal and alternate sources. (Mechanical and Electrical.)

e. Check tightness of all control and power connections.

f. Perform manual and electrical transfer operation.

g. Ensure manual transfer warnings are attached and visible to operator.

h. Perform insulation resistance tests phase-to-phase and phase-to-ground with switch in both source positions.

i. Measure contact resistance in normal and alternate source position.

j. Insulation resistance test voltages and minimum values to be in accordance with Manufacturer's published data.

k. Determine contact resistance in micro-ohms. Investigate any value exceeding 500 micro-ohms or any values which deviate from adjacent poles by more than 50%.

6. Panelboards:

a. Inspect for physical damage and proper grounding.

b. Compare nameplate information with schedules and report any discrepancies.

c. Inspect all panelboards for cleanliness, workmanship, etc.

7. The following systems shall adhere to the general requirements of this section in addition to complying with the specific test requirements outlined in the respective sections listed:

a. Fire Alarm System.

b. Emergency Generator System.

8. Operating Instructions: Furnish operating instructions to Owner's designated representative with respect to operations, functions and maintenance procedures for equipment and systems installed. Cost of such instruction up to a full five (5) days of Electrical Subcontractor's time shall be included in contract. Cost of providing a Manufacturer's Representative at site for instructional purposes shall also be included.

### 3.3 BRANCH CIRCUITRY

A. For all lighting and appliance branch circuitry, raceway sizes shall conform to industry standard maximum permissible occupancy requirements except where these are exceeded by other requirements specified elsewhere.

B. Circuits shall be balanced on phases at their supply as evenly as possible.

C. Feeder connections shall be in the phase rotation which establishes proper operation for all equipment supplied.

D. Reduced size conductors indicated for any feeders shall be taken as their grounding conductors.

E. Feeders consisting of multiple cables and raceways shall be arranged such that each raceway of the feeder contains one (1) cable for each leg and one (1) neutral cable, if any.

F. For circuitry indicated as being protected at 20 Amps or less, abide by the following:

1. All 20 amp, 120/208 volt, 3-phase, 4-wire combined branch circuit homeruns shall be provided with a #8 AWG neutral conductor.

2. Minimum conductor size shall be No. 12 AWG copper.

3. Conductors operating at 120 volts extending in excess of 100 ft. or the last outlet or fixture tap shall be No. 10 AWG copper throughout.

4. Lighting fixtures and receptacles shall not be connected to the same circuit.
5. Circuits shall be balanced on phases at their supply point as evenly as possible.

G. Type MC Cable Installation:

1. Where cable is permitted under the products section, the installation of same shall be done in accordance with code and the following:
   a. Cable shall be supported in accordance with code. Tie wire is not an acceptable means of support. Cable supports such as Caddy WMX-6, MX-3, and clamps such as Caddy 449 shall be used. Where cables are supported by the structure and only need securing in place, then ty-raps will be acceptable. Ty-raps are not acceptable as a means of support. All fittings, hangers, and clamps for support and termination of cables shall be of type specifically designed for use with cable, i.e., romex connectors not acceptable.
   b. Armor of cable shall be removed with rotary cutter device equal to roto-split by Seatek Co.; not with a hacksaw.
   c. Use split “Insuliner” sleeves at terminations.

## 3.4 REQUIREMENTS GOVERNING ELECTRICAL WORK IN DAMP OR WET LOCATIONS

A. Outlets and outlet size boxes shall be of galvanized cast ferrous metal only.

B. The finish of threaded steel conduit shall be galvanized only.

C. Wires for pulling into raceways for lighting and appliance branch circuitry shall be limited to “THWN”.

D. Wires for pulling into raceways for feeders shall be limited to “THWN”.

E. Plates for toggle switches and receptacles shall have gasketed snap shut covers suitable for wet locations while in use.

F. Final connections of flexible conduit shall be neoprene sheathed.

G. Apply one (1) layer of half looped plastic electric insulating tape over wire nuts used for joining the conductors of wires.

H. Enclosures, junction boxes, pull boxes, cabinets, cabinet trims, wiring troughs and the like, shall be fabricated of galvanized sheet metal, shall conform to the following:

1. They shall be constructed with continuously welded joints and seams.
2. Their edges and weld spots shall be factory treated with cold galvanizing compound.
3. Their connection to circuitry shall be by means of watertight hub connectors with sealing rings.

I. Enclosures for individually mounted switching and overcurrent devices shall be NEMA Class IV weatherproof construction.

J. The covers, doors and plates and trims used in conjunction with all enclosures, pull boxes, outlet boxes, junction boxes, cabinets and the like shall be equipped with gaskets.

K. Panels shall be equipped with doors without exception.

L. The following shall be interpreted as damp or wet locations within building confines:

1. Spaces where any designations indicating weatherproof (WP) or vapor proof appear on the Drawings.
2. Below waterproofing in slabs applied directly on grade.
3. Spaces defined as wet or damp locations by Article 100 of the National Electric Code.

## 3.5 REQUIREMENTS GOVERNING ELECTRIC WORK IN AIR HANDLING SPACES

A. Within air handling plenums:

1. Abide by the requirements specified for electric work in damp locations within building confines.
2. All cabling and electrical equipment installed within plenums shall be listed for plenum use.
3. Exclude the installation of type NM or NMC cable.

B. In spaces within suspended ceilings used for air handling purposes, abide by the requirements specified for normal electric work conditions except:

1. Lighting fixtures recessed into the ceilings shall be certified as being suitable for this purpose.

## 3.6 UNDERGROUND CONDUIT BANKS

A. The Electrical work required in conjunction with underground conduit banks shall include providing all conduits.

B. Conduits for underground banks shall be:

1. Trade diameter size as indicated but in no case less than one inch.
2. Polyvinyl chloride Schedule 40 (approved for encased burial) duct, rigid steel conduit for vertical elbows and straight sections used to penetrate equipment pads, building foundation walls and concrete slabs.

C. All conduits indicated as being incorporated into conduit banks unless specifically noted as rigid steel conduits shall be encased in a concrete envelope which accommodates the indicated configuration of conduits and which encompasses dimensions as follows:

1. Outside surfaces of conduits to outside surface of envelope where reinforcement of encasement is required – 6” minimum.
2. Outside surfaces of conduits to outside surface of envelope where no reinforcement of encasement is required – 3” minimum.
3. Spacing between centerlines of conduits assigned to different categories of use primary feeders, secondary feeders, communications and signaling – 10-1/2” minimum.
4. Spacing between centerlines of conduits assigned to the same category of use – 7-1/2” minimum.

D. Reinforcement of the concrete encasement for conduit banks where required shall consist of No. 4 longitudinal reinforcing bars located 3” from the outside surface of the envelope and spaced 6” on centers all around. No. 8 wire reinforcing hoops set 8” apart shall be used to tie the longitudinal bars together.

E. Install conduit in such a manner as to provide a minimum cover of 30 inches after final grading except the cover may be reduced to a minimum of 18 inches to:

1. Tie into existing work.
2. Pass over other underground utilities.
3. Pass over underground obstructions.
4. Assist in the avoidance of low points.

F. Increase the minimum cover where required by field conditions.

G. Lay conduit to avoid low points during run. Pitch at a minimum of 3 inches per 100 feet away from building.

H. Provide reinforcement for the concrete encasement of a conduit bank where:
   1. It passes under or over underground utilities.
   2. It passes under or over underground obstructions.
   3. Its cover is reduced to less than 30 inches.
   4. It runs through foundation walls and other building construction.

I. Concrete encasement reinforcing shall extend in each case 5 feet beyond the points at which the determining conditions terminate.

J. Bends in conduit shall have minimum radii as follows:
   1. For primary feeder 15’-0” except where specifically indicated otherwise or where turning up at termination point.
   2. For primary feeder turning up at termination point – 4’-0”.

K. Install conduit so that adjacent joints are staggered at least 6 inches from one another.

L. Offsets to accommodate field conditions shall be accomplished with two (2) bends of not more than ten (10) degrees each.

M. Plug both ends of all conduit stubs.

N. Seal the end of each conduit run terminating inside a building utilizing a water and gas-tight sealant manufactured specifically for the purpose.

O. After conduit has been installed with concrete encasement completed, clear each conduit of all obstructions and foreign matter by pulling a flexible mandrel (12” minimum length and a diameter 1/4" less than that of the conduit) and brush through it. In the event that obstructions are encountered in any conduit which will not permit the mandrel to pass, remove and replace the blocked section. Include in the electric work all excavation, backfilling, repair of concrete encasement and restoration of surface at grade involved in the conduit replacement.

P. Provide a nylon cord for the pulling of cable in each conduit in which no cable is to be installed as part of the electric work.

Q. The Electrical Subcontractor shall provide all insulated racks as required for proper support of all cables and wires.

R. Provide magnetic warning tape above each full length of duct bank 12 inches below grade.

## 3.7 IDENTIFICATION AND TAGGING

A. Identify individually:
   1. Each transformer.
   2. Each panelboard.
   3. Each switch and circuit breaker.
   4. Each feeder, wire or cable or all systems.
   5. Each switchboard.
   6. Each end of nylon pullwire in empty conduit.

B. Each wire or cable in a feeder shall be identified at its terminal points of connection and in each pullbox, junction box and panel gutter through which it passes.

C. The nomenclature used to identify panelboards or load center shall designate the numbers assigned to them.

D. The nomenclature used to identify switches or circuit breakers shall:

1. Where they disconnect mains or services designate this fact.
2. Where they control feeders, designate the feeder number and the name of the load supplied.
3. Where they control lighting and appliance branch circuitry, designate the name of the space and the load supplied.

E. The nomenclature used to identify feeder wires and cables shall designate the feeder number.

F. Identification for panelboards or load centers shall be by means of engraved Lamacoid nameplates showing 1/4" high white lettering on a black background fastened to the outside face of the front.

G. Identification for switches or circuit breakers shall be by means of the following:

1. Where individually enclosed – engraved Lamacoid nameplates showing 1/8” high white lettering on a black background fastened on the outside front face of the enclosure.
2. Where in panelboards or load centers without doors – same as for individually enclosed.
3. Where in panelboards or load centers with doors – typewritten directories mounted behind transparent plastic covers, in metal frames fastened on the inside face of the doors.

H. Identification for wires and cables shall be by means of wrap around “brady” type labels.

I. Device plates for local toggle switches, toggle switch type motor starters, pilot lights and the like, whose function is not readily apparent shall be engraved with 1/8” high letters suitably describing the equipment controlled or indicated.

J. Phase identification letters shall be stamped into the metal of the bus bars of each phase of the main busses of each switchboard and each panelboard. The letters shall be visible from at least one (1) “normal posture” location without having to demount any current carrying or supporting elements.

K. Equip the front face of all switchboard pull boxes junction boxes and the like containing cables, busing or devices operating in excess of 600 volts with enameled sheetmetal “red on white” signs reading “DANGER-HIGH VOLTAGE.”

L. Equip all electric closets and the like with enameled sheet metal “red on white” signs reading “Electrical Equipment Room – No Storage Permitted”. Signs shall be mounted at clearly visible locations within the rooms.

M. Provide a sign at the service entrance equipment room indicating the type and location of all on-site emergency or standby power sources.

N. Identify each outlet box, junction box, and cabinet used in conjunction with empty raceway for wires of a future system by means of indelible markings on the inside denoting the system.

O. Prior to installing identifying tags and nameplates, submit their nomenclature for approval. Conform to all revisions issued by the Architect.

## 3.8 LIMITING NOISE PRODUCED BY ELECTRICAL INSTALLATION

A. Perform the following work in accordance with field instructions issued by the Architect to assure that minimal noise is produced by electrical installations due to equipment furnished as part of the Electrical work.

B. Check and tighten the fastenings of sheet metal plates, covers, doors and trims used in the enclosures of electrical equipment.

C. Remove and replace any individual device containing one or more magnetic flux path metallic cores (e.g., discharge lamp ballast, transformer, reactor, dimmer, solenoid) which is found to

have a noise output exceeding that of other identical devices installed at the project.

### 3.9 SUPPORTS AND FASTENINGS

A. Support work in accordance with best industry standards, Local Electric Code and the following:

1. Include supporting frames or racks for equipment, intended for vertical surface mounting, which is required in a freestanding position.
2. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members. They shall be rigidly bolted or welded together and adequately braces to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.
3. No work intended for exposed installation shall be mounted directly on any building surface. In such locations, flat bar members or spaces shall be used to create a minimum of ¼" air space between the building surfaces and the work. Provide ¾" thick exterior grade plywood painted with two (2) coats of fire-retardant gray paint for mounting of panelboards.
4. Nothing (including outlet, pull and junction boxes and fittings) shall depend on electric conduits, raceways or cables for support.
5. Nothing shall rest on, or depend for support on, suspended ceiling media.
6. Support less than 2" trade size, vertically run, conduits at intervals no greater than 8'. Support such conduits, 2-1/2" trade size or larger, at intervals no greater than they story height, or 15', whichever is smaller.
7. Where they are not embedded in concrete, support less than 1" trade size, horizontally run, conduits at intervals no greater than 7'. Support such conduits, 1" trade size or larger, at intervals no greater than 10'.
8. Support all lighting fixtures directly from structural slab, intermediate decking or framing member as directed by the Architect. No light fixtures shall be supported directly from the roof deck.
9. Where fixtures and ceilings are such as to require fixture support from ceiling openings frames, include in the electric work the members necessary to tie back the ceiling opening frames to ceiling suspension members or slabs so as to provide actual support for the fixtures noted above.
10. Support all runs of conduit and/or circuitry directly from structural slabs, intermediate decking or framing members.
11. Fasten electric work to building structure in accordance with the best industry practice.
12. Floor mounted equipment shall not be held in place solely by its own dead weight. Include floor anchor fastenings in all cases.
13. For items which are shown as being ceiling mounted at locations where fastenings to the building construction element above is not possible, provide suitably auxiliary channel or angle iron bridging tying to building structural elements.
14. As a minimum procedure, where weight applied to the attachment points is 100 lbs. or less, fasten to concrete and solid masonry with bolts and expansion shields.
15. As a minimum procedure, where weight applied to building attachment points exceed 100 lbs., but is 300 lbs. or less, conform to the following:
    a. At field poured concrete slabs, utilize inserts with 20' minimum length slip-through steel rods, set transverse to reinforcing steel.

### 3.10 SPLICING AND TERMINATING WIRES AND CABLES

A. Maintain all splices and joints in removable cover boxes or cabinets where they may be easily inspected.

B. Locate each completed conductor splice or joint in the outlet box, junction box, or pull box containing it, so that it is accessible from the removal cover side of the box.

C. Join solid conductors No. 8 AWG and smaller by securely twisting them together and soldering, or by using insulated coiled steel spring “wire nut” type connectors. Exclude “wire nuts” employing non-expandable springs. Terminate conductors No. 8 AWG and smaller by means of a neat and fast holding application of the conductors directly to the binding screws or terminals of the equipment or devices to be connected.

D. Join, tap and terminate standard conductors No. 6 AWG and larger by means of solder sleeves, taps, and lugs with applied solder or by means of bolted saddle type or pressure indent type connectors, taps and lugs. Exclude connectors and lugs of the types which apply set screws directly to conductors. Where equipment or devices are equipped with set screw type terminals which are impossible to change, replace the factory supplied set screws with a type having a ball bearing tip. Apply pressure indent type connectors, taps and lugs utilizing tools manufactured specifically for the purpose and having features preventing their release until the full pressure has been exerted on the lug or connector.

E. Except where wire nuts are used, build up insulation over conductor joints to a value, equal both in thickness and dielectric strength, to that of the factory applied conductor insulation. Insulation of conductor taps and joints shall be by means of half-lapped layers of rubber tape, with an outer layer of friction tape; by means of half-lapped layers of approved plastic electric insulating tape; or by a means of split insulating casings manufactured specifically to insulate the particular connector and conductor, and fastened with stainless steel or non-metallic snaps or clips.

F. Exclude splicing procedures for neutral conductors in lighting and appliance branch circuitry which utilize device terminals as the splicing points.

G. Exclude joints or terminations utilizing solder in any conductors used for grounding or bonding purposes.

H. Exclude all but solder or pressure indent type joints in conductors used for signaling or communication purposes.

I. Lugs for conductors used to make phase leg connections on the line side of the main service overcurrent and switching device shall be of the limiter type.

### 3.11 PULLING WIRES INTO CONDUITS AND RACEWAYS

A. Delay pulling wires or cables in until the project has progressed to a point when general construction procedures are not liable to injure wires and cables, and when moisture is excluded from raceways.

B. Utilize nylon snakes or metallic fish tapes with ball type heads to set up for pulling. In raceways 2” trade size and larger, utilize a pulling assembly ahead of wires consisting of a suitable brush followed by a 3-1/2” diameter ball mandrel.

C. Leave sufficient slack on all runs of wire and cable to permit the secure connection of devices and equipment.

D. Include circular wedge-type cable supports for wires and cables at the top of any vertical raceway longer than 20 feet. Also include additional supports spaced at intervals which are no greater than 10’. Supports shall be located in accessible pull boxes. Supports shall be of a non-deteriorating insulating material manufactured specifically for the purpose.

E. Pulling lubricants shall be used. They shall be products manufactured specifically for the

purpose.

F. Slack on wires and cables located in cabinets and pull boxes shall be formed and set in place in groupings corresponding to their occupancy of raceways. They shall also be arranged, with insulators and supports provided where necessary, such that cable shims or other such temporary expedients do not have to be left permanently in place to prevent the wires and cables from shifting when covers or trims are removed.

## 3.12 REQUIREMENTS FOR THE INSTALLATION OF JUNCTION BOXES, OUTLET BOXES AND PULL BOXES

A. Flush wall-mounted outlet boxes shall not be set back to back but shall be offset at least 12” horizontally regardless of any indication on the Drawings.

B. Locate all boxes so that their removable covers are accessible without necessitating the removal of parts of permanent building structure, including piping, ductwork, and other permanent mechanical elements.

C. In conjunction with concealed circuitry, abide by one of the following instructions (as may be applicable to the conditions) in order to assure the aforementioned accessibility. (Not required for circuitry concealed by removable suspended ceiling tiles.)

1. For a small (outlet size) box on circuitry concealed in a partition or wall, locate box or fitting so that its removable cover side, (or the face of any applied raised cover) penetrates through to within 1/8” of the exposed surface of the building materials concealing the circuitry and apply a blank or device plate to suit the functional requirements.

2. For a large box on circuitry concealed in a partition, suspended ceiling, or wall, locate box totally hidden but with its removable cover directly behind an architectural access door or panel (included for the purpose, separate from the electric work) in the building construction which conceals the circuitry.

3. For a small (outlet size) box on circuitry concealed above and intended as an outlet for a surface mounted lighting fixture or other such electrical item, locate box so that its removable cover side penetrates through to the exposed surface of the building materials concealing the circuitry. Arrange the mounting of the lighting fixture or other item so that it completely covers the opening in the building construction caused by the box.

4. For a small (outlet size) box on circuitry concealed in a suspended ceiling, and intended as an outlet for a non-demountable type of recessed lighting fixtures or other such electrical items, locate box totally hidden but with its removable cover not more than 1’ away from the building construction opening occupied by the demountable items.

D. Apply junction and pull boxes in accordance with the following:

1. Include all pull boxes in long straight runs of raceway to assure that cables are not damaged when they are pulled in.

2. Include junction and pull boxes to assure a neat and workmanlike installation of raceways.

3. Include junction and pull boxes to fulfill requirements pertaining to the limitations to the number of bends permitted in raceway between cable access points, the accessibility of cable joints and splices, and the application of cable supports.

4. Include all required junction and pull boxes regardless of indications on the Drawings (which, due to symbolic methods of notation, may omit to show some of them).

E. Apply outlet boxes in accordance with the following:

1. Unless noted below or otherwise specifically indicated, include a separate outlet box for each individual wiring device, lighting fixture and signal or communication system outlet

component. Outlet boxes supplied attached to lighting fixtures shall not be used as replacements for the boxes specified herein.

2. A continuous row of fixtures of the end-to-end channel type, designed for “through wiring”, and wired in accordance with the specification hereinafter pertaining to circuitry through a series of lighting fixtures, may be supplied through a single outlet box.
3. A series of separate fixtures, designed for “through wiring”, spaced not more than 4’ apart, and inter-connected with conduit or raceway and circuitry which is in accordance with the Specifications hereinafter pertaining to circuitry through a series of lighting fixtures, may be supplied through a single outlet box.
4. Connection to recessed ceiling fixtures supplied with pigtails may be arranged so that more than one (1), but not more than four (4) such fixtures are connected into a single outlet box. When adopting this procedure:
   a. Utilize an outlet box no smaller than 5” square by 2-1/2” deep.
   b. Allow no fixture to be supplied from an outlet box in another room.
5. Multiple local switches indicated at a single location shall be gang-mounted in a single outlet box.
6. Include all required outlet boxes regardless of indications on the Drawings (which due to symbolic methods of notation, may omit to show some of them).

F. Install junction boxes, pull boxes and outlet boxes in conjunction with concealed circuitry.
   1. Exclude surface-mounted outlet boxes in conjunction with concealed circuitry.
   2. Exclude unused circuitry openings in junction and pull boxes. In larger boxes each such opening shall be closed with a galvanized sheet steel plate fastened with a continuous weld all around. In small outlet type boxes, utilize plugs as specified for such boxes.
   3. Close up all unused circuitry openings in outlet boxes. Unused openings in cast boxes shall be closed with approved cast metal threaded plugs. Unused openings in sheet metal boxes shall be closed with sheet metal knock-out plugs.
   4. Outlet boxes for switches shall be located at the strike side of doors. Indicate door swings are subject to field change. Outlet boxes shall be located on the basis of final door swing arrangements.
   5. Boxes and plaster covers for duplex receptacles shall be arranged for vertical mounting of the receptacle.
   6. Equip outlet boxes used for devices which are connected to wires of systems supplied by more than one set of voltage characteristics with barriers to separate the different systems.

G. Barriers in junction and pull boxes of outlet size shall be of the same metal as the box.
   1. Barriers in junction and pull boxes which are larger than outlet size shall be of the polyester resin fiberglass of adequate thickness for mechanical strength, but in no case less than 1/4" thick. Each barrier shall be mounted, without fastenings, between angle iron guides so that they may be readily removed.

## 3.13 LOCATING AND ROUTING OF CIRCUITRY

A. In general, all circuitry shall be run concealed except that it shall be run exposed where the following conditions occur:
   1. Horizontally at the ceiling of permanently unfinished spaces which are not assigned to mechanical or electrical equipment.

2. Horizontally and vertically in mechanical equipment spaces.
3. Horizontally and vertically in electric equipment rooms.

B. Concealed circuitry shall be so located that building construction materials can be applied over its thickest elements without being subject to spalling or cracking.

C. All circuitry and raceways shall not be run within slabs. If field conditions requires raceways to be embedded in field-poured structural building construction concrete fill or slab shall conform to the following:

1. All proposed embedded raceways shall be indicated on plan and elevation and submitted to the Architect and Structural Engineer for review and written approval prior to installation. Any costs associated with the review and approval shall be borne by the Electrical Subcontractor.
2. They shall be run “single layer” with their outside surface no closer than 1” to any surface of the structural concrete.
3. They shall not be located in any configuration which places the outside surface of one closer than 3” to outside surface of another, except at tees, crosses or other single level wide angle junction points.
4. Where crossovers or close grouping are unavoidable, circuitry shall be carefully field coordinated so as not to cause structural weakness.
5. Where turned up or down into a wall or partition they shall, before entering same, be routed parallel for a long enough distance to assure that no relocation of the wall or partition will be necessary to conceal the required bend.
6. They shall be routed in such a manner as to coordinate with the structural requirements of the building.
7. They shall be routed in accordance with field instructions issued by the Architect where such instructions differ from Specifications set forth herein.

D. Circuitry run exposed shall be routed parallel to building walls and column lines.

E. Exposed circuitry located overhead shall be run in a completely accessible manner on the underside of all piping and ductwork.

F. Circuitry run in suspended ceilings shall be routed parallel to building walls, column lines, etc.

G. Circuitry shall be routed so as to prevent electric conductors from being subject to high ambient temperature. Minimum clearances from heated lines or surfaces shall be maintained as follows:

1. Crossing where uninsulated: 3”.
2. Crossing where insulated: 1”
3. Running parallel where uninsulated: 36”.
4. Running parallel where insulated: 6”.

H. Circuitry shall not be run in elevator shafts, hoistways, and the like. Where outlets for trail cables, pit lights, run be level lights, and the like, are involved, only the “final connection” outlet boxes themselves shall be located within or open into, the confines of the shaft.

I. Circuitry for miscellaneous systems indicated without notation as to location and routing shall be run as per the requirements and notations governing the adjacent light and power circuitry.

### 3.14 INSTALLING CIRCUITRY

A. The outside surface of circuitry, which is to be embedded in cinder concrete, shall be coated with asphaltum paint.

B. In runs of conduit or raceway including flexible limit the number of bends between cable access points to a total which does not exceed the maximum specified for the particular system. Where no such maximum is specified, limit the number to four (4) right angle bends or the equivalent thereof.

C. In each conduit or raceway assigned for the future pulling in of wires, include a nylon drag cord. In raceways 2" trade size and larger, the cord shall be pulled in utilizing a suitable brush, followed by an 85% diameter ball mandrel ahead of the cord in the pulling assembly. In the event that obstructions are encountered, which will not permit the drag cord to be installed, the blocked section of raceway shall be replaced and any cutting and patching of the structure involved in such replacement shall be included as part of the electric work.

D. Circuitry shall be arranged such that conductors of one feeder or circuitry carrying "going" current are not separated from conductors of the same feeder or circuitry carrying "return" current by any ferrous or other metal. Where not within raceways, all "going" and "return" current conductors of one feeder or circuit shall be laced together so as to minimize induction heating of adjacent metal components.

E. Sleeves used where circuitry is to penetrate waterproof slabs, decks and walls, shall be of a type selected to suit the water condition encountered in the field.

## 3.15 PHYSICAL SEPARATION OF NORMAL, OPTIONAL STANDBY, AND EMERGENCY SYSTEMS

A. ALL emergency system generation and distribution equipment shall be installed within dedicated two-hour fire rated rooms, closets or shafts. All equipment, conduit, piping, ductwork, etc., alien to the emergency system shall not be located within these rooms, closets, or shafts except the equipment that serves these rooms, closets or shafts.

B. All emergency equipment such as transfer switches, switchboards, transformers, and panelboards, shall be installed in two-hour fire rated rooms. The two-hour fire rated rooms shall be provided by the General Contractor.

C. All portions of the emergency system, such as feeders, located outside of rooms, closets, or shafts described in paragraph "B" shall also be enclosed within two-hour fire rated enclosures, provided by the Electrical Subcontractor. Type, method and material of two-hour rated enclosures shall be approved by the Local Electrical Inspector.

D. Emergency system shall be kept entirely independent of all other wiring, devices and equipment, and shall not enter the same raceways, boxes or cabinets with each other or other wiring, except in transfer switches.

E. The Electrical Subcontractor has the option of using UL listed two-hour fire rated MI cable systems only if approved by the Local Electrical Inspector. The Electrical Subcontractor shall be responsible for sizing, routing, installation, supports, etc., of this cable in accordance with manufacturer's requirements. Submit for Architect conductor sizing calculations, voltage drop calculations, etc. for review and approval.

**END OF SECTION**

# SECTION 270526

# GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEM

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:

1. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.
4. Grounding rods.
5. Grounding labeling.

### 1.3 DEFINITIONS

A. BCT: Bonding conductor for telecommunications.

B. TGB: Telecommunications grounding busbar.

C. TMGB: Telecommunications main grounding busbar.

D. Service Provider: The operator of a service that provides telecommunications transmission delivered over access provider facilities.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For communications equipment room signal reference grid. Include plans, elevations, sections, details, and attachments to other work.

### 1.5 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing as-built locations of grounding and bonding infrastructure, including the following:

1. Ground rods.
2. Ground and roof rings.
3. BCT, TMGB, TGBs, and routing of their bonding conductors.

B. Qualification Data: For installation supervisor, and field inspector.

C. Qualification Data: For testing agency and testing agency's field supervisor.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Result of the ground-resistance test, measured at the point of BCT connection.
b. Result of the bonding-resistance test at each TGB and its nearest grounding electrode.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Installation Supervision: Installation shall be under the direct supervision of ITS Technician, who shall be present at all times when Work of this Section is performed at Project site.
2. Field Inspector: Currently registered by BICSI as a designer RCDD to perform the on-site inspection.

**PART 2 - PRODUCTS**

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

C. Comply with TIA-607-B.

2.2 CONDUCTORS

A. Manufacturers: Subject to compliance with requirements, provide products by on of the following:

1. Harger Lightning & Grounding
2. Panduit Corp.
3. TE Connectivity Ltd.

B. Comply with UL 486A-486B.

C. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.

1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
2. Cable Tray Equipment Grounding Wire: No. 6 AWG.

D. Cable Tray Grounding Jumper:

1. Not smaller than No. 6 AWG and not longer than 12 inches (300 mm). If jumper is a wire, it shall have a crimped grounding lug with two holes and long barrel for two crimps. If jumper is a flexible braid, it shall have a one-hole ferrule. Attach with grounding screw or connector provided by cable tray manufacturer.

E. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmils (14.2 sq. mm), 14 strands of No. 17 AWG conductor, and 1/4 inch (6.3 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

## 2.3 CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. Chatsworth Products, Inc.
3. Panduit Corp.

B. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

C. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.

1. Electroplated tinned copper, C and H shaped.

D. Signal Reference Grid Connectors: Combination of compression wire connectors, access floor grounding clamps, bronze U-bolt grounding clamps, and copper split-bolt connectors, designed for the purpose.

E. Busbar Connectors: Cast silicon bronze, solderless compression-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch (15.8- or 25.4-mm) centers for a two-bolt connection to the busbar.

F. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

## 2.4 GROUNDING BUS BARS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Chatsworth Products, Inc.

2. Harger Lightning & Grounding.
3. Panduit Corp.

B. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, length as indicated on Drawings. The busbar shall be NRTL listed for use as TMGB and shall comply with TIA-607-B.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide a 4-inch (100-mm) clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

C. TGB: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches (6.3 by 50 mm) in cross section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with TIA-607-B.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch (50-mm) clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

D. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-607-B. Predrilling shall be with holes for use with lugs specified in this Section.

1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch (483- or 584-mm) equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
3. Rack-Mounted Vertical Busbar: 72 or 36 inches (1827 or 914 mm) long, with stainless-steel or copper-plated hardware for attachment to the rack.

2.5 IDENTIFICATION

A. Comply with requirements for identification products in Section 270553 "Identification for Communications Systems."

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the ac grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.

B. Inspect the test results of the ac grounding system measured at the point of BCT connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.

B. Comply with NECA 1.

C. Comply with TIA-607-B.

## 3.3 APPLICATION

A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.
2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.

B. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

C. Conductor Support:

1. Secure grounding and bonding conductors at intervals of not less than 36 inches (900 mm).

D. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch (900-mm) intervals.
4. Install grounding and bonding conductors in 3/4-inch (21-mm) PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.

    a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with

requirements in Section 270528 "Pathways for Communications Systems," and bond both ends of the conduit to a TGB.

## 3.4 GROUNDING ELECTRODE SYSTEM

A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than No. 3/0 AWG.

## 3.5 GROUNDING BUSBARS

A. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 12 inches (300 mm) above finished floor unless otherwise indicated.

B. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

## 3.6 CONNECTIONS

A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.

B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

1. Use crimping tool and the die specific to the connector.
2. Pretwist the conductor.
3. Apply an antioxidant compound to all bolted and compression connections.

D. Primary Protector: Bond to the TMGB with insulated bonding conductor.

E. Sizing the telecommunications bonding backbone (TBB) The minimum TBB conductor size shall be a No. 6 American Wire Gauge (AWG). The TBB should be sized at 2 kcmil per linear foot of conductor length up to a maximum size of 750 kcmil.

| TBB/GE linear length m (ft) | TBB/GE size (AWG) |
|---|---|
| less than 4 (13) | 6 |
| 4 – 6 (14 – 20) | 4 |
| 6 – 8 (21 – 26) | 3 |
| 8 – 10 (27 – 33) | 2 |
| 10 – 13 (34 – 41) | 1 |
| 13 – 16 (42 – 52) | 1/0 |
| 16 – 20 (53 – 66) | 2/0 |
| 20 – 26 (67 – 84) | 3/0 |
| 26 – 32 (85 – 105) | 4/0 |
| 32 – 38 (106 – 125) | 250 kcmil |
| 38 – 46 (126 – 150) | 300 kcmil |
| 46 – 53 (151 – 175) | 350 kcmil |
| 53 – 76 (176 – 250) | 500 kcmil |
| 76 – 91 (251 – 300) | 600 kcmil |
| Greater than 91 (301) | 750 kcmil |

F. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install top-mounted rack grounding busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 2 AWG bonding conductors.

G. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.

H. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard.

I. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

J. Equipment Room Signal Reference Grid: Provide a low-impedance path between telecommunications cabinets, equipment racks, and the reference grid, using No. 6 AWG bonding conductors.

1. Install the conductors in grid pattern on 4-foot (1200-mm) centers, allowing bonding of one pedestal from each access floor tile.
2. Bond the TGB of the equipment room to the reference grid at two or more locations.
3. Bond all conduits and piping entering the equipment room to the TGB at the perimeter of the room.

## 3.7 IDENTIFICATION

A. Labels shall be preprinted or computer-printed type.

1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier for the space containing the TMGB.
2. Label TGB(s) with "fs-TGB," where "fs" is the telecommunications space identifier for the space containing the TGB.
3. Label the BCT and each telecommunications backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

## 3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.

    a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.

3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.

    a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB and in each TGB. Maximum acceptable ac current level is 1 A.

D. Excessive Ground Resistance: If resistance to ground at the BCT exceeds 5 ohms, notify Architect promptly and include recommendations to reduce ground resistance.

E. Grounding system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 270526

**SECTION 270528**

**PATHWAYS FOR COMMUNICATIONS SYSTEMS**

## PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Optical-fiber-cable pathways and fittings.
4. Metal wireways and auxiliary gutters.
5. Nonmetallic wireways and auxiliary gutters.
6. Metallic surface pathways.
7. Nonmetallic surface pathways.
8. Hooks.
9. Boxes, enclosures, and cabinets.
10. Fiberglass handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. AHJ: Authorities Having Jurisdiction

B. ANSI: American National Standards Institute

C. ARC: Aluminum rigid conduit.

D. BICSI: Building Industry Consulting Service International

E. EMT: Electrical Metallic Tubing

F. FBA: Finish by Architect (Custom)

G. GRC: Galvanized rigid conduit.

H. IMC: Intermediate metal conduit.

I. NECA: National Electrical Contractors Association.

J. NEMA: National Electrical Manufacturers Association

K. NRTL: Nationally Recognized Testing Laboratory

L. RCDD: Registered Communications Distribution Designer.

M. RTRC: Reinforced thermosetting resin conduit.

N. UL: Underwriters Laboratories

1.4 ACTION SUBMITTALS

A. Product data for the following:

1. Surface pathways
2. Wireways and fittings.
3. Boxes, enclosures, and cabinets.
4. Underground handholes and boxes.

B. Shop Drawings: For enclosures and cabinets and underground handholes and boxes. Include plans, elevations, sections, and attachment details. 27 05 28 PATHWAYS FOR COMMUNICATIONS SYSTEMS

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of pathway groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
3. Underground ducts, piping, and structures in location of underground enclosures and handholes.

**PART 2 - PRODUCTS**

2.1 METAL CONDUITS AND FITTINGS

A. Description: Metal raceway of circular cross section with manufacturer-fabricated fittings.

B. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
2. Comply with TIA-569-D.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. PVC-Coated Steel Conduit: PVC-coated GRC or IMC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
2. Fittings for EMT:

    a. Material: Steel
    b. Type: Set screw or compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

H. Joint Compound for IMC or GRC,: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 SURFACE METAL PATHWAYS

A. Description: Galvanized steel with snap-on covers, complying with UL 5.

B. Finish: Manufacturer's standard enamel finish in color selected by Architect; provide white unless otherwise directed.

C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with TIA-569-D.

2.3 SURFACE NONMETALLIC PATHWAYS:

A. Description: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC.

B. Finish: Texture and color selected by Architect from manufacturer's standard colors; provide white unless otherwise directed.

C. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.

D. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

E. Comply with TIA-569-D.

2.4 HOOKS

A. Description: Prefabricated sheet metal cable supports for telecommunications cable.

B. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

C. Comply with TIA-569-D.

D. Galvanized steel.

E. J shape.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Description: Enclosures for communications.

B. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569-D.
2. Boxes, enclosures, and cabinets installed in wet locations shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for use in wet locations.
3. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
4. Device Box Dimensions: 5 inches square by 2-7/8 inches deep
5. Integral cable management.
6. Gangable boxes are prohibited.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

G. Cabinets:

1. NEMA 250, Type 1 or Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.6 FIBERGLASS HANDHOLES AND BOXES

A. Description: Molded of fiberglass-reinforced polyester resin, with frame and covers of fiberglass.

B. General Requirements for Fiberglass Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
3. Comply with TIA-569-D

C. Color of Frame and Cover: Green.

D. Configuration: Designed for flush burial with open bottom unless otherwise indicated.

E. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.

F. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

G. Cover Legend: Molded lettering, **"COMMUNICATIONS"**

H. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

I. Handholes dimensions are indicated on the drawings.

## PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC
2. Concealed Conduit, Aboveground: RNC, Type EPC-40-PVC.
3. Underground Conduit: Type EPC-40-PVC or concrete encased under roadways and driveways.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R

B. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT
2. Exposed and Subject to Severe Physical Damage: GRC. Pathway locations include the following:

    a. Shipping and Receiving.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.
    d. Mechanical Mezzanine
    e. Storage Rooms
    f. Back of house areas (staff only)
    g. Electric Rooms
    h. Career Tech Education (CTE) shop rooms

3. Concealed in Ceilings and Interior Walls and Partitions: Open cabling or EMT
4. Damp or Wet Locations: GRC
5. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: J Hooks with cabling rated for the environment it is being installed in.
6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel units in institutional and commercial kitchens and damp or wet locations.

C. Minimum Pathway Size: 1-inch (25 mm) trade size for low voltage and category cabling, and 1 inch (25 mm) for optical-fiber cables.

D. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression fittings. Comply with NEMA FB 2.10.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface pathways only were indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C)

3.2 INSTALLATION

A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA/BICSI 568.
3. TIA-569-D.
4. NECA 101
5. NECA 105.

B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

C. Comply with requirements in Section 07 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

D. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

E. Complete pathway installation before starting conductor installation.

F. Arrange stub-ups so curved portions of bends are not visible above finished slab.

G. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches (300 mm) of changes in direction. Utilize long radius ells for all optical-fiber cables.

H. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

I. Support conduit within 12 inches (300 mm) of enclosures to which attached.

J. Pathways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot (3-m) intervals.

2. Arrange pathways to cross building expansion joints at right angles with expansion fittings. Comply with requirements for expansion joints specified in this article.
3. Arrange pathways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

K. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

L. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

N. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus one additional quarter-turn.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits of 2-inch (50-mm) trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

Q. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.

R. Surface Pathways:

1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
2. Install surface pathway with a minimum 2-inch (50-mm) radius control at bend points.
3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

S. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:
1. 1-Inch (25-mm) Trade Size and Larger: Install pathways in maximum lengths of 75 feet (23 m).
2. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

T. Install pathway-sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a

blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway-sealing fittings according to NFPA 70.

U. Install devices to seal pathway interiors at accessible locations. Locate seals, so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

V. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

W. Hooks:

1. Size to allow a minimum of 25 percent future capacity without exceeding design capacity limits.
2. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.
3. Hook spacing shall allow no more than 6 inches (150 mm) of slack. The lowest point of the cables shall be no less than 6 inches (150 mm) adjacent to ceilings, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
4. Space hooks no more than 5 feet (1.5 m) o.c.
5. Provide a hook at each change in direction.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

AA. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

BB. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

CC. Set metal floor boxes level and flush with finished floor surface.

DD. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe of less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete around conduit for a minimum of 12 inches (300 mm) on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Underground Warning Tape: Comply with requirements in Section 270553 "Identification for Communications Systems."

## 3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install handholes with bottom below frost line, 50” below grade.

E. Field cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

## 3.5 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 07 "Penetration Firestopping."

## 3.6 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 270528

# SECTION 270536

# CABLE TRAYS FOR COMMUNICATION SYSTEMS

## PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. This Section includes cable trays and accessories.

1.3 DEFINITIONS

A. AHJ: Authorities Having Jurisdiction

B. ANSI: American National Standards Institute

C. ARC: Aluminum rigid conduit.

D. BICSI: Building Industry Consulting Service International

E. EMT: Electrical Metallic Tubing

F. FBA: Finish by Architect (Custom)

G. GRC: Galvanized rigid conduit.

H. IMC: Intermediate metal conduit.

I. NECA: National Electrical Contractors Association.

J. NEMA: National Electrical Manufacturers Association

K. NRTL: Nationally Recognized Testing Laboratory

L. RCDD: Registered Communications Distribution Designer.

M. RTRC: Reinforced thermosetting resin conduit.

N. UL: Underwriters Laboratories

O. Wire basket cable tray is defined to include, but are not limited to straight sections of continuous wire mesh, splices, field formed horizontal and vertical bends, tees, drop outs, supports and accessories.

1.4 SUBMITTALS

A. Product Data: Include data indicating dimensions, materials and finishes for each type of cable tray indicated. Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

B. Shop Drawings: For each type of cable tray.

1. Show fabrication and installation details of cable tray, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.
2. Seismic-Restraint Details: Signed and sealed by a qualified professional engineer, licensed in the state where Project is located, who is responsible for their preparation.

a. Design Calculations: Calculate requirements for selecting seismic restraints.
b. Detail fabrication, including anchorages and attachments to structure and to supported cable trays.

C. Coordination Drawings: Floor plans and sections, drawn to scale. Include scaled cable tray layout and relationships between components and adjacent structural, electrical, and mechanical elements. Show the following:

1. Vertical and horizontal offsets and transitions.
2. Clearances for access above and to side of cable trays.
3. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
4. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.

D. Field quality-control reports.

E. Operation and Maintenance Data: For cable trays to include in emergency, operation, and maintenance manuals.

F. Project Record Documents: Record actual routing of cable tray and locations of supports.

G. Certification:
1. Submit manufacturer’s certification indicating ISO 9001 quality certified.
2. Submit training procedure for certifying cable tray installers.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain cable tray components through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

D. Product Requirements:

1. Source Limitations: Obtain cable tray components through one source from a single manufacturer.
2. Approval and Labeling: Provide cable trays and accessories specified in this Section that are approved and labeled.
    a. The terms “Classified” pertaining to cable trays (rather than “Listed”) and “Labeled”: As defined in NFPA 70, Article 100.
    b. Listing and Labeling Agency Qualifications: A “Nationally Recognized Testing Laboratory” as defined in OSHA Regulation 1910.7.
3. Comply with NFPA 70, National Electrical Code, Article 392: Cable Trays; provide UL Classification and labels.
4. Comply with IEC 61537, Cable Tray Systems and Cable Ladder Systems for Cable Management.
5. Comply with NEMA VE 1/CSA C22.2 No. 126.1, Metal Cable Tray Systems, for materials, sizes, and configurations; provide cCSAus Certificate and labels.
6. Provide documentation of the following certifications:
    a. ISO 9001 quality certification.
    b. American Bureau of Shipping (ABS) Product Design Assessment certification.
    c. Det Norske Veritas (DNV) certification.
    d. E 90 Fire Testing certification.
7. Provide UL (or ETL) test documentation showing cable compression/deformation testing.
8. Structural Performance: Cable trays shall be tested and rated for load carrying capacity and safety factors.
    a. Uniform Load Distribution: Capable of supporting a uniformly distributed load according to NEMA VE 1.
    b. Concentrated Load: A load applied at midpoint of span and centerline of tray.
    c. Load and Safety Factors: Applicable to both side rails and rung capacities.

E. Mock-Up: Provide a mock-up for evaluation of installation techniques and application workmanship.
1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship is approved by Architect.
3. Rework mock-up area as required to produce acceptable work; at no additional cost to Owner

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Store indoors to prevent water or other foreign materials from staining or adhering to cable tray.

B. Cable tray shall be stored in a well-ventilated, dry location. Unpack and dry wet materials before storage.

C. Avoid breakage, denting and scoring finishes. Damaged products shall not be installed. Store cable trays and accessories in original cartons and in clean dry space; protect from weather and construction traffic. Wet materials will be unpacked and dried before storage.

D. Store products in manufacturer’s unopened packaging until ready for installation.

## 1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer’s recommended limits.

1.8 COORDINATION

A. Coordinate layout and installation of cable tray with other installations.
1. Revise locations and elevations from those indicated as required to suit field conditions and as approved by the Architect.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements:
1. Chatsworth
2. Legrand
3. Panduit

2.2 MATERIALS AND FINISHES

A. General
1. Inside Width: As indicated on the drawings.
2. Inside Depth: 4 inches or as indicated on the drawings.
4. Inside Radius of Fittings: As needed.
5. Provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and grounding straps.
6. Covers: None

B. Wire Basket Type Cable Tray

1. Wire basket crosswire to be constructed with shaped wire to provide flat surface for cable support, avoiding pressure points or cable strain. Round wire construction not allowed.
2. Wire basket shall be made of high strength steel wires and formed into a standard 2 inch by 4 inch wire mesh pattern with intersecting wires welded together. All mesh sections must have at least one bottom longitudinal wire along entire length of straight section.
3. All fittings shall be field formed, from straight sections, in accordance with manufacturer’s instructions.
4. Powder Coat: Straight sections shall be powder coated white or as approved by Architect, with an average paint thickness of 1.2 mils (30 microns) to 3.0 mils (75 microns).

2.3 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray. Cable Trays, Fittings, and Accessories: Aluminum, complying with NEMA VE 1, Aluminum Association's Alloy 6063-T6 for rails, rungs, and cable trays, and Alloy 6061-T6 for fabricated parts; with Type 316 stainless-steel splice-plate fasteners, bolts, and screws

B. Cable Trays, Fittings, and Accessories: Same material and finish as tray. Complying with NEMA VE 1.

C. Sizes and Configurations: Refer to drawings for indicated sizes and lengths.

1. Center-hanger supports may be used when indicated.

D. Cable Drops: Same finish as Cable tray.
   1. Center Dropouts – For use directly over racks and wall mounted equipment.
   2. Cable Exits
   3. Drop out Kits.

E. Barrier Strips: Same materials and finishes as cable tray.

F. Cable tray supports and connectors, including bonding jumpers, as recommended by the cable tray manufacturer.

G. All Tray sections and splicing assemblies shall be UL Classified as an Equipment Ground Conductor (EGC).

H. Special accessories shall be furnished as required to protect, support, and install a cable tray support system.

2.3 WARNING SIGNS

A. Lettering: 1-1/2-inch- (40-mm-) high, black letters on yellow background with legend "WARNING! NOT TO BE USED AS WALKWAY, LADDER, OR SUPPORT FOR LADDERS OR PERSONNEL."

B. Materials and fastening are specified in Division 26 Section "Identification for Electrical Systems."

2.4 SOURCE QUALITY CONTROL

A. Perform design and production tests according or NEMA VE 2.

**PART 3 - EXECUTION**

3.1 CABLE TRAY INSTALLATION

A. Comply with recommendations in NEMA VE 2. Install as a complete system, including all necessary fasteners, hold-down clips, splice-plate support systems, barrier strips, hinged horizontal and vertical splice plates, elbows, reducers, tees, and crosses.

B. On jobs over 300 feet (90 m) in total length, installers must be certified and trained by manufacturer.

C. Remove burrs and sharp edges from cable trays.

D. Fasten cable tray supports to building structure and install seismic restraints. Underfloor cable tray shall be installed with adjustable floor supports that do not attach rigidly to floor posts. Supports shall be free standing and shall be usable with 24 inch (610 mm) section or 120 inch (3048 mm) sections of cable tray.

   1. Design each fastener and support to carry load indicated by seismic requirements.
   2. Design each fastener and support to comply with seismic-restraint details according to Division 26 Section "Vibration and Seismic Controls."
   3. Place supports so that spans do not exceed maximum spans on specified or required by installation standards.

4. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.
5. Support bus assembly to prevent twisting from eccentric loading.
6. Manufacturer center-hung support, designed for 60 percent versus 40 percent eccentric loading condition, with a safety factor of 3.
7. Ceiling-mounted supports mount to ceiling structure directly or with 3/8” threaded rod.

E. When connecting cable tray to equipment, make connections with flanged fittings fastened to cable tray and to equipment. Support cable tray independent of fittings. Do not carry weight of cable tray on equipment enclosure.

F. Install expansion connectors where cable tray crosses building expansion joint and in cable tray runs that exceed dimensions recommended in NEMA VE 2. Space connectors and set gaps according to applicable standard.

G. Make changes in direction and elevation using manufacturer recommended fittings.

H. Make cable tray connections using standard fittings.

I. Seal penetrations through fire and smoke barriers according to Division 07 Section on penetration firestopping with UL listed STI EZ-Path 44+ Series device or approved equal. Install E90 certified cable tray (90 minute fire rated) for critical circuits, hallways or in areas of egress as shown on drawings.

J. Provide STI EZ-Path44+ Series or equal for all penetrations and future penetrations 2” and 4” through fire rated walls that meet the requirements of the UL assembly being penetrated. Any areas of non-typical construction will require UL engineering judgement prior to determining methods of fire rating sealant.

K. Workspace: Install cable trays with enough space to permit access for installing cables.

L. Install barriers to separate cables of different systems, such as power, communications, and data processing; or of different insulation levels, such as 600, 5000, and 15,000 V.

M. After installation of cable trays is completed, install warning signs in visible locations on or near cable trays at 25 feet (750 mm) centers along cable tray, located to be visible**.**

3.2 CABLE INSTALLATION

A. Install cables only when cable tray installation has been completed and inspected.

B. Velcro Straps
1. Cables shall be fastened to support structures with Velcro straps.
2. Velcro straps installed in air handling spaces must be plenum rated.
   a. Plenum Velcro strap color shall be red.
3. Use 1-inch wide Velcro to secure cables to all support structures.

C. On vertical runs, fasten cables, separated by type and color, to tray every 18 inches (457 mm). Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

D. Ground cable trays according to manufacturer's written instructions, and to conform to local codes and regulations.

## 3.3 CONNECTIONS

A. Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Cable trays with electrical power conductors shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

C. Cable trays with single-conductor power conductors shall be bonded together with a grounding conductor run in the tray along with the power conductors and bonded to the tray at 72-inch (1800-mm) intervals. The grounding conductor shall be sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors," and Article 392, "Cable Trays."

D. Cable trays with powder-coat paint should have coating mask completely removed at factory supplied grounding location and splice with listed connectors as recommended by manufacturer. After completing splice-to-grounding-bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.

E. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

## 3.4 FIELD QUALITY CONTROL

A. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements. Perform the following field quality-control survey:

1. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable tray, vibration, and thermal expansion and contraction conditions, which may cause or have caused damage.
2. Verify that the number, size, and voltage of cables in cable tray do not exceed that permitted by NFPA 70. Verify that communication or data-processing circuits are separated from power circuits by barriers.
3. Verify that there is no intrusion of such items as pipe, hangers, or other equipment that could damage cables.
4. Remove deposits of dust, industrial process materials, trash of any description, and any blockage of tray ventilation.
5. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
6. Check for missing or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
7. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable tray. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.

B. Report results in writing to Engineer of Record.

## 3.5 PROTECTION

A. Protect installed cable trays.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by cable tray manufacturer.
3. Install temporary protection for cables in open trays to protect exposed cables from falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials until the risk of damage is over.

B. Touch-up, repair or replace damaged products before Substantial Completion

END OF SECTION

# SECTION 270001
# GENERAL REQUIREMENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

B. This Division shall/must be used in conjunction with the following other specifications and related Contract Documents to establish the total general requirements for the communications systems and equipment:

1. Contract Documents.
2. Division 00 –Procurement & Contracting Requirements Group.
3. Division 01 – General Requirements.
4. Division 26
5. Division 270526 Grounding and Bonding for Communications Systems
6. Division 270528 Pathways for Communications Systems
7. Division 270536 Cable Trays for Communications Systems
8. Division 271323 Communications Optical Fiber Backbone Cabling
9. Division 271513 Communications Copper Horizontal Cabling
10. Division 271700 Testing, Identification and Administration of Fiber Infrastructure
11. Division 271710 Testing Id and Administration of Balanced Twist Pair Infrastructure

### 1.2 REFERENCES

A. All codes and standards shall be the newest in effect at the time of project award or Notice to Proceed (whatever occurs first).

1. ANSI/BICSI N1
2. BICSI Telecommunications Distribution Methods Manual (TDMM)
3. BICSI Transport Systems Installation Methods Manual (ITSIMM)
4. NECA 1
5. NECA 101
6. NECA 102
7. NECA 105
8. NFPA 70
9. TIA-568
10. TIA-568-0
11. TIA-568-1
12. TIA-568-2
13. TIA-569
14. TIA-606
15. TIA-607

### 1.3 WARRANTY

A. The Low Voltage Contractor shall/must employ an RCDD as a permanent staff member, supply references for projects completed of similar size and scope, specific references of installation of copper and fiber optic cabling systems tested to the highest testing standards and the MANUFACTURERS specifications throughout the project and shall/must employ BICSI Certified technicians as permanent staff members.

B. The Low Voltage Contractor shall/must submit a manufacturer limited lifetime warranty on all Fiber-Optic and Copper Structured Cabling Systems.

C. The Low Voltage Contractor shall/must supply a material list which includes quantities, manufacturer name, manufacturer part number and a description of all components required for a complete cabling system.

1.4 COORDINATION

A. Coordinate layout and installation of active equipment with the owners Information & Technology Services department.

1. Meet jointly with the owner and/or their designated representatives to exchange information and agree on details of equipment arrangements and installation interfaces.

2. Record agreements reached in meetings and distribute them to other participants.

3. Adjust arrangements and locations of distribution frames, cross-connects and patch panels in equipment rooms to accommodate and optimize space requirements with other Telecommunications, AV, CATV, electronic safety and security, BAS/ BMS and related systems sharing space in the equipment room(s).

1.5 SUMMARY

A. This Division includes general requirements specifically applicable to Division 27.

B. The Low Voltage Contractor shall/must be responsible for:

1. Providing all additional materials, and the necessary labor and services required to ensure all components of the system are completely installed in accordance with the intent of the Contract Documents and relevant drawings.

2. Furnishing and installing all incidental items not actually shown or specified, but which are required by good practice to provide complete functional systems.

3. Coordinating the details of facility equipment and construction for all specification divisions affecting the work covered under this Division.

4. Coordinating all activities with the overall construction schedule and communicating to the owner or owners designated representative any site, logistics or trade coordination issues which will impact the schedule, budget and/or completion schedule dates.

5. Developing bill of materials, perform material management and efficient use

of the materials whether they are issued by the Low Voltage Contractor, the owner or purchased by the Low Voltage Contractor.

6. Ensure materials attic stock (extra materials) are turned over to the owner and are properly documented and signed for. Items shall be complete, kept in their original condition, and packaging for restocking.

7. Ensure the project is properly registered for a Manufacturer‘s Structured Cabling System (SCS) warranty and provide the supporting documentation for all warranties and employee credentials.

C. Intent of Drawings:

1. LV Series drawings show only general locations of equipment, devices, raceways, cable trays, boxes, etc. All dimensioned locations and elevations are approximate. The Low Voltage Contractor shall/must be responsible for the field coordination of communications work with the other trades prior to beginning work.

2. The Low Voltage Contractor shall/must be responsible for the proper placement and routing of equipment, cable, raceways, cable tray, and related components in coordination with the general and electrical contractor (division 26) and the design team (architect, engineers, and designer) according to the Contract Documents and subject to prior review by the Low Voltage Contractor.

3. Refer all conflicts between Contract Documents to the owner or owner’s representatives and general contractor/construction manager for resolution.

1.6 DEFINITIONS

A. Active Equipment: Electronic equipment used to develop, deliver and support various WAN and LAN services.
B. Backbone: Collective term sometimes used to describe the campus and vertical distribution subsystem facilities and media interconnecting service entrances, communications rooms, and communications cabinets.
C. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.
D. BICSI: Building Industry Consulting Service International.
E. BICSI - RCDD: Registered Communications Distribution Designer.
F. BICSI TDMM: Telecommunications Distribution Methods Manual.
G. Bonding: the Permanent joining of metallic parts to form an electrically conductive path which will assure electrical continuity and the capacity to conduct safely any current likely to be imposed on it.
H. Building Equipment Room/Main Distribution Facility (BER/MDF): Room in each building used to distribute communications services to Telecommunications Rooms (TR/IDF) in the same building. Typically, the BER/MDF contains passive equipment used for electrical protection (protectors) and building cross-connect, and active network equipment used for LANs. The BER/MDF may also serve the function of a TR.
I. Cabinet: Freestanding, floor-mounted modular enclosure designed to house and protect rack-mounted electronic equipment and connectivity.
J. Cable Tray (Runway): Vertical and/or horizontal open supports usually made of aluminum or steel that is fastened to a building ceiling or wall. Cables are laid in and

fastened to the trays. A cable tray is not a raceway.

K. Campus: Physically contiguous grounds and buildings of a multi-building premises environment.

L. Channel: The end-to-end transmission path between two points at which application-specific equipment is connected; may include one or more links, cross-connect jumpers and/or patch cords, and work area station cords. Does not include connection to active equipment.

M. Channel Cable Tray: A fabricated structure consisting of a one-piece, ventilated-bottom or solid-bottom channel.

N. Communications Equipment Room – See Telecommunications Room (TR).

O. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.

P. Cross-Connect: Equipment used to terminate and tie together communications circuits (Point of Administration between services and client devices).

Q. Cross-Connect Jumper: A cluster of twisted-pair conductors without connectors used to establish a circuit by linking two cross-connect termination points.

R. EF: Entrance Facility.

S. EMI: Electromagnetic interference.

T. Fiber Optic Distribution Unit (FDU): Cabinet with terminating equipment used to develop fiber optic cross-connect facilities. (also referred to as an LIU or Light-guide Interconnecting Unit)

U. Grounding: A conducting connection to earth, or to some conducting body that serves in place of earth.

V. Hinged Cover Enclosure: Wall-mounted box with a hinged cover that is used to house and protect electrical devices.

W. Horizontal: Pathway facilities and media connecting Telecommunications Rooms (TR) to Telecommunications Outlets (TO).

X. IDC: Insulation displacement connector.

Y. Inner-Duct: product used to sub-divide the capacity of a larger conduit into smaller compartments.

Z. Jack: Receptacle used in conjunction with a plug to make electrical contact between communications circuits, e.g., eight-position/eight-contact modular jacks or RJ-45.

AA. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).

BB. LAN: Local Area Network.

CC. Link: A transmission path between two points, not including terminal equipment, work area cables, and equipment cables; one continuous division of conductors or fiber, including the connecting hardware at each end.

DD. Local Area Network (LAN): Data transmission facility connecting several communicating devices, e.g., serial data, Ethernet, token ring, etc. Typically, the network is limited to a single physically contiguous site.

EE. Main Equipment Room (Main Distribution Frame) – (MER/MDF): The room used to distribute communication services to all Building Equipment Rooms (BER's/IDF's/TR's) on the premises, and to interconnect premises services with the telephone companies. Typically, the MER contains passive equipment used for electrical protection (protectors) and main campus cross-connect, and active equipment used for PBX, WAN, and LAN.

FF. Media: Twisted-pair, coaxial, and fiber optic cable or cables used to provide signal transmission paths.

GG. Mounting Frame: A rectangular steel framework that can be equipment rack or wall mounted to support wiring blocks, patch panels, and other communications equipment.

HH. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlets/connectors.
II. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
JJ. NRTL: Nationally Recognized Testing Laboratory
KK. NSPD: North Smithfield Police Department
LL. OSP: Outside plant-rated cable.
MM. Passive Equipment: Non-electronic hardware and apparatus, e.g., equipment racks, cable trays, electrical protection, wiring blocks, fiber optic termination hardware, etc.
NN. Patch Cords: A length of wire or fiber cable with connectors on one or both ends used to join communications circuits at a cross-connect.
OO. Patch Panel: System of terminal blocks or connectors used with patch cords that facilitate administration of cross-connect fields.
PP. Pathway: Facility for the placement of communications cable. A pathway facility can be composed of several components, including conduit, wireway, cable tray, surface raceway, underfloor systems, raised floor, independent ceiling support wires, etc.
QQ. Private Branch Exchange (PBX): Private communications switching system located on the user's premises. A PBX switches voice and data calls within a building or premises and between the premises and facilities provided by public common carrier networks.
RR. Protectors: Electrical protection devices are used to limit foreign voltages on metallic communications circuits. These are listed for the application, typically by UL.
SS. Raceway: An enclosed channel designed expressly for holding wires or cables; may be of metal or insulating material. The term includes conduit, tubing, wireway, underfloor raceway, and surface raceway; does not include cable tray.
TT. Racks: An open, freestanding, floor-mounted structure, typically made of aluminum or steel, used to mount equipment; usually referred to as an equipment or relay rack.
UU. Telecommunication Outlet (TO): Connecting device mounted in a work area used to terminate horizontal cable and interconnect cabling with station/user equipment.
VV. Telecommunications Room (TR/IDF): Distributes communications services to users within a serving zone and interconnects with the BER/MDF. Typically, the TR/IDF contains passive equipment used for cross-connect and active network equipment used or LANs. TR is sometimes referred to as the communications equipment room or Intermediate Distribution Facility (IDF).
WW. Trough: Voice wall field wire manager.
XX. TR: Telecommunications Room/IDF.
YY. Wide Area Network (WAN): Active communications transmission facilities extending beyond the premises.
ZZ. Wiring Block: Punch down terminating equipment used to develop twisted-pair cross-connect facilities.

## 1.7 SYSTEM DESCRIPTION

A. The contractor shall implement a comprehensive, integrated communications distribution system, as described in paragraph B below, which may be used to support one or more of the following services and systems:

1. Data Telecommunications.

2. Wireless systems.

3. Paging and Mass Notification (Visual and Audible).

4. Audio-Visual Systems.

5. Security Systems – Division 28

6. Building Management Systems – (mechanical Division 23, lighting Division 26, etc.)

B. The communications distribution system consists of the following major subsystems, as specified elsewhere:

1. Intra-building Backbone (Risers): The intra-building subsystem refers to all twisted-pair and fiber optic backbone communications cabling connecting the Main Telecommunications Room (MDF) to each Telecommunication Room (TR) in the buildings. (Building Backbones)

2. Equipment Rooms: The equipment room contains the distribution subsystem comprised of the passive components used to terminate cabling subsystems and distribute communications services from active equipment. This subsystem includes installations in the Building Equipment Rooms (BERs), in Telecommunications Rooms (TRs) and Telecommunications Enclosures (TEs).

3. Horizontal Distribution: The horizontal distribution subsystem refers to all intra-building twisted-pair and fiber optic communications cabling connecting telecommunication rooms (TRs) to telecommunication outlets (TOs) located at individual work areas. Constructed as specified in Division 27 15 00.

C. The communications distribution system may include but is not limited to the following:

1. 100-ohm 4-pair unshielded twisted-pair cable (UTP), (Cat 5e, Cat 6, Cat 6A)

2. 100-ohm 4-pair shielded twisted-pair cable (F/UTP) (Category 6A)

3. 850 nm Laser Optimized 50/125-micron multimode fiber optic cable (OM4).

4. 8.3/125-micron single-mode fiber optic cable. (OS2)

5. 8-position Telecommunications Jacks (modular inserts).

6. Unloaded Telecommunications Patch Panels. Field loaded with color-coded connectors.

7. Insulation displacement connector (IDC) type field terminated wiring blocks.

8. Factory terminated copper patch cords manufactured by the structured cabling system manufacturer.

9. Rack mounted fiber optic hardware.

10. Fiber optic connectors.

11. Factory terminated fiber optic patch cords (jumpers).

D. The work locations and limits of work are shown on the drawings.

1.8 TELECOMMUNICATIONS ROOM DESIGN CRITERIA – GENERAL CONTRACTOR

A. Compliance by the Low Voltage Contractor with the provisions of this specification does not relieve them of the responsibilities of furnishing materials and equipment of proper design, mechanically and electrically suited to meet operating guarantees at the specified service conditions.

B. The following are incorporated into the Telecommunications Room (TR) design and shall/ must be provided by the General Contractor:

1. TR's shall/must be designed to be as similar as possible and stacked floor to floor.

2. The location of TR's is intended to restrict the maximum horizontal subsystem wiring length (defined as a channel between a telecommunications room cross-connect termination field and a served Telecommunications Outlet) to a maximum of 295 feet (90 meters).

3. Floors shall/must be concrete or VCT, no carpeting will be allowed. Ceiling shall/must be open, no hung ceiling required (cabling will be supported above cabinets and racks in cable tray). Concrete flooring shall/must be properly sealed to minimize dust and moisture migration.

4. The walls of the Telecommunications Rooms shall/must be covered with ¾" fire-retardant-rated Plywood, surface grade A-C or better, installed with the smooth (A) side facing into the room. Grade stamps shall/must be left unpainted to facilitate inspection.

5. Air conditioning shall/must be provided for each room with a minimum of 3000 BTU's per equipment rack with a minimum of 2 air exchanges per hour. Co-located AV equipment generates additional heat output and shall/must be reviewed on a per project basis. (Specific for Telecommunications Rooms)

6. Any TR that is traversed by plumbing or other HVAC piping must be provided with "drip" pans below piping or any other moisture-producing infrastructure to divert moisture and condensation from above ceiling areas.

1.9 PROJECT ELECTRICAL REQUIREMENTS – DIVISION 26

A. All electrical components required for the low-voltage cabling system for this project shall/must be provided by the Division 26 contractor.
B. Telecommunications Room – lighting and power outlets.
C. LED lighting to be configured a minimum of 15" from cable tray, racks, equipment etc., and shall/must have guards installed over the tubes.
D. Outlets – Power outlets in Telecommunications Rooms.
E. One (1) telecommunications grounding Busbar (TGB) shall/must be provided and installed per telecommunications room. per local codes, TIA/EIA-607-C

requirements, and the NEC. Utilize Existing TGB

F. Bonding Lugs - Two-hole, long barrel copper compression lugs for grounding conductors shall/must be color-coded barrel. Utilize the proper grounding crimp tool to complete the installation.

G. Floor to Floor fire rated reusable Sleeves – Conduit sleeves and bushings. Refer to the T-Series drawings for additional information.

H. Low Voltage Outlets – Backboxes and Conduit. Division 26 shall coordinate all backbox and conduit requirements with the telecommunications contractor (division 27) via a minimum of two (2) 1-hour coordination meetings prior to the start of rough-in.

## 1.10 FIRESTOPPING

A. Fire Stopping materials shall/must be UL Listed, re-enterable, reusable, and manufactured by STI, Hilti, 3M, or approved equal.

## 1.11 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cable, equipment frames, and cable trays until spaces are enclosed and weather-tight and wet work in spaces are complete and dry.

B. All Low Voltage Cable shall/must be stored and installed within the temperature and humidity guidelines of the manufacturer(s) products.

C. Do not install cable or leave services loops where damage from construction equipment and other trades activities will subject them to damage or loss of overall integrity.

## 1.12 QUALIFICATIONS

A. Licensing

1. Low Voltage Contractor shall/must submit a copy valid state contractors license and Rhode Island TSC Telecommunications System Contractors License and a copy of each apprentice and technician as required by the state of Rhode Island.
   - State Of Rhode Island Telecommunications System Contractor (TSC) License
   - State Of Rhode Island Telecommunications System Technician (TST) License

B. Low Voltage Contractor Qualifications: For Contractor, qualified layout technician, installation supervisor, and field inspector.

1. Layout Responsibility: Preparation of Shop Drawings shall/must be under the direct supervision of Contractor's RCDD.

2. Installation Supervision: Installation shall/must be under the direct supervision of a BICSI Registered Technician, who shall/must be present at all times when Work of this Section and related Sections is performed at the Project site. All technicians shall/must be trained and certified by the specified Structured Cabling System (SCS) manufacturer. Apprentices and installers shall/must be directly supervised by the Technician and/or RCDD.

3. Field Inspector: Currently registered by BICSI as permanently employed RCDD to perform the on-site inspection.

C. Communications Pathway Installation: The Low Voltage Contractor shall/must have 5 years of documented experience installing raceway and cable tray systems for each of the types and system material components specified in the Contract Documents, e.g., underground duct banks, cable tray, etc. In the case of newer technologies that do not have a 3-year history, the Low Voltage Contractor shall/must have documented experience for at least half of the lifetime of the new technology.

D. The Low Voltage Contractor selected for this project must be certified by the manufacturer of the products, adhere to the engineering, installation, and testing procedures, and utilize the authorized manufacturer components and distribution channels in provisioning this project.

E. Company certificate & letter from manufacturer(s) stating that their certification is in current standing shall/must be included with submittal package.

F. The Low Voltage Contractor shall/must be experienced in all aspects of this work and shall/must be required to demonstrate direct experience on recent systems of similar type and size. The Low Voltage Contractor shall/must own and maintain tools and equipment necessary for successful installation and testing of fiber optic cables, Category 5e, Category 6 and Category 6A Copper Cabling and Coaxial Cabling premise distribution systems and have personnel who are adequately trained in the use of such tools, equipment and current system manufacturer's training/installation requirements.

G. All on-site labor must be in compliance with Job-Site Specific requirements.

H. A resume of qualification shall/must be submitted with the Low Voltage Contractor's proposal indicating the following:

1. A list of recently completed projects of similar type and size with contact names and telephone numbers for each.

2. A list of test equipment proposed for use in verifying the installed integrity of metallic and fiber optic cable systems on this project.

3. A technical resume of experience for the Low Voltage Contractor's Project Manager and on-site installation supervisor who will be assigned to this project.

4. A list of technical product training attended by the Low Voltage Contractor's personnel that will install the structured cabling system shall/must be submitted with the response.

5. Any sub-contractors, who will assist the Certified Low Voltage Contractor in the performance of this work, shall/must have the same training and certification as the Low Voltage Contractor.

1.13 SUBMITTALS

A. General:

1. Provide ongoing inspection and permit certificates and certificates of final inspection and acceptance from the authority having jurisdiction.

2. Manufacturer's standardized schematic diagrams and catalog cuts shall/must not be acceptable unless applicable portions of same are clearly indicated and non-applicable portions clearly deleted or crossed out.

3. When the specifications include product descriptions, model numbers, part numbers, etc. that have been superseded, changed, or discontinued, the Low Voltage Contractor shall/must issue a comparable substitution to the design team for review.

B. Product Data: Provide product data for each type of product indicated, specified, and shown on drawings or schedules, prepared in coordination with product manufacturers, suppliers, and vendors. Provide the above with all model/part numbers, colors, types, accessories, etc. clearly highlighted on all product data sheets.

1. Provide a table of contents with page numbers and list the Data Sheets in the order the products appear in the "Products Sections" of each Division.

C. Shop Drawings: For Telecommunications equipment (MDF, IDFs) room(s). Include plans, elevations, sections, details, and attachments to other work.

1. Telecommunications Cable Runway.
2. Telecommunications Equipment Racks, Cabinets and Cable Management.
3. All wall mounted equipment.
4. Fire Stopping Materials.

1.14 PROJECT RECORD DOCUMENTS

A. Provide one (1) complete set of "AS-BUILT" drawings in AutoDesk AutoCAD (2018 or newer) and PDF (softcopy) format within 30 days after completion and before acceptance of all components of the Network Cabling System included in this division. Refer to the latest version of the owner's Standards and Specifications for additional information.

B. Maintain separate sets of red-lined "field set" of record drawings for the telecommunications and audiovisual work, which show the exact placement and identification of as-built system components during the installation-construction process.

C. Provide telecommunication outlet (TO) exact location with labeling on final record drawings.

D. Provide communication pathway record drawings that indicate exact placement and routing for all components, e.g., maintenance holes, hand-holes, conduit, wireway, cable tray, pull boxes, enclosures, telecommunications outlet boxes, etc.

E. Provide communication room record drawings that indicate the exact placement for all components, e.g., conduit, wireway, cable tray, backboards, equipment cabinets, equipment racks, cross-connect equipment, etc.

F. Provide communication wiring and cabling record "As-Builts'" drawings and schedules which indicate exact placement, routing, and connection details for all components, e.g., twisted-pair and fiber optic cables, splices, cable cross-connect termination locations, enclosures, telecommunications outlets, cross-connect jumpers, patch cords, etc.

G. Provide network schematics when appropriate.

Note: All "RECORD" and "AS-BUILT DRAWINGS" shall/must be completed from a conformance set of drawings or from the most recent addended set of T and TA-Series drawings.

1.15 DEFINITION OF ACCEPTANCE

A. System acceptance shall/must be defined as that point in time when the following requirements have been fulfilled:

1. All submittals, test results and documentation have been submitted, reviewed, and approved.

2. The complete system has successfully completed all testing requirements.

3. All owner staff personnel training programs have been completed.

4. All punch list items have been corrected and accepted.

5. Project registration certificate for warranty by manufacturer has been provided.

**PART 2 PRODUCTS**

2.1 Approvals and substitutions

A. All products provided for this project shall/must be "NEW" and of current design from the original manufacturer(s) as specified.

B. Products shall/must be purchased through authorized manufacturers and/or distributors with a quality system in-place to ensure products are genuine and traceable to the point of manufacture.

C. All required system material shall/must be delivered, assembled and installed in a neat and workmanlike manner. All methods of work not specifically described or indicated in the contract documents shall/must be subject to the control and approval of the owner and/or owner's representative. All specified materials shall/must be of the quality and manufacture indicated in the appropriate division. The material specified is based upon the acceptable manufactures listed. Where "Approved Equal" is stated, material shall/must be equivalent in every way to that of the material specified and subject to written approval from the owners Information & Technology Services and/or their designated owners representatives.

**PART 3 - EXECUTION**

3.1 WORKMANSHIP

A. Manufactured products, materials, equipment, and components shall/must be provided, conditioned, applied, installed, connected, and tested in accordance with the manufacturer's specifications and printed instructions.

B. All system components shall/must be installed under the direction of qualified personnel. The appearance shall/must be considered as important as mechanical and electrical efficiency. Workmanship shall/must meet or exceed industry standards.

3.2 SERVICE CONTINUITY

A. Maintain continuity of communications services to all functioning portions of the process or buildings during hours of normal use.

B. Arrange temporary outages for cutover work with the electrical contractor or general contractor. Keep outages to a minimum number and a minimum length of time in order to provide minimum impact.

C. Advise the owner and/or their designated representatives in advance of any and all activities that will disrupt or affect services for any length of time.

D. Cables and components serving life safety and/or fire alarm systems require the inclusion of other trades, public service or safety personnel to be present during the cut-over of services and this shall/must be coordinated in advance through NSPD and/or their designated representative.

3.3 LAYOUT AND TOLERANCES

A. Follow as closely as practicable the design shown on the drawings. Make all necessary measurements in the field to verify exact locations and ensure precise location and fit of specified items in accordance with the drawings. Make no substantial alterations without the prior approval of the owners' IT department and/or their designated owner's representative.

B. Perform all work to the lines, grades, and elevations indicated on the drawings. Provide experienced, competent personnel to locate and lay out the work and provide them with suitable tools, equipment, and other materials required to complete layout and measurement work. Use lasers or other approved methods to establish line and grade.

3.4 CONSTRUCTION REVIEW

A. NSPD Information & Technology Services shall/must review and observe installation work to ensure compliance by the Low Voltage Contractor with requirements of the Contract Documents.

B. The Low Voltage Contractor shall/must inspect and test the completed network cabling installation to demonstrate specified performance requirements including the following:

1. Furnish all instruments and personnel required for the inspections and tests.

2. Perform tests in the presence of the owners IT department and/or their designated representative.

3. Demonstrate that the system components operate in accordance with the Contract Documents.

END OF SECTION 270001

# SECTION 271323

# COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. Section Includes:
1. 850 nanometer laser-optimized 50/125 micrometer multimode optical fiber cable (OM4).
2. 9/125 micrometer single-mode, indoor optical fiber cable (OS2).
3. Optical fiber cable connecting hardware, patch panels, and cross-connects.
4. Cabling identification products.

1.3 DEFINITIONS

A. AHJ: Authorities Having Jurisdiction

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. EMI: Electromagnetic interference.

D. FTP: Shielded twisted pair.

E. F/FTP: Overall foil screened cable with foil screened twisted pair.

F. F/UTP: Overall foil screened cable with unscreened twisted pair.

G. IDC: Insulation displacement connector.

H. LAN: Local area network.

I. Jack: Also commonly called an "outlet," it is the fixed, female connector.

J. NRTL: Nationally Recognized Testing Laboratory

K. NSPD: North Smithfield Police Department

L. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.

M. RCDD: Registered Communications Distribution Designer.

N. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

O. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

P. S/FTP: Overall braid screened cable with foil screened twisted pair.

Q. S/UTP: Overall braid screened cable with unscreened twisted pairs.

R. UL: Underwriters Laboratories

S. UTP: Unscreened (unshielded) twisted pair.

1.4 REFERENCES

A. All codes and standards shall be the newest in effect at the time of project award or Notice to Proceed (whatever occurs first).
   1. ANSI/BICSI N1
   2. BICSI Telecommunications Distribution Methods Manual (TDMM)
   3. BICSI Transport Systems Installation Methods Manual (ITSIMM)
   4. NECA 1
   5. NECA 101
   6. NECA 102
   7. NECA 105
   8. NFPA 70
   9. TIA-568
   10. TIA-568-0
   11. TIA-568-1
   12. TIA-568-2
   13. TIA-569
   14. TIA-606
   15. TIA-607

1.5 BIDDING REQUIREMENTS

A. Contractor and technician licenses and certifications.
   1. Federal and State Licenses
      a. Rhode Island – Telecommunications System Contractor License
      b. Rhode Island – Telecommunications System Technician License

B. Manufacturer Certifications
      a. Cabling, connector, plug, etc.

C. Installer Qualifications, submit on all the following:

   1. System installer shall have on staff a RCDD (registered communication distribution designer) certified by BICSI (Building Industry Consulting Service International).
   2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician Level 2 Installer, who shall be present at all time when Work of this Section is performed at Project site.
   3. System Installer shall hold relevant certifications for all products and materials required by the scope of this project beyond those listed above.
   4. System Installer shall carry all state, federal and local licenses.
   5. System Installer shall carry OSHA 10 or OSHA 30 certification.

6. On a separate sheet, list 3-5 structured cabling projects the contractor's organization has completed or is in progress of completing, the past 5 years. Projects shall utilize the basis of design products and/or systems.
   a. Name of project:
   b. Project summary:
   c. Contact name:
   d. Contract amount:
   e. Date of completion:
   f. Percentage of the cost of the work performed with the contractor's own forces:

B. The Contractor shall not employ a Subcontractor to fulfill any of the duties as herein specified unless expressly allowed by the general conditions of the project.

1.6 OPTICAL FIBER BACKBONE CABLING DESCRIPTION

A. Optical fiber backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Reviewed and stamped by RCDD.

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics including the following:
   a. Telecommunications rooms plans and elevations.
   b. Telecommunications pathways.
   c. Telecommunications system access points.
   d. Telecommunications grounding system.
   e. Cross-connects.
   f. Patch panels.
   g. Patch cords.

5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

C. Optical fiber cable testing plan.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For RCDD, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Product Certificates: For each type of product.

D. Field quality-control reports.

1.9 CLOSEOUT SUBMITTALS

A. Maintenance Data: For optical fiber cable, splices, and connectors to include in maintenance manuals.

1.10 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Patch-Panel Units: One of each type.
2. Fiber enclosure. One of each type
3. Fiber Patch Cables (jumper cables): Ten of each type.

1.11 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer shall have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings and Cabling Administration Drawings, by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.

1.13 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.14 COORDINATION

A. Coordinate enclosure and rack layouts with the owners IT department, Internet service provider, and LAN equipment suppliers.

B. Coordinate the layout and installation of telecommunications pathways and cabling with all trades to verify and rectify clashes prior to installation.

1.15 WARRANTY

A. Optical fiber cabling twenty-five (25) Year Warranty for premise communications wiring.
   1. The systems integrator shall provide proof that they are authorized and certified, in good standing, to offer a 25-year warranty.
   2. The warranty shall include connecting hardware products and installed cable as part of the optical fiber cabling system.
   3. The optical fiber cabling system shall include:
      a. Termination enclosures
      b. Backbone cabling
      c. The connecting hardware in the horizontal cross-connect
      d. The equipment cords.
      e. The patch cords for the horizontal cross-connect and equipment connection.
   4. The warranty system performance shall guarantee that:
      a. The optical fiber cabling system shall be free from defects in materials and workmanship, for duration of the warranty.
      b. The optical fiber cabling system shall support any current or future application ratified by IEE, ANSI, ISO, designed to operate compliant optical fiber draft or standard in effect at the time of the installation, for the duration of the warranty.
   5. If the optical fiber cabling system is determined to be defective within the scope of this warranty, the product found to be non-conforming shall be repaired or replaced under this warranty.
   6. Optical fiber cabling system shall be tested per the manufacturer's warranty requirements.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 50 or less.

C. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

D. Grounding: Comply with TIA-607-B.

2.2 MULTIMODE OPTICAL FIBER CABLE (OM4)

A. Description: Multimode, 50/125-micrometer, dielectric (nonmetallic) armoring, non-conductive tight buffer, optical fiber cable. Refer to drawings for additional information.

B. Standards:

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA-568-C.3 for performance specifications.
3. Comply with TIA-492AAAD for detailed specifications.

C. Maximum Attenuation: 2.8 dB/km at 850 nm; 1.0 dB/km at 1300 nm.

D. Minimum Overfilled Modal Bandwidth-length Product: 3500 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

E. Jacket:

1. Jacket Color: Aqua.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

F. Listed and labeled by an NRTL acceptable to AHJ as complying with UL 444, UL 1651, and NFPA 70 for the following types:

2.3 9/125 MICROMETER SINGLE-MODE, INDOOR, OPTICAL FIBER CABLE (OS2)

A. Description: Single mode, 9/125-micrometer, dielectric (nonmetallic) armoring, non-conductive tight buffer, optical fiber cable. Refer to drawings for additional information.

B. Standards:

1. Comply with TIA-492CAAA for detailed specifications.
2. Comply with TIA-568-C.3 for performance specifications.
3. Comply with ICEA S-104-696 for mechanical properties.

C. Armored cable shall be dielectric armored type.

D. Maximum Attenuation: .65 dB/km at 1310 nm; .65 dB/km at 1383 nm; .5 dB/km at 1550 nm.

E. Jacket:

1. Jacket Color: Yellow
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

F. Listed and labeled by an NRTL acceptable to AHJ as complying with UL 444, UL 1651, and NFPA 70.

2.4 OPTICAL FIBER CABLE HARDWARE

A. All Hardware and components shall be per NSPD Information Technology Standards.

B. Standards:

1. Comply with Fiber Optic Connector Intermate ability Standard (FOCIS) specifications of the TIA-604 series.

2. Comply with TIA-568-C.3.

C. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.

1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

D. Patch Cords: Provide one (1) per patch panel duplex port plus 25percent extra for future. Factory-made, dual-fiber. Shall match cabling and patch panel manufacturer.
1. Lengths
a. Custom lengths to match

E. Connector Type: Type LC complying with TIA-604-10-B connectors.

F. Plugs and Plug Assemblies:

1. Male; color-coded modular telecommunications connector designed for termination of a single optical fiber cable.
2. Insertion loss not more than 0.3 dB.
3. Marked to indicate transmission performance.

G. Jacks and Jack Assemblies:

1. Female; quick-connect, simplex and duplex; fixed telecommunications connector designed for termination of a single optical fiber cable.
2. Insertion loss not more than 0.3 dB.
3. Marked to indicate transmission performance.
4. Designed to snap-in to a faceplate.

2.5 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with TIA-607-B.

2.6 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.7 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test multimode optical fiber cables according to TIA-526-14-B and TIA-568-C.3.

C. Factory test pre-terminated optical fiber cable assemblies according to TIA-526-14-B and TIA-568-C.3.

D. Cable shall be considered defective if it does not pass tests and inspections. Cabling shall be replaced with new non-defected cabling at no additional cost to the owner.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider. Coordinate exact routing and termination within the entrance facility.

3.2 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF OPTICAL FIBER BACKBONE CABLES

A. Comply with NECA 1, NECA 301, and NECA/BICSI 568.

B. General Requirements for Optical Fiber Cabling Installation:

1. Comply with TIA-568-C.1 and TIA-568-C.3.
2. Comply with BICSI ITSIMM, Ch. 6, "Cable Termination Practices."
3. Terminate all cables; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
4. Cables shall not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
6. Bundle, lace, and train cable to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable at no additional cost to the owner.
8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.

9. In the communications equipment room, provide a 10-foot- (3-m-) long service loop on each end of cable.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 4, "Pulling Cable." Monitor cable pull tensions and cable manufacturer's recommended installation methods.
11. Cable shall be terminated on connecting hardware that is rack, cabinet or wall mounted enclosures as indicated on drawings.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Group connecting hardware for cables into separate logical fields.

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI ITSIMM, "Firestopping" Chapter.

3.5 GROUNDING

A. Install grounding according to BICSI ITSIMM, "Grounding (Earthing), Bonding, and Electrical Protection" Chapter.

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

1. Administration Class: Class 2.
2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2 level of administration.

C. Comply with requirements in Section 271523 "Communications Optical Fiber Horizontal Cabling" for cable and asset management software.

D. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

F. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
4. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA 606-B, for the following:

1. Flexible vinyl or polyester that flexes as cables are bent.

## 3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections.

E. Tests and Inspections:

1. Visually inspect optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.

2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Optical Fiber Cable Tests:

    a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    b. Link End-to-End Attenuation Tests:

        1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in one direction according to TIA-526-14-B, Method B, One Reference Jumper.
        2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than those calculated according to equation in TIA-568-C.1.

F. Clean and inspect all fiber optic connector end faces per IEC 61300-3-35 “Basic Test and Measurement Procedures Standard for Fiber Optic Interconnecting Devices and Passive Components”.

G. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

H. Remove and replace cabling where test results indicate that it does not comply with specified requirements.

I. End-to-end cabling will be considered defective if it does not pass tests and inspections.

J. Prepare test and inspection reports.

END OF SECTION

# SECTION 271513

# COMMUNICATIONS COPPER HORIZONTAL CABLING

## PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. Section Includes:
1. Category 6 twisted pair cable.
2. Category 6a twisted pair cable.
3. Twisted pair cable hardware, including plugs and jacks.
4. Cabling identification products.
5. Grounding provisions for twisted pair cable.
6. Source quality control requirements for twisted pair cable.

1.3 DEFINITIONS

A. AHJ: Authorities Having Jurisdiction

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. EMI: Electromagnetic interference.

D. FTP: Shielded twisted pair.

E. F/FTP: Overall foil screened cable with foil screened twisted pair.

F. F/UTP: Overall foil screened cable with unscreened twisted pair.

G. IDC: Insulation displacement connector.

H. LAN: Local area network.

I. Jack: Also commonly called an "outlet," it is the fixed, female connector.

J. NRTL: Nationally Recognized Testing Laboratory

K. NSPD: North Smithfield Police Department

L. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.

M. RCDD: Registered Communications Distribution Designer.

N. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

O. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

P. S/FTP: Overall braid screened cable with foil screened twisted pair.

Q. S/UTP: Overall braid screened cable with unscreened twisted pairs.

R. UL: Underwriters Laboratories

S. UTP: Unscreened (unshielded) twisted pair.

1.4 REFERENCES

A. All codes and standards shall be the newest in effect at the time of project award or Notice to Proceed (whatever occurs first).
   1. ANSI/BICSI N1
   2. BICSI Telecommunications Distribution Methods Manual (TDMM)
   3. BICSI Transport Systems Installation Methods Manual (ITSIMM)
   4. NECA 1
   5. NECA 101
   6. NECA 102
   7. NECA 105
   8. NFPA 70
   9. TIA-568
   10. TIA-568-0
   11. TIA-568-1
   12. TIA-568-2
   13. TIA-569
   14. TIA-606
   15. TIA-607

1.5 BIDDING REQUIREMENTS

A. Contractor and technician licenses and certifications.
   1. Federal and State Licenses
      a. Rhode Island – Telecommunications System Contractor License
      b. Rhode Island – Telecommunications System Technician License

B. Manufacturer Certifications
      a. Cabling, connector, plug, etc.

C. Installer Qualifications, submit on all the following:

   1. System installer shall have on staff a RCDD (registered communication distribution designer) certified by BICSI (Building Industry Consulting Service International).
   2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician Level 2 Installer, who shall be present at all time when Work of this Section is performed at Project site.
   3. System Installer shall hold relevant certifications for all products and materials required by the scope of this project beyond those listed above.
   4. System Installer shall carry all state, federal and local licenses.
   5. System Installer shall carry OSHA 10 or OSHA 30 certification.

6. On a separate sheet, list 3-5 structured cabling projects the contractor's organization has completed or is in progress of completing, the past 5 years. Projects shall utilize the basis of design products and/or systems.
   a. Name of project:
   b. Project summary:
   c. Contact name:
   d. Contract amount:
   e. Date of completion:
   f. Percentage of the cost of the work performed with the contractor's own forces:

B. The Contractor shall not employ a Subcontractor to fulfill any of the duties as herein specified unless expressly allowed by the general conditions of the project.

1.6 COPPER HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable cabling system shall provide interconnections between Distributor A, Distributor B, or Distributor C, and the equipment outlet, otherwise known as "Cabling Subsystem 1," in the telecommunications cabling system structure. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.

   1. TIA-568-C.1 requires that a minimum of two equipment outlets be installed for each work area.
   2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications equipment outlet.
   3. Bridged taps and splices shall not be installed in the horizontal cabling.

B. A work area is approximately 100 sq. ft. (9.3 sq. m), and includes the components that extend from the equipment outlets to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Reviewed and stamped by RCDD.

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. Cabling administration Drawings and printouts.
3. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment, including the following:
   a. Telecommunications rooms plans and elevations.
   b. Telecommunications pathways.
   c. Telecommunications system access points.
   d. Telecommunications grounding system.
   e. Telecommunications conductor drop locations.
   f. Typical telecommunications details.
   g. Mechanical, electrical, and plumbing systems.

C. Twisted pair cable testing plan.

D. Samples: For telecommunications jacks and plugs, in specified finish, one for each type and configuration and faceplates for color selection and evaluation of technical features.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For RCDD, installation supervisor, and field inspector.

B. Product Certificates: For each type of product.

C. Source quality-control reports.

1.9 CLOSEOUT SUBMITTALS

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.10 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Connecting Blocks: One of each type.
2. Faceplates: Five of each type.
3. Jacks: Ten of each type/color.
4. Patch-Panel Units: One of each type.
5. Plugs: Ten of each type.
6. Cabling: 1000ft (one box) of each type/color.

1.11 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer shall have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings and cabling administration Drawings, by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits using a wire map / continuity tester.

1.13 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.14 COORDINATION

A. Coordinate enclosure and rack layouts with the owners IT department, Internet service provider, and LAN equipment suppliers.

B. Coordinate the layout and installation of telecommunications pathways and cabling with all trades to verify and rectify clashes prior to installation.

1.15 WARRANTY

A. UTP Cabling twenty-five (25) Year Warranty for premise communications wiring.

1. The systems integrator shall provide proof that they are authorized and certified, in good standing, to offer a 25-year warranty.
2. The warranty shall include all connecting hardware products and installed cable as part of the structural cabling system.
3. The structural cabling system shall include:
    a. Work area outlets
    b. Horizontal cable
    c. The connecting hardware in the horizontal cross-connect
    d. The equipment cord at the work area
    e. The patch cord for the horizontal cross-connect.
4. The warranty system performance shall guarantee that:
    a. The structural cabling system shall be free from defects in materials and workmanship, for duration of the warranty.
    b. The structural cabling system shall support any current or future application ratified by IEE, ANSI, ISO, designed to operate compliant category 3, 5, 5e, 6, 6e, or 6a draft or standard in effect at the time of the installation, for the duration of the warranty.
5. If the structural cabling system is determined to be defective within the scope of this warranty, the product found to be non-conforming shall be repaired or replaced, at no additional cost to the owner, under this warranty.
6. Structural cabling system shall be tested per the manufacturer’s warranty requirements.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-1, when tested according to test procedures of this standard.

B. Telecommunications Pathways and Spaces: Comply with TIA-569.

C. Grounding: Comply with TIA-607.

2.2 GENERAL CABLE CHARACTERISTICS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:

1. Communications, Plenum Rated: Type CMP complying with UL 1685 or Type CMP in listed plenum communications raceway.

2. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. RoHS compliant.

2.3 CATEGORY 6 TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6 cable at frequencies up to 350MHz.

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.

C. Standard: Comply with NEMA and TIA-568 for Category 6 cables.

D. Conductors: 100-ohm, 23 AWG solid copper.

E. Shielding/Screening: As indicated on drawings.

F. Cable Rating: As indicated on drawings.

G. Jacket: As indicated on drawings.

2.4 CATEGORY 6a TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6a cable at frequencies up to 500MHz.

B. Basis-of-Design Product: Subject to compliance with requirements; provide product indicated on Drawings.

C. Standard: Comply with TIA-568 for Category 6a cables.

D. Conductors: 100-ohm, 23 AWG solid copper.

E. Shielding/Screening: As indicated on drawings.

F. Cable Rating: As indicated on drawings.

G. Jacket: As indicated on drawings.

2.5 TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.

C. General Requirements for Twisted Pair Cable Hardware:

1. Comply with the performance requirements of products indicated on drawings.
2. Comply with TIA-568, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.

D. Patch Panel: Unloaded modular panels housing numbered jack units with color coded connectors at each jack location for permanent termination of pair groups of installed cables.

1. Features:

a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to connectors.
c. Replaceable connectors.
d. 24 or 48 ports.

2. Construction: 16-gauge steel and mountable on 19-inch (483 mm) equipment racks.
3. Number of Jacks per Field: One colored convector for each available port.

E. Patch Cords: Provide one (1) per work area outlet port indicated and one (1) per patch panel port plus 25percent extra for future. Shall match horizontal cabling manufacturer, factory-made, four-pair cables terminated with an eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance.
2. Patch cords shall have latch guards to protect against snagging.
3. Patch cords shall match color code of connecting link.
4. Lengths: Confirm all lengths and quantities prior to ordering.
    a. Work Area Outlets:
        1) 36inches
        2) 48inches
        3) 60inches
    b. Patch Panel:
        1) 6inches
        2) 12inches
5. Patch cord color shall match connecting cabling and connectors.

F. Plugs and Plug Assemblies:

1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Standard: Comply with TIA-568.
3. Marked to indicate transmission performance.

G. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standard: Comply with TIA-568.
4. Marked to indicate transmission performance.

H. Faceplate:
1. As indicated on drawings
2. Per NSPD Standards.
3. Faceplate: Stainless Steel
4. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.

I. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.6 IDENTIFICATION PRODUCTS

A. Comply with TIA-606 and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.7 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with TIA-607.

2.8 SOURCE QUALITY CONTROL

A. Factory test cables on reels according to TIA-568.

B. Factory test twisted pair cables according to TIA-568.

C. Cable shall be considered defective if it does not pass tests and inspections. Cabling shall be replaced with new non-defected cabling at no additional cost to the owner.

D. Prepare test and inspection reports.

**PART 3 - EXECUTION**

3.1 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, attics, and gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables, except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Section 270528 "Pathways for Communications Systems."

B. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF PATHWAYS

A. Comply with Section 270528 "Pathways for Communications Systems."

B. Drawings indicate general arrangement of pathways and fittings.

3.3 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. General Requirements for Cabling:

1. Comply with TIA-568.
2. Comply with BICSI's "Information Transport Systems Installation Methods Manual (ITSIMM), Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Do not untwist twisted pair cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. MUTOA shall not be used as a cross-connect point.
7. Consolidation points shall not be used.
8. Cables shall not be spliced.
9. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
10. Cable ties shall not be accepted; all cables shall be secured with fabric hook and loop rated for environment being installed within.
11. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
12. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI Information Transport Systems Installation Methods Manual , Ch. 5, "Cable Installation," "Cable Termination" Section. Use lacing bars and distribution spools.
13. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation, and replace it with new cable.
14. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
15. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
16. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Cabling Installation," "Pulling Cable" Section. Monitor cable pull tensions.
17. Cables shall be trained, bundled, and separated by color in exposed pathways. Cables shall be bundled with fabric hook and loop that matches cabling color.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend twisted pair cabling, not in a wireway or pathway, a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1524 mm) apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

4. Cables shall be trained, bundled, and separated by color in all exposed areas. Cables shall be bundled with fabric hook and loop that matches cabling color.

D. Group connecting hardware for cables into separate logical fields.

E. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569 for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

## 3.4 FIRESTOPPING

A. Comply with requirements in Division 07 "Penetration Firestopping."

B. Comply with TIA-569, Annex A, "Firestopping."

C. Comply with "Firestopping Systems" Chapter in BISCI's "Telecommunications Distribution Methods Manual."

## 3.5 GROUNDING

A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.

D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606.

1. Administration Class: Class 1, Class 2, Class 3.
2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with TIA-606 for Class 2 level of administration.

C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

E. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
    b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

F. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606 requirements for the following:

1. Cable labels shall use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Tests and Inspections:

1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but before cross-connection.
    a. Test instruments shall meet or exceed applicable requirements in TIA-568. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.

D. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Refer to section 271710 “Testing, Identification and Administration of Balanced Twisted Pair Infrastructure” for testing requirements.

END OF SECTION

# SECTION 271700

# TESTING, IDENTIFICATION AND ADMINISTRATION OF FIBER INFRASTRUCTURE

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Carefully examine all the Contract Documents for requirements which affect the work of this Section. The exact scope of this Section cannot be determined without a thorough review of all specification sections and other Contract Documents.

C. Where referred to, Standard Specifications, Recommendations of Technical Societies, and/or Manufacturer's Associations, plus Codes of Federal, State, and Local Agencies shall include all amendments current as of date of issue of these specifications.

### 1.2 WORK INCLUDED

A. Provide all labor, materials, tools, field-test instruments, and equipment required for the complete testing, identification and administration of the work called for in the Contract Documents.

B. In order to conform to the overall project event schedule, the cabling contractor shall survey the work areas and coordinate cabling testing with other applicable trades. The cabling contractor shall carry out testing in accordance with this document for all new and temporary fiber systems. Testing shall be done at the end of every phasing period. Coordinate all phasing requirements with General Contractor/Owner prior to start of any work.

C. In addition to the tests detailed in this document, the contractor shall notify the Owner’s representative or engineer on record of any additional tests that are deemed necessary to guarantee a fully functional system. The contractor shall carry out and record any additional measurement results at no additional charge.

### 1.3 SCOPE

A. This Section includes the minimum requirements for the test certification, identification, and administration of backbone and horizontal optical fiber cabling.

B. This Section includes minimum requirements for:

1. Fiber optic test instruments
2. Fiber optic testing
3. Identification
    a) Labels and labeling
4. Administration
    a) Test results documentation
    b) As-built drawings

C. Testing shall be carried out in accordance with this document. This includes testing the attenuation and polarity of the installed cable with an optical loss test set (OLTS) and the installed condition of the cabling system and its components with an optical time domain reflectometer (OTDR). The condition of the fiber end faces shall also be verified.

D. Testing shall be performed on each cabling link (connector to connector).

E. Testing shall be performed on each cabling channel (equipment to equipment) that is identified by the owner.

1. Testing shall not include any active devices or passive devices within the link or channel other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.

F. All tests shall be documented including OLTS dual wavelength attenuation measurements for multimode and singlemode links and channels and OTDR traces and event tables for multimode and singlemode links and channels and multifiber polarity verification for multimode and single mode links and channels.

1. Optionally documentation shall also include optical length measurements and pictures of the connector end face.

G. Testing shall be performed in accordance with this document. Multi-Fiber cables that are factory pre-terminated and brought onto the site shall have optical loss testing performed prior to install to confirm Polarity and Skew. After installation and prior to turnover TIA-568-C certification testing shall be performed to confirm the individual fibers within each cable performs to the 40G-Base-XX performance of the channel and shown on each test report.

## 1.4 REFERENCES

A. All codes and standards shall be the newest in effect at the time of project award or Notice to Proceed (whatever occurs first).

1. ANSI/BICSI N1
2. BICSI Telecommunications Distribution Methods Manual (TDMM)
3. BICSI Transport Systems Installation Methods Manual (ITSIMM)
4. NECA 1
5. NECA 101
6. NECA 102
7. NECA 105
8. NFPA 70
9. TIA-1152
10. TIA-568
11. TIA-568-0
12. TIA-568-1
13. TIA-568-2
14. TIA-569
15. TIA-606
16. TIA-607

## 1.5 QUALITY ASSURANCE

A. All testing procedures and field-test instruments shall comply with applicable requirements of:

1. ANSI Z136.2, ANS For Safe Use Of Optical Fiber Communication Systems Utilizing Laser Diode And LED Sources

2. ANSI/EIA/TIA-455-50B, Light Launch Conditions For Long-Length Graded-Index Optical Fiber Spectral Attenuation Measurements
3. ANSI/TIA/EIA-455-59A, Measurement of Fiber Point Discontinuities Using an OTDR.
4. ANSI/TIA/EIA-455-60A, Measurement of Fiber or Cable Length Using an OTDR.
5. ANSI/TIA/EIA-455-61A, Measurement of Fiber or Cable Attenuation Using an OTDR.
6. ANSI/TIA/EIA-526-7, Optical Power Loss Measurements of Installed Singlemode Fiber Cable Plant.
7. ANSI/TIA-526-14-B, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant; IEC 61280-4-1 edition 2, Fibre-Optic Communications Subsystem Test Procedure- Part 4-1: Installed cable plant- Multimode attenuation measurement.
8. ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises.
9. ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standard.
10. ANSI/TIA-606-B, Administration Standard for Commercial Telecommunications Infrastructure, including the requirements specified by the customer, unless the customer specifies their own labeling requirements.

B. The technicians shall have successfully attended the following training programs and have obtained a certificate as proof thereof shall execute the tests. These certificates shall be issued by the following organizations or an equivalent organization:

1. Manufacturer of the fiber optic cable and the fiber optic connectors.
2. Manufacturer of the test equipment used for the field certification.
3. Training organizations (e.g., BICSI, A Telecommunications Association headquarters in Tampa, Florida; ACP [Association of Cabling Professionals™] Cabling Business Institute located in Dallas, Texas)

C. The Owner’s representative and the on record engineer shall be invited to witness and/or review field-testing.

1. The Owner’s representative and the on record engineer shall be notified of the start date of the testing phase five (5) business days before testing commences.
2. The Owner’s representative and/or the on record engineer will select a random sample of 5% of the installed links. The Owner’s representative and/or the on record engineer shall test these randomly selected links and the results are to be stored in accordance with Part 3 of this document. The results obtained shall be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the representative shall repeat 100% testing at no cost to the Owner.

## 1.6 SUBMITTALS

A. Product Data:
1. Manufacturers catalog sheets and specifications for fiber optic field-test instruments including optical loss test sets (OLTS; power meter and source), multifiber, optical time domain reflectometer (OTDR) and inspection scope.
2. A schedule (list) of all optical fibers to be tested.
3. Sample test reports.

B. Test Reports:
1. Provide a PDF of each labeled cables passed test result.
2. (1) set of PDF as-builts where each cable is labeled to match the submitted test results.

3. Original, unaltered test results in testers format file type. Contractor shall provide the owner and engineer of record required software (download links or hard copy) to review submitted test results.

## 1.7 ACCEPTANCE OF TEST RESULTS

A. Unless otherwise specified by the Owners representative or the on record engineer, each cabling link shall be in compliance with the following test limits:

1. Optical loss testing

a) Multimode and Singlemode links

1) The link attenuation shall be calculated by the following formulas as specified in ANSI/TIA-568-C.0.

(i) Link Attenuation (dB) = Cable_Attn (dB) + Connector_Attn (dB) + Splice_Attn (dB)
(ii) Cable_Attn (dB) = Attenuation_Coefficient (dB/km) * Length (Km)
(iii) Connector_Attn (dB) = number_of_connector_pairs * connector_loss (dB)
(iv) Maximum allowable connector_loss = 0.75 dB
(v) Splice_Attn (dB) = number_of_splices * splice_loss (dB)
(vi) Maximum allowable splice_loss = 0.3 dB
(vii) The values for the Attenuation_Coefficient (dB/km) are listed in the table below:

| Type of Optical Fiber | Wavelength (nm) | Attenuation coefficient (dB/km) | Wavelength (nm) | Attenuation coefficient (dB/km) |
|---|---|---|---|---|
| Multimode 50/125 µm | 850 | 3.5 | 1300 | 1.5 |

2. OTDR testing

a) Reflective events (connections) shall not exceed 0.75 dB.
b) Non-reflective events (splices) shall not exceed 0.3 dB.

3. Magnified end face inspection

a) Fiber connections shall be visually inspected for end face quality.
b) Scratched, pitted or dirty connectors shall be diagnosed and corrected.

B. All installed cabling links and channels shall be field-tested and pass the test requirements and analysis as described in Part 3. Any link or channel that fails these requirements shall be diagnosed and corrected. Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected link or channel meets performance requirements. The final and passing result of the tests for all links and channels shall be provided in the test results documentation in accordance with Part 3.

C. All test results shall be approved by the Owner's representative or the on record engineer at the end of every phasing period.

D. Acceptance of the test results shall be given in writing after the project is fully completed and tested in accordance with Contract Documents and to the satisfaction of the Owner.

Note: High Bandwidth applications such as 1000BASE-SX, 10GBASE-SR, and FC1200 impose stringent channel loss limits. Where practical, certification should consider loss length limits that meet maximum channel (transmitter to receiver) loss.

Performance specification for MM fiber at 850 nm

| Fiber Type | | Bandwidth | 1000BASE-SX | | 10GBASE-SR | |
|---|---|---|---|---|---|---|
| | µm | (MHz• Km) | Length (m) | Loss (dB) | Length (m) | Loss (dB) |
| OM 4 | 50 | 4700 | N/A | N/A | 550 | 2.8 |

**PART 2 - PRODUCTS**

2.1 OPTICAL FIBER CABLE TESTERS

A. The field-test instrument shall be within the calibration period recommended by the manufacturer.

B. Optical loss test set (OLTS)

1. Multimode optical fiber light source

a) Provide dual LED light sources with central wavelengths of 850 nm (±30 nm) and 1300 nm (±20 nm)
b) Output power of –20 dBm minimum.
c) The light source shall meet the Encircled Flux launch requirements of ANSI/TIA-526-14-B.
d) Acceptable manufacturers

1) Fluke Networks

2. Power Meter

a) Provide 850 nm, 1300/1310 nm, and 1550 nm wavelength test capability.
b) Power measurement uncertainty of ± 0.25 dB.
c) Store reference power measurement.
d) Save at least 100 results in internal memory.
e) PC interface (serial or USB).
f) Acceptable manufacturers

1) Fluke Networks

3. Optional length measurement

a) It is preferable to use an OLTS that is capable of measuring the optical length of the fiber using time-of-flight techniques.

C. Optical Time Domain Reflectometer (OTDR)

1. Shall have a bright, color transmissive LCD display with backlight.
2. Shall have rechargeable Li-Ion battery for 8 hours of normal operation.
3. Weight with battery and module of not more than 4.5 lb and volume of not more 200 in³.

4. Internal non-volatile memory and removable memory device with at least 16 MB capacity for results storage.
5. Serial and USB ports to transfer data to a PC.
6. Multimode OTDR
    a) Wavelengths of 850 nm (± 20 nm) and 1300 nm (± 20 nm).
    b) Event dead zones of 3.7 m maximum at 850 nm and 1300 nm.
    c) Attenuation dead zones of 10 m maximum at 850 nm and 13 m maximum at 1300 nm.
    d) Distance range not less than 2000 m.
    e) Dynamic range at least 10 dB at 850 nm and 1300 nm
7. Acceptable manufacturers
    a) Fluke Networks

D. Fiber Microscope
1. Magnification of 200X or 400X for end face inspection
2. Acceptable manufacturers
    a) Fluke Networks
3. Optional requirements
    a) Video camera systems are preferred.
    b) Camera probe tips that permit inspection through adapters are preferred.
    c) It is preferable to use test equipment capable of saving and reporting the end face image.

E. Integrated OLTS, OTDR and fiber microscope
1. Test equipment that combines into one instrument an OLTS, an OTDR and a fiber microscope may be used.
2. Acceptable manufacturers
    a) Fluke Networks.

## 2.2 IDENTIFICATION

A. Labels
1. Shall meet the legibility, defacement, exposure and adhesion requirements of UL 969.
2. Shall be preprinted using a mechanical means of printing (e.g., laser printer).
3. Where used for cable marking, provide vinyl substrate with a white printing area and a clear “tail” that self laminates the printed area when wrapped around the cable. If cable jacket is white, provide cable label with printing area that is any other color than white, preferably orange or yellow – so that the labels are easily distinguishable.
4. Where insert type labels are used provide clear plastic cover over label.
5. Provide plastic warning tape 6 inches wide continuously printed and bright colored 18” above all direct buried services, underground conduits and duct-banks.
6. Acceptable Manufacturers:
    a) Silver Fox
    b) W.H. Brady
    c) Brothers

2.3 ADMINISTRATION

A. Administration of the documentation shall include test results of each fiber link and channel.

B. The test result information for each link shall be recorded in the memory of the field-test instrument upon completion of the test.

C. The test result records saved within the field-test instrument shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of these test records.

**PART 3 – EXECUTION**

3.1 GENERAL

A. All tests performed on optical fiber cabling that use a laser or LED in a test set shall be carried out with safety precautions in accordance with ANSI Z136.2.

B. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to field-testing. Any testing performed on incomplete systems shall be redone on completion of the work.

3.2 OPTICAL FIBER CABLE TESTING

A. Field-test instruments shall have the latest software and firmware installed.

B. Link and channel test results from the OLTS and OTDR shall be recorded in the test instrument upon completion of each test for subsequent uploading to a PC in which the administrative documentation (reports) may be generated.

C. Fiber end faces shall be inspected at 200X or 400X magnification. 200X magnification is suitable for inspecting multimode and singlemode fibers. 400X magnification may be used for detailed examination of singlemode fibers. Scratched, pitted or dirty connectors shall be diagnosed and corrected.

1. It is preferable that the end face images be recorded in the memory of the test instrument for subsequent uploading to a PC and reporting.

D. Testing shall be performed on each cabling segment (connector to connector).

E. Testing shall be performed on each cabling channel (equipment to equipment) that is planned for use per the owner's instructions.

F. Testing of the cabling shall be performed using high-quality test cords of the same fiber type as the cabling under test. The test cords for OLTS testing shall be between 1 m and 5 m in length. The test cords for OTDR testing shall be approximately 100 m for the launch cable and at least 25 m for the receive cable.

G. Optical loss testing

1. Horizontal/Backbone link
   a) Multimode links shall be tested at 850 nm and 1300 nm in accordance with ANSI/TIA-526-14-B, one-cord reference method.

b) Singlemode backbone links shall be tested at 1310 nm and 1550 nm in accordance with ANSI/TIA/EIA-526-7, Method A.1, One Reference Jumper equivalent method.
c) Link attenuation does not include any active devices or passive devices other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.

H. OTDR Testing

1. Fiber links shall be tested at the appropriate operating wavelengths for anomalies and to ensure uniformity of cable attenuation and connector insertion loss.
   a) Multimode: 850 nm and 1300 nm
   b) Singlemode: 1310 nm and 1550 nm
2. Each fiber link and channel shall be tested in both directions.
3. A launch cable shall be installed between the OTDR and the first link connection.
4. A receive cable shall be installed after the last link connection.

I. Magnified End face Inspection

1. Fibers shall be inspected at 250X or 400X magnification. 250X magnification is suitable for inspecting multimode and singlemode fibers.

J. Length Measurement

1. The length of each fiber shall be recorded.
2. It is preferable that the optical length be measured using an OLTS or OTDR.

K. Polarity Testing

1. Paired duplex fibers in multi-fiber cables shall be tested to verify polarity in accordance with Clause E.5.3 of ANSI/TIA-568-C.0. The polarity of the paired duplex fibers shall be verified using an OLTS.

L. All test results shall be approved by the Owner's representative or the on record engineer at the end of every phasing period.

## 3.3 IDENTIFICATION

A. Labeling

1. Labeling shall conform to the requirements specified within ANSI/TIA-606-B or to the requirements specified by the Owner or the Owner's representative.

## 3.4 ADMINISTRATION

A. Test results documentation

1. Test results saved within the field-test instrument shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of the test records. These test records shall be uploaded to the PC unaltered, i.e., "as saved in the field-test instrument". The file format, CSV (comma separated value), does not provide adequate protection of these records and shall not be used.
2. The test results documentation shall be available for inspection by the Owner or the Owner's representative during the installation period and shall be passed to the Owner's representative within 5 working days of completion of tests on cabling served by a

telecommunications room or of backbone cabling. The installer shall retain a copy to aid preparation of as-built information.

3. The database for the complete project, including twisted-pair copper cabling links, if applicable, shall be stored and delivered on CD-ROM prior to Owner acceptance of the building. This CD-ROM shall include the software tools required to view, inspect, and print any selection of the test reports.
4. Circuit IDs reported by the test instrument should match the specified label ID (see 3.3 of this Section).
5. The detailed test results documentation data is to be provided in an electronic database for each tested optical fiber and shall contain the following information

    a) The identification of the customer site as specified by the end-user
    b) The name of the test limit selected to execute the stored test results
    c) The name of the personnel performing the test
    d) The date and time the test results were saved in the memory of the tester
    e) The manufacturer, model and serial number of the field-test instrument
    f) The version of the test software and the version of the test limit database held within the test instrument
    g) The fiber identification number
    h) The length for each optical fiber

        1) Optionally the index of refraction used for length calculation when using a length capable OLTS

    i) Test results to include OLTS attenuation link and channel measurements at the appropriate wavelength(s) and the margin (difference between the measured attenuation and the test limit value).
    j) Test results to include OTDR link and channel traces and event tables at the appropriate wavelength(s).
    k) The length for each optical fiber as calculated by the OTDR.
    l) The overall Pass/Fail evaluation of the link-under-test for OLTS and OTDR measurements.
    m) A picture or image of each fiber end-face
    n) A pass/fail status of the end-face based upon visual inspection.

B. Record copy and as-built drawings

1. Provide record copy drawings periodically through out the project as requested by the Construction Manager or Owner, and at end of the project on USB Flash-drive and via FTP file share website. Record copy drawings at the end of the project shall be in CAD format and include notations reflecting the as built conditions of any additions to or variation from the drawings provided such as, but not limited to cable paths and termination point. CAD drawings are to incorporate test data imported from the test instruments.
2. The as-built drawings shall include, but are not limited to block diagrams, frame and cable labeling, cable termination points, equipment room layouts and frame installation details. The as-builts shall include all field changes made up to construction completion:

    a) Field directed changes to pull schedule.
    b) Field directed changes to cross connect and patching schedule.
    c) Horizontal cable routing changes.
    d) Backbone cable routing or location changes.
    e) Associated detail drawings.

END OF SECTION

# SECTION 271710

# TESTING, IDENTIFICATION AND ADMINISTRATION OF BALANCED TWISTED PAIR INFRASTRUCTURE

## PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 WORK INCLUDED

A. Provide all labor, materials, tools, field-test instruments and equipment required for the complete testing, identification and administration of the work called for in the Contract Documents.

B. In order to conform to the overall project event schedule, the cabling contractor shall survey the work areas and coordinate cabling testing with other applicable trades.

C. In addition to the tests detailed in this document, the contractor shall notify the Owner's representative or Engineer of Record of any additional tests that are deemed necessary to guarantee a fully functional system. The contractor shall carry out and record any additional measurement results at no additional charge.

1.3 SCOPE

A. This Section includes the minimum requirements for the test certification, identification and administration of horizontal balanced twisted pair cabling.

B. This Section includes minimum requirements for:

1. Copper cabling test instruments
2. Copper cabling testing
3. Identification
    a) Labels and labeling
4. Administration
    a) Test results documentation
    b) As-built drawings

C. Testing shall be carried out in accordance with this document.

D. Testing shall be performed on each cabling link. (100% testing)

E. All tests shall be documented.

1.4 QUALITY ASSURANCE

A. All testing procedures and field-test instruments shall comply with applicable requirements of:

1. ANSI/TIA-1152, Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
2. ANSI/TIA-568-#.0, Generic Telecommunications Cabling for Customer Premises.
3. ANSI/TIA-568-#.1, Commercial Building Telecommunications Cabling Standard
4. ANSI/TIA-568-#.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standards.
5. ANSI/TIA-606-#, Administration Standard for Commercial Telecommunications Infrastructure, including the requirements specified by the customer, unless the customer specifies their own labeling requirements.

B. The technicians shall have successfully attended the following training programs and have obtained a certificate as proof thereof shall execute the tests. These certificates shall be issued by the following organizations or an equivalent organization:

1. Manufacturer of the connectors and cable.
2. Manufacturer of the test equipment used for the field certification.
3. Training organizations (e.g., BICSI, A Telecommunications Association headquarters in Tampa, Florida; ACP [Association of Cabling Professionals™] Cabling Business Institute located in Dallas, Texas)

C. The Owner's representative or Engineer of Record shall be invited to witness and/or review field-testing.

1. The Owner's representative or Engineer of Record shall be notified of the start date of the testing phase five (5) business days before testing commences.
2. The Owner's representative or Engineer of Record will select a random sample of 5% of the installed links. The Owner's representative or Engineer of Record shall test these randomly selected links and the results are to be stored in accordance with Part 3 of this document. The results obtained shall be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the representative shall repeat 100% testing at no cost to the Owner.

## 1.5 SUBMITTALS

A. Manufacturers catalog sheets and specifications for the test equipment.

B. A schedule (list) of all balanced twisted-pair copper links to be tested.

C. Sample test reports.

## 1.6 ACCEPTANCE OF TEST RESULTS

A. Unless otherwise specified by the Owner or the Owners representative, each cabling link shall be in tested for:

1. Wire Map
2. Length
3. Propagation Delay
4. Delay Skew
5. DC Loop Resistance – recorded for information only

6. DC Resistance Unbalance – recorded for information only
7. Insertion Loss
8. NEXT (Near-End Crosstalk)
9. PS NEXT (Power Sum Near-End Crosstalk)
10. ACR-N (Attenuation to Crosstalk Ratio Near-End) – recorded for information only
11. PS ACR-N (Power Sum Attenuation to Crosstalk Ratio Near-End) – recorded for information only
12. ACR-F (Attenuation to Crosstalk Ratio Far-End)
13. PS ACR-F (Power Sum Attenuation to Crosstalk Ratio Far-End)
14. Return Loss
15. TCL (Transverse Conversion Loss) – recorded for information only
16. ELTCTL (Equal Level Transverse Conversion Transfer Loss) – recorded for information only
17. PS ANEXT (Power Sum Alien Near-End Crosstalk) – sampled per section 3.2
18. Average PS ANEXT (Average Power Sum Alien Near-End Crosstalk) – sampled per section 3.2
19. PS AACR-F (Power Sum Alien Attenuation to Crosstalk Ratio Far-End) – sampled per section 3.2
20. Average PS AACR-F (Average Power Sum Alien Attenuation to Crosstalk Ratio Far-End) – sampled per section 3.2

B. All installed cabling Permanent Links shall be field-tested and pass the test requirements and analysis as described in Part 3. Any Permanent Link that fails these requirements shall be diagnosed and corrected. Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected Permanent Link meets performance requirements. The final and passing result of the tests for all Permanent Links shall be provided in the test results documentation in accordance with Part 3.

C. All test results shall be approved by the Owner's representative or the on record engineer at the end of every phasing period.

D. Test Reports:

1. Provide a PDF of each labeled cables passed test result.
2. (1) set of PDF as-builts where each cable is labeled to match the submitted test results.
3. Original, unaltered test results in testers format file type. Contractor shall provide the owner and engineer of record required software (download links or hard copy) to review submitted test results.

E. Acceptance of the test results shall be given in writing after the project is fully completed and tested in accordance with Contract Documents and to the satisfaction of the Owner.

## PART 2 - PRODUCTS

2.1 BALANCED TWISTED-PAIR CABLE TESTERS

A. The field-test instrument shall be within the calibration period recommended by the manufacturer, typically 12 months.

B. Certification tester

1. Accuracy
   a) Level IIIe accuracy in accordance with ANSI/TIA-1152
   b) Independent verification of accuracy
   c) Acceptable manufacturers
      1) Fluke Networks
      2) Or approved equal
2. Permanent Link Adapters
   a) RJ45 plug must meet the requirements for NEXT, FEXT and Return Loss in accordance with ANSI/TIA-568-C.2 Annex C
   b) Twisted pair Category 5e, 6, and 6A cords are not permitted as their performance degrades with use and can cause false Return Loss failures
3. Results Storage
   a) Must be capable of storing > 10,000 results for all measurements found in 2.1.B.4 below
4. Measurement capabilities
   a) Wire Map
   b) Length
   c) Propagation Delay
   d) Delay Skew
   e) DC Loop Resistance
   f) DC Resistance Unbalance
   g) Insertion Loss
   h) NEXT (Near-End Crosstalk)
   i) PS NEXT (Power Sum Near-End Crosstalk)
   j) ACR-N (Attenuation to Crosstalk Ratio Near-End)
   k) PS ACR-N (Power Sum Attenuation to Crosstalk Ratio Near-End)
   l) ACR-F (Attenuation to Crosstalk Ratio Far-End)
   m) PS ACR-F (Power Sum Attenuation to Crosstalk Ratio Far-End)
   n) Return Loss
   o) TCL (Transverse Conversion Loss)
   p) ELTCTL (Equal Level Transverse Conversion Transfer Loss)
   q) Time Domain Reflectometer
   r) Time Domain Xtalk Analyzer
   s) PS ANEXT (Power Sum Alien Near-End Crosstalk)
   t) Average PS ANEXT (Average Power Sum Alien Near-End Crosstalk)
   u) PS AACR-F (Power Sum Alien Attenuation to Crosstalk Ratio Far-End)
   v) Average PS AACR-F (Average Power Sum Alien Attenuation to Crosstalk Ratio Far-End)

C. PC Software

1. Windows® based.
2. Must show when 3 dB and 4 dB rules are applied
3. Re-certification capability, where results must have their Cable IDs suffixed with (RC).
4. Built in PDF export – no additional third party software permitted.
5. Built-in statistical analysis.

2.2 IDENTIFICATION

A. Labels

1. Shall meet the legibility, defacement, exposure and adhesion requirements of UL 969.
2. Cable identification shall comply with North Smithfield Police Department Information Technology standards.
3. Shall be preprinted using a mechanical means of printing (e.g., laser printer).
4. Where used for cable marking, provide vinyl substrate with a white printing area and a clear “tail” that self laminates the printed area when wrapped around the cable. If cable jacket is white, provide cable label with printing area that is any other color than white, preferably orange or yellow – so that the labels are easily distinguishable.
5. Where insert type labels are used provide clear plastic cover over label.
6. Provide plastic warning tape 6 inches wide continuously printed and bright colored 18” above all direct buried services, underground conduits and duct-banks.
7. Acceptable Manufacturers:

a) Brady Corporation
b) Silver Fox
c) Brothers

2.3 ADMINISTRATION

A. Administration of the documentation shall include test results of each Permanent Link.

B. The test result information for each link shall be recorded in the memory of the field-test instrument upon completion of the test.

C. The test result records saved within the field-test instrument shall be transferred into a Windows® -based database utility that allows for the maintenance, inspection and archiving of these test records.

D. Alien Crosstalk measurements shall be stored to a PC upon completion of the test.

**PART 3 – EXECUTION**

3.1 GENERAL

A. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to field-testing. Any testing performed on incomplete systems shall be redone on completion of the work.

3.2 BALANCED TWISTED PAIR CABLE TESTING

A. Field-test instruments shall have the latest software and firmware installed.

B. Permanent Link test results including the individual frequency measurements from the tester shall be recorded in the test instrument upon completion of each test for subsequent uploading to a PC in which the administrative documentation (reports) may be generated.

C. Permanent Link testing shall be performed on each cabling segment (connector to connector). Sampling is not acceptable.

D. Alien Crosstalk testing shall be performed using a sampling plan. An acceptance quality level (AQL) of 0,4 %, normal inspection, general inspection level I as defined in ISO 2859-1 for populations of up to 500,000 links shall be used. The following table represents this sampling level.

| Installation size (No. of total links) | Sample size (No. of links to test) |
|---|---|
| 3 – 33 | 100% |
| 34 – 3,200 | 33 |
| 3,201 – 35,000 | 126 |
| 35,001 – 150,000 | 201 |
| 150,001 – 500,000 | 315 |

Disturbed (Victim) links chosen for Alien Crosstalk testing shall be an equal combination of short, medium and long links.

E. Permanent Link adapters made from twisted pair Category 5e, 6, and 6A cords are not permitted as their performance degrades with use and can cause false Return Loss failures.

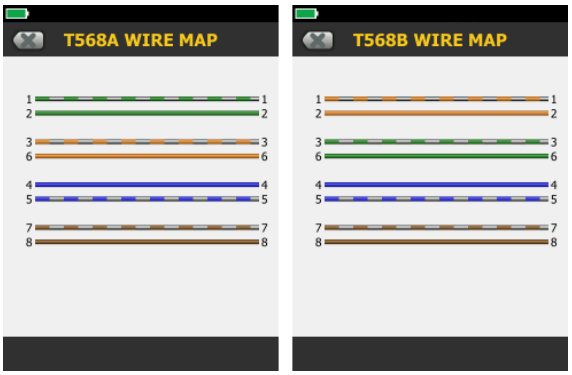
F. The installer shall build a reference link. All components shall be anchored so it is not possible to disturb them. The technician is to conduct a Category 6A Permanent Link test each day to ensure no degradation of the tester or its Permanent Link adapters.

G. Wire Map Measurement

1. The wire map test is intended to verify pin-to-pin termination at each end and check for installation connectivity errors. For each of the 8 conductors in the cabling, the wire map indicates:

   a) Continuity to the remote end
   b) Shorts between any two or more conductors
   c) Reversed pairs
   d) Split pairs
   e) Transposed pairs
   f) Distance to open on shield
   g) Any other miss-wiring

2. The correct connectivity of telecommunications outlets/connectors is defined in ANSI/TIA-568-#.2. Two color schemes are permitted. The user shall define which scheme is to be used. The field tester shall document which color scheme was used. Examples are given below:




H. Length Measurement

1. The length of each balanced twisted pair shall be recorded.
2. Since physical length is determined from electrical length, the physical length of the link calculated using the pair with the shortest electrical delay shall be reported and used for making the pass or fail determination.
3. The pass or fail criteria is based on the maximum length allowed for the Permanent Link as specified in ANSI/TIA-568-#.2 plus the nominal velocity of propagation (NVP) uncertainty of 10%. For a Permanent Link, the length measurement can be 325 ft. (99 m) before a fail is reported.

I. Propagation Delay measurement

1. Is the time it takes for a signal to reach the end of the link.
2. The measurement shall be made at 10 MHz per ANSI/TIA-1152.
3. The propagation delay of each balanced twisted pair shall be recorded.
4. Is not to exceed 498 ns per ANSI/TIA-568-#.2 Section 6.3.18.

J. Delay Skew measurement

1. Is the difference in propagation delay @ 10 MHz between the shortest delay and the delays of the other wire pairs.
2. The delay skew of each balanced twisted pair shall be recorded.
3. Is not to exceed 44 ns per ANSI/TIA-568-#.2 Section 6.3.19.

K. DC Resistance

1. Often reported as Resistance, is the loop resistance of both conductors in the pair.
2. Is not specified in ANSI/TIA-1152, but shall be recorded for all four pairs.

L. DC Resistance Unbalance

1. Often reported as Resistance Unbalance, is the difference in resistance of the two wires within the pair.
2. Is not specified in ANSI/TIA-1152 for a Permanent Link, but shall be recorded for all four pairs.

M. Insertion Loss

1. Is the loss of signal strength over the cabling (in dB).

2. The frequency resolution shall be:
    a) 1 – 31.25 MHz: 150 kHz
    b) 31.25 – 100 MHz: 250 kHz
    c) 100 – 250 MHz: 500 kHz
    d) 250 – 500 MHz: 1000 kHz
3. Worst case shall be reported for all four pairs in one direction only.
4. Reported margins found to be within the accuracy of the field tester shall be marked with an asterisk (*).
5. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-#.2 Section 6.3.7.

N. NEXT (Near-End Crosstalk)
1. Is the difference in amplitude (in dB) between a transmitted signal and the crosstalk received on other wire pairs at the same end of the cabling.
2. The frequency resolution shall be:
    a) 1 – 31.25 MHz: 150 kHz
    b) 31.25 – 100 MHz: 250 kHz
    c) 100 – 250 MHz: 500 kHz
    d) 250 – 500 MHz: 1000 kHz
3. Shall be measured in both directions. (12 pair to pair possible combinations)
4. Both worst case and worst margins shall be reported.
5. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-#.2 Section 6.3.8.
6. Reported margins found to be within the accuracy of the field tester shall be marked with an asterisk (*).
7. The Time Domain Xtalk data shall be stored for any marginal or failing NEXT results.

O. PS NEXT (Power Sum Near-End Crosstalk)
1. Is the difference (in dB) between the test signal and the crosstalk from the other pairs received at the same end of the cabling.
2. The frequency resolution shall be:
    a) 1 – 31.25 MHz: 150 kHz
    b) 31.25 – 100 MHz: 250 kHz
    c) 100 – 250 MHz: 500 kHz
    d) 250 – 500 MHz: 1000 kHz
3. Shall be measured in both directions. (8 pair possible combinations)
4. Both worst case and worst margins shall be reported.
5. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-#.2 Section 6.3.9.
6. Reported margins found to be within the accuracy of the field tester shall be marked with an asterisk (*).
7. The Time Domain Xtalk data shall be stored for any marginal or failing PS NEXT results.

P. ACR-N (Attenuation Crosstalk Ratio Near-End)
1. Is a calculation of NEXT minus Insertion Loss of the disturbed pair in dB.
2. The frequency resolution shall be:

a) 1 – 31.25 MHz: 150 kHz
b) 31.25 – 100 MHz: 250 kHz
c) 100 – 250 MHz: 500 kHz
d) 250 – 500 MHz: 1000 kHz

3. Shall be calculated in both directions.
4. Is not specified in ANSI/TIA-1152, but shall be recorded for all 12 possible combinations.

Q. PS ACR-N (Power Sum Attenuation Crosstalk Ratio Near-End)
1. Is a calculation of PS NEXT minus Insertion Loss of the disturbed pair in dB.
2. The frequency resolution shall be:

a) 1 – 31.25 MHz: 150 kHz
b) 31.25 – 100 MHz: 250 kHz
c) 100 – 250 MHz: 500 kHz
d) 250 – 500 MHz: 1000 kHz

3. Shall be calculated in both directions.
4. Is not specified in ANSI/TIA-1152, but shall be recorded for all 8 possible combinations.

R. ACR-F (Attenuation Crosstalk Ratio Far-End)

1. Is a calculation of FEXT minus Insertion Loss of the disturbed pair in dB.
2. The frequency resolution shall be:

a) 1 – 31.25 MHz: 150 kHz
b) 31.25 – 100 MHz: 250 kHz
c) 100 – 250 MHz: 500 kHz
d) 250 – 500 MHz: 1000 kHz

3. Shall be measured in both directions. (24 pair to pair possible combinations)
4. Both worst case and worst margins shall be reported.
5. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-#.2 Section 6.3.11.
6. Reported margins found to be within the accuracy of the field tester shall be marked with an asterisk (*).

S. PS ACR-F (Power Sum Attenuation to Crosstalk Ratio Far-End)

1. Is a calculation of PS FEXT minus Insertion Loss of the disturbed pair in dB.
2. The frequency resolution shall be:

a) 1 – 31.25 MHz: 150 kHz
b) 31.25 – 100 MHz: 250 kHz
c) 100 – 250 MHz: 500 kHz
d) 250 – 500 MHz: 1000 kHz

3. Shall be measured in both directions. (8 pair possible combinations)
4. Both worst case and worst margins shall be reported.
5. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-#.2 Section 6.3.13.
6. Reported margins found to be within the accuracy of the field tester shall be marked with an asterisk (*).

T. Return Loss

1. Is the difference (in dB) between the power of a transmitted signal and the power of the signals reflected back.
2. The frequency resolution shall be:
    a) 1 – 31.25 MHz: 150 kHz
    b) 31.25 – 100 MHz: 250 kHz
    c) 100 – 250 MHz: 500 kHz
    d) 250 – 500 MHz: 1000 kHz
3. Shall be measured in both directions. (8 pair possible combinations)
4. Both worst case and worst margins shall be reported.
5. Shall be ignored at all frequencies where the Insertion Loss is less than 3 dB for that pair.
6. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-#.2 Section 6.3.6.
7. Reported margins found to be within the accuracy of the field tester shall be marked with an asterisk (*).
8. The Time Domain Reflectometer data shall be stored for any marginal or failing Return Loss results.

U. TCL (Transverse Conversion Loss)

1. Is the ratio (in dB) between a differential mode signal inject at the near-end and the common-mode signal measured at the near-end on the same wire pair.
2. The frequency resolution shall be:
    a) 1 – 31.25 MHz: 150 kHz
    b) 31.25 – 100 MHz: 250 kHz
    c) 100 – 250 MHz: 500 kHz
    d) 250 – 500 MHz: 1000 kHz
3. Shall be measured in both directions.
4. Is not specified in ANSI/TIA-1152 for a Permanent Link, but shall be recorded for all 8 possible combinations.

V. ELTCTL (Equal Level Transverse Conversion Transfer Loss)

1. Is the ratio (in dB) between a differential mode signal inject at the near-end and the common-mode signal measured at the far end on the same wire pair minus the Insertion Loss of that pair.
2. The frequency resolution shall be:
    a) 1 – 31.25 MHz: 150 kHz
    b) 31.25 – 100 MHz: 250 kHz
    c) 100 – 250 MHz: 500 kHz
    d) 250 – 500 MHz: 1000 kHz
3. Shall be measured in both directions.
4. Is not specified in ANSI/TIA-1152 for a Permanent Link, but shall be recorded for all 8 possible combinations.

W. PS ANEXT (Power Sum Alien Near-End Crosstalk)

1. Takes into account the combined alien crosstalk (statistical) on a receive pair from all external near-end disturbers operating simultaneously.
2. The frequency resolution shall be:

a) 1 – 31.25 MHz: 150 kHz
b) 31.25 – 100 MHz: 250 kHz
c) 100 – 250 MHz: 500 kHz
d) 250 – 500 MHz: 1000 kHz

3. The disturbed (victim) link shall have links to the left and right of it and if present, links above and below it.
4. Disturber cables shall include all links within the same bundle as the disturbed (victim) link and adjacent links
5. Should be measured in both directions if the link is patch panel to patch panel. If the link is patch panel to telecommunications outlet, then it shall be measured from the patch panel end only.
6. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-#.2 Section 6.3.21.

X. Average PS ANEXT (Power Sum Alien Near-End Crosstalk)

1. Is calculated by averaging the individual PSANEXT loss values, in dB, for all four pairs in the disturbed (victim) link.
2. The frequency resolution shall be:

a) 1 – 31.25 MHz: 150 kHz
b) 31.25 – 100 MHz: 250 kHz
c) 100 – 250 MHz: 500 kHz
d) 250 – 500 MHz: 1000 kHz

3. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-#.2 Section 6.3.22.

Y. PS AACR-F (Power Sum Alien Attenuation to Crosstalk Ratio Far-End)

1. AFEXT loss is the coupling of crosstalk at the far-end from external link pairs into a disturbed (victim) pair of the 4-pair link under test. PS AACR-F is the calculated power sum from all external pairs into the disturbed (victim) pair.
2. The frequency resolution shall be:

a) 1 – 31.25 MHz: 150 kHz
b) 31.25 – 100 MHz: 250 kHz
c) 100 – 250 MHz: 500 kHz
d) 250 – 500 MHz: 1000 kHz

3. The disturbed (victim) link shall have links to the left and right of it and if present, links above and below it.
4. Disturber cables shall include all links within the same bundle as the disturbed (victim) link and adjacent links
5. Should be measured in both directions if the link is patch panel to patch panel. If the link is patch panel to telecommunications outlet, then it shall be measured from the patch panel end only.
6. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-#.2 Section 6.3.25.

Z. Average PS AACR-F (Power Sum Alien Attenuation to Crosstalk Ratio Far-End)

1. Is calculated by averaging the individual PS AACR-F values, in dB, for all four pairs in the disturbed (victim) link.

2. The frequency resolution shall be:
    a) 1 – 31.25 MHz: 150 kHz
    b) 31.25 – 100 MHz: 250 kHz
    c) 100 – 250 MHz: 500 kHz
    d) 250 – 500 MHz: 1000 kHz
3. The disturbed (victim) link shall have links to the left and right of it and if present, links above and below it.
4. Disturber cables shall include all links within the same bundle as the disturbed (victim) link and adjacent links
5. Should be measured in both directions if the link is patch panel to patch panel. If the link is patch panel to telecommunications outlet, then it shall be measured from the patch panel end only.
6. Is not to exceed the Category 6A Permanent Link limits found in ANSI/TIA-568-C.2 Section 6.3.26.

## 3.3 ADMINISTRATION

A. Test results documentation

1. Test results saved within the field-test instrument shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of the test records. These test records shall be uploaded to the PC unaltered, i.e., “as saved in the field-test instrument”. The file format, CSV (comma separated value), does not provide adequate protection of these records and shall not be used.
2. The test results documentation shall be available for inspection by the Owner or the Owner’s representative during the installation period and shall be passed to the Owner's representative within 5 working days of completion of tests on cabling served by a telecommunications room or of backbone cabling. The installer shall retain a copy to aid preparation of as-built information.
3. The database for the complete project, including twisted-pair copper cabling links, if applicable, shall be stored and delivered on CD or DVD prior to Owner acceptance of the building. This CD or DVD shall include the software tools required to view, inspect, and print any selection of the test reports.
4. Circuit IDs reported by the test instrument should match the specified label ID
5. For Permanent Link testing, the detailed test results documentation data is to be provided in an electronic database for each tested balance twisted-pair and shall contain the following information
    a) The overall Pass/Fail evaluation of the link-under-test
    b) The date and time the test results were saved in the memory of the tester
    c) The identification of the customer site as specified by the end-user
    d) The name of the test limit selected to execute the stored test results
    e) The name of the personnel performing the test
    f) The version of the test software and the version of the test limit database held within the test instrument
    g) The manufacturer, model and serial number of the field-test instrument
    h) The adapters used
    i) The factory calibration date
    j) Wire Map
    k) Propagation Delay values, for all four pairs
    l) Delay Skew values, for all four pairs

m) DC Resistance values, for all four pairs
n) DC Resistance Unbalance, values for all four pairs
o) Insertion Loss, worst case values for all four pairs
p) NEXT, worst case margin and worst case values, both directions
q) PS NEXT, worst case margin and worst case values, both directions
r) ACR-F, worst case margin and worst case values, both directions
s) PS ACR-F, worst case margin and worst case values, both directions
t) Return Loss, worst case margin and worst case values, both directions
u) TCL, worst case values both directions
v) ELTCTL, worst case values, both directions.
w) Time Domain Crosstalk data if the link is marginal or fails
x) Time Domain Reflectometer data if the link is marginal or fails

6. For Alien Crosstalk testing, the detailed test results documentation data is to be provided in an electronic database for each tested balance twisted-pair and shall contain the following information

a) The overall Pass/Fail evaluation of the link-under-test
b) The date and time the measurements were made
c) The identification of the customer site as specified by the end-user
d) The name of the test limit selected to execute the stored test results
e) The name of the personnel performing the test
f) The version of the test software
g) PS ANEXT, worst case margin for all four pairs
h) Average PS ANEXT, worst case margin
i) PS AACR-F, worst case margin for all four pairs
j) Average PS AACR-F, worst case margin

B. Record copy and as-built drawings

1. Provide record copy drawings periodically through out the project as requested by the Construction Manager or Owner, and at end of the project on a USB and FTP downloadable link. Record copy drawings at the end of the project shall be in CAD format and include notations reflecting the as built conditions of any additions to or variation from the drawings provided such as, but not limited to cable paths and termination point. The as-built drawings shall include, but are not limited to block diagrams, frame and cable labeling, cable termination points, equipment room layouts and frame installation details. The as-builts shall include all field changes made up to construction completion:

a) Field directed changes to pull schedule.
b) Horizontal cable routing changes.
c) Associated detail drawings.

END OF SECTION

# SECTION 281300

# INTEGRATED SECURITY SOFTWARE AND HARDWARE

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. Section Includes:

1. Security access central-control station.
2. One or more security access networked workstations.
3. Security access operating system and application software.
4. Security access controllers connected to high-speed electronic-data transmission network.

B. Related Requirements:

1. Section 281500 "Access Control Hardware Devices" for access control system hardware, such as keypads, card readers, controllers, and other access control devices.

2. Section 281300 “Intrusion Detection” for intrusion detection system hardware.

3. Section 282000 “Video Surveillance” for video surveillance system hardware.

1.3 DEFINITIONS

A. ACS: Access Control System.

B. Credential: Data assigned to an entity and used to identify that entity.

C. Identifier: A credential card; keypad personal identification number; or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.

D. Integrate/Integration: To merge physical security applications (VSS, ACS, IDS, etc.) into one comprehensive system that is accessed from one platform.

E. IDS: Intrusion Detection System.

F. Location: A Location on the network having a workstation-to-controller communications link, with additional controllers at the Location connected to the workstation-to-controller link with a TIA 485-A communications loop. Where this term is presented with an initial capital letter, this definition applies.

G. NSPD: North Smithfield Police Department

H. PC/Workstation: Personal computer. Applies to the central station, workstations, and file servers.

I. RAS: Remote access services.

J. RF: Radio frequency.

K. ROM: Read-only memory. ROM data are maintained through losses of power.

L. TCP/IP: Transport control protocol/Internet protocol.

M. TWAIN: Technology without an Interesting Name. A programming interface that lets a graphics application, such as an image editing program or desktop publishing program, activate a scanner, frame grabber, or other image-capturing device.

N. VSS: Video Surveillance System.

O. VSSS: Video Surveillance System Server.

P. WMP: Windows media player.

Q. Wiegand: Patented magnetic principle that uses specially treated wires embedded in the credential card.

R. WYSIWYG: What You See Is What You Get. Text and graphics appear on the screen the same as they will in print.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Reference each product to a location on drawings and specifications. Test and evaluation data presented in Product Data shall comply with SIA BIO-01.

B. Shop Drawings: Include plans, elevations, sections, details, calculations and attachments to other work.

1. Diagrams for cable management system.
2. System labeling schedules, including electronic copy of labeling schedules.
3. Wiring Diagrams. For power, signal, and control wiring. Show project specific wiring schematics including the following:

    a. Workstation outlets, jacks, and jack assemblies.
    b. Patch cords.
    c. Patch panels.

4. Cable Administration Drawings.
5. UPS battery calculations for VSS, workstations, and ACS control panels (battery calcs).
6. Network diagrams showing the connection between the existing PSD network and the VSS System.
7. VSS server using the specified storage parameters.
8. Indicate quantity and types of licenses.

C. VSS, ACS and IDS project questionnaire to be provided to the owner for review and response. Questionnaire shall include security contractor questions for system configuration and set up. For example:
   1. Hours of operation.
   2. Observed Holidays.
   3. Employee Count.
   4. List of required User Logins.
   5. Current owners active directory file format.
   6. Owners Information Technology (IT) contact information for required IP addresses and network requirements.

D. Product Schedules including the following:
   1. VSS Camera schedule including:
      a. Camera ID Tag
      b. Camera Location
      c. Manufacturer
      d. Model Number
      e. Switch and Port number
      f. IP Address
      g. Subnet Address
      h. Gateway Address
      i. MAC address
      j. Frame Rate (Live and recorded)
      k. Compression Protocol (Live and recorded)
      l. Resolution (live and recorded)
      m. Installation Date
   2. ACS Schedule including:
      a. Door Number
      b. Device Tag
      c. Device Type
      d. Device Manufacturer
      e. Device Model Number
      f. Device Location
      g. Door Type
      h. Controller Type
      i. Controller Location
      j. IP Address
      k. Subnet Mask
      l. Gateway
      m. Installation Date
   3. IDS Schedule including:
      a. Device Tag
      b. Device Type
      c. Device Manufacturer
      d. Device Model Number
      e. Device Location
      f. Device Zone
      g. Installation Date

E. Warranty: Provide warranty information specified herein.

F. Samples: For workstation outlets, jacks, jack assemblies, and faceplates. For each exposed product and for each color and texture specified.

G. Product Demo: Provide one manufacturer software and hardware demo for owner and owners representatives, as requested.

1.5 WARRANTY

A. Description:
1. The product shall perform in all material respects in accordance with the accompanying user manual, and the media on which the Software Product resides will be free from defects in materials and workmanship under normal use. Software defects are covered through Service Releases and Cumulative Updates which are available for a period of three (3) year from the date of the software purchase.
2. The systems installer/integrator shall supply a three (3) year extended service and preventative maintenance agreement on the entire security electronics package (Section 28 and its related sections); in conjunction to the three (3) year project warranty. The owner shall have the option to renew the agreement (additional 1, 3, or 5 years) upon expiration.
3. The agreement must be provided by the Systems installer/integrator which provided and installed the entire security package.
4. Equipment warranty shall be provided for a period of three (3) years as described elsewhere within the specification; in addition to the one year project warranty.
5. Provide a manufactured approved software maintenance plan for the VSS, ACS for a period of three (3) years where any software updates/patches and upgrades are included at no cost to the owner.
6. Access to 24/7/365 phone support. A technician will be dispatched the next day of when the service call was placed.
7. A technician will be dispatched within 4 hours of when the call was placed for an emergency service call. Emergency service is defined as any one of the following: VSS server or workstation fails, camera/card reader does not work, etc.
8. A technician will be dispatched within 24 hours of when the call was placed for a normal service call.
9. Provide the client with 48 hours' notice of arriving for all preventative maintenance work. And provide a one hour notice prior to arrival for all preventative maintenance work.
10. Provide the client a written report explaining the scope of the service call within 48 hours after completing the service call.
11. If an device (i.e. camera, card reader, keypad, door contact, etc.) is determined to be defected, damaged, broken, or not working shall be removed and replaced the same day it has been reported.

1.6 PREVENTATIVE MAINTENANCE

A. Upon a monthly basis:
1. Reboot all VSS servers and ACS control panels; if needed. Verify all cameras are properly reporting and recording. Verify all workstations are reporting and working properly.
2. Check for system updates.
3. Provide written report to end user stating the above findings.

B. Upon a quarterly basis verify the following are as directed by the owner:
1. Inspect cameras and verify their field of view and focus are as directed by the owner.
2. Reset all device passwords and log for owner.
3. Check system alarm and event logs. Attach a printed copy of the logs if applicable.
4. Camera programming, naming, image quality, settings and recording settings are as directed by the owner.
5. System is recording as specified.
6. Recording hard drive configuration and status. Check for drive failures or bad sectors.

7. Motion detection recording settings and those cameras are capturing the expected motion activity. Note any discrepancies.
8. All channels of the video encoder(s) are working to standard.
9. Provide Microsoft Window updates to each security workstation and server.
10. Network switch utilization and network switch ports are functioning.
11. Inspect and test operation of access control equipment at each door. I.e. Card readers, door contacts, REX & door release push buttons where applicable.
12. Test operation of ancillary access control inputs and outputs.
13. Camera call-up upon event/alarm where applicable.
14. Door programming, time schedules, access levels and door unlock schedules.
15. System time of day is configured and is synchronizing with a time server or consistent source.
16. Current software version and device firmware versions; update as required.
17. Client and server computer hardware specifications.
18. CPU, memory & network utilization. Note Performance Stats.
19. Perform reboot of all computers and verify system back-online and note any changes in performance stats.
20. Provide written report to end user stating the above findings.

C. On an annual basis:
1. Notify the owner of any new integrated security system software updates/patches which are available. Install updates/patches as approved by the owner for the (3) year time period specified.

D. Hardware Support
1. The systems installer/integrator shall perform scheduled maintenance services on all systems and equipment as specified in this section.
2. Components and parts that are found to be defective, have failed operationally or which exhibit signs of near term failure will be identified during each preventive maintenance inspection or test. If the component or part is covered under a current Systems installer/integrator or factory warranty, said part or component will be replaced at no charge to owner including labor during normal business hours.
3. For any equipment requiring repair or replacement that is not covered, an estimate will be prepared and submitted for approval on a reimbursable basis and repair authorization shall be issued in writing by an authorized representative of the owner before proceeding with the work.

E. Response Time
1. Should an emergency arise, the systems installer/integrator personnel will assess the situation either by phone or remote diagnostics, or both, and will determine the required course of action with the owner.
2. If it is determined that a site visit is required, the systems installer/integrator personnel will arrive at the affected premises within four (4) hours of the request of the owner.
3. If the resolution of the emergency service call requires the systems installer/integrator to provide service for equipment that is not listed under section 28 and its related sections, owner will be liable for charges and expenses prevailing for such service.
4. Emergency Service will be provided during the following periods.
    a. Provide Emergency Service Monday through Friday 8:00 AM – 5:00PM excluding evenings and weekends, city, state, federal and systems installer/integrator observed holidays at no additional charge to the base annual service fee. Labor for travel time is included under this agreement. The systems installer/integrator will provide a response time as stated and agreed to above. Emergency Service requested by the CUSTOMER to be provided outside of the above stated times will be reimbursed by the CUSTOMER as shown below.
5. Emergency Service during the following periods is not included.

a. Emergency Service Monday through Friday 5:00PM – 8:00AM, weekends, city, state, federal and Systems installer/integrator observed holidays are not included. Emergency Services provided under this scope will be reimbursable by the CUSTOMER to the Systems installer/integrator at then current Systems installer/integrator published service labor rates and standard service charges (Minimum Labor Charge, Vehicle Charges, Round Trip Travel Time, Mileage, etc.

1.7 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.8 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For security system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Workstation operating system documentation.
2. Workstation installation and operating documentation, manuals, and software for the workstation and all installed peripherals. Software shall include system restore, emergency boot diskettes, and drivers for all installed hardware. Provide separately for each workstation.
3. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on USB or cloud media of the hard-copy submittal.
4. System installation and setup guides with data forms to plan and record options and setup decisions.

1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Credential card blanks, ready for printing. Include enough credential cards for all personnel to be enrolled at the site plus an extra 50 percent for future use.
2. Fuses of all kinds, power and electronic, equal to 10 percent of amount installed for each size used, but no fewer than three units.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1. Cable installer must have on staff an RCDD certified by Building Industry Consulting Service International.

B. Source Limitations: Obtain central station, workstations, controllers, Identifier readers, and all software through one source from single manufacturer.

1.11 DELIVERY, STORAGE, AND HANDLING

A. VSS Server, Workstations, and Controllers:

1. Store in temperature- and humidity-controlled environment in original manufacturer's sealed containers. Maintain ambient temperature between 50 and 85 deg F (10 and 30 deg C), and not more than 80 percent relative humidity, noncondensing.

2. Open each container; verify contents against packing list; and file copy of packing list, complete with container identification, for inclusion in operation and maintenance data.
3. Mark packing list with the same designations assigned to materials and equipment for recording in the system labeling schedules.
4. Save original manufacturer's containers and packing materials and deliver as directed under provisions covering extra materials.

1.12 COORDINATION

A. Coordinate enclosure and rack layouts with the low voltage contractor, owners IT department, Internet service provider, and LAN equipment suppliers.

B. Coordinate network connection requirements (IP addresses, VLAN, ports, etc.) with LAN equipment vendor prior to the submittal submission.

**PART 2 - PRODUCTS**

2.1 SOFTWARE

A. Manufacturer: Subject to compliance with requirements, provide products by the following:
   1. Basis of design video surveillance system (VSS) software:
      a. The latest version of Hanwha Wisenet Wave 6.0 (or newer) video management software with lifetime perpetual license which includes all software and security updates/patches.
      b. Approved video surveillance system software equals are as follows:
         1) The latests version of Milestone Xprotect professional+ with three (3) years of licenses and software updates included.
         2) The latests version of Qumulex (by Synerion) cloud-based video surveillance system with three (3) years of licenses and software updates included.
   2. Basis of design access control system (ACS) software:
      a. The latests version of S2 Systems Netbox Extreme with three (3) years of licenses and software updates included.
      b. Approved access control system software equals:
         1) The latests version of Qumulex (by Synerion) cloud-based access control system with three (3) years of licenses and software updates included.
         2) The latests version of Galaxy Enterprise software with three (3) years of licenses and software updates included.
   3. IDS – Non required.

B. Description:
   1. The VSS consists of the following integrated subsystems:
      a. IP Video System
      b. IP Video Intercom
      c. Integrated Access Control system (ACS)
      d. Integrated Intrusion alarm system (IDS)
      e. Security Peripherals
      f. Servers and Workstations
      g. Network Electronics
   2. The VSS shall be an enterprise class IP-enabled security and safety software solution.
   3. The VSS shall implement seamless unification of the access control system (ACS), Axis IP Video Intercom, and Intrusion detection system (IDS) system under a single platform. The VSS user interface (UI) applications shall present a unified security interface for the

management, configuration, monitoring, and reporting of embedded IP video, ACS, Video Intercom, and IDS systems and associated edge devices.

4. The VSS shall be provided with mobile apps for various off-the-shelf smartphones and tablets. The mobile apps shall communicate with the USP's Mobile Server over any WiFi or wireless IP connection. Provide three mobile licenses and mobile setups.
5. The VSS shall support a unified web client (UWC) for access control, video, video intercom and intrusion.
6. The VSS shall consist of a role-based architecture, with each Server Software Module hosting one or more roles.
7. The VSS shall support multiple approaches to integrating third party systems. These shall include: Software Development Kits (SDKs), Driver Development Kits (DDKs), REST-based Web Service SDKs, and more. Provide all required third party integration licenses.
8. The VSS shall implement the concept of a Federation for both access control and video. Federation shall allow multiple independent VSS systems (Federated systems) to be unified into a larger virtual system (the Federation). This shall facilitate global monitoring of multiple independent VSS systems shall be possible. All remote sites shall be monitored and controlled via a single log-in, systems which utilize multiple user log-ins to view remote sites will not be allowed.
9. The VSS, ACS, and IDS shall implement a direct connection to one or multiple Microsoft Active Directory server via the Active Directory Role(s). Active Directory integration shall enable the synchronization of information from the Active Directory server to the ISS.
10. The VSS shall integrate with third party intrusion panels and devices via an Intrusion DDK. The Intrusion Manager Role shall manage communications with the intrusion panels. Communications with intrusion devices shall be over serial communications and/or an IP network. All intrusion points shall be annunciated on the ISS.
11. The VSS shall include Mapping functionality for access control, video, and intrusion.
12. The Badge designer module, license, and printer station shall be included in the base bid and provided at no cost to the owner. Provide 1000 printer ready access control cards.
13. Provide all necessary licenses as required by the system manufacture; I.e. cameras, controllers, intrusion panels, mobile viewing applications, fail over, etc.
14. Recording and storage parameters
    1) Period – One Hundred and Eighty (180) days
    2) Timeframe - Record 24/7/365
    3) Resolution- Full camera resolution
    4) Framerate- 15 fps (recorded), full camera framerate (live view)
    5) Redundancy- RAID 6, No fail over
    6) Provide 25% spare capacity.

C. Workstation Software:
1. User profile levels shall be individually customized at each workstation to allow or disallow operator access to program functions for each Location.
2. Workstation event filtering shall allow user to define events and alarms that will be displayed at each workstation. If an alarm is unacknowledged (not handled by another workstation) for a preset amount of time, the alarm will automatically appear on the filtered workstation.
3. Provide necessary VSS licenses are required by the manufacturer.
4. Provide up to 15 user logins with 15 different programming requirements at a minimum. Coordinate exact requirements with owner during submittal time.

## 2.2 OPERATION

A. VSS and ACS shall use an existing developed database for access-control and credential-creation functions. Security contractor shall work with PSD regarding the existing Microsoft Active Directory of all employees and registered individuals.

B. Distributed Processing: A fully distributed processing system.

1. Access-control information, including time, date, valid codes, access levels, and similar data, shall be downloaded to controllers so each controller can make access-control decisions.
2. In the event that communications with the ACS and controller are lost, controllers shall automatically buffer event transactions until communications are restored, at which time buffered events shall be uploaded to the ACS.

C. System Network Requirements:

1. System components shall be interconnected and shall provide automatic communication of status changes, commands, field-initiated interrupts, and other communications required for proper system operation.
2. Communication shall not require operator initiation or response and shall return to normal after partial- or total-network interruption such as power loss or transient upset.
3. System shall automatically annunciate communication failures to the operator via notifications and shall identify the communications link that has experienced a partial or total failure.

D. Field equipment shall include controllers, sensors, and controls.

1. Controllers shall serve as an interface between the ACS, sensors and controls.
2. Data exchange between the VSS and the controllers shall include down-line transmission of commands, software, and databases to controllers.
3. The up-line data exchange from the controller to the VSS shall include status data such as intrusion alarms, status reports, and entry-control records.

E. System Response to Alarms:

1. Field device network shall provide a system end-to-end response time of one second or less for every device connected to the system.
2. Alarms shall be annunciated at the VSS within one second of the alarm occurring at a controller or at a device controlled by a local controller, and within 100 ms if the alarm occurs at the VSS.
3. Alarm and status changes shall be displayed within 100 ms after receipt of data by the VSS.
4. Notification shall be sent out to owner defined authorized users via: web, software and mobile based devices.
5. All graphics shall be displayed, including graphics-generated map displays, on web, software and mobile based devices within five seconds of alarm receipt at the VSS, ACS or IDS.
6. This response time shall be maintained during system heavy load.

F. False-Alarm Reduction: The design of the ACS and controllers shall contain features to reduce false alarms. Equipment and software shall comply with SIA CP-01.

G. Door Hardware Interface:

1. Comply with requirements in Section 087100 "Door Hardware" and Section 087111 "Door Hardware (by Hardware Consultant)" for door hardware required to be monitored or controlled by the security access system.
2. Electrical characteristics of controllers shall match the signal and power requirements of door hardware.

2.3 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70, "National Electrical Code."

C. Comply with SIA DC-01 and SIA DC-03 and SIA DC-07.

D. Anti-Passback:

1. System shall have global and local anti-passback features, selectable by Location. System shall support hard and soft anti-passback.
2. Hard Anti-Passback: Once a credential holder is granted access through a reader with one type of designation (IN or OUT), the credential holder may not pass through that type of reader designation until the credential holder passes through a reader of opposite designation.
3. Soft Anti-Passback: Should a violation of the proper IN or OUT sequence occur, access shall be granted, but a unique alarm shall be transmitted to the control station, reporting the credential holder and the door involved in the violation. A separate report may be run on this event.
4. Timed Anti-Passback: A controller capability that prevents an access code from being used twice at the same device (door) within a user-defined amount of time.
5. Provide four separate zones per Location that can operate without requiring interaction with the host workstation (done at controller). Each reader shall be assignable to one or all four anti-passback zones. In addition, each anti-passback reader can be further designated as "Hard," "Soft," or "Timed" in each of the four anti-passback zones. The four anti-passback zones shall operate independently.
6. The anti-passback schemes shall be definable for each individual door.
7. The Master Access Level shall override anti-passback.
8. System shall have the ability to forgive (or reset) an individual credential holder or the entire credential-holder population anti-passback status to a neutral status.

E. Visitor/Contractor Assignment:

1. Provide for and allow an operator to be restricted to only working with visitors or contractors. The visitor and contractor badging subsystem shall assign credentials and enroll visitors and contractors. Allow only those access levels that have been designated as approved.
2. Provide an automated log of visitor or contractor by: name, time, doors accessed, and name of visitor or contractors companies contact person.
3. Allow a visitor or contractor designation to be assigned to a credential holder.
4. Security access system shall be able to restrict the access levels that may be assigned to credentials issued to visitors.
5. Allow operator to recall visitors' or contractors' credential-holder file once a visitor or contractor is enrolled in the system.
6. The operator may designate any reader as one that deactivates the credential after use at that reader. The history log shall show the return of the credential.
7. System shall have the ability to use the visitor or contractor designation in searches and reports. Reports shall be able to print all or any visitor or contractor activity.

F. Training Software: Enables operators to practice system operation, including alarm acknowledgment, alarm assessment, response force deployment, and response force communications. System shall continue normal operation during training exercises and shall terminate exercises when an alarm signal is received at the console.

G. Entry-Control Enrollment Software: Database management functions that allow operators to add, delete, and modify access data as needed.

1. The enrollment station shall not have alarm response or acknowledgment functions.
2. Provide multiple, password-protected access levels. Database management and modification functions shall require a higher operator access level than personnel enrollment functions.
3. The program shall provide means to disable the enrollment station when it is unattended, to prevent unauthorized use.
4. The program shall provide a method to enter personnel identifying information into the entry-control database files through enrollment stations. In the case of personnel identity-verification subsystems, this shall include biometric data. Allow entry of personnel identifying information into the system database using menu selections and data fields. The data field names shall be customized during setup to suit user and site needs. Personnel identity-verification subsystems selected for use with the system shall fully support the enrollment function and shall be compatible with the entry-control database files.
5. Cardholder Data: Provide 99 user-defined fields. System shall have the ability to run searches and reports using any combination of these fields. Each user-defined field shall be configurable, using any combination of the following features:

    a. MASK: Determines a specific format with which data must comply.
    b. REQUIRED: Operator is required to enter data into field before saving.
    c. UNIQUE: Data entered must be unique.
    d. DEACTIVATE DATE: Data entered will be evaluated as an additional deactivate date for all cards assigned to this cardholder.
    e. NAME ID: Data entered will be considered a unique ID for the cardholder.

6. Personnel Search Engine: A report generator with capabilities such as search by last name, first name, group, or any predetermined user-defined data field; by codes not used in definable number of days; by skills; or by seven other methods.
7. Multiple Deactivate Dates for Cards: User-defined fields to be configured as additional stop dates to deactivate any cards assigned to the cardholder.
8. Batch card printing.
9. Default card data can be programmed to speed data entry for sites where most card data are similar.
10. Enhanced ASCII File Import Utility: Allows the importing of cardholder data and images.
11. Card Expire Function: Allows readers to be configured to deactivate cards when a card is used at selected devices.

## 2.4 SYSTEM DATABASE

A. Database and database management software shall define and modify each point in database using operator commands. Definition shall include parameters and constraints associated with each system device.

B. Database Operations:

1. System data management shall be in a hierarchical menu-tree format, with navigation through expandable menu branches and manipulated with use of menus and icons in a main menu and system toolbar.
2. Navigational Aids:

    a. Toolbar icons for add, delete, copy, print, capture image, activate, deactivate, and muster report.

b. Point and click feature to facilitate data manipulation.
c. Next and previous command buttons visible when editing database fields to facilitate navigation from one record to the next.
d. Copy command and copy tool in the toolbar to copy data from one record to create a new similar record.

3. Data entry shall be automatically checked for duplicate and illegal data and shall be verified for valid format.
4. System shall generate a memo or note field for each item that is stored in database, allowing the storing of information about any defining characteristics of the item. Memo field is used for noting the purpose for which the item was entered, reasons for changes that were made, and the like.

C. File Management:

1. File management shall include database backup and restoration system, allowing selection of storage media, including cloud based, solid state hard drive and designated network resources.
2. Operations shall be both manual and automatic modes. The number of automatic sequential backups before the oldest backup will be overwritten; FIFO mode shall be operator selectable.
3. Backup program shall provide manual operation from any workstation on the LAN and shall operate while system remains operational.

D. Operator Passwords:

1. Support up to 32,000 individual system operators, each with a unique password.
2. One to eight alphanumeric characters
3. Allow passwords to be case sensitive.
4. Passwords shall not be displayed when entered.
5. Passwords shall have unique and customizable password profile, and allow several operators to share a password profile. Include the following features in the password profile:

a. Predetermine the highest-level password profile for access to all functions and areas of program.
b. Allow or disallow operator access to any program operation, including the functions of View, Add, Edit, and Delete.
c. Restrict doors to which an operator can assign access.

6. Operators shall use a user name and password to log on to system. This user name and password shall be used to access database areas and programs as determined by the associated profile.
7. Make provision to allow the operator to log off without fully exiting program. User may be logged off but program will remain running while displaying the login window for the next operator.

E. Access Card/Code Operation and Management: Access authorization shall be by card, by a manually entered code (PIN), or by a combination of both (card plus PIN).

1. Access authorization shall verify the facility code first, the card or card-and-PIN validation second, and the access level (time of day, day of week, date), anti-passback status, and number of uses last.

2. Use data-entry windows to view, edit, and issue access levels. Access-authorization entry-management system shall maintain and coordinate all access levels to prevent duplication or the incorrect creation of levels.
3. Allow assignment of multiple cards/codes to a cardholder.
4. Allow assignment of up to four access levels for each Location to a cardholder. Each access level may contain any combination of doors.
5. Each door may be assigned four time zones.
6. Access codes may be up to 11 digits in length.
7. Software shall allow the grouping of locations so cardholder data can be shared by all locations in the group.
8. Visitor Access: Issue a visitor badge for data tracking or photo ID purposes without assigning that person a card or code.
9. Cardholder Tracing: Allow for selection of cardholder for tracing. Make a special audible and visible annunciation at control station when a selected card or code is used at a designated code reader. Annunciation shall include an automatic display of the cardholder image.
10. Allow each cardholder to be given either an unlimited number of uses or a number from one to 9999 that regulates the number of times the card can be used before it is automatically deactivated.
11. Provide for cards and codes to be activated and deactivated manually or automatically by date. Provide for multiple deactivate dates to be preprogrammed.

F. Security Access Integration:

1. Photo ID badging and photo verification shall use the same database as the security access and may query data from cardholder, group, and other personal information to build a custom ID badge.
2. Automatic or manual image recall and manual access based on photo verification shall also be a means of access verification and entry.
3. System shall allow sorting of cardholders together by group or other characteristic for a fast and efficient method of reporting on, and enabling or disabling, cards or codes.

G. Key control and tracking shall be an integrated function of cardholder data.

1. Provide the ability to store information about which conventional metal keys are issued and to whom, along with key construction information.
2. Reports shall be designed to list everyone who possesses a specified key.

H. Facility Codes: System shall accommodate up to 2048 facility codes per Location, with the option of allowing facility codes to work at all doors or only at particular doors.

I. Operator Comments:

1. With the press of one appropriate button on the toolbar, the user shall be permitted to enter operator comments into the history at any time.
2. Automatic prompting of operator comment shall occur before the resolution of each alarm.
3. Operator comments shall be recorded by time, date, and operator number.
4. Comments shall be sorted and viewed through reports and history.
5. The operator may enter comments in two ways; either or both may be used:

    a. Manually entered through keyboard data entry (typed), up to 65,000 characters per each alarm.
    b. Predefined and stored in database for retrieval on request.

6. System shall have a minimum of 999 predefined operator comments with up to 30 characters per comment.

J. Group:

1. Group names may be used to sort cardholders into groups that allow the operator to determine the tenant, vendor, contractor, department, division, or any other designation of a group to which the person belongs.
2. System software shall have the capacity to assign one of 32,000 group names to an access authorization.
3. Make provision in software to deactivate and reactivate all access authorizations assigned to a particular group.
4. Allow sorting of history reports and code list printouts by group name.

K. Holidays:

1. Three different holiday schedules may be assigned to a time zone. Holiday schedule consists of date in format MM/DD/YYYY and a description. When the holiday date matches the current date of the time zone, the holiday schedule replaces the time-zone schedule for that 24-hour period.
2. System shall have the capacity for 32,000 holidays.
3. Three separate holiday schedules may be applied to a time zone.
4. Holidays have an option to be designated as occurring on the designated date each year. These holidays remain in the system and will not be purged.
5. Holidays not designated to occur each year shall be automatically purged from the database after the date expires.

L. Access Levels:

1. System shall allow for the creation of up to 32,000 access levels.
2. One level shall be predefined as the Master Access Level. The Master Access Level shall work at all doors at all times and override any anti-passback.
3. System shall allow for access to be restricted to any area by reader and by time. Access levels shall determine when and where an Identifier is authorized.
4. System shall be able to create multiple door and time-zone combinations under the same access level so that an Identifier may be valid during different time periods at different readers even if the readers are on the same controller.

M. User-Defined Fields:

1. System shall provide a minimum of 99 user-defined fields, each with up to 50 characters, for specific information about each credential holder.
2. System shall accommodate a title for each field; field length shall be 20 characters.
3. A "Required" option may be applied to each user-defined field that, when selected, forces the operator to enter data in the user-defined field before the credential can be saved.
4. A "Unique" option may be applied to each user-defined field that, when selected, will not allow duplicate data from different credential holders to be entered.
5. Data format option may be assigned to each user-defined field that will require the data to be entered with certain character types in specific spots in the field entry window.
6. A user-defined field, if selected, will define the field as a deactivate date. The selection shall automatically cause the data to be formatted with the windows MM/DD/YYYY date format. The credential of the holder will be deactivated on that date.
7. A search function shall allow any one user-defined field or combination of user-defined fields to be searched to find the appropriate cardholder. The search function shall include a search for a character string.

8. System shall have the ability to print cardholders based on and organized by the user-defined fields.

2.5 SURGE AND TAMPER PROTECTION

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor-entry connection to components.

1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits" as recommended by manufacturer for type of line being protected.

B. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station control-unit alarm display shall identify tamper alarms and indicate locations.

2.6 FIXED MAP DISPLAY

A. Provide an interior and exterior fixed map display showing devices location within the ACS and VSS software. Zones corresponding to those monitored by the system shall be highlighted on the display. Status of each zone shall be displayed using digital displays as required within each designated zone. A digital display test switch shall be provided on the map display.

2.7 HARDWARE

A. Server(s)
1. Manufacturer: Provide products by the following:
a. Per Milestones requirements to meet the forementioned retention requirements.

B. Security Workstation Type “SSW”
1. Manufacturer: Subject to compliance with requirements, provide products by the following:
a. Dell
b. Hewlett Packard
c. Boxx

2. Description:
a. Performance requirements may dictate equipment exceeding minimum requirements indicated.
b. Energy Star compliant.
c. Windows 11 Pro
d. Processor:
1) Minimum Speed: 3.6GHz
2) Cores: Quad
3) Series: Core i7
e. 64-bit operating system
f. 500GB Solid State Drive for OS and Security Center applications or better.
g. RAM:
1) Capacity: 32GB

2) Speed and Type: 2133MHz, ECC.
h. Video Card:
1) NVIDIA M4000 8GB GPU or better
i. Network interface card:
1) 10-100-1000 base TX Ethernet with RJ45 connector port.
2) 100 base FX Ethernet with SC or ST port.
j. Wireless Ethernet, 802.11 a/b/g/n.
k. Keyboard:
1) 101 key enhanced keyboard.
2) Full upper- and lowercase ASCII keyset, numeric keypad, dedicated cursor control keypad, and 12 programmable function keys.
3) Wireless operation within up to 72 inches (1800 mm) in front of workstation.
l. Flat Panel Displays:
1) Number of Displays: Two
2) Display Size: 27” Edgeless
3) Aspect Ratio: 16 to 9
4) Resolution: 3840 x 2160
5) Response time: 6ms
6) Inputs: HDMI, DisplayPort and Mini DisplayPort
7) Energy Star compliant.
8) Antiglare display.
9) Desk mounted, adjustable bracket capable of supporting number of monitors specified above with integral power and display cable organization.

C. Security Workstation Type “SSW” – Micro-workstation concealed behind 65inch Wall Display
1. Manufacturer: Subject to compliance with requirements, provide products by the following:
a. Dell
b. Hewlett Packard

2. Description:
a. Performance requirements may dictate equipment exceeding minimum requirements indicated.
b. Energy Star compliant.
c. Windows 11 Pro
d. Processor:
1) Minimum Speed: 2.3-3.8GHz
2) Cores: 6
3) Series: Core i5 10th Generation
e. 64-bit operating system
f. 256GB Solid State Drive for OS and Security Center applications or better.
g. RAM:
1) Capacity: 16GB
2) Speed and Type: DDR4, non ECC.
h. Video Card:
1) NVIDIA M4000 8GB GPU or better
i. Network interface card:
1) 10-100-1000 base TX Ethernet with RJ45 connector port.
j. Wireless Ethernet, 802.11 a/b/g/n. Intel Wifi6
k. Wireless Keyboard and Mouse:
1) 101 key enhanced keyboard.
2) Full upper- and lowercase ASCII keyset, numeric keypad, dedicated cursor control keypad, and 12 programmable function keys.
3) Wireless operation within up to 72 inches (1800 mm) in front of workstation.
l. Display:

1) Size: 65inch
2) Aspect Ratio: 16 to 9
3) Resolution: 3840 x 2160 4K
4) High Dynamic Range (HDR)
5) Direct-lit LED
6) Inputs:
   a) 2 – HDMIs
   b) 1 – DisplayPort
   c) 1 - DVI
7) Energy Star compliant.
8) Commercial Grade rated for 24/7/365 use.
9) Antiglare display.
10) Mount: Articulating Wall mount.

D. Badges:
   a. Provide 150 HID iCLASS SE Clamshell cards.
      1) Model #3350 – Coordinate exact model with PSD.

E. KVM Switch with Monitor
   1. Provide (1) KVM in IT 004
   2. Manufacturer: Subject to compliance with requirements, provide products by the following:
      a. Tripp-Lite
      b. Dell
      c. IOGear
   3. Description:
      a. Rack Mounted.
      b. Configured to manage all servers.
      c. Provide with KVM extender.
      d. Provide with multiple USB ports, DVI, DisplayPort, and HDMI ports.

2.8 HARDWARE INTERFACE

A. Exit Alarm: Operation of a monitored door shall generate an alarm. Exit devices and alarm contacts are specified in Section 087100 "Door Hardware."

B. Electric Door Strikes: Use end-of-line resistors to provide power-line supervision. Signal switches shall transmit data to controller to indicate when the bolt is not engaged and the strike mechanism is unlocked, and they shall report a forced entry. Power and signal shall be from the controller. Electric strikes are specified in Section 087100 "Door Hardware."

2.9 TRANSFORMERS

A. NFPA 70, Class II control transformers, NRTL listed. Transformers for security access-control system shall not be shared with any other system.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. Examine roughing-in for LAN and control cable conduit systems to workstations, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. All IP devices default passwords shall be changed to a password directed by the owner.

3.2 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with TIA 606-B, "Administration Standard for Commercial Telecommunications Infrastructure."

C. Product Schedules: Obtain detailed product schedules from manufacturer of access-control system or develop product schedules to suit Project. Fill in all data available from Project plans and specifications and publish as Product Schedules for review and approval.

1. Record setup data for control station and workstations.
2. For each Location, record setup of controller features and access requirements.
3. Propose start and stop times for time zones and holidays, and match up access levels for doors.
4. Set up groups, facility codes, linking, and list inputs and outputs for each controller.
5. Assign action message names and compose messages.
6. Set up alarms. Establish interlocks between alarms, intruder detection, and video surveillance features.
7. Prepare and install alarm graphic maps.
8. Develop user-defined fields.
9. Develop screen layout formats.
10. Propose setups for guard tours and key control.
11. Discuss badge layout options; design badges.
12. Complete system diagnostics and operation verification.
13. Prepare a specific plan for system testing, startup, and demonstration.
14. Develop acceptance test concept and, on approval, develop specifics of the test.
15. Develop cable and asset-management system details; input data from construction documents. Include system schematics and AutoCad 2018 drawings.

D. In meetings with Architect and Owner, present Product Schedules and review, adjust, and prepare final setup documents. Use approved, final Product Schedules to set up system software.

3.3 IDENTIFICATION

A. In addition to requirements in this article, comply with applicable requirements in Section 270553 "Identification for Communications Systems" and with TIA 606-B.

B. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

C. At completion, cable and asset management software shall reflect as-built conditions.

3.4 SYSTEM SOFTWARE AND HARDWARE

A. Develop, install, and test software and hardware, and perform database tests for the complete and proper operation of systems involved. Assign software license(s) to Owner.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service.

1. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.
2. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

3.6 PROTECTION

A. Maintain strict security during the installation of equipment and software. Rooms housing the control station, and workstations that have been powered up shall be locked and secured with an activated burglar alarm and access-control system reporting to a central station complying with UL 1610, "Central-Station Burglar-Alarm Units," during periods when a qualified operator in the employ of Contractor is not present.

3.7 DEMONSTRATION/TRAINING

A. Engage a factory-authorized service representative to train owner and owner’s staff on the VSS, ACS, and IDS system. The VSS, ACS and IDS training shall include (2) 4 hour sessions with ten of the owners staff. Session number one shall be scheduled once the system has been configured and operational. Session number two shall be 1-3 months after training session one. Security contractor shall provide a location suitable to support owners staff and training personnel.

B. During each training session the security contractor and factory-authorized service representative shall help attending users with their user logins system optimization. E.g. showing each user how to reconfigure their user profile to customized to their person use.

END OF SECTION

# SECTION 281500

# ACCESS CONTROL HARDWARE DEVICES

## PART 1 - GENERAL

### 1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications

### 1.2 SUMMARY

A. Section Includes:

1. Card readers, credential cards, and keypads
2. Cables
3. Transformers

B. Related Requirements:

1. Section 281300 "Integrated Security Software and Hardware" for control and monitoring applications, workstations, and interfaces.

### 1.3 DEFINITIONS

A. ACS: Access Control System.

B. Credential: Data assigned to an entity and used to identify that entity.

C. DTS: Digital Termination Service. A microwave-based, line-of-sight communication provided directly to the end user.

D. Identifier: A credential card; keypad personal identification number; or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.

E. Location: A Location on the network having a PC-to-controller communications link, with additional controllers at the Location connected to the PC-to-controller link with a TIA 485-A communications loop. Where this term is presented with an initial capital letter, this definition applies.

F. NSPD: North Smithfield Police Department.

G. PC: Personal computer. Applies to the central station, workstations, and file servers.

H. RAS: Remote access services.

I. RF: Radio frequency.

J. ROM: Read-only memory. ROM data are maintained through losses of power.

K. TCP/IP: Transport control protocol/Internet protocol.

L. TWAIN: Technology without an Interesting Name. A programming interface that lets a graphics application, such as an image editing program or desktop publishing program, activate a scanner, frame grabber, or other image-capturing device.

M. WMP: Windows media player.

N. Wiegand: Patented magnetic principle that uses specially treated wires embedded in the credential card.

O. WYSIWYG: What You See Is What You Get. Text and graphics appear on the screen the same as they will in print.

## 1.4 ACTION SUBMITTALS

A. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier/Dealer, Systems Integrator, and Contractor to review proper methods and procedures for receiving, handling, and installing the access control system hardware. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedules.
   1. Inspect and discuss Division 26 electrical roughing-in and similar preparatory work performed by other trades.
   2. Review and verify sequence of operation descriptions for each unique access-controlled opening.
   3. Review and finalize construction schedule and verify availability of materials.
   4. Review the required inspecting, testing, commissioning, and demonstration procedures.

B. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Reference each product to a location on Drawings. Test and evaluation data presented in Product Data shall comply with SIA BIO-01.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

   1. Diagrams for cable management system.
   2. System labeling schedules, including electronic copy of labeling schedules that are part of the cable and asset identification system of the software specified in Parts 2 and 3.
   3. Wiring Diagrams. For power, signal, and control wiring. Show typical wiring schematics including the following:

      a. Control Panel Card Readers
      b. Door Hardware
      c. Door Contacts
      d. Door Releases
      e. Request to Exit Devices
      f. Push Button ADA openers

   4. Cable Administration Drawings: As specified in "Identification" Article.

D. Product Schedules.

E. Samples: For card readers, credential cards, and doors releases. For each exposed product and for each color and texture specified.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For security system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on USB or cloud media of the hard-copy submittal.
2. System installation and setup guides with data forms to plan and record options and setup decisions.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. 150 Credential card blanks, ready for printing. Include ISO credential cards. Program for all personnel to be enrolled at the site including providing, etc.
2. Fuses of all kinds, power and electronic, equal to 10 percent of amount installed for each size used, but no fewer than three units.
3. Card reader: 1 of each type.
4. Controller: 1 of each type.
5. Network Module/Application Blade(s): 1 of each type.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1. Cable installer must have on staff an RCDD certified by Building Industry Consulting Service International.

B. Source Limitations: Obtain central station, workstations, controllers, Identifier readers, and all software through one source from single manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store in temperature- and humidity-controlled environment in original manufacturer's sealed containers. Maintain ambient temperature between 50 and 85 deg F (10 and 30 deg C), and not more than 80 percent relative humidity, noncondensing.

B. Open each container; verify contents against packing list; and file copy of packing list, complete with container identification, for inclusion in operation and maintenance data.

C. Do not store electronic access control hardware, software or related accessories at Project site without prior authorization.

1. Access control firmware and software: Where approved and directed, inventory upon receipt and store electronic access control equipment in a secure, temperature and humidity-controlled environment in original manufacturer's sealed containers.

D. Tag each item or package separately with identification related to the final Access Control Door

E. Schedule, and include basic installation instructions with each item or package. Save original manufacturer's containers and packing materials and deliver as directed under provisions covering extra materials.

1.10 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article will not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and are in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of the installed access control system hardware and software that fails in materials or workmanship, including all related parts and labor, within specified warranty period after final testing and acceptance by the Owner. Failures include, but are not limited to, the following:
1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods (Electrified Access Control Door Hardware):
1. Two years for Electrified, Wiegand Output, and IP-Enabled Access Control Door Hardware.

E. Maintenance Support and Extended Service Agreement: Submit for Owner’s consideration an optional extended Service Agreement for the installed access control system, including support for software related issues. The extended Service Agreement is considered elective and is without manufacturer's requirement stipulating mandatory coverage for owner and/or vendor system support.
1. A published copy of this agreement to be included with the submittal package
2. Support for the installed access control system components is provided through the vendor under a 24 hour technical assistance program.
3. Access control and management system components are to be available on a one-day turn around time frame from the manufacturer.
4. Primary systems manufacturer to offer and provide remote modem or internet access for direct factory support to the vendor. The factory level support to include diagnostics and troubleshooting support on systems related issues at no additional cost to the owner.

F. Access Control Software Upgrades: Version upgrades and "fix" releases to the access control system software are available at no extra charge as long as the version of software provided under this specification remains the current manufacturer’s version or for up to (2) years after a new version release.
1. Major access control software revisions that provide new functionality to the product provided free of charge for up to one (1) year from the date of substantial completion.

2. Access control system software is to be upgradable as may be required or as necessary, to expand and manage the owner's site or sites. Upgrades are to be offered at a published flat fee for the primary system software, with single license modules included in the primary fee structure. System upgrades offered at a costing structure based upon the original number of licensed modules issued, or on those to be purchased at a future date, are not allowed.
3. As part of the submittal package, provide a list of available software upgrades and/or expansions modules. List to identify related costs for upgrades, or expansions to the original system, up to the next qualifying operational level.

1.11 COORDINATION

A. Coordinate enclosure and rack layouts with the low voltage contractor, owners IT department, Internet service provider, and LAN equipment suppliers.

B. Coordinate network connection requirements (IP addresses, VLAN, ports, etc.) with LAN equipment vendor prior to the submittal submission.

C. Coordinate the layout and installation of security pathways and cabling with all trades to verify and rectify clashes prior to installation.

D. Coordinate exact door and door hardware requirements with general contractor and door hardware vendor prior to the submittal submission.

E. Coordinate quantity and arrangement of assemblies with ceiling space configuration and with components occupying ceiling space, including structural members, pipes, air-distribution components, raceways, cable trays, recessed lighting fixtures, and other items.

F. Access Control System Electrical Coordination: Coordinate the layout and installation of scheduled electrified door hardware, and related access control equipment, with required connections to source power junction boxes, power supplies, detection and monitoring hardware and fire alarm system.
   1. Door Hardware Interface: The card key access control system to interface and be connected to electronic door control hardware (electromechanical locks, electric strikes, magnetic locks, door position switches, other monitoring contacts, and related auxiliary control devices) as described under Division 8 "Door Hardware". Coordinate the installation and configuration of specified door hardware being monitored or controlled with the controls, software and access control hardware specified in this Section.

G. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing electrified door hardware and access control system components. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing access control system hardware to comply with indicated requirements.

H. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

**PART 2 - PRODUCTS**

2.1 OPERATION

A. PSD is currently standardized on Premisys (Now Acre) - https://acresecurity.com/access-control-solutions/premisys-boldly-securing-your-world access control system utilizing Mercury boards.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70, "National Electrical Code."

C. Comply with SIA DC-01 and SIA DC-03 and SIA DC-07.

2.3 CARD READERS, CREDENTIAL CARDS, AND KEYPADS

A. Card Reader:
   1. HID Signo Readers
      a. Model 20 – Mullion use
      b. Model 40
   2. Power:
      a. 12v DC
      b. 250mA Peak
   3. Frequency:
      a. 2.4GHz (Bluetooth)
      b. 13.56 MHz (NFC)
      c. 125 kHz
   4. Response Time: Card reader shall respond to passage requests by generating a signal that is sent to the controller. Response time shall be 200 ms or less, from the time the card reader finishes reading the credential card until a response signal is generated.
   5. Enclosure: Suitable for surface, semi-flush, pedestal, or weatherproof mounting. Mounting types shall additionally be suitable for installation in the following locations:
      a. Indoors, controlled environment.
      b. Outdoors, IP65 Rated.
   6. Display: Digital visual indicator shall provide visible and audible status indications and user prompts. Indicate power on or off, whether user passage requests have been accepted or rejected, and whether the door is locked or unlocked.
   7. The card reader shall read credential cards in a range from direct contact to at least 6 inches (150 mm) from the reader.

B. All devices data shall be Open Supervised Device Protocol (OSDP) encrypted.

C. Communication Protocol: Compatible with local processor.

D. Credential Card – Provide twenty-five-hundred (2,500) badges. Program and configure 1000 as directed by Pawtucket School District Security.
   1. HID iClass SE Clamshell Card.
      a. Size: 2.125" x 3.375" x 0.070"
      b. Frequency: 13.56 MHz
   2. Card Layout: Existing PSD template and other markings shall be hot stamped into the credential material or direct printed.

3. The design of the credential cards shall allow for the addition of at least one slot or hole to accommodate the attachment of a clip for affixing the credential card to the badge holder used at the site.

2.4 CABLES

A. General Cable Requirements: Comply with requirements in Section 270513 "Conductors and Cables for Communications Systems" and as recommended by system manufacturer for integration requirement.

B. Plenum-Rated TIA 232-F Cables:

1. Three, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PE insulation.
3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
4. Fluorinated ethylene propylene jacket.
5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

C. Plenum-Rated TIA 485-A Cables:

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. NFPA 70 Type: Type CMP
6. Flame Resistance: NFPA 262, Flame Test.

D. Multiconductor, PVC, Reader and Wiegand Keypad Cables:

1. No. 22 AWG, paired and twisted multiple conductors, stranded (7x30) tinned copper conductors, semirigid PVC insulation, overall aluminum-foil/polyester-tape shield with 100 percent shield coverage, plus tinned copper braid shield with 65 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CMG.
3. Flame Resistance: UL 1581 vertical tray.
4. For TIA 232-F applications.

E. Paired, Plenum-Type, Reader and Wiegand Keypad Cables:

1. Three pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, individual aluminum-foil/polypropylene-tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and fluorinated-ethylene-propylene jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

F. Multiconductor, Plenum-Type, Reader and Wiegand Keypad Cables:

1. Six conductors, No. 20 AWG, stranded (7x28) tinned copper conductors, fluorinated-ethylene-propylene insulation, overall aluminum-foil/polyester-tape shield with 100 percent shield coverage plus tinned copper braid shield with 85 percent shield coverage, and fluorinated-ethylene-propylene jacket.

2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

G. LAN Cabling:

1. Comply with requirements in Section 271513 "Communications Copper Horizontal Cabling."

2.5 TRANSFORMERS

A. NFPA 70, Class II control transformers, NRTL listed. Transformers for security access-control system shall not be shared with any other system.

2.6 POWER SUPPLIES

A. Power Supplies, including battery back up and separately fused surge protection, required for the electrified door hardware and access control equipment.

B. Provide manufacturer required power controllers, interface boards, and programming that may be required for approved electric latch retraction exit devices supplied under Division 08 Section "Door Hardware."

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with TIA 606-B, "Administration Standard for Commercial Telecommunications Infrastructure."

C. Product Schedules: Obtain detailed product schedules from manufacturer of access-control system or develop product schedules to suit Project. Fill in all data available from Project plans and specifications and publish as Product Schedules for review and approval.

D. In meetings with Architect and Owner, present Product Schedules and review, adjust, and prepare final setup documents. Use approved, final Product Schedules to set up system software.

3.3 CABLING

A. Comply with NECA 1, "Good Workmanship in Electrical Construction."

B. For communication wiring, comply with the following:
   1. Section 271323 "Communications Optical Fiber Backbone Cabling."
   2. Section 271513 "Communications Copper Horizontal Cabling."

C. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.

D. Install LAN cables using techniques, practices, and methods that are consistent with Category 5e rating of components and optical fiber rating of components, and that ensure Category 6 and optical fiber performance of completed and linked signal paths, end to end.

E. Boxes and enclosures containing security-system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.

F. Install end-of-line resistors at the field device location and not at the controller or panel location.

## 3.4 CABLE APPLICATION

A. Comply with TIA 569-D, "Commercial Building Standard for Telecommunications Pathways and Spaces."

B. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.

C. TIA 232-F Cabling: Install at a maximum distance of 50 ft. (15 m) between terminations.

D. TIA 485-A Cabling: Install at a maximum distance of 4000 ft. (1220 m) between terminations.

E. Card Readers and Keypads:

   1. Install number of conductor pairs recommended by manufacturer for the functions specified.
   2. Unless manufacturer recommends larger conductors, install No. 22 AWG wire if maximum distance from controller to the reader is 250 ft. (75 m), and install No. 20 AWG wire if maximum distance is 500 ft. (150 m).
   3. For greater distances, install "extender" or "repeater" modules recommended by manufacturer of the controller.
   4. Install minimum No. 18 AWG shielded cable to readers and keypads that draw 50 mA or more.

F. Install minimum No. 16 AWG cable from controller to electrically powered locks. Do not exceed 250 ft. (75 m) between terminations.

G. Install minimum No. 18 AWG ac power wire from transformer to controller, with a maximum distance of 25 ft. (8 m) between terminations.

## 3.5 GROUNDING

A. Comply with Section 270526 "Grounding and Bonding for Communications Systems."

B. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

D. Bond shields and drain conductors to ground at only one point in each circuit.

E. Signal Ground:

1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
2. Bus: Mount on wall of main equipment room with standoff insulators.
3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

3.6 INSTALLATION

A. Install card readers, keypads, push buttons.

B. Installation, final configuration and commissioning of electrified door and access control system hardware, communication firmware, power supplies and related accessories.

C. Full and seamless integration of the site intrusion alarm service if applicable, with the installed site access control system software.

D. Final connections to fire alarm system, if required, shall be provided by the electrical and fire alarm system contractors.

3.7 IDENTIFICATION

A. In addition to requirements in this article, comply with TIA 606-B.

B. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

C. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.

3.8 SYSTEM SOFTWARE AND HARDWARE

A. Refer to Section 281300 "Integrated Security Software and Hardware".

3.9 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use tester approved for type and kind of installed cable. Test for faulty connectors, splices, and terminations. Test according to TIA 568-C.1, "Commercial Building Telecommunications Cabling Standards - Part 1: General Requirements." Link performance for balanced twisted-pair cables must comply with minimum criteria in TIA 568-C.1.

2. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power-supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.
3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

B. Devices and circuits will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

D. All IP devices default passwords shall be changed to a password directed by the owner.

3.10 STARTUP SERVICE

A. System application software including installation, programming, and end user training of the access control system demonstrating operating, repair, and maintenance procedures. Include no fewer than 8 hours of on-site central server training for designated personnel (facilities maintenance, security, IT, administration) by a factory certified representative.

B. Engage a factory-authorized service representative to supervise and assist with startup service.

1. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.
2. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

3.11 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain security access system. See Section 017900 "Demonstration and Training."

B. Develop separate training modules for the following:

1. Computer system administration personnel to manage and repair the LAN and databases and to update and maintain software.
2. Operators who prepare and input credentials to man the control station and workstations and to enroll personnel.
3. Security personnel.
4. Hardware maintenance personnel.
5. Corporate management.

END OF SECTION

# SECTION 282000

# VIDEO SURVEILLANCE

## PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. Section includes a video surveillance system consisting of cameras, transmission wiring, and a control station with its associated equipment.

B. Related Requirements:
1. Section 281300 “Integrated Security Software and Hardware”.
2. Section 281300 "Access Control System" to integrate access control system interface and control.
3. Section 283100 "Intrusion Detection" to integrate video surveillance used for intrusion detection.

1.3 DEFINITIONS

A. AHJ: Authorities Having Jurisdiction

B. AGC: Automatic gain control.

C. FTP: File transfer protocol.

D. IP: Internet protocol.

E. LAN: Local area network.

F. MPEG: Moving picture experts group.

G. NSPD: North Smithfield Police Department.

H. NTSC: National Television System Committee.

I. PC: Personal computer.

J. RAID: Redundant array of independent disks.

K. TCP: Transmission control protocol - connects hosts on the Internet.

L. UPS: Uninterruptible power supply.

M. VMS, VSS, or VSSS: Video Surveillance Server

N. WAN: Wide area network.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For video surveillance. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
4. Wiring Diagrams: For power, signal, and control wiring.

C. Design Data: Include an equipment list consisting of every piece of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set points of adjustments, name and description of the view of preset positions, description of alarms, and description of unit output responses to an alarm.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Product Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: THREE years from date of Substantial Completion.

1.8 COORDINATION

A. Coordinate enclosure and rack layouts with the low voltage contractor, owners IT department, Internet service provider, and LAN equipment suppliers.

B. Coordinate the layout and installation of security pathways and cabling with all trades to verify and rectify clashes prior to installation.

C. Coordinate camera mounting locations, conduit, back boxes, and blocking requirements with the general contractor and electrical contractor prior to rough-in.

D. Coordinate network connection requirements (IP addresses, VLAN, ports, etc.) with LAN equipment vendor prior to the submittal submission.

**PART 2 - PRODUCTS**

2.1 SYSTEM REQUIREMENTS

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.

1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."

B. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarms and indicate locations.

C. Cameras with the “AI” indication shall have AI features like object detection and recognition (identification) that detect and classify people, vehicles, faces, license plates, and more in real-time.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NECA 1.

C. Comply with NFPA 70.

D. Electronic data exchange between video surveillance system with an access-control system shall comply with SIA TVAC.

2.3 FIXED CAMERAS

A. Basis of design manufacturer: Subject to compliance with requirements, provide products by one of the following:
1. Indicated on drawings.

2.4 MULTISENSOR CAMERAS

A. Basis of design manufacturer: Subject to compliance with requirements, provide products by one of the following:
1. Indicated on drawings.

2.5 POWER SUPPLIES

A. Provide all required POE injectors (POE+, POE++, UPOE, etc.).

1. Enclosure: NEMA 250, 3R, 4X etc.
   a. Type designation determined by installation location environment.

B. Low-voltage power supplies matched for voltage and current requirements of cameras and accessories, and of type as recommended by manufacturer of camera and lens.

1. Enclosure: NEMA 250, 3R, 4X etc.
   a. Type designation determined by installation location environment.

2.6 CAMERA ACCESSORIES.

A. Camera equipment and mounting accessories shall match camera manufacturer.

B. Minimum Load Rating: Rated for load in excess of the total weight supported times a minimum safety factor of two.

C. Mounting Brackets: Type matched to items supported and mounting conditions.
1. Mounting bracket and hardware for wall or ceiling mounting of the housing. Bracket shall be of same material as the housing.
2. Finish: Housing and mounting bracket shall be factory finished, unless otherwise noted, using manufacturer's standard finishing process suitable for the environment.
3. Enclosure Rating: NEMA Type designation determined by installation location environment.

D. Mounting Accessories:
1. Include sun shield on exterior fixed dome cameras.
2. Camera Viewing Window: Polycarbonate window, aligned with camera lens.
3. Alignment Provisions: Camera mounting shall provide for field aiming of camera and permit removal and reinstallation of camera lens without disturbing camera alignment.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.

B. Examine roughing-in for LAN, WAN, and IP network before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WIRING

A. Comply with requirements in Section 270528 "Pathways for Communications Systems."

B. Wiring Method: Install cables in raceways unless otherwise indicated.

1. Except raceways are not required in accessible indoor ceiling spaces and attics.
2. Except raceways are not required in hollow gypsum board partitions.
3. Conceal raceways and wiring except in unfinished spaces.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

D. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

E. For communication wiring, comply with the following:
1. Section 271323 "Communications Optical Fiber Backbone Cabling."
2. Section 271513 "Communications Copper Horizontal Cabling."

F. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

## 3.3 VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. Install cameras, mounts, junction boxes, and infrared illuminators level and plumb.

B. Weatherproof all exterior devices with approved sealants for the building materials the device is mounted too. Custom finish sealant to match surround material finishes as directed by the architect.

C. Install cameras with 84-inch- (2134-mm-) minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

D. Adjust pan, tilt, rotate, and focus to suit final camera position to obtain the field of view. Final camera views shall be approved by NSPD and the design engineer.

E. Install power supplies and other auxiliary components in cable termination IT closets unless otherwise indicated.

F. Install tamper switches on components indicated to receive tamper switches, arranged to detect unauthorized entry into system-component enclosures and mounted in self-protected, inconspicuous positions.

G. Identify system components, wiring, cabling, and terminals according to Section 270553 "Identification for Communications Systems."

## 3.4 FIELD QUALITY CONTROL

A. All IP camera default passwords shall be changed to a password directed by the owner.

B. Tests and Inspections:

1. Coordinate all test and inspections with Owner prior start. All camera view ranges and set focus areas shall be determined by the Owner.
2. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.

3. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:

    a. Prepare equipment list described in "Informational Submittals" Article.
    b. Verify operation of auto-iris lenses.
    c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
    d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet (17 to 23 m) away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
    e. Set and name all preset positions; consult Owner's personnel.
    f. Set sensitivity of motion detection.
    g. Connect and verify responses to alarms.
    h. Verify operation of control-station equipment.

4. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
5. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

C. Video surveillance system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

## 3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to four visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:

1. Check cable connections.
2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
3. Adjust all preset positions; consult Owner's personnel.
4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's use of video surveillance system.
5. Provide a written report of adjustments and recommendations.

## 3.6 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean video-surveillance-system components, including camera-housing windows, lenses, and monitor screens.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.

END OF SECTION 28 2000

# SECTION 31 25 00 - EROSION AND SEDIMENTATION CONTROLS

## PART 1 GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes: Labor, materials and equipment necessary to install proper control measures to prevent erosion, siltation and sedimentation of the Project site and adjacent and off-site areas.

B. Related Sections:
   1. Section 31 10 00 - Site Clearing.
   2. Section 31 20 00 - Earthmoving.
   3. Section 32 91 19 - Landscape Grading.

### 1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Product Data: Submit data on siltation fence, tubular sediment barrier, erosion control blanket, erosion control turf reinforcement matting, Catchbasin inserts, each type of proprietary erosion control devices, and geotextile.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

### 1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

### 1.5 PRE-INSTALLATION MEETINGS

A. Division 01 Sections for Administrative Requirements and Procedures for: Pre-installation meetings.

B. Convene minimum one week prior to commencing work of this section.

## PART 2 PRODUCTS

### 2.1 MATERIAL

A. Straw Bales: bales of straw, bound with wire or nylon twine oriented around sides, rather than over and under the bales.

B. Stakes: Stakes for bales as indicated on Drawings.

C. Silt Fence: Prefabricated unit consisting of the following:

1. Requirements:

| | | | |
|---|---|---|---|
| a. | Grab Tensile Strength (lbs./in.) | 90 | ASTM D1682 |
| b. | Elongation at Failure (%) | 50 | ASTM D1682 |
| c. | Mullen Burst Strength (psi) | 190 | ASTM D3786 |
| d. | Puncture Strength (lbs) | 70 | ASTM D751 |
| e. | Equivalent Opening Size | 40-80 | US Std Sieve CW-02215 |
| f. | Ultraviolet Radiation Stability (%) | 90 | ASTM G26 |

2. Manufacturers:
   a. Tencate - Mirafi Envirofence
   b. Contech
   c. Propex Geotex

D. Tubular Sediment Barrier: Tubular netting filled with water permeable compost material meeting the following requirements:
   1. Compost:
      a. Derived from a well-decomposed source of organic matter.
      b. Free of weeds, refuse, contaminants or other materials toxic to plant growth. Non-composted products will not be accepted.
   2. Tubular Netting:
      a. One continuous barrier.
      b. Twelve inches in diameter.
      c. Equal to the following:
         1) Silt Soxx by Filtrexx
         2) Silt Sock
         3) FilterMitt by Phase II Stormwater Products, Inc.

E. Erosion Control Blanket: machined produced 100% biodegradable blanket. Equal to:
   1. North American Green Bionet 150BN

F. Erosion Control Turf Reinforcement Matting: A permanent turf reinforcement mat consisting of a matrix of ultraviolet stabilized, 100% polypropylene fibers stitched between two ultraviolet-stabilized synthetic nets. Equal to:
   1. North American Green Vmax 350
   2. Landlok 450
   3. East Coast Erosion Blanket ECP-2
   4. Western Excelsior Excel PP5-10

G. Catchbasin Inserts: permeable geotextile fabric that mounts under the grate of catchbasins.
   1. ACF Environmental Silt Sack
   2. UltraTech International, Inc. Ultra-Drain Guard
   3. Enpac 1341 Catch Basin Insert

H. Temporary Stabilization Practices:
   1. Straw temporary mulch, 100 pounds per 1,000 square feet.
   2. Wood fiber cellulose temporary mulch, 35 pounds per 1,000 square feet.
   3. Tackafier for anchoring mulch or straw: a non-petroleum based liquid bonding agent specifically made for anchoring straw.
   4. Provide natural (jute, wood excelsior) or man-made (glass fiber) covering with suitable staples or anchors to secure to ground surface. Do not use wire staples and non-biodegradable coverings for any area that will be mown turf.
   5. Temporary vegetative cover for graded areas must be undamaged and free of undesirable weed seed.
   6. Spray-applied bonded fiber matrix.

I. Construction Entrance Materials
   1. Stone size: ASTM designation C-33, size No. 2 (1-1/2 inches to 2-1/2 inches).
   2. Base Course: Crushed stone.

J. Seeding Materials
   1. Seeding and Soil Supplements: Furnish in accordance with State Department of Transportation standard specifications.

K. Mulch: Furnish in accordance with State standards.

2.2 SOURCE QUALITY CONTROL (AND TESTS)

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify compacted subgrade is acceptable and ready to support devices and imposed loads.

C. Verify gradients and elevations of base or foundation for other work are correct.

3.2 PREPARATION

A. Install control measures prior to construction to prevent erosion, siltation and sedimentation of construction areas, adjacent areas and off-site areas in the following work areas:
   1. Soil stockpiles, storage and staging areas;
   2. Cut and fill slopes and other stripped and graded areas;
   3. Constructed and existing swales and ditches;
   4. Bioretention areas and other stormwater controls.
   5. As indicated on Drawings

B. Provide additional means of erosion and sediment control as required for continued or unforeseen erosion problems.

3.3 GENERAL

A. Install and maintain site erosion and sediment controls as indicated on Drawings

3.4 STRAW BALE BARRIERS

A. Excavate the width of the bale and the length of the proposed barrier to a minimum depth of 6 inches.

B. Place bales in a single row, lengthwise on proposed line, with ends of adjacent bales tightly abutting one another.

C. In swales and ditches where strawbale checkdams are to be installed, extend barrier to a length where end bales are higher in elevation than the top of the lowest middle bale.

D. Anchor bales by driving at least two stakes or rebars through each bale as indicated on Drawings.

E. Wedge straw in the gaps between bales to prevent water from escaping between the bales.

F. Backfill excavated soil against the straw barrier. Backfill to match ground level on the downhill side and built up to 4 inches on the uphill side.

3.5 SILT FENCING

A. Excavate a trench along the upstream side of the desired fence location as indicated on Drawings.

B. Install fence, staked at a maximum 4 foot intervals in locations indicated on Drawings.

C. Lay silt fence into the trench as indicated on Drawings. Backfill trench and compact.

D. Overlap joints in silt fencing, as indicated on Drawings, to prevent leakage of silt at seams.

3.6 TUBULAR SEDIMENT BARRIER

A. See Drawings and manufacturer's recommendations for installation.

3.7 SITE STABILIZATION

A. Incorporate erosion control devices indicated on Drawings into the Project at the earliest practicable time.

B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.

C. Do not exceed 35 feet height for stockpile(s) and waste pile(s). Slope stockpile(s) sides at 2: 1 or flatter.

D. Provide appropriate temporary stabilization of any disturbed area on which activity has ceased and which will remain exposed for more than 14 days.
   1. Provide temporary seed mix with application rates according to the RIDOT Standard Specifications.
      a. Water the seeded areas as required until satisfactory establishment.
   2. During non-germinating periods, apply mulch at recommended rates.

E. Provide permanent stabilization of disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with permanent seeding specifications or as indicated on Drawings with one of the following:.
   1. Application of Bonded Fiber Matrix hydroseed seed mix as specified.
   2. Placement of erosion control blanket as indicated on Drawings.

F. Stabilize diversion channels, sediment traps, and stockpiles immediately.

3.8 SLOPE STABILIZATION (SLOPES OF 4:1 OR GREATER)

A. Do not leave disturbed areas and slopes unattended or exposed for excessive periods of time such as the inactive Winter season. Provide appropriate stabilization practices as indicated on Drawings on disturbed area as soon as possible, but not more than 14 days after the construction activity in that area has temporarily or permanently ceased.

B. Reinforce temporary areas having a slope greater than 4:1 with erosion control blankets or approved equivalent until the site can be properly stabilized.

C. Provide permanent slope stabilization immediately after the placement of topsoil. Provide permanent stabilization as indicated on Drawings with one of the following:
   1. Apply of hydroseed seed mix as specified. See Section 32 92 19 – Seeding:
   2. Application of Bonded Fiber Matrix hydroseed seed mix as specified.
   3. Placement of erosion control blanket as indicated on Drawings.

D. Apply of hydroseed seed mix as specified.

3.9 EROSION CONTROL BLANKET

A. As indicated on Drawings and or manufacturer's recommendations for installation.

3.10 TURF REINFORCEMENT MATTING

A. As indicated on Drawings and/or manufacturer's recommendations for installation.

3.11 BONDED FIBER MATRIX

A. As indicated on Drawings and/or manufacturer's recommendations for installation.

3.12 CATCHBASIN INSERTS

A. As indicated on Drawings and/or manufacturer's recommendations for installation.

3.13 FIELD QUALITY CONTROL

A. Section 017300 Execution and Division 01 Sections for Closeout Requirements of field inspecting, testing, adjusting, and balancing.

B. Inspect erosion and sediment control devices and stabilized slopes on a weekly basis and after each rainfall event of .25 inch or greater. Make necessary repairs of identified problems within 24 hours to ensure erosion and sediment controls are in good working order. Reset or replace materials as required.

C. When field visits indicate Work does not meet specified requirements, repair and/or replace Work.

D. Any deviation from the requirements provided must be approved by the Engineer.

3.14 CLEANING

A. Section 017300 - Execution for Requirements for cleaning.

B. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment barrier or device, remove and dispose of sediment.

C. Do not damage structure or device during cleaning operations.

D. Do not permit sediment to erode into construction or site areas or natural waterways.

E. Clean channels when depth of sediment reaches approximately one half channel depth.

3.15 PROTECTION

A. Section 017300 - Execution: Requirements for protecting finished Work.

B. Do not permit construction traffic over stabilized areas.

C. Protect Project site stabilization from elements, flowing water, or other disturbance until vegetation established.

END OF SECTION

# SECTION 32 11 23 - AGGREGATE BASE COURSES

## PART 1 GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Aggregate subbase.
   2. Aggregate base course.

B. Related Sections:
   1. Section 32 12 16 - Asphalt Paving.
   2. Section 32 13 13 - Concrete Paving: Finish concrete surface course.
   3. Section 32 91 19 - Landscape Grading

### 1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
   2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
   3. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.

B. ASTM International:
   1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
   2. ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction
   3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   4. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   5. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   6. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   7. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
   8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   9. ASTM D2940 - Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports.
   10. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

11. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit data for geotextile fabric and herbicide.

C. Samples: Submit, in air-tight containers, 10 lb sample of each type of aggregate fill to testing laboratory.

D. Materials Source: Submit name of aggregate materials suppliers.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Perform Work in accordance with Local, State and Federal Standards.

PART 2 PRODUCTS

2.1 AGGREGATE MATERIALS

A. Subbase Aggregate: ASTM D2940; graded type.

| Sieve Size | Percent Passing |
|---|---|
| 2 inches (50 mm) | 100 |
| No. 4 (4.75 mm) | 30 to 60 |
| No. 200 (0.075 mm) | 0 to 12 |

B. Base Aggregate: ASTM D2940; graded type.

| Sieve Size | Percent Passing |
|---|---|
| 2 inches (50 mm) | 100 |
| 1-1/2 inches (37.5 mm) | 95 to 100 |
| 3/4 inches (19 mm) | 70 to 92 |
| 3/8 inches (9.5 mm) | 50 to 70 |
| No. 4 (4.75 mm) | 35 to 55 |
| No. 30 (0.600 mm) | 12 to 25 |
| No. 200 (0.075 mm) | 0 to 8 |

C. Crushed Stone: durable crushed rock consisting of angular fragments, free from a detrimental quantity of thin, flat, elongated pieces or durable crushed gravel stone obtained by artificial crushing of boulders or fieldstone. The crushed stone must be free from clay, loam, or deleterious material.

Crushed Stone to conform to the following gradations:

| | Percent Passing By Weight | |
|---|---|---|
| Sieve Size | 1/2-Inch Stone | 3/4-Inch Stone |
| | | |
| 1 inch | --- | 100 |
| 3/4 inch | --- | 90-100 |
| 5/8 inch | 100 | --- |
| 1/2 inch | 85-100 | 10-50 |
| 3/8 inch | 15-45 | 0-20 |
| No. 4 | --- | 0-5 |
| No. 8 | 0-5 | --- |
| | | |
| | Percent Passing By Weight | |
| Sieve Size | 1-1/2-Inch Stone | 2-Inch Stone |
| | | |
| 2 inch | 100 | 90-100 |
| 1-1/2 inch | 95-100 | --- |
| 1-1/4 inch | --- | 25-50 |
| 1 inch | 35-70 | --- |
| 3/4 inch | 0-25 | 0-15 |
| 1/2 inch | --- | --- |

## 2.2 FINE AGGREGATE MATERIALS

A. Fine Aggregate Type (Sand): Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter; within the following limits:

| Sieve Size | Percent Passing |
|---|---|
| No. 4 (4.75 mm) | 100 |
| No. 16 (1.18 mm) | 10-100 |
| No. 30 (600 micro m) | |
| No. 50 (300 micro m) | 5-90 |
| No. 100 (150 micro m)\ | 4-30 |
| No. 200 (75 micro m) | 0 |

## 2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing and inspection services.

B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D1557.

C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D1557.

D. When tests indicate materials do not meet specified requirements, change material and retest.

2.4 ACCESSORIES

A. Geotextile Fabric: AASHTO M288; non-woven, polypropylene.

PART 3 EXECUTION

3.1 EXAMINATION

A. Division 01 Section “Execution”: Verification of existing conditions before starting work.

B. Verify compacted substrate is dry and ready to support paving and imposed loads.
   1. Proof roll substrate in minimum two perpendicular passes to identify soft spots.
   2. Remove soft substrate and replace with compacted fill as specified in Section 31 23 23.

C. Verify substrate has been inspected, gradients and elevations are correct.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. If fill is required, compact subgrade soil in accordance with Section 31 20 00.

C. Excavate sandy loam and loamy sand topsoil from areas to be paved prior to subbase installation.

D. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

A. Where required, install geotextile fabric over subgrade in accordance with manufacturer's instructions.
   1. Lap ends and edges minimum 6 inches (150 mm).
   2. Anchor fabric to subgrade when required to prevent displacement until aggregate is installed.

B. Spread aggregate over prepared substrate to total compacted thickness of 6 inches indicated on Drawings.

C. Roller compact aggregate to 95 percent maximum density.

D. Level and contour surfaces to elevations, profiles, and gradients indicated on Drawings.

E. Roadway Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to 95 percent of maximum density.

F. Maintain optimum moisture content of fill materials to attain specified compaction density.

G. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation From Flat Surface: 1/2 inch measured with 10 foot (3 m) straight edge.

C. Maximum Variation From Thickness: 1/4 inch.

D. Maximum Variation From Elevation: 1/2 inch.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform compaction testing in accordance with ASTM D1557.

C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

D. Frequency of Tests: One test for every 1,000 square yards of each layer compacted aggregate.

3.6 COMPACTION

A. Compact materials to 98 percent of maximum density as determined from test strip, in accordance with ASTM D2940.

END OF SECTION

# SECTION 32 12 16 - ASPHALT PAVING

## PART 1 GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Asphalt materials.
2. Aggregate materials.
3. Asphalt paving base course, binder course, and wearing course.
4. Asphalt paving overlay for existing paving.
5. Surface slurry.
6. Asphalt berm (Cape Cod berm).
7. Extruded asphalt curb.

B. Related Requirement:
1. Section 31 20 00 - Earth Moving: Preparation of site for paving.
2. Section 32 11 23 - Aggregate Base Courses: Compacted subbase for paving.
3. Section 32 17 23 - Pavement Markings:
4. Section 33 05 14 - Manholes and Structures:

### 1.3 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:
1. AASHTO M17 - Standard Specification for Mineral Filler for Bituminous Paving Mixtures.
2. AASHTO M29 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
3. AASHTO M140 - Standard Specification for Emulsified Asphalt.
4. AASHTO M208 - Standard Specification for Cationic Emulsified Asphalt.
5. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.
6. AASHTO M320 - Standard Specification for Performance-Graded Asphalt Binder.
7. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
8. AASHTO MP1a - Standard Specification for Performance-Graded Asphalt Binder.

B. Asphalt Institute:
1. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot- Mix Types.
2. AI MS-2 – Asphalt Plant Manual
3. AI MS-19 - Basic Asphalt Emulsion Manual.
4. AI SP-2 - Superpave Mix Design.

C. U.S. Army Corp OF Engineers
1. UN-13 (CE MP-ET) – Hot Mix Asphalt Handbook

D. ASTM International:

1. ASTM C1371[-2004a] - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
2. ASTM C1549[-2004] - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
3. ASTM D242 - Standard Specification for Mineral Filler For Bituminous Paving Mixtures.
4. ASTM D692 - Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.
5. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
6. ASTM D977 - Standard Specification for Emulsified Asphalt.
7. ASTM D1073 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
8. ASTM D1188 - Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
9. ASTM D2027 - Standard Specification for Cutback Asphalt (Medium-Curing Type).
10. ASTM D2397 - Standard Specification for Cationic Emulsified Asphalt.
11. ASTM D2726 - Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
12. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
13. ASTM D3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
14. ASTM D3515 - Standard Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
15. ASTM D3549 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
16. ASTM D3910 - Standard Practices for Design, Testing, and Construction of Slurry Seal.
17. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
18. ASTM E408[-1971(1996)e1] - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
19. ASTM E903[-1996] - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
20. ASTM E1918[-1997] - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
21. ASTM E1980[-2001] - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

## 1.4 SUBMITTALS

A. Division 01 Section Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit product information for asphalt and aggregate materials.
   2. Submit mix design with laboratory test results supporting design.
      a. Design mix submittal to follow the format indicated in the Asphalt Institute Manual MS-2, Marshall Stability Method; and include the following:
         1) Type/name of the mix.
         2) Gradation analysis.
         3) Grade of asphalt cement used
         4) Marshall Stability (lbs.).
         5) Flow and effective asphalt content (percent).

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Mixing Plant: Conform to RIDOT standard.

B. Obtain materials from same source throughout.

C. Perform Work in accordance with RIDOT standard.

D. Perform work within public rights-of-way in accordance with the rules, regulations and requirements of the Public Agency having control and ownership of such rights-of-way.

1.6 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with 5 minimum years documented experience or approved by manufacturer.

1.7 AMBIENT CONDITIONS

A. Provide temporary gravel surface parking areas to accommodate construction personnel.

B. If Site space is not adequate, provide additional off-Site parking.

C. Permanent Pavements and Parking Facilities:
   1. Avoid traffic loading beyond paving design capacity. Tracked vehicles are not allowed.

D. Maintenance:
   1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, ice, and the like.
   2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original condition.

E. Removal, Repair:
   1. Remove temporary materials and construction when permanent paving is usable.
   2. Repair existing facilities damaged by use, to original condition.

F. Mud from Site vehicles: Provide means of removing mud from vehicle wheels before entering streets.

G. Do not place asphalt mixture between November 1 and March 1 or when prohibited by City of Providence DPW.

H. Do not place asphalt mixture when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

I. Apply tack coat only when the ambient temperature is above 40°F, and when the temperature has been above 35°F for 12 hours immediately prior to application. Do not apply when base is wet, contains excess moisture, or during rain.

J. The required temperature of the bituminous pavement mixture, within a tolerance of plus or minus 15°F, when delivered at the site, will be governed by the temperature of the base upon which the mix is placed, as follows:

| Base Temperature in Degrees F | Required Material Temperature in Degrees F For Course Thickness in Inches | | | |
|---|---|---|---|---|
| | 1 | 1-1/2 | 2 | 3 and Greater |
| 35-40 | - | 305 | 295 | 280 |
| 41-50 | 310 | 300 | 285 | 275 |
| 51-60 | 300 | 295 | 280 | 270 |
| 61-70 | 290 | 285 | 275 | 265 |
| 71-80 | 285 | 280 | 270 | 265 |
| 81-90 | 275 | 270 | 265 | 260 |
| 91 & over | 270 | 265 | 260 | 255 |

PART 2 PRODUCTS

2.1 ASPHALT PAVING

A. Asphalt Materials:
1. Asphalt Cement: Comply with AASHTO M-226/ASTM D 3381; Table 2 for grades AC-10, AC-20, or AC-30, AR-8000, viscosity grade, depending on local mean annual air temperature, as follows:

| Temperature Condition | Asphalt Grades |
|---|---|
| Cold, mean annual air temperature < 7 degrees C) 45 degrees F) | AC-10 85/100 pen. |
| Warm, mean annual air temperature Between 7 degrees C (45 degrees F) And degrees C (75 degrees F) | AC-20 60/70 pen. |
| Hot, mean annual air temperature > 24 degrees C (75 degrees F) | AC-30 |

2. Tack Coat: AASHTO M140 or ASTM D2397; SS-1h, CSS-1, or CSS-1h; diluted emulsified asphalt, one part water to one part emulsified asphalt setting type.

B. Aggregate Materials:
1. Coarse Aggregate: in accordance with State Department of Transportation Standards.
2. Fine Aggregate: must consist of one of the following:
   a. 100% Natural sand
   b. 100% Stone sand
   c. A blend of natural sand and stone sand
   d. The fine aggregate, as delivered to the mixer, must meet the following gradation requirement:

| | Percent Passing | |
|---|---|---|
| Sieve | Minimum | Maximum |
| 3/8 inch | 95 | 100 |
| No. 8 | 70 | 95 |
| No. 50 | 20 | 40 |
| No. 200 | 2 | 16 |

e. In the fine aggregate sieve analysis (passing No. 8), the amount between two successive sieves (No. 16, 30, 50, and 100) not to exceed 33 percent of the fine aggregate total.

3. Mineral Filler: ASTM D242 or AASHTO M17; Rock or slag dust, Portland cement, or other inert material or finely ground mineral particles, free of foreign matter.
4. The use of reclaimed asphalt pavement in new bituminous pavement will not be permitted.

C. Reclaimed Asphalt Pavement (RAP): Provide material obtained from the highways or streets by crushing, milling, or planing existing hot mix asphalt pavements.
1. Proportion of RAP to virgin aggregate for base course mixtures and intermediate course mixtures maximum amounts:
a. 40% for drum mix plants
b. 20% for modified batch plants.
c. 10% for surface course mixtures.

D. Aggregate Subbase: Specified in Section 32 11 23.

2.2 MIXES

A. Use dry material to avoid foaming. Mix uniformly.

B. Asphalt Paving Mixtures: Designed in accordance with State Department of Transportation Standards.

2.3 ACCESSORIES

A. Geotextile Fabric: AASHTO M288; non-woven, polypropylene or Geogrid sub-base reinforcement Model TriAx TX5 manufactured by Tensar International Corporation or Engineer approved equal.

B. Sealant: ASTM D6690; Type II or Type III; hot applied type.

2.4 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Submit proposed mix design of each class of mix for review prior to beginning of Work.

C. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by RIDOT Specifications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 017300 - Execution: Requirements for installation examination.

B. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.

C. Verify compacted subbase is dry and ready to support paving and imposed loads.
1. Proof roll subbase with heavy pneumatic-tired equipment in minimum two perpendicular passes to identify soft spots.

2. Remove soft subbase and replace with compacted fill as specified in Section 31 23 23.

D. Verify gradients and elevations of base are correct.

E. Verify gutter drainage grilles and frames and manhole frames are installed in correct position and elevation.

F. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

G. Proceed with paving only after the Engineer inspects and approves the finished subbase and base and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate paving operations with all other work, especially underground utility construction, to prevent covering up unfinished or uninspected work and loss of time or labor by improper scheduling.

B. Prepare subbase in accordance with RIDOT standard specifications.

C. Apply a uniform coating of an approved tack coat material on vertical surfaces of structures and existing pavement surfaces in contact with new bituminous pavement. Prevent splattering or staining of exposed surfaces above finished grade during the application. Clean, repair or replace exposed surfaces that are stained as a result of incorrect application.

D. Thoroughly clean with a self-propelled sweeper all existing paved surfaces to be overlaid. Broom sweep until areas inaccessible by power sweeper.

3.3 DEMOLITION

A. Saw cut and notch existing paving as indicted on Drawings.

B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.

C. Repair surface defects in existing paving to provide uniform surface to receive new paving.

3.4 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling.

B. Remove existing asphalt pavement by cold milling to grades and cross sections as indicated on Drawings.

C. Perform milling by machinery suitable for the type and size of project.

3.5 INSTALLATION

A. Install pavements in the location and to the grades as indicated on Drawings.

B. Install pavement courses at thickness as indicated on Drawings.

C. Subbase:
   1. Aggregate Subbase: Install as specified in Section 32 11 23.

D. Primer:
   1. Apply primer in accordance with AI MS-2.

E. Tack Coat:
   1. Apply tack coat in accordance with AI MS-19.

F. Single Course Asphalt Paving:
   1. Install Work in accordance with RIDOT standards.
   2. Place asphalt within 24 hours of applying primer or tack coat.
   3. Place asphalt wearing course to compacted thickness identified on Drawings.
   4. Compact paving by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
   5. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

G. Double Course Asphalt Paving:
   1. Place asphalt binder course within 24 hours of applying primer or tack coat.
   2. Place binder course to compacted thickness indicated on Drawings.
   3. Place wearing course within 24 hours of placing and compacting binder course. When binder course is placed more than 24 hours before placing wearing course, clean surface and apply tack coat before placing wearing course.
   4. Place wearing course to compacted thickness indicated on Drawings.
   5. Compact each course by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
   6. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

H. Meeting Existing Pavements
   1. Sawcut the existing pavements to produce a uniform, smooth joint surface. Sawcut neat, straight, even lines with straight vertical edges free from irregularities. Do not damage the pavement to remain.
   2. Full-Depth Pavement: Sawcut to the full depth of the pavement prior to placement of any new pavement. Apply tack coat to the sawcut surface immediately prior to the installation of the new abutting bituminous pavement material to provide a bond between the old and new pavement. The new compacted pavement surface must be finished flush with the abutting pavement.
   3. Bituminous Pavement Overlays: Sawcut existing pavement to a minimum depth of one and one half inches. Prior to completing overlays, taper existing pavements by grinding one-half inches deep at the sawcut face and taper to zero inches deep at the following distances:
      a. Six feet from the sawcut face in driveways and parking areas.
      b. Twelve feet in roadways.

      Clean and apply an asphalt emulsion tack coat immediately prior to placement of the overlay. The new compacted surface at the joint must be flush with the abutting existing pavement.

I. Surface Slurry
   1. Install uniform thickness surface slurry over existing paving in accordance with ASTM D3910.

2. Allow slurry to cure.
3. Roll paving to achieve uniform surface.

J. Asphalt Berm
1. Clean surface of all loose and deleterious material.
2. Apply tack coat in accordance with the Drawings and RIDOT requirements.
3. Installed as indicated on Drawings.
4. Install asphalt berm with a self-propelled automatic berm machinery.
5. Do not place asphalt berm on wet surfaces, or when weather conditions otherwise prevent the proper handling or finishing of asphalt mixtures.
6. Backfill the back of the berm with top soil within 24 hours after placement.

K. Curbs
1. Install extruded asphalt curbs of profile as indicated on Drawings.

## 3.6 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

C. Scheduled Compacted Thickness: Within 1/4 inch.

D. Variation from Indicated Elevation: Within 1/2 inch.

## 3.7 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting, testing.

B. Owner to provide an Independent Testing Laboratory to perform testing of in-place bituminous pavement courses for compliance with requirements for thickness, density and surface smoothness. Top and base courses will be randomly tested with a calibrated nuclear gauge or Engineer approved equal. If density tests are found to be not in conformance with the specifications, additional core samples are to be provided at the same interval listed above for the paved surface for further testing. Pavement samples will be tested for conformance with the mix design. If additional core samples are found to be not in conformance with the specifications, remove and replace pavement at no expense to the Owner. Fill core samples with bituminous or cement concrete.

C. Compaction: Perform the field density test for in-place materials by examination of field cores or nuclear gauge testing and provide a minimum compacted density of 95% of laboratory Marshall Density in accordance with one of the following standards:
1. Bulk Specific Gravity and Density of Compacted Bituminous Mixture Using Paraffin-Coated Specimens: ASTM D-1188.
2. Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface Dry Specimens: ASTM D-2726.

D. Remove and replace areas of insufficient compaction in compliance with the specifications.

3.8 PROTECTION

A. No vehicular traffic or loads permitted on the newly completed pavement until adequate stability has been attained, the material has cooled sufficiently to prevent distortion or loss of fines, and the pavement has achieved a maximum temperature of 140 degrees F.

B. If the climatic or other conditions warrant it, the period of time before opening to traffic may be extended at the discretion of the Engineer.

3.9 FINAL CLEAN UP

A. Clean all pavement surfaces with proper sweeping machinery.

B. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an approved landfill.

END OF SECTION

# SECTION 32 13 13 - CONCRETE PAVING

## PART 1 GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Aggregate subbase and base course.
   2. Concrete paving for:
      a. Concrete sidewalks.
      b. Concrete stair steps
      c. Concrete driveway aprons.

B. Related Requirements:
   1. Section 31 20 00 – Earth Moving.
   2. Section 32 11 23 - Aggregate Base Courses
   3. Section 32 12 16 - Asphalt Paving: Asphalt
   4. Section 32 16 13 – Precast Concrete Curb
   5. Section 32 91 19 - Landscape Grading: Preparation of subsoil at pavement perimeter.

### 1.3 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

B. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

C. ASTM International:
   1. ASTM A184/A184M - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
   2. ASTM A185/A185M - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
   3. ASTM A497/A497M - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
   4. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   5. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
   6. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
   7. ASTM A775/A775M - S Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
   8. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.

9. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
10. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
11. ASTM C33 - Standard Specification for Concrete Aggregates.
12. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
13. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
14. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
15. ASTM C150 - Standard Specification for Portland Cement.
16. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
17. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
18. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
19. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
20. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
21. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
22. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
23. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
24. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
25. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
26. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
27. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
28. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
29. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
30. ASTM C1371[-2004a] - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
31. ASTM C1549[-2004] - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
32. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
33. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
34. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
35. ASTM E408[-1971(1996)e1] - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
36. ASTM E903[-1996] - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
37. ASTM E1918[-1997] - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
38. ASTM E1980[-2001] - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

1.4 PRE-INSTALLATION MEETINGS

A. Division 01 Section “Execution”: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.5 SUBMITTALS

A. Division 01 Section - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit data on concrete materials, joint filler, admixtures, and curing compounds.

C. Design Data:
   1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
      a. Hot and cold weather concrete work.
   2. Identify mix ingredients and proportions, including admixtures.
   3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.

D. Source Quality Control Submittals: Indicate results of shop tests and inspections.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and RIDOT standards.

B. Obtain cementitious materials from same source throughout.

C. Perform Work in accordance with Local, State and Federal Standards.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum five years documented experience.

B. Installer: Company specializing in performing work of this section with minimum five years documented experience.

1.8 AMBIENT CONDITIONS

A. Provide temporary gravel surface parking areas to accommodate construction personnel.

B. If Site space is not adequate, provide additional off-Site parking.

C. Permanent Pavements and Parking Facilities: Avoid traffic loading beyond paving design capacity. Tracked vehicles are not allowed.

D. Maintenance:
   1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, ice, and the like.

2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original condition.

E. Removal, Repair:
1. Remove temporary materials and construction when permanent paving is usable.
2. Repair existing facilities damaged by use, to original condition.

F. Mud from Site vehicles: Provide means of removing mud from vehicle wheels before entering streets.

G. Do not place concrete when base surface temperature is less than 40 degrees F or surface is wet or frozen.

## PART 2 PRODUCTS

### 2.1 AGGREGATE SUBBASE

A. Aggregate Subbase: As specified in Section 32 11 23.

### 2.2 CONCRETE PAVING

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
1. Use flexible or curved forms for curves with a radius 100 feet or less.
2. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

B. Reinforcement
1. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
2. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
3. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
4. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.
5. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.
6. Plain Steel Wire: ASTM A 82, as drawn.
7. Deformed-Steel Wire: ASTM A 496.
8. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.
9. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
10. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice."
11. Zinc Repair Material: ASTM A 780.

C. Fiber Reinforcement
1. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III.

D. Concrete Materials:
   1. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:
      a. Portland Cement: ASTM C 150, Type I or II. Supplement with the following:
         1) Fly Ash: ASTM C 618, Class C or F.
         2) Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
   2. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source.
   3. Water: ASTM C 94/C 94M.
   4. Air-Entraining Admixture: ASTM C 260.
   5. Chemical Admixtures: ASTM C 494/C 494M, of type suitable for application, certified by manufacturer to be compatible with other admixtures and to contain no more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

## 2.3 MIXES

A. Concrete Mix
   1. Prepare design mixtures, proportioned according to ACI 301, with the following properties:
      a. Compressive Strength (28 Days): 3500 psi.
      b. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
      c. Slump Limit: 4 inches, plus or minus 1 inch.
      d. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch nominal maximum aggregate size.
   2. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
   3. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements as follows:
      a. Fly Ash or Pozzolan: 25 percent.
      b. Ground Granulated Blast-Furnace Slag: 50 percent.
      c. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
   4. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.

B. CONCRETE MIXING
   1. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.
      a. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature

## 2.4 FINISHES

A. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

## 2.5 ACCESSORIES

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.

B. Curing Compound: In accordance with RIDOT Standards.

C. Joint Sealers: ASTM D6690; Type II or Type III; hot applied type.

2.6 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing and Inspection Services.

B. Submit proposed mix design of each class of concrete to appointed firm for review prior to commencement of Work.

C. Tests on cement, aggregates, and mixes will be performed to ensure conformance with specified requirements.

D. Test samples in accordance with ACI 301.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 017300 - Execution Requirements for installation examination.

B. Verify compacted subgrade is dry and ready to support paving and imposed loads.
1. Proof roll subbase in minimum two perpendicular passes to identify soft spots.
2. Remove soft subbase and replace with compacted fill.

C. Verify gradients and elevations of base are correct.

D. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Moisten substrate to minimize absorption of water from fresh concrete.

C. Remove loose material from compacted subbase surface immediately before placing concrete.

D. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete paving.

E. Notify Architect/Engineer minimum 24 hours prior to commencement of concreting operations.

3.3 INSTALLATION

A. Subbase:
1. Aggregate Subbase: Install as specified in Section 32 11 23.

B. Forms:
1. Place and secure forms and screeds to correct location, dimension, profile, and gradient.
2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Reinforcement:

1. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
2. Clean reinforcement of loose rust and mill scale, earth, ice or other bonding reducing materials.
3. Place reinforcing as indicated on Drawings.
4. Place dowels/reinforcing to achieve paving and curb alignment as detailed.

D. Placing Concrete:
1. Coordinate installation of snow melting components.
2. Place concrete in accordance with ACI 301.
3. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
4. Place concrete using the slip form technique.
5. Ensure reinforcing, inserts, embedded parts, formed joints are not disturbed during concrete placement.
6. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
7. Place concrete to indicated pattern.
8. Screed pavement surfaces with a straightedge and strike off.
9. Commence initial floating using bull floats or darbies to provide an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
10. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
    a. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
    b. Remove snow, ice, or frost from subbase surface before placing concrete. Do not place concrete on frozen surfaces.
    c. Do not use frozen materials or materials containing ice or snow.
    d. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.
11. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
    a. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water.
    b. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
    c. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

E. Joints
1. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
2. When joining to existing paving, place traverse joints to align with previously placed joints unless otherwise indicated.
3. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

4. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
5. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, to match jointing of existing adjacent concrete pavement.
6. Edging: Tool edges of pavement and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

F. Exposed Aggregate:
1. Apply surface retarder where exposed aggregate finish is required.
2. Wash exposed aggregate surface with clean water and scrub with stiff bristle brush exposing aggregate.

G. Finishing:
1. Float Finishing
   a. General: Do not add water to concrete surfaces during finishing operations.
   b. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
      1) Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
   c. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on pavement surface according to manufacturer's written instructions.
      1) Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
      2) After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.
2. Sidewalk Paving: Light broom and trowel joint edges. Wood float.
3. Inclined Vehicular Ramps: Broomed perpendicular to slope.
4. Place curing compound sealer on exposed concrete surfaces immediately after finishing.

H. Curing and Protection
1. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
2. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
3. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
4. Comply with ACI 306.1 for cold-weather protection.
5. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
6. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
7. Curing Methods: Cure concrete by moisture-retaining-cover curing or curing compound, as follows:
   a. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends

lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

b. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

## 3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Comply with tolerances of ACI 117 and as follows:
1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
4. Joint Spacing: 3 inches.
5. Contraction Joint Depth: Plus 1/4 inch, no minus.
6. Joint Width: Plus 1/8 inch, no minus.

## 3.5 FIELD QUALITY CONTROL

A. Testing Agency: CONTRACTOR to engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Test composite samples of fresh concrete obtained (ASTM C 172) according to the following requirements:
1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
7. A compressive-strength test: The average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Report test results in writing to Engineer within 48 hours of testing. Reports of compressive-strength tests to include Project identification, name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design

compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Perform additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at CONTRACTOR's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

J. Inspect reinforcing placement for size, spacing, location, support.

K. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.6 REPAIRS AND PROTECTION

A. Section 01 73 00 - Execution Requirements for protecting finished Work.

B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.

C. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

D. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

E. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

F. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

# SECTION 32 16 13 – PRECAST CONCRETE CURB

## PART 1 GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Precast concrete curbs.

B. Related Requirements:
   1. Section 32 20 00 – Earth Moving.
   2. Section 32 12 16 - Asphalt Paving.
   3. Section 32 13 13 - Concrete Paving.

### 1.3 REFERENCE STANDARDS

A. ASTM International:
   1. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   2. ASTM C33 - Standard Specification for Concrete Aggregates.
   3. ASTM C150 - Standard Specification for Portland Cement.
   4. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
   5. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.

### 1.4 COORDINATION

A. Division 01 Section “Execution”: Requirements for coordination.

B. Coordinate the Work with pavement placement for road, parking areas and sidewalks.

### 1.5 SUBMITTALS

A. Division 01 Section - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit unit configuration, dimensions and installation instructions.

### 1.6 QUALITY ASSURANCE

A. Perform Work in accordance with RIDOT Standards.

### 1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver and protect in accordance with the manufacturer’s recommendations.

## PART 2 PRODUCTS

### 2.1 PRECAST CONCRETE CURB

A. Precast Concrete Curbs:
   1. Minimum height: 18”
   2. Minimum width: 6”
   3. Exposed surface: Sponge float finish true to line and face, free from defects, sharp arises, and with curved surfaces accurately reproduced.
   4. Curb surface to be sealed by precast manufacturer.
   5. Exposed edges: 1” chamfer.
   6. Minimum compression strength: 5,000 psi.
   7. Minimum length of straight or curve filling pieces: 3’-0”.
   8. Castings: Plane smooth surfaces,
   9. Overall dimensions for each casting: Not to vary more than 1/16 inch from those indicated.

B. Do not use cast-in-place curbs.

C. Cast curbing to be set on a radius of 100 feet or less to the curve indicated on Drawings. Form or saw ends on radial lines.

D. Provide transition curbs at all sidewalk ramps as indicated on Drawings.

E. Curb Foundation and footing: As indicated on Drawings.

### 2.2 ACCESSORIES

A. Dowel: #4 epoxy coated, 2” min. embedment into curb

## PART 3 EXECUTION

### 3.1 PREPARATION

A. Confirm subbase has been properly compacted to 95% compaction.

### 3.2 INSTALLATION

A. Provide curb expansion joints at 5’ O.C. The joints between curbstones (both front and back) or edging shall be carefully filled with cement mortar and neatly pointed on the top, front and back. After pointing, the curbstones or edging shall be satisfactorily cleaned of all excess mortar that may have been forced out of the joints. Acceptable joints width are 3/8 inches to 1/2 inches.

B. Install rebar dowel for each curb joint per the Drawings.

C. Install concrete footing and sub base material as shown in the Drawings.

D. Install joint sealer where curb abuts existing walls, posts, buildings, and fixed structures or appurtenance.

E. All curbs to be installed at the reveal and slope as shown in the Drawings.

F. Install transition curb at all walkway ramps and curb endings as indicated on Drawings.

G. Curb Replacement: Sawcut edge a minimum of 12” from curb.

H. Install units without damage to shape or finish. Replace or repair damaged units.

3.3 RESETTING EXISTING CURBS

A. Remove mortar and concrete from existing curbs to be reused. Powerwash exposed exterior surface after placement to remove any remaining debris. Replace units damaged by the contractor’s negligence.

B. Reset existing curbs approved for reuse as shown in the Drawings or as directed by the Engineer.

END OF SECTION

# SECTION 32 17 23 - PAVEMENT MARKINGS

## PART 1 GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Traffic lines and markings.
   2. Paint.
   3. Glass beads.

B. Related Requirements:
   1. Section 32 12 16 - Asphalt Paving.
   2. Section 32 13 13 - Concrete Paving.

### 1.3 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M247 - Standard Specification for Glass Beads Used in Traffic Paint.

B. ASTM International:
   1. ASTM D34 - Standard Guide for Chemical Analysis of White Pigments.
   2. ASTM D126 - Standard Test Methods for Analysis of Yellow, Orange, and Green Pigments Containing Lead Chromate and Chromium Oxide Green.
   3. ASTM D562 - Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer.
   4. ASTM D711 - Standard Test Method for No-Pick-Up Time of Traffic Paint.
   5. ASTM D713 - Standard Practice for Conducting Road Service Tests on Fluid Traffic Marking Materials.
   6. ASTM D969 - Standard Test Method for Laboratory Determination of Degree of Bleeding of Traffic Paint.
   7. ASTM D1301 - Standard Test Methods for Chemical Analysis of White Lead Pigments.
   8. ASTM D1394 - Standard Test Methods for Chemical Analysis of White Titanium Pigments.
   9. ASTM D1475 - Standard test Method for Density of Liquid Coatings, Inks, and Related Products.
   10. ASTM D1640 - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature.
   11. ASTM D2202 - Standard Test Method for Slump of Sealants.
   12. ASTM D2371 - Standard Test Method for Pigment Content of Solvent-Reducible Paints.
   13. ASTM D2621 - Standard Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints.
   14. ASTM D2743 - Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography.

1.4 SUBMITTALS

A. Division 01 Section - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit paint formulation for each type of paint.

C. Samples:
1. Submit eight sample plates of each color of material. Prepare four plates without glass beads and four with glass beads for each different batch of material. After approval, Owner will retain these plates for field comparisons of applied paint.
2. Submit two gallons and four one quart paint samples accompanied by properly executed test reports.
3. Submit samples of glass bead in compliance with AASHTO M247.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

E. Test and Evaluation Reports: Submit source and acceptance test results in accordance with AASHTO M247.

F. Manufacturer's Instructions: Submit instructions for application temperatures, eradication requirements, application rate, line thickness, type of glass beads, bead embedment and bead application rate, and any other data on proper installation.

G. Proposed schedule of pavement marking with type of equipment to be used and description of colors to be installed at locations within project.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with RIDOT Standards.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing work of this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Invert containers several days prior to use when paint has been stored more than 2 months. Minimize exposure to air when transferring paint. Seal drums and tanks when not in use.

C. Glass Beads. Store glass beads in cool, dry place. Protect from contamination by foreign substances.

1.8 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.

B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

C. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.

D. Do not apply paint when temperatures are expected to fall below **50** degrees F for 24 hours after application.

E. Volatile Organic Content (VOC). Do not exceed State or Environmental Protection Agency maximum VOC on traffic paint.

1.9 WARRANTY

A. Section 017300 - Execution: Requirements for warranties.

B. Furnish three year manufacturer's warranty for traffic paints.

PART 2 PRODUCTS

2.1 PAINTED PAVEMENT MARKINGS

A. Furnish materials in accordance with RIDOT Standards.

B. Performance / Design Criteria:
1. Paint Adhesion: Adhere to road surface forming smooth continuous film one minute after application.
2. Paint Drying: Tack free by touch so as not to require coning or other traffic control devices to prevent transfer by vehicle tires within two minutes after application.

C. Paint: Ready mixed, conventional and fast dry waterborne traffic paints, lead-free, non-toxic, NASSHTO Test Deck, minimum retroreflectance of 100 mcds, durability rating of 6 or more after in place for 9 months; within following limits:
1. Pigment, percent by weight: 60 plus or minus 2
2. Vehicle, percent by weight: 40 plus or minus 2
3. Non-Volatile, percent by weight of paint: 76.0
4. Weight per gallon, pounds minimum 13.0
5. Viscosity: 80-95 Kreb Units at 77 degrees F.
6. Grind (Hegeman Gauge), minimum Field Tested no tracking time under ambient conditions: 20-90 seconds.
7. Dry Through Time, 15 mils wet at 90 percent relative humidity, 72 degrees F, ASTM D1640: 125 minutes maximum.
8. VOC (Volatile Organic Content): One lbs/gal maximum.

D. Glass Beads: AASHTO M247, Type 1, coated to enhance embedment and adherence with paint.

E. Marking paint:
   1. Roadway pavement: Thermoplastic type material as manufactured by an Engineer approved supplier.
   2. Parking Lots or Private Property: Waterbourne as manufactured by an Engineer approved supplier
   3. Pedestrian trails/paths: Waterbourne as manufactured by an Engineer approved supplier.
   4. Colors: White and/or yellow at the locations as indicated on Drawings.
   5. Do not use pavement marking paints containing more than 150 grams per liter of volatile organic compounds (VOC).

## 2.2 EQUIPMENT

A. Continuous Longitudinal Line Application Machine: Use application equipment with following capabilities.
   1. Dual nozzle paint gun to simultaneously apply parallel lines of indicated width in solid or broken patterns or various combinations of those patterns.
   2. Pressurized bead-gun to automatically dispense glass beads onto painted surface, at required application rate.
   3. Measuring device to automatically and continuously measure length of each line placed, to nearest foot.

B. Machine Calibration:
   1. Paint Line Measuring Device: Calibrate automatic line length gauges to maintain tolerance of plus or minus 25 feet per mile.
   2. Cycle Length/Paint Line Length Timer: Calibrate cycle length to maintain tolerance of plus or minus 6 inches per 40 feet; calibrate paint line length to maintain tolerance to plus or minus 3 inches per 10 feet.
   3. Paint Guns: Calibrate to simultaneously apply paint binder at uniform rates as specified with an allowable tolerance of plus or minus 1 mil.
   4. Bead Guns: Calibrate to dispense glass beads simultaneously at specified rate. Check guns by dispensing glass beads into gallon container for predetermined fixed period of time. Verify weight of glass beads.

C. Other Equipment:
   1. For application of crosswalks, intersections, stop lines, legends and other miscellaneous items by walk behind stripers, hand spray or stencil trucks, apply with equipment meeting requirements of this section. Do not use hand brushes or rollers. Optionally apply glass beads by hand.

## 2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Test and analyze traffic paints in accordance with ASTM D34.

C. Make paints and glass beads available for inspection at manufacturer’s factory prior to packaging for shipment. Notify Architect/Engineer at least seven days before inspection is allowed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 017300 - Execution: Requirements for installation examination.

B. Prior to marking verify that new asphalt is complete, has been accepted by Engineer, and cured a minimum of fourteen (14) days.

C. Inspect pavement surfaces for conditions and defects that will adversely affect quality of work. Do not place marking paint over unacceptable surfaces. If these conditions exist, immediately notify the Engineer.

D. Commencement of installation constitutes acceptance of surface as suitable for installation.

E. Do not apply paint to concrete surfaces until concrete has cured for 28 days.

3.2 PREPARATION

A. Section 017300 - Execution: Requirements for installation preparation.

B. Maintenance and Protection of Traffic:
1. Provide short term traffic control in accordance with Section 01 50 00 - Temporary Facilities and Controls.
2. Prevent interference with marking operations and to prevent traffic on newly applied markings before markings dry.
3. Maintain travel lanes between 7: 00 AM to 9: 00 AM, and between 4: 00 PM and 6: 00 PM.
4. Maintain access to existing businesses and other properties requiring access.

C. Surface Preparation.
1. Clean and dry paved surface prior to painting.
2. Blow or sweep surface free of dirt, debris, oil, grease or gasoline.
3. Spot location of final pavement markings as specified and as indicated on Drawings by applying pavement spots 25 feet on center. Mark layout of stripes and lines with chalk or paint.
4. Notify Engineer after placing pavement spots and minimum 3 days prior to applying traffic lines.

D. Provide qualified technician to supervise equipment and application of marking. Layout markings using guide lines, templates and forms. Use stencils and templates made to industry standards.

E. "Free hand" painting of arrows, symbols, or wording is unacceptable.

3.3 DEMOLITION

A. Remove existing markings in an acceptable manner.

B. Do not remove existing pavement markings by painting over with blank paint.

C. Remove marking paint removal by machine only and in a manner to reduce grooves in the pavement and abraded dust from the road surface to the maximum extent practicable. Remove

by methods that will cause least damage to pavement structure or pavement surface. Satisfactorily repair any pavement or surface damage caused by removal methods.

D. Clean and repair existing remaining or reinstalled lines and legends.

3.4 APPLICATION

A. Agitate paint for 1-15 minutes prior to application to ensure even distribution of paint pigment.

B. Apply marking paint at a rate of one (1) gallon per three to four hundred (300-400) lineal feet of four (4) inch wide stripes or to manufacturer's specification.

C. Apply glass beads at rate of 6 pounds per gallon of paint.

D. Apply markings in locations and to indicated dimensions at indicated locations.

E. Prevent splattering and over spray when applying markings. Protect adjacent curbs, walks, fences, and other items from receiving paint.

F. Unless material is track free at end of paint application convoy, use traffic cones to protect markings from traffic until track free. When vehicle crosses a marking and tracks it or when splattering or over spray occurs, eradicate affected marking and resultant tracking and apply new markings.

G. Collect and legally dispose of residues from painting operations.

3.5 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation from Wet Film Thickness: 1 mil.

C. Maximum Variation from Wet Paint Line Width: Plus or minus 1/8 inch (3 mm).

D. Maintain cycle length for skip lines at tolerance of plus or minus 6 inches per 40 feet and line length of plus or minus 3 inches per 10 feet.

E. Maximum Variation from Specified Application Temperature: Plus or minus 5 degrees F (2.8 degrees C)

3.6 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting, testing.

B. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured or discolored material, and insufficient bonding.

C. Repair lines and markings, which after application and curing do not meet following criteria:
   1. Incorrect Location: Remove and replace incorrectly placed patterns.
   2. Insufficient Thickness, Line Width, Paint Coverage, Glass Bead Coverage or Retention: Prepare defective material by acceptably grinding or blast cleaning to remove substantial

amount of beads and to roughen marking surface. Remove loose particles and debris. Apply new markings on cleaned surface in accordance with this Section.

3. Uncured or Discolored Material, Insufficient Bonding: Remove defective markings in accordance with this Section and clean pavement surface one foot beyond affected area. Apply new markings on cleaned surface in accordance with this Section.

D. Replace defective pavement markings as specified throughout 3 year warranted period. Replace markings damaged by anti-skid materials, studded tires, tire chains, chemical deicers, snow plowing or other loss of marking material regardless of cause. When markings are damaged by pavement failure or by Owner's painting, crack sealing, or pavement repair operations, Contractor is released from warranty requirements for damaged work.

E. A three member team will evaluate warranty provisions. Team will consist of one member from Owner, one member from Contractor, and third person who is mutually acceptable to Owner and Contractor. Any costs for third person will be equally shared between Owner and Contractor. At least once each year, beginning with year after acceptance, team shall:
   1. Observe Owner taking readings by retroreflectometer, or review Owner records of such evaluation. The number of readings will be as large as necessary to ensure that minimum criteria are satisfied. Readings will be during period from March 15 through October, when pavement is clean and dry.
   2. Determine color fade, discoloration or pigment loss based on visual color comparison between original sample plates with glass beads and in-place pavement markings.
   3. Determine magnitude of material loss.

F. Prepare list of defective areas and areas requiring additional inspection and evaluation to decide where material may need replaced. Provide traffic control as necessary if markings require more detailed evaluation.

G. Replace failed or defective markings in entire section of defective markings within 30 days after notification when any of the following exists during warranty period:
   1. Average retroreflectivity within any 528 foot (161 m) section is less than 1225 mcd/m2/1x for white pavement markings and 100 mcd/m2/1x for yellow pavement markings.
   2. Marking is discolored or exhibits pigment loss, and is determined to be unacceptable by three member team based on visual comparison with beaded color plates.
   3. More than 15 percent of area of continuous line, or more than 15 percent of combined area of skip lines, within any 528 foot (161 m) section of roadway is missing.

H. Replace pavement marking material under warranty using original or better type material. Continue warranty to end of original 3 year period even when replacement materials have been installed as specified.

I. When eradication of existing paint lines is necessary, eradicate by shot blast or water blast method. Do not gouge or groove pavement more than 1/16 inch (1.5 mm) during removal. Limit area of removal to area of marking plus 1 inch (25 mm) on all sides. Prevent damage to transverse and longitudinal joint sealers, and repair any damage according to requirements in Section 32 13 13 or Section 32 12 16.

J. Maintain daily log showing work completed, results of above inspections or tests, pavement and air temperatures, relative humidity, presence of any moisture on pavement, and any material or equipment problems. Make legible entries in log in ink, sign and submit by end of each work day. Enter environmental data into log prior to starting work each day and at two additional times during day.

3.7 PROTECTION

A. Section 017300 - Execution: Requirements for protecting finished Work.

B. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free. Follow manufacturer's recommendations or use minimum of 30 minutes. Consider barrier cones as satisfactory protection for materials requiring more than 2 minutes dry time.

3.8 MAINTENANCE

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance service.

B. Furnish service and maintenance of traffic paints for one year from Date of Substantial Completion.

END OF SECTION

# SECTION 32 31 13 - CHAIN LINK FENCES

## 1.1 SUMMARY

A. Section Includes:
1. Fence framework, fabric, and accessories.
2. Excavation for post bases.
3. Concrete foundation for posts.
4. Manual gates and related hardware.
5. Privacy slats.

## 1.2 REFERENCES

A. ASTM International:
1. ASTM A121 - Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
5. ASTM A491 - Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
6. ASTM A817 - Standard Specification for Metallic-Coated Steel Wire for Chain-Link Fence Fabric and Marcelled Tension Wire.
7. A1011/A1011M-07 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
8. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
9. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
10. ASTM F552 - Standard Terminology relating to Chain Link Fencing.
11. ASTM F567 - Standard Practice for Installation of Chain-Link Fence.
12. ASTM F626 - Standard Specification for Fence Fittings.
13. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric.
14. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.
15. ASTM F934 - Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
16. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
17. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
18. ASTM F1183 - Standard Specification for Aluminum Alloy Chain Link Fence Fabric.
19. ASTM F1184 - Standard Specification for Industrial and Commercial Horizontal Slide Gates.
20. ASTM F1345 - Standard Specification for Zinc - 5% Aluminum -Mischmetal Alloy-Coated Steel Chain-Link Fence Fabric.

B. Chain Link Fence Manufacturers Institute:
1. CLFMI - Product Manual.

## 1.3 SYSTEM DESCRIPTION

A. Fence Height: as indicated on Drawings.

B. Line Post Spacing: At intervals not exceeding 10 feet.

C. Fence Post and Rail Strength: Conform to ASTM F1043 Heavy Industrial Fence quality.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

C. Product Data: Submit data on fabric, posts, accessories, fittings and hardware.

D. Samples: Submit two inch samples of fence fabric illustrating construction and finish.

E. Manufacturer's Installation Instructions: Submit installation requirements.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. Section 01 81 13 - Sustainable Design Requirements: Requirements for sustainable design submittals.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines.

C. Operation and Maintenance Data: Procedures for submittals.

1.7 QUALITY ASSURANCE

A. Supply material in accordance with CLFMI - Product Manual.

B. Perform installation in accordance with ASTM F567.

C. Perform Work in accordance with Town and RIDOT requirements.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.9 DELIVERY, STORAGE AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.

C. Identify each package with manufacturer's name.

D. Store fence fabric and accessories in secure and dry place.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

A. Manufacturers:
   1. Ameristar, Master Halco, Eastern Chain-Link Fence, or approved equal.
   2. Substitutions: Section 01 60 00 - Product Requirements.

### 2.2 MATERIALS AND COMPONENTS

A. Materials and Components: Conform to CLFMI Product Manual.

B. Fabric Size: CLFMI Heavy Industrial service.

C. Intermediate Posts: Type II round.

D. Terminal, Corner, Rail, Brace, and Gate Posts: Type II round.

### 2.3 MATERIALS

A. Framing (Steel): ASTM F1083 Schedule 40 galvanized steel pipe, welded construction, minimum yield strength of 25 ksi; coating conforming to ASTM F1043 Type A on pipe exterior and interior.

B. Fabric Wire (Steel): ASTM A615 GR 60 steel wire.

C. Concrete: Type specified in Section 03 30 00.

### 2.4 COMPONENTS

A. Line Posts: 2.38 inch diameter.

B. Corner and Terminal Posts: 2.38 inch diameter.

C. Gate Posts: 3.5 inch diameter.

D. Top and Brace Rail: 2 inch diameter, plain end, sleeve coupled.

E. Gate Frame: 1.66 inch diameter for fabrication.

F. Fabric: 2 inch diamond mesh interwoven wire, 9 gage thick.

G. Tension Wire: 6 gage thick steel, single strand, marcelled, spiraled or crimped, aluminum-coated tension wire conforming to ASTM A824.

H. Tie Wire: Aluminum alloy steel wire.

2.5 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; galvanized steel.

C. Extension Arms: Cast steel galvanized, to accommodate strands of barbed wire.

2.6 GATES

A. General:
1. Gate Types, Opening Widths and Directions of Operation: As indicated on Drawings.
2. Factory assemble gates.
3. Conform to requirements specified for PVC coated steel chain link fence except that PVC coated aluminum alloy framing conforming to ASTM B429/B429M may be used.
4. Design gates for operation by one person.

B. Swing Gates:
1. Fabricate gates to permit 180 degree swing.
2. Gates Construction: ASTM F900 with welded corners. Use of corner fittings is not permitted.

2.7 FINISHES

A. Components and Fabric: Vinyl coating, color selected by Owner and color in accordance with ASTM F934 as selected over galvanized coating.

B. Vinyl Components: color to match fabric as selected.

C. Hardware: Galvanized to ASTM A153/A153M.

D. Accessories: Same finish as framing.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Set posts plumb, in concrete footings with top of footing 2 inches above grade. Slope top of concrete for water runoff.

C. Line Post Footing Depth Below Finish Grade: ASTM F567 3’-6” below grade.

D. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567 3’-6” below grade.

E. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.

F. Install top rail through line post tops and splice with 6 inch long rail sleeves.

G. Install center and bottom brace rail on corner gate leaves.

H. Place fabric on outside of posts and rails.

I. Do not stretch fabric until concrete foundation has cured 28 days.

J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

K. Position bottom of fabric 2 inches above finished grade.

L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

N. Install bottom tension wire stretched taut between terminal posts.

O. Install support arms sloped inward and attach barbed wire; tension and secure.

P. Support gates from gate posts. Do not attach hinged side of gate from building wall.

Q. Install gate with fabric to match fence. Install three hinges on each gate leaf, latch, catches.

R. Connect to existing fence where indicated on plans by installation of brace rails and brace rods.

S. Install posts with 6 inches maximum clear opening from end posts to buildings, fences and other structures.

T. Excavate holes for posts to diameter and spacing indicated on Drawings without disturbing underlying materials.

U. Center and align posts. Place concrete around posts, and vibrate or tamp for consolidation. Verify vertical and top alignment of posts and make necessary corrections.

V. Extend concrete footings 2 inches above grade, and trowel, forming crown to shed water.

W. Allow footings to cure minimum 7 days before installing fabric and other materials attached to posts.

3.2 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation From Plumb: 1/4 inch.

C. Maximum Offset From Indicated Position: 1 inch.

D. Minimum distance from property line: 6 inches.

END OF SECTION

# SECTION 32 91 19 - LANDSCAPE GRADING

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Final grade topsoil for finish landscaping.

B. Related Sections:
   1. Section 31 25 00 – Erosion and Sedimentation Controls.
   2. Section 32 92 19 - Seeding.

### 1.2 REFERENCES AND STANDARDS

A. AOAC: Association of Official Agricultural Chemists.

B. ASTM International: American Society of Testing Materials International.

C. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

D. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

E. UMTC: University of Massachusetts Transportation Center, "Manufactured Loam using Compost Material - Phase 1: Feasibility", October 1966 or latest update.

### 1.3 SUBMITTALS

A. Division 01 Sections: Submittal procedures

B. Topsoil tests: Reports indicating and interpreting test results for complete topsoil and soil components. Submit reports at least one (1) month before any delivery of materials. See Section 2.3 Source Quality Control.

C. Soil Additives and amendments: Product or testing certificates signed by manufacturers certifying that their products comply with specified requirements:
   1. Manufacturers' certified analysis for all products specified.
   2. Analysis for other amendments, such as organic compost, by the University of Massachusetts Agricultural Extension Service or other approved testing laboratory, made according to methods established by the AOAC, where applicable, and as required in this Specification.
   3. Sieve and salt analysis of sand proposed as a planting soil amendment or component.

D. Organic Material: A letter certifying source and composition of organic material proposed for use as a soil amendment indicating compliance with UMTC "Article 5.4 Standard Compost Specifications for Massachusetts" and meets requirements. Letter must also give description of product and recommendations for use as a planting soil component or amendment.

E. Samples:
   1. Topsoil: Submit, 2 lb sample of fill to the Landscape Architect.
   2. Organic Material: Submit, 2 lb sample of fill to Landscape Architect

F. Materials Source: Submit name of imported materials source.

G. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Furnish each topsoil material from single source throughout the Work.

B. Prior to delivery or spreading, submit a minimum of two (2) approved sample test results of planting soil from each proposed location or source.
   1. Mix and obtain composite top soil samples for testing to ensure the topsoil conform to the specifications. Collect composite samples from the stockpiles and source or material to be delivered to the site. Submit prototype topsoil mixes to Laboratory at least 30 days before intended use on site, to allow for reformulation and retesting if test results are rejected.
   2. Provide samples to both Landscape Architect and testing laboratory and have testing report sent directly to the Landscape Architect.

C. Do not order or deliver materials until required samples, certifications, manufacturers' literature and test results have been reviewed by the Landscape Architect. Delivered materials must be from the same source as the submitted samples.

D. The Landscape Architect may compare each soil delivery to the site with submission samples. Any deviations from the approved materials identified will require resubmission and further testing be performed. The Landscape Architect reserves the right to reject on or after delivery any material that does not meet specifications or match approved samples. Use of unapproved topsoil will result in rejection and removal.

E. Soil tests: All Tests performed by the University of Massachusetts Cooperative Extension Service in accordance with current standards of Association of Official Agricultural Chemists or other testing laboratory as approved by the Landscape Architect. Deliver test samples to laboratory, and have test results sent directly to the Landscape Architect. Testing reports to include the following for the stockpiled topsoil and finished planting soil that may or may not be amended in order to meet the specifications:
   1. Mechanical gradation (sieve analysis) and USDA soil classification
   2. Percent organic matter
   3. Chemical analysis for the following elements:
      a. Soluble salts.
      b. Carbon: nitrogen ratio
      c. Potassium
      d. Phosphorus
      e. Magnesium
      f. Calcium
      g. Acidity (pH)
      h. Toxic Elements

4. Testing for heavy metals as required by the USEPA
5. Recommendations for soil additives to correct soils deficiencies as necessary to accomplish particular planting operations of the Project.

F. When tests indicate materials do not meet specified requirements, change material and retest.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Weather Limitations: Proceed with grading only when existing and forecasted weather conditions permit.

PART 2 PRODUCTS

2.1 MATERIAL

A. Topsoil Source:
1. Reuse surface soil stockpiled on-site if adequate stockpile areas are available .
2. Supplement with imported topsoil from off-site sources when on-site reusable quantities are insufficient.
3. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least four inches deep; do not obtain from agricultural land, bogs or marshes.

B. Topsoil:
1. Reusable excavated and /or Imported borrow
a. Fertile, friable, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots;
2. USDA Textural Classification: Sandy Loam.
3. Acidity range (pH) of 6.0 to 7.0.
4. Containing the minimum of 4 percent and maximum of 10 percent inorganic matter by weight.
5. Soluble salt content (Electrical Conductivity):
a. Conductivity not to exceed 900 ppm/0.9 mmhos/cm in soil.
1) Naturally Stripped Topsoil: .01-.25 mmhos/cm
2) Loam borrow manufactured from organic compost: not to exceed levels recommended for the specific plantings (.01-.75 mmhos/cm)
b. Salt content will lower the longer the soil is spread on site, with rain and aging of the organic component. If salt content of the topsoil is too high, as determined by the Landscape Architect or Engineer, the salt content must be within approved ranges by the time the soil is spread on site and plants installed, or planting will be delayed or soil rejected and will require replacement with an approved planting soil.
6. Nutrient Ranges:
a. Magnesium: 60-200 ppm
b. Phosphorus: 10- 100 ppm.
c. Potassium to exceed 120 – 300 ppm.
7. Reasonably free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds, and foreign matter.
a. Screening: Double screened.
8. Free of other extraneous materials harmful to plant growth.

C. Organic matter proposed as a soil amendment: Natural or manufactured mature, composted organic material
   1. Comply with UMTC "Article 5.4 Standard Compost Specifications for Massachusetts" and that the compost is mature.
   2. Produced by an approved composting vendor of material originating from mature leaf compost, mature composted animal manure, other aged, composted vegetable materials such as brewer's waste, or chemically tested toxin-free processed sludge products (biosolids), composted with wood products, safe for plants, humans and soil organisms (Class A or Type I).
   3. Organic matter manufactured from sludge and other biowaste materials or manure to be aged for at least one (1) year without exception, and have no objectionable biowaste odor.
   4. Do not use raw (uncomposted or unprocessed) or incompletely composted organic matter. Refer also to requirements included in Section 32 93 00 – Plants for Soil Amendments for Planting Soil.

2.2 SOURCE QUALITY CONTROL

A. Division 01 Section: Testing and analysis of soil material.

B. Testing and Analysis of Topsoil Material: Perform in accordance with one of the following ASTM D698, ASTM D1557 or AASHTO T180.

C. Prior to delivery, analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

D. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

E. All topsoil delivered to the site must match the samples approved by the Landscape Architect. Additional testing of topsoil delivered to the site will be required if it does not appear to be consistent with previously tested samples.

F. When tests indicate materials do not meet specified requirements, change material and retest.

G. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXAMINATION

A. Division 01 Section "Execution": Verification of existing conditions before starting work.

B. Section 31 20 00 - Earthmoving: Verification of rough grading, trench backfilling and subbase has been contoured and compacted before starting work.

C. Verify compliance with requirements and for conditions affecting performance of work of this Section prior to starting any work. Report any defect, such as incorrect grading, incorrect subgrade elevations, improper compaction or drainage problems, to the Landscape Architect prior to beginning Work. Do not proceed with installation until unsatisfactory conditions have been corrected. Commencement of Work indicates acceptance of filled subgrade areas to and responsibility for Work.

1. When conditions detrimental to work are encountered including, but not limited to, incorrect grading, adverse drainage conditions, poor soil conditions, or invasive species problems, immediately notify the Owner and/or Landscape Architect before beginning any Work.

D. Verify the location of the irrigation system and protect during operations.

3.2 PREPARATION

A. Coordinate topsoil placement with other Work of this contract being performed on the Project site.

B. Protect landscaping and other features remaining as final Work.

C. Protect existing trees, structures, fences, sidewalks, utilities, paving, and curbs.

D. Immediately notify Landscape Architect if adjustments in grades and alignments are necessary to avoid interference with unforeseen conditions encountered.

E. Protect subgrade areas scheduled for planting or stormwater infiltration systems from traffic and erosion.

3.3 SUBGRADE PREPARATION

A. Eliminate uneven areas and low spots.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove contaminated subsoil.

C. Scarify surface to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.4 PLACING TOPSOIL

A. Place topsoil in areas where seeding, sodding and planting, is required to thickness as scheduled. Place topsoil during dry weather. Do not spread if either the topsoil or subgrade is frozen, muddy, compacted or excessively wet.

B. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade. Fill depressions caused by settlement with additional topsoil and regrade and rake until a smooth and even finished grade is created.

C. Remove roots, weeds, rocks, and foreign material while spreading.

D. Manually spread topsoil close to plant material, building, and other landscape elements to prevent damage.

E. Lightly compact placed topsoil and roll areas to be seeded.

F. Remove surplus subsoil and topsoil from site.

G. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.5 COMPACTION

A. Planting areas to be drill seeded or hydroseeded: Roll and compact bed before seeding. Compact with a roller or other suitable means to achieve a maximum dry density of 88 to 90% for the placed loam in accordance with compaction standards of ASTM D1557, Method D.

B. Areas to be hand seeded: Smooth surface to meet finished grades with raking and broadcast seed according to requirements specified. Compact with rolling after seeding.

C. Do not over compact, or loosening and re-rolling of the soils will be required. Adjust the compaction of the soil by soil type within the required maximums, with less compaction preferred in finer soils.

3.6 FIELD VISIT

A. A field visit is required by Landscape Architect of the finished grades for approval.

3.7 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Top of Topsoil: Plus or minus 1/2 inch.

C. Evenly grade slopes with smooth lines and grades.

3.8 PROTECTION OF INSTALLED WORK

A. Section 01 73 00 - Execution: Requirements for protecting finished Work.

B. Prohibit construction traffic over topsoil.

3.9 SCHEDULES

A. Compacted topsoil thicknesses:
   1. Seeded Grass: 6 inches.
   2. Sod: 4 inches.
   3. Shrub Beds: 18 inches.
   4. Flower Beds: 12 inches.

END OF SECTION

# SECTION 32 92 19 - SEEDING

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Fertilizing.
   2. Seeding.
   3. Hydroseeding.
   4. Mulching.
   5. Maintenance.

B. Related Sections:
   1. Section 32 91 19 - Landscape Grading.

### 1.2 REFERENCES

A. ASTM International:
   1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

### 1.3 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

### 1.4 SUBMITTALS

A. Division 01 Section - Submittal Procedures: Requirements for submittals.

B. Seed Mix: Product Data and Manufacturer's Certificate of Compliance with the specifications for each type of seed to include the No seed may be sown until the Contractor has submitted the certificates.

C. Product Data: Submit data for the following:
   1. Seed mixes.
   2. Fertilizer.
   3. Mulch,
   4. Lawn herbicides and pesticides.
   5. Other accessories.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements for the following:
   1. Seed mixes
      a. Guaranteed percentage of purity, weed content and germination of the seed, and the net weight and date of shipment and pounds per acre sowing rate.
      b. Fertilizer
      c. Lawn herbicides and pesticides.

E. Maintenance Schedule: Provide watering, fertilizing and mowing schedule to the Owner and Landscape Architect for approval.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer;

1.6 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

B. If required, only use herbicides, pre-emergents, fertilizers, fungicides, and pesticides reviewed and approved by the Landscape Architect. Application to be performed by a licensed professional according to manufacturer's recommendations.

C. Select compatible products where options are provided

1.7 QUALIFICATIONS

A. Seed Supplier: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with a minimum 5 Year experience and with a record of successful grass establishment.
   1. Installer to provide an experienced supervisor on the project site during all times that landscape construction is in progress. Provide written qualification data for firms and persons to be responsible for Work, to demonstrate their capabilities and experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.9 MAINTENANCE SERVICE

A. Section 017300 - Execution and Closeout Requirements: Requirements for maintenance service.

B. Maintenance includes the watering, weeding, fertilizing, mowing, repairing and/or reseeding of all seeded areas.

C. Initial maintenance period:
   1. Immediately after grass areas are seeded and continue for a minimum of a 60 day active growing period following the completion of all grass construction work.

D. Extend the maintenance period for all seeded areas until satisfactory grass growth is established.

E. In the event that seeding operations are completed too late in the Fall for adequate germination, continue maintenance into the following Spring and Fall and reseed as necessary for satisfactory seeded grass establishment.

1.10 GUARANTEE

A. Satisfactory Seeded Grass: A healthy, uniform close stand of grass free of surface irregularities with coverage exceeding 90 percent over any 10 sq. ft. scattered bare spots, none of which are larger than 72 square inches, will be allowed up to a maximum of 2% of any lawn area.

B. Upon completion of the minimum maintenance period, request, in writing, an inspection by the Landscape Architect to determine whether satisfactory seed growth has been established. If the seeded areas and workmanship are determined to be satisfactory as defined in the specifications, written notice will be given by the Landscape Architect to the Contractor and Owner.

C. If the grass is determined to be unsatisfactory as defined in the specifications at the time of inspection, repair and/or reseed areas determined to be unacceptable.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Planting Restrictions: Plant during one of the following periods:
   1. Mown lawns
      a. Spring: April 1 - June 1
      b. Fall: August 15 – October 15

B. Seeding before or after the above referenced planting dates will increase the likelihood of grass seed establishment failure. Any deviation from the above referenced planting dates is undertaken at sole risk of the contractor and it is the responsibility of the contractor to provide any additional maintenance and watering which may be required to ensure satisfactory plant and seed establishment.

C. Seeding outside of season to occur only with permission of the Landscape Architect and may result in reseeding the following season until satisfactory seed establishment is provided. Acceptance will not be given to areas seeded outside of season until satisfactory grass has been established. Out-of-season seeding during hot weather will require additional watering and shade mulching with netted hay-type erosion control fabric.

D. Seeding under frozen conditions in either the spring or fall will not be permitted.

PART 2 PRODUCTS

2.1 SEED MIXTURE

A. Grass Seed to be of the previous year's crop and the weed seed content is not to exceed 1% by mass.

B. Use only low maintenance seed mixes appropriate for cut and fill slopes, detention basins, and disturbed areas as listed below.

C. Suppliers:
   1. Colonial Seed Company

28 School St East Granby, CT. 06026
(413) 355 - 0200

2. Substitutions: Permitted with Landscape Architect approval.

D. Seed Mixture:

1. Harmony Low Maintenance Grass Mix:

| | |
|---|---|
| Coastal/Wavy Hair Grass | Percent Not Available |
| Sheep Fescue | Percent Not Available |
| Blue X Hard Fescue | Percent Not Available |
| Blue Fescue | Percent Not Available |
| Hard Fescue | Percent Not Available |
| Application rate of 3-4 lbs per 1,000 sq ft | |

2. The seed mixes to be a low maintenance seeding, and appropriate for cut and fill slopes, detention basins, and disturbed areas adjacent to environmental resource areas.

## 2.2 SOIL AMENDMENTS

A. Fertilizer: Granular commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil, as indicated in analysis.
1. Consist of slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium.
a. Manufacturers:
1) Sustane™
2) Or approved equivalent.

B. Bone Meal: Raw, finely ground, commercial grade, minimum of 3 percent nitrogen and 20 percent phosphorous.

C. Lime: Ground limestone, dolomite type, containing a minimum 89 percent calcium carbonate equivalent.
1. Its value is based on chemical composition (calcium carbonate equivalent) and degree of fineness. Ground agricultural limestone is available as calcium carbonate (calcite) or as a mixture of calcium and magnesium carbonate (dolomite). Standard ground agricultural limestone contains a minimum of 89 percent calcium carbonate equivalent [calcium carbonate plus (magnesium carbonate × 1.19)].
2. 95 percent passing a 20 mesh sieve, 60 percent passing a 60 mesh sieve, and 50 percent passing a 100 mesh sieve.

D. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass. Includes hose and all other watering equipment required for the Work.

E. Erosion Fabric: jute matting, open weave.

## 2.3 ACCESSORIES

A. Wood-Cellulose Mulch (Hydromulch): Specially prepared green-dyed and air-dried wood-cellulose fibers, containing no growth or germination inhibiting substances, in packages not exceeding 100 pounds gross, with net weight shown on the package, and meeting the following requirements:

1. Fiber processed from whole wood chips manufactured specifically for standard hydraulic mulching equipment. Not produced from recycled material such as sawdust, paper, or cardboard.
2. Moisture content of hydromulch not to exceed 10%, plus or minus 3% as defined by the pulp and paper industry standards.
3. Water holding capacity of not less than 900 grams water per 100 grams fiber.
4. Nontoxic to plant life or animal life.
5. Non petroleum based organic tackifier and a green dye to allow for easy visual metering during application and noninjurious to plant growth.
6. Fiber to be dispersed into uniform slurry when mixed with water.

B. Stakes: Softwood lumber, chisel pointed.

C. String: Inorganic fiber.

2.4 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

C. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

D. Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.1 EXAMINATION

A. Division 01 Section “Execution”: Verification of existing conditions before starting work.

B. Verify prepared soil base is ready to receive the Work of this section.

C. Verify compliance with requirements and for conditions affecting performance of work of this Section prior to starting any work. Report any defect, such as incorrect grading, incorrect subgrade elevations, improper compaction or drainage problems, to the Landscape Architect prior to beginning Work. Do not proceed with installation until unsatisfactory conditions have been corrected. Commencement of Work indicates acceptance of filled subgrade areas to and responsibility for Work.
   1. When conditions detrimental to work are encountered including, but not limited to, incorrect grading, adverse drainage conditions, poor soil conditions, or invasive species problems, immediately notify the Owner and/or Landscape Architect before beginning any Work.

3.2 PREPARATION

A. Refer to Section 32 91 91 – Landscape Grading.

B. Correct any grading and drainage problems. Restore areas if erosion has occurred or Project site has been disturbed.

C. Moisten prepared grass areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.3 FERTILIZING

A. Apply lime at application rate recommended by soil analysis. Work lime into top 4 inches of soil.

B. Apply fertilizer at application rate recommended by soil analysis, but not in excess of 20 pounds per 1000 square feet.

C. Apply after smooth raking of topsoil and prior to roller compaction.

D. When applying , avoid spreading the fertilizer onto hard surfaces where it will wash into local surface water through the storm sewer system. Sweep and remove fertilizer that lands on the sidewalk/driveway onto place onto the lawn area. Over-spreading fertilizers onto hard surface (sidewalks, driveways and streets) adds to surface water pollution.

E. Do not apply fertilizer at same time or with same machine used to apply seed.

F. Spread and thoroughly mix fertilizer thoroughly into upper 3 inches of topsoil by harrowing or as part of hydroseed slurry.

G. Do not apply fertilizers in water protection areas or in wetland buffer areas under any circumstances.

H. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

I. Use no or minimal fertilizer in native grass, wildflower areas or meadow, conservation mix seeding areas and only per the soil analysis recommendations. If the soil testing determines the topsoil does not contain appropriate levels of nutrients for establishment of these native species, fertilize these areas at the rates recommended by the test results.

3.4 SEEDING

A. Sow seed with spreader or seeding machine.

B. Do not use wet seed or seed that is moldy or otherwise damaged.

C. Apply seed at rate of per seed mix requirements lbs per 1000 sq ft evenly in two directions at right angles to each other. Rake in lightly into top 1/8 inch of topsoil.

D. Do not use wet seed or seed that is moldy or otherwise damaged.

E. Do not seed areas in excess of that which can be mulched on same day.

F. Planting Season: See Section 1.13 Environmental Requirements

G. Schedule seeding when rain is not expected for 48 hours and within seasonal dates specified. Seed only when soil is in friable condition, not muddy, dried, or frozen.

H. Do not sow immediately following rain, when ground is too dry, when winds are over 12 mphor when temperatures are expected to be less than 45 or higher than 75 degrees Fahrenheit during and for two (2) weeks after seeding. .

I. Roll seeded area with roller not exceeding 112 lbs/linear foot.

J. Immediately following seeding, apply mulch to thickness of 1/8 inches. Maintain clear of shrubs and trees.

K. Apply water with fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.5 SEEDING SLOPES GREATER THAN 3:1

A. Protect seeded areas with slopes exceeding 3:1 with specified erosion control blankets or bonded fiber matrix as indicated on Drawings and approved by the Landscape Architect.

B. See Section 31 25 00 – Erosion and Sediment Control.

3.6 HYDROSEEDING

A. Protect adjacent and adjoining areas from hydroseeding overspray.

B. Mix specified seed, fertilizer, and premium wood fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
   1. Mix slurry with tackifier.
   2. Apply the hydroseeding in the form of slurry consisting of organic soil amendments, commercial fertilizer, and any other recommended additives.
   3. Apply slurry uniformly to all areas to be seeded in a one-step process. Spray the area with a visible uniform coat, using the dark color of the cellulose fiber as a visual guide. Apply the slurry in a downward drilling motion via a fan stream nozzle. Ensure that all of the slurry components enter the mix with the soil.
   4. Ensure the uniformity of the hydroseed application at a minimum rate of 1,500-lb/acre dry weight but not less than the rate required to obtain specified seed-sowing rate.
   5. Exercise special care to prevent any of the slurry from being sprayed onto any hardscape areas including paved surface, fences, walls, buildings, etc. Remove all slurry sprayed onto these surfaces at their own expense.
   6. Save all seed and fertilizer tags and fiber mulch bags for the Landscape Architect to verify compliance with the Drawings and Specifications.

C. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

3.7 SEED PROTECTION

A. Identify seeded areas with stakes and string around area periphery.

B. The following are applicable only for areas were hydroseeding is NOT applied.
   1. Cover seeded slopes where grade is 3:1 or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

2. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.
3. Secure outside edges and overlaps at 36 inch intervals with stakes.
4. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
5. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.8 MAINTENANCE

A. Mow grass at regular intervals to maintain at maximum height of 3 inches. Do not cut more than 1/3 of grass blade at each mowing. Perform first mowing when seedlings are 40 percent higher than desired height.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming. Do not let clippings lay in clumps.

D. Water to prevent grass and soil from drying out.
1. Provide all labor and water required to establish all grass areas. Water as required, during maintenance period to ensure the seed bed is thoroughly and evenly watered with a fine spray to penetrate the soil to a depth of at least 4 inches.
2. Keep seeded areas evenly moist until germination and satisfactory establishment.
3. Water in a manner to provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment.

E. Roll surface to remove minor depressions or irregularities.

F. Control growth of weeds.
1. Apply herbicides only as necessary and as approved by the Landscape Architect. Remedy damage resulting from improper use of herbicides.

G. Immediately reseed areas showing bare spots.

H. Repair washouts or gullies.

I. Protect seeded areas with warning signs during maintenance period.

J. Take immediate action to identify potential problems and undertake corrective measures in areas where a decline in the condition of grass seed areas is observed.

3.9 CLEAN UP

A. Promptly remove soil and debris created by grass work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove erosion-control measures after satisfactory grass establishment and site stabilization is complete

END OF SECTION