PROJECT MANUAL

SPECIFICATIONS

Issued for 100% Submittal – 10 January 2026

For

MAINTAIN/REPAIR/CONSTRUCT VARIOUS ROOM RENOVATIONS AT BUILDING 305 MX COMMANDER OFFICES

ZQEL 19-0016

For

910th AIRLIFT WING
3976 KING GRAVES ROAD
VIENNA, OHIO 44473-5931

PREP ARED BY

DEPARTMENT OF THE AIR FORCE
910th BASE CIVIL ENGINEERING OFFICE
3976 KING GRAVES ROAD, BLDG 510
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AT BUILDING 305 MX COMMANDER OFFICES
PROJECT # ZQEL 19-001

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SECTION 01 00 00 - GENERAL REQUIREMENTS

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. The Contractor shall furnish all supervision, labor, materials, tools, equipment, apparatus, and transportation required to complete the construction in conformity with the Contract Documents.

B. The Project is to Maintain/Repair/Construct Various Room Renovations for building 305. Rooms will be reconfigured to provide the Maintenance CC office space suitable to their needs.

C. The Work consists of – but is not limited to – the following

1. **Building 305: Aircraft Maintenance Hanger**
Remodel of Commanders Suite Area, and portion of hallway leading to commanders suite. Work to include: Remove exiting walls, doors and drop ceiling from room 248-249. Remove electrical within interior walls, relocate too new wall. Remove carpeting from 246-247-248-249. Install new walls as per plan. All walls to be painted, new vinyl base cove to be installed. Hallway base cove to be 6" (Wedgewood Blue). Remove and Replace doors with solid cherry finish, existing hardware to be reused and kick plates to be replaced. From existing doors to be installed on new doors. Metal Jambs to be painted. Install 6' x 4' picture windows as shown. Existing Duct Work in Hanger to be rerouted as shown.

2. **Base Beautification, Tree Plantings TREE CITY USA**

Planting of trees will be a standard for all Projects on base. Contractor will incorporate the planting of 30 select trees at a designated place around project location or as noted around base. This project will designate 3 Norway Spruce trees to be planted on an earthen mound along the fence line of Perimeter Road at the westerly corner of the base property. Area is located outside the main perimeter fencing of the installation. Mound will be 3'-4' wide at the top and a minimum of 3' tall. Refer to Section 32 93 00 & 32 94 00.

1.3 SCHEDULE

A. The contractor is advised that the work required must be scheduled to occur between base UTA schedule time. UTA schedules occur every 30 calendar days, and contractors activities shall be coordinated between the MX operations schedule and staff and the contractor, with approval of the Contracting Officer. Refer to article 1.7 of this Section for additional requirements

1.4 REFERENCES

A. United States Air Force (USAF or AF) Forms:

1. Base Civil Engineering Work Clearance Request Form (AF Form 103): Found at the end of this Section.
2. The Material Approval Submittal Transmittal Form (AF Form 3000): Found at the end of Section 01 33 00 – Submittal Procedures.

1.5 DEFINITIONS

A. Any and all references in the Specifications and/or on the Drawings to – and/or requirements for – "notifications" shall be taken to mean written notification to the Contracting Officer.

B. Any and all references in the Specifications and/or on the Drawings to – and/or requirements for – "submittals" shall be taken to mean submittals in accordance with both of the following:

1. Section 01 30 01 – Submittal Descriptions.
2. Section 01 33 00 – Submittal Procedures.

C. Any and all references to – and/or requirements for materials and work to be in – compliance with the Manufacturer's recommendations shall be taken to mean – and/or includes the requirement that:

Work shall be accomplished in accordance with the Manufacturer's recommendations. In the event of a conflict between the Manufacturer's recommendations and the Specifications, the Manufacturer's recommendations shall take precedence. Any and all references to – and/or requirement for – testing by "an approved independent commercial testing laboratory" shall be taken to mean an independent testing laboratory

that has been approved by the United States Army Corps of Engineers (USACE) within the last year.

1.6 DOCUMENTS

A. The Contractor shall be responsible for reviewing the complete set of Contract Documents for:

1. Procedures.
2. Space requirements.
3. Materials.
4. Installation sequence.
5. Similar items.

B. The Contractor shall coordinate efforts with all others working on the Project.

1.7 CONTRACTOR USE OF THE PREMISES

A. The Work shall not commence until the Contractor receives a completed AF Form 103 from Base Engineering.

B. Confine construction activities to areas defined for the Work in the Specifications and on the Drawings – or specifically assigned for that use by the Contracting Officer. Do not use any other areas on Government premises without written consent of the Contracting Officer.

C. Do not unreasonably encumber the Site with materials or equipment.

D. Assume full responsibility for protection and safekeeping of products stored at the Site.

E. The Government will occupy the premises during the construction period. Coordinate required shutdowns of building areas with the Government to facilitate construction operations and minimize conflict with Government usage.

F. The building occupants will remove personal and work-related materials from the work areas prior to the Contractor starting work in those areas.

G. Move, protect, store, and return furniture, equipment, and other items as necessary to complete painting, wall covering, tiling, carpeting, or any other work. Cover the existing furniture with durable drop cloths and develop a schedule to minimally impact the occupants.

1.8 CUTTING AND PATCHING

A. Perform cutting necessary for the installation of the Work. Perform patching required as a consequence thereof.

1.9 SITE ADMINISTRATION

A. The Prime Contractor shall assume responsibility for the general charge of the construction and the Site until the Project is turned over to the Government.

1.10 SHOP DRAWINGS

A. Where required by individual sections, submit one copy of the Shop Drawings to the Contracting Officer for approval. The Contractor's responsibility for errors and omission in submittals will not be relieved by the Contracting Officer's review of submittals. Do not begin work that requires submittals until those submittals have been returned with the Contracting Officer's signature indicating review and approval.

1.11 LAYOUT

A. Immediately locate all reference points, layout the Work, and be responsible for all measurements and other work to be executed by the Contractor under the Contract. Exercise precautions to confirm the figures shown on the Drawings before laying out the Work. Note: The Contractor shall be responsible for any errors resulting from a failure to do so.

B. Verify all dimensions of existing and new work. Be responsible for their accuracy. Submit differences found to the Contracting Officer for consideration before proceeding with the Work. No extra compensation will be permitted because of differences between the actual dimensions and the measurements indicated on the Drawings.

1.12 TESTING

A. Wherever various sections of the Specifications indicate that tests are to be performed, they shall be performed at the expense of the Contractor.

1. Perform laboratory testing using an approved independent Testing Laboratory (ITL)
2. Sampling and handling shall be the responsibility of the Testing Engineer.

B. Submit certified test data results to the Contracting Officer using AF Form 3000.

C. Notify the Government 48 hours prior to testing, so that a representative of the Government may be present during testing.

1.13 TEMPORARY FACILITIES AND CONTROLS

A. Streets, Drives, and Walks:

1. Keep streets and drives clear of equipment, tools, and machinery.
2. If during the execution of this Contract it becomes necessary to obstruct any street, make necessary arrangements with the Contracting Officer's Representative – and the Security Police – at least 48 hours in advance.

   a. Keep streets and walks clear of mud and debris caused by construction operations.
   b. Provide all drive and sidewalk barriers required and necessary, complete with lights for night use.

B. Provide temporary weather tight closures of openings in exterior surfaces to prevent entry of unauthorized persons. Coordinate with Security Police. Erect and maintain temporary dustproof partitions as required to prevent spread of dust, fumes, and smoke to other parts of the building. At completion of the Work, remove partitions and repair damaged surfaces to match adjacent surfaces.

C. Provide adequate sanitary toilet facilities for all workers employed on the Project. Maintain toilet facilities used by construction employees in a clean and sanitary condition and furnish necessary supplies.

D. Only store materials within the area of the Contract Limits. Do not store materials in a manner creating a nuisance or a fire or traffic hazard. Store flammable and combustible materials separately. Inside storage (project area) will be the only area for storage of materials.

E. The Contractor shall ensure that all materials and equipment are protected prior to installation and until final acceptance. Storage shall be dry, clean, and safe. Materials or

F. equipment that become damaged, deteriorated, rusted, or defaced due to improper storage shall be fully repaired, refinished, or replaced as directed by the Contracting Officer. Materials or equipment lost through theft or mishandling shall be replaced by the Contractor without additional cost to the Government.

G. Temporary Fire Protection: Observe all provisions of the Government safety regulations relative to fire prevention throughout the construction period. Ensure that applicable permits are visible and kept current.

H. Provide temporary safety equipment in accordance with the requirements of the Government's safety regulations.

I. Utilities:

1. Notwithstanding the provisions of other clauses of the Contract, all reasonably required amounts of water, gas, electricity, and the like, essential to the performance of the Contract, will be made available at no cost to the Contractor from existing systems, outlets, and supplies.

2. Tying into Electrical Utilities: For this entire Project, tie-ins within Government-owned components will be at no cost to the Contractor.
3. Any arrangements with the utility company – or any fees involved in tying into the distribution system owned by the utility company – are the responsibility of the Contractor. The Government will not be held responsible for interruption of utility service and will not be liable for the Contractor's delays, damages, or increased costs occasioned by such an interruption of service.
4. Temporary connections or lines shall be installed, maintained, and removed by the Contractor at no additional expense to the Government and in a manner acceptable to the Contracting Officer.
5. No water may be obtained from the fire hydrants on the Base without permission from both the Contracting Officer and the Base Fire Department.

a. Temporary water lines connected by the Contractor to hydrants on the Base shall be equipped with reduced pressure backflow preventers.

1.14 PROJECT CLOSE-OUT

A. When the Contractor determines that the Work is complete, submit to the Contracting Officer a request (in writing) for final inspection in accordance with the terms of the Contract.

1.15 CLEANING

A. Conduct cleaning and disposal operations to comply with Federal, State EPA, and local land, air, and water laws.

B. Be responsible for seeing that the Site is kept clean at all times and that a daily cleaning is conducted. Storage shall only take place in designated areas.

C. Unless noted otherwise, all materials removed as a result of the Contractor's operations under the Contract shall become the property of the Contractor and shall be properly disposed of, reused, or recycled – away from the Base – at the expense of the Contractor.

D. Be responsible for final cleaning. See that the building and the Site are in a clean condition when they are turned over to the Government. At completion of the Work, the Contractor shall remove the Contractor's remaining tools, scaffolding, and surplus materials from the Site.

E. Prior to any demolition/excavation, submit a waste disposal plan for the recycling and disposal of construction waste materials and demolition debris resulting from the Work of this Contract, including:

1. A description of the waste materials and debris to be reused or recycled.
2. The proposed method of collection and transport.
3. The location of proposed disposal and recycling facilities.

4. The name, address, and telephone number for each facility and transporter.

   a. If, for any applicable materials listed in Paragraph H below, recycling facilities are not available within a 100-mile radius of the Base, state that in the plan.

F. Provide all containers required to collect solid wastes collected during the performance of the Contract. At no time shall the Contractor use dumpsters or other waste receptacle maintained by the Base for the disposal of any solid wastes. Small quantities of recyclable materials, such as cardboard, metals, and wood pallets, may be placed in the recycling containers maintained by the Base. Coordinate this exception with the Base Environmental Office.

1. The dumpsters maintained by the Base are periodically checked. If it is determined that the Contractor has placed construction and/or demolition debris (other than the recyclable materials listed above) – or any other waste – in a dumpster or other solid-waste collection unit maintained by the Base, the Contractor will immediately remove said waste and dispose of it – or recycle it – properly, away from the Base.

2. If any waste is dumped in an unauthorized area, immediately remove the material and restore the area to its pre-existing condition.

G. Track the amount of construction/demolition debris and other solid waste that is disposed of under this Contract. It is preferred that the waste be tracked by weight – but tracking the waste by volume (that is, cubic yards) will also be accepted. Submit the amount of waste disposed of – and all associated weight tickets – to the Contracting Officer monthly using AF Form 3000.

H. Transport as much of the recyclable construction waste materials and demolition debris as practicable to a valid recycling facility. The recyclable materials can include:

1. Cardboard.
2. Rubble (asphalt and concrete).
3. Recycled cementitious materials (in concrete mix).
4. Brick.
5. Metals.
6. Wood.
7. Plastic.
8. Insulation.
9. Roofing.

10. Glass.
11. Acoustical ceiling panels.
12. Carpet.
13. Polyvinyl chloride piping.
14. R-22 refrigerant.
15. Ballasts.
16. Other materials applicable to the Project that can be reused or recycled.

I. Submit the amount of materials recycled – and all associated weight tickets – to the Contracting Officer monthly using AF Form 3000.

1.16 RECORD DOCUMENTS

A. Maintain at the Site one copy of the Drawings with redline changes.

B. At completion of the Work, deliver Record Documents to the Contracting Officer.

1. Be responsible for the preparation and furnishing of marked-up Contract Drawings including all of the Work of this Contract. Record, using colored pencil, in a neat, workmanlike manner, all cases where actual field construction differs from the Work as indicated by the Contract Documents – as well as changes in location and in elevation. Dimension concealed work and utility locations.
2. These marked-up Contract Drawings will not be acceptable as Shop Drawings.
3. Maintain these marked-up Contract Drawings at the Site as an up-to-date set of Contract Drawings. At completion of the Work, turn this set of marked-up Contract Drawings over to the Contracting Officer for the updating of Record Drawings.

C. At completion of the Work, furnish one ccopy of a manual of information describing the products used for the Contract.

1. This manual shall serve as a reference to the products for potential maintenance and repair purposes.
2. This manual shall not supersede requirements for manuals or other information as may be stated in the submittal list and other sections of this Contract.
3. As applicable to the Contract:

a. This manual shall cover products such as:
1) Concrete.
2) Unit masonry.
3) Interior woodwork.
4) Steel studs.
5) Insulation.
6) Roofing.
7) Metal wall panels.
8) Sealants.
9) Door and door frames.
10) Windows
11) Entrance Framing System
12) Glass and Glazing
13) Gypsum board.
14) Door hardware.

15) Ceramic tile.
16) Folding Accordion partition
17) Paint.

Note: Do not turn containers of paint over to the Government.

18) Toilet accessories
19) Plumbing fixtures.
20) HVAC equipment.
21) Lighting components.
22) Fire detection equipment
23) Similar products.

b. This manual shall present product information such as:
1) Catalog cut sheets.
2) Manufacturer's names.
3) Brand names.
4) Model/serial/part numbers or product types.
5) Color names/codes and the like.
6) Room number and/or location where the product was used.

4. Furnish each copy of this manual in a three-ring binder from which material can readily be removed and replaced. Clearly label the exterior spine and front cover of each binder indicating:

a. The Contract number.
b. The Project number.
c. The Project title.
d. The submittal number.
e. The contents of the binder.

1.17 PHOTOGRAPHY PERMIT

A. Prior to taking any photographs or video recordings – either for internal record or as required by the terms of the Contract – prepare a request for a photography permit, in letter format, and submit it to the Contracting Officer using AF Form 3000. The request shall indicate:

1. The Contract number.
2. The term of the Contract.
3. The locations or the Site(s) to be photographed.
4. Proposed dates and times to be accomplished.
5. Reason for photography complete with justification.
6. Whether the Contractor intends to take photographs and/or video recordings.

B. Provide a copy of any and all photographs and/or video recordings to the Government within ten calendar days of being taken, using AF Form 3000.

1. Still images shall be digital and submitted in compact disc (CD) format.
2. Video recordings shall be provided in either of the following formats:
a. Digital Versatile Disc (DVD).

3. Clearly label the CD, DVD, or the videocassette and the videocassette case indicating:
   a. The Contract number.
   b. The Project number.
   c. The Project title.
   d. The date taken.

PART 2 – PRODUCTS – Not Used

PART 3 – EXECUTION – Not Used

END OF SECTION 01 00 00

SECTION 01 30 01 - SUBMITTAL DESCRIPTIONS

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 SUBMITTAL CLASSIFICATION

A. Related Documents: Other requirements pertaining to submittals are included in:

1. The CONTRACT CLAUSES.
2. SECTION 01 33 00 – SUBMITTAL PROCEDURES.

B. Submittals required by the CONTRACT CLAUSES and other non-technical parts of the Contract are not included in this Section.

C. The submittals described below are those required and further described in other sections of the specifications.

1. Submittal Description No. 1 (SD-01) – Data: Submittals that provide calculations, descriptions, or documentation regarding the Work.
2. Submittal Description No. 2 (SD-02) – Not Used.
3. Submittal Description No. 3 (SD-03) – Not Used.
4. Submittal Description No. 4 (SD-04) – Drawings: Submittals that graphically show:
   a. Relationship of various components of the Work.
   b. Schematic diagrams of systems.
   c. Details of fabrication.
   d. Layouts of particular elements.
   e. Connections.
   f. Other relational aspects of the work.
5. Submittal Description No. 5 (SD-05) – Not Used.
6. Submittal Description No. 6 (SD-06) – Instructions: Preprinted materials describing installation of a product, system, or material, including special notices and material safety data sheets, if any, concerning impedances, hazards, and safety precautions.
7. Submittal Description No. 7 (SD-07) – Schedules: Tabular lists showing location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the Work.
8. Submittal Description No. 8 (SD-08) – Statements: Documents, required of the Contractor, or through the Contractor from a Supplier, Installer, Manufacturer, or other lower tier Contractor, the purposes of which is to confirm the quality or orderly progression of a portion of the Work by:

a. Documenting procedures.
b. Acceptability of methods or personnel.
c. Qualifications.
d. Other verifications of quality.

9. Submittal Description No. 9 (SD-09) – Reports: Reports of inspections or tests, including analysis and interpretation of test results. Each report shall be properly identified, signed, and dated. Test methods used shall be identified and test results shall be recorded.
10. Submittal Description No. 10 (SD-10) – Not Used.
11. Submittal Description No. 11 (SD-11) – Not Used.
12. Submittal Description No. 12 (SD-12) – Not Used.
13. Submittal Description No. 13 (SD-13) – Certificates: Statements signed by an official authorized to certify on behalf of the Manufacturer of a product, system, or material, attesting that the product, system, or material meets specified requirements. The statement shall:

    a. Be dated after the award of this Contract.
    b. State the Contractor's name and address.
    c. Name the Project and its location.
    d. List the specific requirements that are being certified.

14. Submittal Description No. 14 (SD-14) – Samples: Samples, including both fabricated and unfabricated physical examples of materials, products, and units of the Work – as complete units or as portions of units of the Work.
15. Submittal Description No. 15 (SD-015) – Not Used.
16. Submittal Description No. 16 (SD-16) – Not Used.
17. Submittal Description No. 17 (SD-17) – Not Used.
18. Submittal Description No. 18 (SD-18) – Records: Documentation required to record compliance with technical or administrative requirements.
19. Submittal Description No. 19 (SD-19) – Operation and Maintenance Manuals: Data that forms a part of an operation and maintenance manual.

PART 2 – PRODUCTS – Not Used

PART 3 – EXECUTION – Not Used

END OF SECTION 01 30 01

SECTION 01 33 00 - SUBMITTAL 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, including – but not limited to – the following.

1. SECTION 01 00 00 – GENERAL REQUIREMENTS: Other required submittals:
   a. The Waste Disposal Plan for the recycling and disposal of waste Republic Waste resulting from the Work under this Contract.
   b. A monthly accounting of the amount of waste disposed of – and all associated weight tickets.
   c. A monthly accounting of the amount of material recycled – and all associated weight tickets.
   d. Marked-up Contract Drawings.
   e. The Manual of Information.
   f. A Request-for-Photography Permit.
   g. Copies of any and all photographs and/or video recordings.
2. SECTION 01 35 43 – ENVIRONMENTAL PROCEDURES: The required detailed proposal for implementing specified requirements for environmental pollution control, including a Sediment and Erosion Control Plan.

1.2 REFERENCES

A. United States Air Force (USAF or AF) Forms: The following documents can be found at the end of this Section.

1. Schedule of Material Submittals (AF Form 66) aka "Submittal Register."
2. The Material Approval Submittal Transmittal Form (AF Form 3000).
3. The Contract Progress Schedule (AF Form 3064).

1.3 DEFINITIONS

A. Submittals requiring "Government approval":

1. "Government approval" is required for:
   a. Extensions of design.
   b. Critical materials.
   c. Deviations.
   d. Equipment whose compatibility with the entire system is required to be checked.
   e. Other items as designated by the Contracting Officer.

2. Within the terms of the Contract, submittals requiring "Government approval" are considered to be “Shop Drawings.”

B. Approved Submittals:

1. The approval of submittals by the Contracting Officer shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error that might exist. The Contractor remains responsible for the dimensions and the design of adequate connections, details, and satisfactory construction of the Work.

2. After submittals have been approved by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be given consideration unless accompanied by an explanation as to why a substitution is necessary.

C. Disapproved Submittals: Make all corrections required by the Contracting Officer and furnish a corrected submittal within five calendar days in the form and number of copies as specified for the initial submittal.

1. If the Contractor considers any correction indicated on the submittals to constitute a change to the Contract, give prompt notice to the Contracting Officer as required by the terms of the Contract.

PART 2 – PRODUCTS – Not Used

PART 3 – EXECUTION

3.1 GENERAL

A. Submit two copies of all items listed on the Submittal Register or specified in the other sections of the Specifications.

B. The Contracting Officer may request submittals in addition to those listed when deemed necessary to adequately describe the work covered in the respective sections.

C. Units of weights and measures used on all submittals shall be the same used on the Contract Drawings.

D. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with the requirements of the Contract.

E. Prior to submittal, all items shall be checked and approved by the Contractor.

F. Proposed deviations from the contract requirements shall be clearly identified.

G. Submittals shall include items as:

1. The Contractor's, manufacturer's, or fabricator's drawings.
2. Descriptive literature including – but not limited to:
   a. Catalog cuts.
   b. Diagrams.
   c. Operating charts or curves.
3. Test reports.
4. Test cylinders.
5. Samples
6. Operations and maintenance manuals (including parts list).
7. Certifications.
8. Warranties.
9. Other similar required submittals.

H. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby.

3.2 SUBMITTAL REGISTER

A. At the end of this Section is a Submittal Register showing – at a minimum – which submittals are required by the Specifications.

3.3 SCHEDULING

A. Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently.

B. Certifications that are specified to be submitted with related Shop Drawings shall be so scheduled.

C. Allow adequate time for review and approval. No delays, damages or time extensions will be allowed for time lost due to late submittals.

3.4 SUBMITTAL FORM

A. Use AF Form 3000 for submitting Government-approved submittals in accordance with the instructions on the reverse side of the form. Copies of this form will be furnished to the Contractor.

B. Properly complete this form by filling out all the heading blank spaces and identifying each item submitted. Exercise special care to ensure proper listing of the specification paragraph and/or sheet number of the Contract Drawings pertinent to the data submitted for each item.

3.5 SUBMITTAL PROCEDURE

A. Submittals shall be made as follows:

1 Schedule:

a. Prepare and submit to the Contracting Officer for approval, three copies of the Submittal Register found at the end of this Section.
b. The proposed schedule shall reflect the Contractor's practicable schedule of planned dates of submittal of AF Form 3000.
c. The Submittal Register shall be submitted concurrently with the Contractor's submittal of the required AF Form 3064.
d. The Contracting Officer will review and return submittals received, approved or disapproved, within ten calendar days after receipt.
e. Warranties and operating instructions are required at the completion of the Work, after final inspection.

2 Deviations: For submittals that include proposed deviations requested by the Contractor, set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing un-noted deviations.

3.6 NOT USED

3.7 GOVERNMENT - APPROVED SUBMITTALS

A. Upon completion of review of submittals, the submittals will be identified as having received approval by being signed and dated. Two copies of the submittal will be retained by the Contracting Officer and one copy of the submittal will be returned to the Contractor to be retained at the Site.

END OF SECTION 01 33 00

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SCHEDULE OF MATERIAL SUBMITTALS	PROJECT NUMBER ZQEL 19- 0016	PROJECT TITLE Construct / Maintain/ Various Rooms	SOLICITATION/CONTRACT NUMBER

TO BE COMPLETED BY CONTRACTOR | **-TO BE COMPLETED BY CONTRACT ADMINISTRATOR**

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		CERTIFICATION OF COMPLIANCE	SHOP DRAWINGS	SAMPLES	COLOR SELECTION	MANUFACTURER' S RECCOMMENDATIONS	MANUFACTURER' S WARRANTY	CATALOG DATA	OPERATING INSTRUCTIONS								APPROVED	DIS-APPROVED			
1	DIVISION 01 – Gen'l Rqmts Waste Disposal Plan 01000, 11.E QA/QC Procedure																				
2	Monthly Report of Construction Debris – Disposed of 01000, 11.G QA/QC Report																				
3	Monthly Report of Construction Debris – Recycled 01000, 11.I QA/QC Report																				
4	Marked-Up Contract Drawings 01000. 12.B.3 Closeout Submittal																				
5	Manual(s) of Information 01000, 12.C Closeout Submittal																				
6	Environmental Protection Plan 01570, 1.05.A Informational Submittal																				
7	Sediment and Erosion Plan 01570, 3.01.A.1.b Informational Submittal																				
8	Request to Use Laser Devices 01570, 3.06.C Action Submittal																				
9	Substitution Request (if req'd) 01732, 1.03.B Action Submittal																				

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SCHEDULE OF MATERIAL SUBMITTALS	PROJECT NUMBER ZQEL 19-0016	PROJECT TITLE Construct / Maintain Various Rooms	SOLICITATION/CONTRACT NUMBER

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10	Request for Cutting & Alteration 01732, 1.03.C.1 Informational Submittal																				
11	Notice of Times and Dates 01732, 1.03.C.2 Informational Submittals																				
12	Demolition Procedures and Operational Sequence 01736, 1.04.A Informational Submittals																				
13	DIV'N 02 – Site Demolition Selective Demolition 024119 1.3 Informational Submittal																				
14	DIVISION 06 – Wood, Plastics, and Composites PLAM Samples for Selection 061000, 12 A Action Submittal																				
15	Wood, Plastics, and Composites Interior Architectural Woodwork 06 40 23-1, 1.4 Product Data																				
16	Wood, Plastics, and Composites Solid Surfacing 06 65 10-2, Product Data																				
17	Wood, Plastics, and Composite Solid Surfacing 06 65 10-2, Shop Drawings																				
18	DIVISION 08 – Openings Hollow-Metal Product Data & Shop Drawings 08 11 13-, 1.2 A,B,C Action Submittal																				

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19	Openings Hollow-Metal Product Data & Shop Drawings 08 14 16-, 1.2 A,B,C Action Submittal																				
20	Access Doors and Panelsl Product Data & Shop Drawings 08 31 00-, 1.4,B Action Submittal																				
21	Exterior Aluminum Windows Product Data & Shop Drawings 08 41 13-2, 1.3 A-G Action Submittal																				
22	Door Hardware Product Data & Schedule 08710, 1.3.A,B Action Submittals																				
23	Glazing Data & Schedule 08 880 00-1, 1.5.A-F Action Submittals																				
24	DIVISION 09 – Metal Studs Product Data 092216, 1.2 A Action Submittal																				
25	Metal Suspension Systems Product Data 092216, 2.4 A,B,C Action Submittal																				
26	Gypsum Board Product Data 092900, 1.3 AB Action Submittal																				
27	Tiling Product Data 09300, 1.50. A, B, Action Submittal																				

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		CERTIFICATION OF COMPLIANCE	SHOP DRAWINGS	SAMPLES	COLOR SELECTION	MANUFACTURER' S RECOMMENDATIONS	MANUFACTURER' S WARRANTY	CATALOG DATA	OPERATING INSTRUCTIONS								APPROVED	DIS-APPROVED			
28	Tiling Certificates 09300, 1.50.C.1 Informational Submittals																				
29	Acoustical Panel Ceilings Samples for Verification 095123, 1.3.A.B,C Action Submittal																				
30	Resilient Base Manufacturers Instructions 096513, 1.3 A Informational Submittal																				
31	Tile Carpeting Product Data 096813, 1.40.A Action Submittal																				
32	Painting and Coating Product Data and Schedule 099100, 1.3.A, B, C Action Submittal																				
33	DIVISION 10 - Signage 101400, 1.30.A,B,C Shop Drawings, Product Data, & Samples																				
34	DIVISION 12 – Roller Shades 122123, 1.50.A,B,C,D,E.F Shop Drawings, Product Data, & Samples																				
35	DIVISION 23 – HVAC 2301001, 1.07.A,B,C Shop Drawings																				
36	Pipe Hangers And Supports Section 15178, 1.04.A Shop Drawings & Product Data Submittals																				

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37	DIVISION 26 – Electrical Interior & Exterior Ltg. Fixtures 16511, 1.04.A Product Data																				
38	Interior & Exterior Ltg. Fixtures 16511, 1.04.B Operation and Maintenance Data																				
39	Interior & Exterior Ltg. Fixtures 16511, 1.04.B Operation and Maintenance Data																				
40	Interior & Exterior Ltg. Fixtures 16511, 1.04.C Warranties																				
41	Raceways and Boxes 16511, 1.04.C Product Data																				
42	Wiring Devices 16511, 1.04.C Product Data																				
43	DIVISION 27 Communications 270500, 1.2.A Product Data																				
44																					
45																					

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SECTION 01 35 43 - ENVIRONMENTAL 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. Contractor Liabilities for Environmental Protection:

1. Government installations must comply with environmental protection laws including – but not limited to the following:

a. The Clean Water Act
b. The Clean Air Act
c. The Resource Conservation and Recovery Act.
d. The Federal Facilities Compliance Act.

2. The United States Environmental Protection Agency (USEPA) has granted inspection and enforcement authority to the State of Ohio Environmental Protection Agency (Ohio EPA).

a. Inspection by either agency might include questioning of the construction personnel who are working with or have contact with hazardous materials and waste.
b. Complete – and provide documentation of – environmental training required by federal, state, and local regulations.

1.3 REFERENCES

A. The publications listed below form a part of the requirements of this Section to the extent referenced. The publications are referenced in the text using the basic designation only.

1. United States Air Force (USAF or AF) Forms: The following documents can be found at the end of SECTION 01 33 00 – SUBMITTAL PROCEDURES.

a. Material Approval Submittal (AF Form 3000).
b. Contractors Progress Reports (AF Form 3065).

2. Code of Federal Regulations (CFR):

a. 40 CFR 261: Identification and Listing of Hazardous Waste (1999).
b. 40 CFR 262: Generators of Hazardous Waste (1999).
c. 40 CFR 263: Transporters of Hazardous Waste (1999).
d. 40 CFR 264: Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (1999).

e. 40 CFR 265: Interim Status Standard for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (1999).
f. 40 CFR 300: National Oil and Hazardous Substances Pollution Contingency Plan (1999).
g. 40 CFR 355: Emergency Planning and Notification (2003)
   1) Appendix A: The List of Extremely Hazardous Substances and Their Threshold Planning Quantities.
h. 49 CFR 171: General Information, Regulations, and Definitions (1999).
i. 49 CFR 172: Hazardous Materials, Tables, and Hazardous Materials Communications Regulations (1999).
j. 49 CFR 178: Shipping Container Specification (1999).

3. Corps of Engineers (COE): Safety and Health Requirements Manual (COE EM-385-1-1 (1996)).
4. Executive Orders: Greening the Government Through Leadership in Environmental Management, 21 April 2000 (13148).
5. NFPA International: Safeguarding Construction, Alteration, and Demolition operations (NFPA 241 (2000)).
6. United States Department of Defense (USDoD) Military Standard: Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment, Revision E (MIL-STD-461E, 20 August 1999).

1.4 DEFINITIONS

A. Sediment = Soil and other debris that have eroded and have been transported by runoff water or wind.

B. Solid Waste = Rubbish, debris, garbage, and other discarded solid materials (except hazardous waste as defined in paragraph entitled "Hazardous Waste") resulting from industrial, commercial, and agricultural operations and from community activities.

C. Sanitary Wastes = Wastes characterized as domestic sanitary sewage.

D. Rubbish = Combustible and noncombustible wastes such as paper, boxes, glass, crockery, metal, lumber, cans, and bones.

E. Debris = Combustible and noncombustible wastes such as ashes and waste materials resulting from construction or maintenance and repair work, leaves, and tree trimmings.

F. Chemical Wastes = This includes salts, acids, alkalis, herbicides, pesticides, and organic chemicals.

G. Garbage = Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

H. Hazardous Waste = Hazardous substances as defined in 40 CFR 261 or as defined by applicable state and local regulations.

I. Hazardous Materials = Hazardous materials as defined in 49 CFR 171 and listed in 49 CFR 172.

J. Landscape Features = Trees, plants, shrubs, and ground cover.

K. Lead Acid Battery Electrolyte = The electrolyte substance (liquid medium) within a battery cell.

L. Oily Waste = Petroleum products and bituminous materials.

M. Class I Ozone-Depleting Substance (ODS) = Class I ODS is defined in Section 602(a) of The Clean Air Act and includes the following chemicals:

1. Chlorofluorocarbon-11 (CFC-11).
2. Chlorofluorocarbon-12 (CFC-12).
3. Chlorofluorocarbon-13 (CFC-13).
4. Chlorofluorocarbon-111 (CFC-111).
5. Chlorofluorocarbon-112 (CFC-112).
6. Chlorofluorocarbon-113 (CFC-113).
7. Chlorofluorocarbon-114 (CFC-114).
8. Chlorofluorocarbon-115 (CFC-115).
9. Chlorofluorocarbon-211 (CFC-211).
10. Chlorofluorocarbon-212 (CFC-212).
11. Chlorofluorocarbon-1, 213 (CFC-213).
12. Chlorofluorocarbon-214 (CFC-214).
13. Chlorofluorocarbon-215 (CFC-215).
14. Chlorofluorocarbon-216 (CFC-216).
15. Chlorofluorocarbon-217 (CFC-217).
16. Halon-1211.
17. Halon-1301.
18. Halon-2402.
19. Carbon tetrachloride.
20. Methyl chloroform.

N. Industrial Hygienist = A hygienist certified by the American Board of Industrial Hygiene.

1.5 SUBMITTALS

A. Statements (SD-08): Within ten calendar days after Notice-to-Proceed – and prior to commencement of the Work at the Site – submit in writing (in accordance with SECTION 01 30 01 – SUBMITTAL PROCEDURES) a detailed proposal for an Environmental Protection Program to implement requirements for the environmental pollution controls specified herein, including a Sediment and Erosion Control Plan.

1.6 Quality Assurance

A. Regulatory Requirements:

1. Hazardous Waste, Spills, and Asbestos:

a. Hazardous Waste/Spill Response:

1) Unless otherwise specified in this Contract, no hazardous waste as defined in 40 CFR 261 will be generated by the Contractor; however, should the Contractor cause a hazardous material release, the Contractor shall immediately take action to stop the release and clean up the material.

A. Notify the Base Fire Department immediately if a large spill occurs.

B. The Contractor shall verbally notify the Contracting Office as soon as the leak has been stopped and cleaned up – followed by a written notification/report of the incident to the Contracting Officer within one day.

C. The Contractor shall be responsible for having adequate spill response equipment and material at the Site to clean up any hazardous material release created by the Contractor.

D. The spill residue, which includes the hazardous material, absorbent used in the clean up action, and contaminated soil, if any, will be placed in an appropriate container.

E. Replace any excavated contaminated soil with suitable fill material and return the area to its original condition, all at the Contractor's expense.

F. It shall be the Contractor's responsibility to analyze the spill residue for hazardous waste characteristics – and to dispose of accordingly.

G. Clean-up actions, hazardous waste analysis, and disposal shall be at the Contractor's expense and shall be accomplished per all applicable USEPA and OSHA requirements.

2) The Contractor will be monitored for compliance with USEPA hazardous waste requirements. Any violations of said requirements will be made known to the Ohio EPA and/or the USEPA. The Contractor shall be responsible for any fines or penalties assessed by either agency.

b. Spill Containment:

1) The Contractor shall provide secondary containment for all hazardous material containers that have a capacity greater than 30 gallons. This shall include fuels, lubricants, chemical additives, and any other material that requires a Material Safety Data Sheet (MSDS).

2) The secondary containment units may be dikes, containment pallets, overpacks, or similar equipment that will contain a release from the primary container. Secondary containment units shall be compatible with the hazardous material. The Contractor shall

ensure that rainwater does not accumulate in the secondary containment units.

2 Environmental Protection:

a. Provide and maintain, during the life of the Contract, environmental protection as defined. Plan for – and provide – environmental protective measures to:

1) Control pollution that develops during normal construction practice.
2) Correct conditions that develop during the construction of permanent or temporary environmental features associated with the Project.

b. Comply with federal, state, and local regulations pertaining to the environment, including- but not limited to – those regulating water, air, and noise pollution.

c. Class I ODS Prohibition: Class I ODS as defined and identified herein shall not be used in the performance of this Contract – nor be provided as part of the equipment. This prohibition will be considered to prevail over any other provision, specification, drawing, or referenced document.

3. Safety Program:

a. Entry: Entry into a confined or enclosed space by personnel for any purpose, including hot work, shall be prohibited until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the Work intended. The following definitions apply to this Subsubparagraph only:

1) Confined Spaces (first of two parts) = Refers to spaces that by design have one or more of the following characteristics:
A. Have limited openings for entry and exit.
B. Have unfavorable natural ventilation that could contain or produce dangerous air contaminants.
C. Are not intended for continuous employee occupancy.

2) Confined Spaces (second of two parts) = Include – but are not limited to – the following:

3) Qualified Person = A person designated by the Contractor, in writing, as capable (by education or specialized training) of anticipating, recognizing, and evaluating employee exposure to hazardous substances or other unsafe conditions in a confined space. This person shall be capable of specifying necessary control and protective action to ensure worker safety. Where work involves facilities that handle combustible and hazardous materials, this qualified person shall be an NFPA -certified marine chemist.

4) Entry Permit: The Contractor shall submit for review and approval a Daily Confined Space Entry Permit at any location deemed necessary by the Contracting Officer. Complete the permit at least

24 hours prior to entering a designated confined space. The permit shall be posted in a conspicuous place close to the confined space entrance with a copy furnished to the Contracting Officer.

5) Letter of Certification: Submit to the Contracting Officer a letter of certification for the qualified person. The letter shall state the qualified person's name and qualifications and delineate the qualified person's authority to direct work stoppage in the event of hazardous conditions.

b. Unforeseen Hazardous Material:

1) If material that is not indicated on the Drawings is encountered that might be dangerous to human health upon disturbance during construction operations, stop that portion of the Work and notify the Contracting Officer immediately.

2) The intent is to identify materials such as:
   a. Polychlorinated biphenyl (PCB).
   b. Lead paint.
   c. Friable and non-friable asbestos.

3) Within 14 calendar days, the Government will determine if the material is hazardous. If the material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If the material is hazardous and handling of the material is necessary to accomplish the Work, the Government will issue a modification per the terms of the Contract.

c. Hazardous Noise: Provide hazardous noise signs, as directed, wherever equipment and work procedures produce sound-pressure levels greater than 85 dBA steady state or 140 dBA impulse, regardless of the duration of the exposure. When personnel are subject to sound-pressure levels exceeding the limits specified in COE EM-385-1-1, Table 5-3, they shall be provided with hearing protection.

PART 2 – PRODUCTS

2.1 GENERAL

A. Green Purchasing:

1. Youngstown ARS is obligated to comply with the affirmative procurement requirements of:

   a. Section 6007 of the Resource Conservation and Recovery Act (RCRA).
   b. Executive Order 13148.
   c. The policies of the United States Department of Defense (USDoD) “Green Procurement Program (GPP).”

2. In order to comply, Youngstown ARS requires its Contactors to use, provide, and/or install environmentally preferable products and services in accordance with federally mandated preference programs.
3. Green purchasing includes the acquisition of:
   a. Recycled content products.
   b. Environmentally preferable products and services.
   c. Bio-based products.
   d. Energy- and water-efficient products.
   e. Alternate fuel vehicles.
   f. Products using renewable energy.
   g. Alternatives to hazardous or toxic chemicals.
4. The elements of GPP are described on the Office of the Federal Environmental Executive website (http://www.ofee.gov/gp/gp.htm).
5. The Contractor shall comply with the following agency listings and guidelines/recommendations:

Agency	Listing/Guidelines Website
United States Environmental Protection Agency (USEPA) Comprehensive Procurement Guidelines (CPG)	http://www.epa.gov/cpg
United States Department of Agriculture (USDA) Bio - based Products Guidelines	http://www.biobased.oce.usda.gov
United States Department of Energy (USDOE) Federal Energy Management Program (FEMP) Energy Efficiency Recommendations	http://www.eere.energy.gov/femp/technologies/eep_eerecommendations.cfm
Green Seal Product Standards	http://www.greenseal.org/certproducts.htm

If it is determined that a guideline/recommended product does not meet the specified performance requirements (or other known Government performance requirements), the Contractor shall submit for approval a proposed alternative with the lowest environmental impact that would meet the performance requirements.

6. The Contractor shall provide EPA-designated products containing recovered material unless the item cannot be acquired:
   a. Competitively within a reasonable time frame.
   b. Meeting the appropriate performance standards.
   c. At a reasonable price.
7. Items identified in the USEPA's CPG shall be viewed as the minimum that can be considered when evaluating recycled/reused materials. Other materials and products not listed, but commonly used in industry outside of the Government, shall also be considered.
8. Material and product submittals for all recycled-content items shall list the recycled and recovered materials used and the percentage content listed.

B. Hazardous Materials (HazMat) Management:

1. HazMat Management Program (HMMP): The Contractor shall participate in the HMMP to the extent described in this Contract. Participation shall include:
   a. Designation of a single individual who has experience and knowledge of hazardous materials as the point of contact for HazMat issues.
   b. Provision of MSDSs for all HazMat used or stored on the Base.
   c. Limited storage of HazMat on the Base.
   d. Identification of all HazMat stored or used on the Base through the provisions of contract submittal documentation.
   e. Tracking all HazMat stored or used on the Base.
   f. Implementation of best management practices to prevent spills and other releases to the environment.
   g. Proper storage and management of HazMat while in use or in storage to meet NFPA, OSHA, and RCRA requirements
   h. Participation in an accurate exit inventory of HazMat used on the Base.
2. HAZMART is the central tracking function for HazMat used on the Base. It is located at Building 205.
3. Review of HazMat for Use on the Base:
   a. The Contractor shall submit the current Material Safety Data Sheet (MSDS) for each HazMat to be used for the performance of the Work under this Contract to the Contracting Officer using AF Form 3000 – for review – prior to bringing any HAZMAT onto the Base.
      1) HazMat will be reviewed by personnel in Bioenvironmental Engineering, Safety, and Environmental Engineering.
      2) HazMat reviews are for material tracking purposes only. The Contractor remains responsible for compliance with applicable health and safety requirements for use of HazMat.
   b. Substantiating documentation for the use of any HazMat required to complete work shall be submitted with the MSDS if the HazMat contains any of the following:
      1) USEPA Industrial Toxics Program Chemicals, also known as EPA 17 toxic chemicals.

2) Carcinogens as defined by OSHA.
3) Ozone-depleting chemicals (ODC).
4) Compounds with high volatile organic contents (VOCs).
5) CERCLA 102(a) Extremely Hazardous Substances (EHS) – see Appendix A of 40 CFR 355.
6) Hazardous air pollutants (HAP) – see Section 112 (b)(1) of the Clean Air Act and its amendments.

c. For each HazMat stored or used on the Base, the Contractor shall maintain a current MSDS at the Site where the HazMat is being stored or used, and shall make the MSDSs available for inspection upon request from the Contracting Officer or authorized representative.

4. Tracking Usage of HazMat: The Contractor shall maintain a daily Usage Log for each HazMat.

a. Submit a copy of the updated Usage Log to the Contracting Officer, biweekly – concurrently with AF Form 3065.
b. The Usage Log shall indicate the:
1) Name of the material.
2) Date used.
3) Quantity used in units of measurement consistent with units marked on container.
4) Cumulative quantity used by material for the time period of the log.
5) User of the material.
c. The Usage Log shall include a provision for identification of a HazMat tracking number that will be designated by the Government.
d. Maintain the Usage Logs sequentially for tracking of HazMat.
e. When a HazMat from an individual container is totally used during the Contract period, annotate the Usage Log using a designation for the empty container and noting the date the container was empty. Ensure that all empty containers are removed from the Base and disposed of – or recycled – properly.
f. The Usage Log shall have:
1) The Contractor's name.
2) The Contract number
3) The Project number and title.
4) A sequence/date designation on the sheets.
g. Each sheet of the Usage Log shall be signed and dated by the Contractor.
h. Make the Usage Log available for review upon request by the Contracting Officer or authorized representative.
i. Indicate on the Usage Log the quantities and dates of spillage (if any) for each container – on a daily basis.
j. Upon completion of the Project/Work – and concurrently with submission of the AF 3065 that reflects 100 percent completion –submit a final version of the Usage Log to the Contracting Officer. Include certification

that the final version of the Usage Log is complete and accurate. Such certification shall include:

1) Signature of the firm's authorized representative.
2) Date.
3) Typed/printed name, title, and firm name.

5. HazMat Storage Area:

a. Store all HazMat in their designated HazMat storage area. The Contractor will be subject to visits by the Contracting Officer or the Contracting Officer's representative for assessment of their HazMat storage Site/area for compliance with the requirements specified herein for HAZMAT MANAGEMENT during the Contract period.
b. Ensure that all BEST MANAGEMENT PRACTICES (immediately below) are in place while HazMat is used or stored on the Base.
c. Provide secondary containment for all HazMat being stored and used on the Base when the primary container exceeds 30 gallons. Secondary containment shall be chemically inert to the HazMat being stored and impervious to absorption of that HazMat. The containment volume shall not be less than 10 percent of the total quantity being stored or the equal quantity of the largest container being stored – whichever is greater in volume. Provide separate secondary containment for incompatible HazMat.

6. Best Management Practices:

a. Ensure that the segregation of incompatible materials is accomplished at all times in the Contractor's field office, storage, staging, and work areas.
b. Keep all containers closed when not in use. At the end of the workday, or when finished using any material, return the container to a proper storage area.
c. Follow all Manufacturers' recommendations for storage/use of HazMat.
d. Have current MSDS documents available at all times where employees can access them in case of an emergency at the Site.

7. Spill Control and Cleanup:

a. Be responsible for the cleanup and disposal of all spilled materials whether or not they are hazardous materials, including all materials used to contain and absorb the spill.
b. Spills of hazardous materials shall be managed in accordance with HazMat Emergency Response requirements.
c. Dispose of wastes generated from spill cleanup per the provisions of solid waste and hazardous waste disposal requirements.

8. Hazardous Materials Transport:

a. When quantities of HazMat transported onto the installation meet certain United States Department of Transportation (USDOT) thresholds, use only drivers and vehicles that are permitted by the State of Ohio to

transport hazardous materials onto or off of the Base per the USDOT regulations. Under these conditions:
1) Properly manifest hazardous materials coming onto the Base.
2) Mark vehicles per USDOT specifications for the materials being transported.

c. Remove all unused materials from the Base upon completion of the Work – or when the materials are no longer needed – whichever comes first.

PART 3 – EXECUTION

3.1 GENERAL

A. Perform all of the Work in a manner that minimizes the pollution of air, water, or land. Control – within reasonable limits–noise and the disposal of solid waste materials, as well as other pollutants.

1. Develop a Sediment and Erosion Control Plan.

a. Maintain and control stormwater runoff to ensure that during the construction time period:
1) Erosion does not occur.
2) Sediment is not discharged into the stormwater collection system.

b. Submit the Sediment and Erosion Control Plan for approval by the Contracting Officer prior to commencing construction.

3.2 PROTECTION OF LAND AREAS

A. The land areas outside the limits of the permanent work performed under this Contract shall be preserved in their present condition.

1. Exception: Work on storage areas and access routes specifically assigned for the use of the Contractor under this Contract

B. Confine construction activities to areas defined for the Work on the Drawings or specifically assigned for the use of the Contractor. Storage and related areas – and access routes required temporarily by the Contractor in the performance of the work – will be assigned by the Contracting Officer. No other areas on Government premises shall be used by the Contractor without written consent of the Contracting Officer.

C. Protection of Natural Resources: Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work. Confine construction activities to within the limits of the work indicated or specified.

1. Land Resources:

a. Do not remove, cut, deface, injure, or destroy trees or shrubs without the Contracting Officer's permission.
   1) Exception: Areas to be cleared.
b. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless recommended by the arborist or nurseryman and approved by the Contracting Officer. Where such use of attached ropes, cables, or guys is authorized, the Contractor shall be responsible for any resultant damage.

2. Protection:

a. Protect existing trees that are indicated to remain and that may be injured, bruised, defaced, or otherwise damaged by construction operations.
b. Remove displaced rocks from uncleared areas.
c. By approved excavation, remove trees with 30 percent or more of their root systems destroyed.

3. Replacement: Remove trees and other landscape features scarred or damaged by equipment operations, and replace with equivalent, undamaged trees and landscape features. Obtain the Contracting Officer's approval before replacement.

3.3 PROTECTION OF WATER RESOURCES

A. Control the disposal of fuels, oils, bitumens, calcium chloride, acids, or harmful materials, both on and off the Government premises.

B. Comply with applicable federal, state, county and municipal laws concerning pollution of rivers and streams while performing the Work under this Contract.

C. Special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, herbicides and insecticides from entering public waters.

D. Water used at the Site for material processing, concrete curing, foundation and concrete cleanup, and other waste waters shall not be allowed to reenter a stream if an increase in the turbidity of the stream could result therefrom.

E. Oily Wastes: Prevent oily or other hazardous substances from entering the ground, drainage areas, or local bodies of water. Surround all temporary fuel oil or petroleum storage tanks with a temporary earth berm of sufficient size and strength to contain the contents of the tanks in the event of leakage or spillage.

3.4 TEMPORARY CONSTRUCTION

A. Remove traces of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other signs of construction. Grade temporary roads, parking areas, and similar temporarily used areas to conform to surrounding contours.

3.5 NOISE

A. Make the maximum use of low-noise emission products, as certified by the USEPA. Blasting or use of explosives will be grounds for rejection of the installation.

3.6 RESTRICTIONS ON EQUIPMENT

A. Electromagnetic Interference Suppression

1. Electric motors shall comply with MIL-STD-461 relative to radiated and conducted electromagnetic interference.

   a. A test for electromagnetic interference will not be required for motors that are identical physically and electrically to those that have previously met the requirements of MIL-STD-461.
   b. An electromagnetic interference suppression test will not be required for electric motors without commutation or sliprings having no more than one starting contact and operated at 3,600 revolutions per minute or less.

2. Construction equipment used by the Contractor shall comply with the following:

   a. For devices capable of producing radiated or conducted interference: MIL-STD-461.

3. Tests for Electromagnetic Interference Suppression:

   a. Conduct tests on electric motors and the Contractor's construction equipment per MIL-STD-461.
   b. The test location shall be reasonably free from radiated and conducted interference.
   c. Furnish:

      1) The testing equipment, instruments, and personnel for making the tests.
      2) A test location.
      3) Other necessary facilities.

B. Radio Transmitter Restrictions: Conform to the restrictions and procedures for the use of radio transmitting equipment, as directed. Do not use transmitters without prior approval.

C. Laser/Radioactive Device(s): Comply with the requirements of the Occupational Safety and Health Administration (OSHA). Comply with other restrictions and procedures for the use of laser/radioactive devices, as directed by the Contracting Officer.

1. Use AF Form 3000 to notify the Base Safety Office of – and to obtain approval from the Contracting Officer for – the use of each such device prior to bringing it onto the Base. Indicate when and where the laser/radioactive device will be used so that:

   a. An evaluation of the potential hazards to base personnel can be assessed.
   b. Precautionary actions can be taken to protect the population at the Base.

3.7 BURNING

A. Air pollution restrictions applicable to this Project are as follows:

1. Materials shall not be burned on the Government premises.
2. If the Contractor elects to dispose of waste materials off of the Government premises, by burning, he shall make his own arrangements for such burning area and shall conform to all local regulations.

B. Compliance: COE EM-385-1-1, NFPA 2, T1, and activity fire regulations. Obtain approval from the activity Fire Chief prior to commencement of hot work operations.

3.8 EROSION CONTROL

A. Surface drainage from cuts and fills within the construction limits (whether or not completed) – and from borrow and waste disposal areas – shall be graded to control erosion within acceptable limits. Provide and maintain temporary control measures until permanent drainage facilities are completed and operative. Hold the area of bare soil exposed at any one time by construction operations to a minimum. Outline additional erosion control measures in the Sediment and Erosion Control Plan.

B. Burn-Off: Burn-off of the ground cover will be grounds for rejection of the installation.

C. Borrow Pit Areas: Manage and control borrow pit areas that are not at the Base to prevent sediment from entering nearby streams or lakes.

1. Restore areas – including those outside the borrow pit – disturbed by borrow and haul operations. Restoration shall include the following:

   a. Grading.
   b. Replacement of topsoil.
   c. Establishment of a permanent vegetative cover.

2. Uniformly grade side slopes of borrow pit to not more than a slope of one part vertical to two parts horizontal. Uniformly grade the bottom of the borrow pits to provide a flat bottom and drain by outfall ditches or other suitable means.

3. Stockpile topsoil remove during the borrow pit operation, and use as part of restoring the borrow pit area.

D. Protection of Erodible Soils: Immediately finish the earthwork brought to a final grade, as indicated or as specified. Immediately protect the side slopes and back slopes upon completion of rough grading. Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Use the following methods to temporarily protect erodible soils by preventing erosion and controlling sedimentation:

1. Mechanically retard and control the rate of runoff from the Site. This shall include construction of diversion ditches, benches, berms, and use of silt fences and straw bales to retard and divert runoff to protected drainage courses.
2. Vegetation and Mulch: Provide temporary protection on sides and back slopes as

soon as rough grading is completed or sufficient soil is exposed to require erosion protection.

a. Protect slopes by:

1) Accelerated growth of permanent vegetation.
2) Temporary vegetation.
3) Mulching.
4) Netting.

b. Stabilize slopes by:

1) Hydro-seeding.
2) Anchoring mulch in place.
3) Covering with anchored netting.
4) Sodding.
5) Such combination of these and other methods necessary for effective erosion control.

c. Seeding: Provide new seeding where ground is disturbed. Include topsoil or nutriment during the seeding operation necessary to reestablish a suitable stand of grass.

3.9 DUST CONTROL

A. Maintain all excavations, stockpiles, access roads, waste areas, and all other work free from excess dust to such reasonable degree as to avoid causing a hazard or nuisance to the Users or to others.

B. Keep dust down at all times, including nonworking periods. Using dust suppressants, sprinkle or treat the soil at:

1. The Site.
2. Haul roads.
3. Other areas disturbed by operations.

C. Dry power-brooming will be grounds for rejection of the installation. Instead, use:

1. Vacuuming.
2. Wet-mopping.
3. Wet-sweeping.
4. Wet power-brooming.

D. Air-blowing used for anything other than cleaning non-particulate debris such as steel reinforcing bars will be grounds for rejection of the installation.

E. Cutting bituminous concrete, Portland cement concrete, and concrete masonry units by other means than wet-cutting will be grounds for rejection of the installation.

F. Do not shake bags of cement, concrete mortar, or plaster unnecessarily.

G. The proposed dust control method shall be approved by the Contracting Officer.

H. the Contracting Officer may issue an order stopping all or part of the Work until satisfactory corrective action has been taken. No part of the time lost due to any such stop work order shall be made the subject of a claim for extension of time or for excess costs of damages by the Contractor.

1. Exception: If it is later determined that the Contractor was in compliance.

3.10 POST-CONSTRUCTION CLEANING OR OBLITERATION

A. Unless other wise instructed in writing by the Contracting Officer, obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the Work. Grade and fill the disturbed areas and seed the entire area.

3.11 CULTURAL RESOURCES

A. It is not likely that cultural resources such as historic or archeological items (for example, Native-American artifacts or human remains) will be found on the Base; however, should a potential cultural resource be discovered during demolition or excavation, the Contractor shall immediately stop work in that area and notify the Contracting Officer.

3.12 CONTAMINATION

A. Should the Contractor discover and/or encounter contaminated soil and/or hazardous materials during demolition or excavation, immediately stop work in that area and notify the Contracting Officer.

3.13 CONTROL AND DISPOSAL OF SOLID WASTES

A. General: Remove and dispose of rubbish and debris away from Government premises.

1. Pick up solid wastes and place in covered containers that are regularly emptied.
2. Do not prepare or cook food at the Site.
3. Prevent contamination of the Site or other areas when handling and disposing of wastes.
4. At project completion, leave the areas clean.

3.14 SEWAGE, ODOR, AND PEST-CONTROL

A. Dispose of sewage through connection to a municipal, sanitary sewage system. Where such system is not available, propose one of the following alternatives:

1. Use chemical toilets – or comparably effective units – and periodically empty wastes into a municipal sanitary sewage system.
2. Construct and maintain an approved type of adequate sanitary convenience for the use of persons employed on the Work.

B. Include provisions for pest-control and elimination of odors.

3.15 GARBAGE DISPOSAL

A. Place garbage in approved containers, and move to a pickup point or disposal area, where directed.

3.16 CONTROL AND DISPOSAL OF HAZARDOUS WASTE

A. Hazardous Waste Generation: Handle generated hazardous waste per 40 CFR 262.

B. Hazardous Waste Disposal: Dispose of hazardous waste per federal, state, and local regulations, especially 40 CFR 263, 40 CFR 264, and 40 CFR 265.

C. Hazardous Waste Storage: Store hazardous waste in containers per 49 CFR 178. Identify hazardous waste per 40 CFR 261 and 40 CFR 262.

D. Spills of Oil and Hazardous Materials: Take precautions to prevent spills of oil and hazardous material. In the event of a spill, immediately notify the Contracting Officer. Spill response shall be per 40 CFR 300 – and applicable state regulations.

E. Petroleum Products: Protect against spills and evaporation during fueling and lubrication of equipment and motor vehicles. Properly dispose of:

1. Lubricants to be discarded.
2. Excess oil.

3.17 ABRASIVE BLASTING

A. Do not use silica sand in abrasive blasting.

B. Enclose abrasive blasting operations using tarpaulin drop cloths and windscreens to confine and collect dust, abrasive, agent, paint chips, and other debris per the requirements specified herein.

C. Disposal Requirements: Collect dust, sand, paint, and other debris resulting from abrasive blasting operations and store in 55-gallon drums with watertight lids. Take a representative sample of this material, and test for EP toxicity with respect to lead, chromium, and cadmium content. Perform the sampling and testing per 40 CFR 261.

END OF SECTION 01 35 43

SECTION 01 42 00 - SOURCES FOR REFERENCE PUBLICATIONS

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 REFERENCES

A. Various publications are referenced in other sections of the Specifications to establish requirements for the Work. These references are identified in each section by document title, number, and date. The document number used in the citation is the number assigned by the standards-producing organization, (for example, ASTM B-564 for "Standard Specification for Nickel Alloy Forgings"). However, when the standards-producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

B. Ordering Information: The addresses of the standards-producing organizations whose documents are referenced in other sections of these Specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the Specifications with numbers that were not assigned by the standards-producing organization should be ordered from the source by title rather than by number.

1. ACI INTERNATIONAL
   PO Box 9094
   Farmington Hills MI 48333-9094
   Voice: 248.848.3700
   Facsimile: 248.848.3701
   URL: http://www.aci-int.org

2. AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)
   Attention: Publications Department
   4301 North Fairfax Drive, Suite 425
   Arlington VA 22203-1653
   Voice: 703.524.8800
   Facsimile: 703.528.3816
   URL: http://www.ari.org
   E-mail Address: ari@ari.org

3. AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL INCORPORATED (AMCA)
30 West University Drive
Arlington Heights IL 60004-1893
Voice: 847.394.0150
Facsimile: 847.253.0088
URL: http://www.amca.org

4. AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)
1827 Walden Office Square, Suite 550
Schaumburg IL 60173-4268
Voice: 847.303.5664
Facsimile: 847.303.5774
URL: http://www.aamanet.org

5. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
444 North Capital Street, NW, Suite 249
Washington DC 20001-1539
Voice: 800.231.3475 or 202.624.5800
Facsimile: 800.525.5562 or 202.624.5806
URL: http://www.aashto.org

6. AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)
PO Box 12215
Research Triangle Park NC 27709-2215
Voice: 919.549.8141
Facsimile: 919.549.8933
URL: http://www.aatcc.org

7. AMERICAN FOREST & PAPER ASSOCIATION (AF&PA)
AMERICAN WOOD COUNCIL (AWC)
1111 19th Street, NW, Suite 800
Washington DC 20036
Voice: 800.878.8878
URL: http://www.afandpa.org

8. AMERICAN GAS ASSOCIATION (AGA)
400 North Capitol Street NW, Suite 450
Washington DC 20001-1535
Voice: 202.824.7000
Facsimile: 202.824.7115
URL: http://www.aga.org

9. AMERICAN IRON AND STEEL INSTITUTE (AISI)
1101 17th Street, NW, Suite 1300
Washington DC 20036-4710
Voice: 202.452.7100
URL: http://www.steel.org

10. AMERICAN LUMBER STANDARD COMMITTEE (ALSC), INCORPORATED
Board of Review
PO Box 210
Germantown MD 20875-0210
Voice: 301.972.1700
Facsimile: 301.540.8004
URL: http://www.alsc.org

11. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1819 L Street, NW, Sixth Floor
Washington DC 20036-3864
Voice: 202.293.8020
Facsimile: 202.293.9287
URL: http://www.ansi.org/

Note: Documents that begin with the letter "S" can be ordered from:

Standards and Publications Fulfillment Center
Acoustical Society of America
PO Box 1020
Sewickley PA 15143-9998
Voice: 412.741.1979
Facsimile: 412.741.0609
URL: http://asa.aip.org
General E-mail Address: asa@aip.org
Publications E-mail Address: asapubs@abdintl.com

12. AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)
1801 Alexander Bell Drive
Reston VA 20191-5467
Voice: 800.548.2723
URL: http://www.asce.org

13. AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)
1791 Tullie Circle, NE
Atlanta GA 30329-2305
Voice: 800.527.4723 or 404.636.8400
Facsimile: 404.321.5478
URL: http://www.ashrae.org

14. AMERICAN WATER WORKS ASSOCIATION (AWWA)
6666 West Quincy Avenue
Denver CO 80235-3098
Voice: 800.926.7337 or 303.794.7711
Facsimile: 303.794.7310
URL: http://www.awwa.org

15. AMERICAN WELDING SOCIETY (AWS)
550 Northwest LeJeune Road
Miami FL 33126-5649
Voice: 800.443.9353 or 305.443.9353
Facsimile: 305.443.7559
URL: http://www.amweld.org

16. ARCHITECTURAL WOODWORK INSTITUTE (AWI)
46179 Westlake Drive, Suite 120
Potomac Falls VA 20165-6874
Voice: 571.323.3636
Facsimile: 571.323.3630
URL: http://www.awinet.org

17. ASME INTERNATIONAL
(formerly, AMERICAN SOCIETY OF MECHANICAL ENGINEERS)
Three Park Avenue
New York NY 10016-5990
Voice: 212.591.7722
Facsimile: 212.591.7674
URL: http://www.asme.org

18. ASTM INTERNATIONAL
(formerly, AMERICAN SOCIETY FOR TESTING AND MATERIALS)
100 Barr Harbor Drive
West Conshohocken PA 19428-2959
Voice: 610.832.9585
Facsimile: 610.832.9555
URL: http://www.astm.org

19. BRICK INDUSTRY ASSOCIATION (BIA)
(formerly, BRICK INSTITUTE OF AMERICA)
1850 Centennial Park Drive, Suite 310
Reston VA 20191-1524
Voice: 703.620.0010
Facsimile: 703.620.3928
URL: http://www.bia.org

20. BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)
355 Lexington Avenue, 17th Floor
New York NY 10017-6603
Voice: 212.297.2122
Facsimile: 212.370.9047
URL: http://www.buildershardware.com

21. CARPET AND RUG INSTITUTE (CRI)
Shipping Address: 310 Holiday Avenue
Dalton GA 30720-3760
Mailing Address: PO Box 2048
Dalton GA 30722-2048
Voice: 800.882.3176 or 706.278.0232
Facsimile: 706.278.8835
URL: http://www.carpet-rug.com

22. CAST IRON SOIL PIPE INSTITUTE (CISPI)
5959 Shallowford Road, Suite 419
Chattanooga TN 37421-2228
Voice: 423.892.0137
Facsimile: 423.892.0817
URL: http://www.cispi.org

23. CEILINGS AND INTERIOR SYSTEMS CONTRACTORS ASSOCIATION (CISCA)
1500 Lincoln Highway, Suite 202
St. Charles IL 60174
Voice: 630.584.1919
Facsimile: 630.584.2003
URL: http://www.cisca.org

24. DOOR AND HARDWARE INSTITUTE (DHI)
14150 Newbrook Drive, Suite 200
Chantilly VA 20151-2223
Voice: 703.222.2010
Facsimile: 703.222.2410
URL: http://www.dhi.org
E-mail Address: techdept@dhi.org

25. ENGINEERED WOOD ASSOCIATION (APA)
7011 South 19th
Tacoma WA 98466
Voice: 253.565.6600
Facsimile: 253.565.7265
URL: http://apawood.org

26. FM GLOBAL (formerly, FACTORY MUTUAL ENGINEERING and FACTORY MUTUAL RESEARCH CORPORATION)
Shipping Address: 1301 Atwood Avenue
Johnston RI 02919-4900
Mailing Address: PO Box 7500
Johnston RI 02919-0750
Voice: 877.364.6726 or 781.255.6681
Facsimile: 781.255.0181
URL: http://www.fmglobal.com

27 GAS APPLIANCE MANUFACTURERS ASSOCIATION (GAMA)
2107 Wilson Boulevard, Suite 600
Arlington VA 22201-3042
Voice: 703.525.7060
Facsimile: 703.525.6790
URL: http://www.gamanet.org
E-mail Address: info@gamanet.org

Order publications from:

GAMA Certification Services Office
(formerly Hydronics Institute)
35 Russo Place
Berkeley Heights NJ 07922-1606
Voice: 908.464.8200, Extension 10
Facsimile: 908.464.7818
E-mail Address: publications@gamanet.org

28. GLASS ASSOCIATION OF NORTH AMERICA (GANA)
2945 Southwest Wanamaker Drive, Suite A
Topeka KS 66614-5321
Voice: 785.271.0208
Facsimile: 785.271.0166
URL: http://www.glasswebsite.com/GANA

29. GYPSUM ASSOCIATION (GA)
810 First Street NE, Suite 510
Washington DC 20002-8027
Voice: 202.289.5440
Facsimile: 202.289.3707
URL: http://www.gypsum.org

30. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
Shipping Address: 445 Hoes Lane
Piscataway NJ 08854-4141
Mailing Address: PO Box 1331
Piscataway NJ 08855-1331
Voice: 800.701.4333 or 732.981.0060
Facsimile: 732.981.9667
URL: http://www.ieee.org
E-mail Address: customer.services@ieee.org

31. INSULATING GLASS CERITIFACTION COUNCIL (IGCC)
Mailing Address: PO Box 9
Henderson Harbor NY 13651
Voice: 315.646.2234
Facsimile:315.646.2297
URL: http://www.igcc.org
E-mail Address: staff@amscert.com

32. INTERNATIONAL CERTIFIED FLOORCOVERING INSTALLER ASSOCIATION (CFI)
2400 East Truman Road
Kansas City MO 64127- 2038
Voice: 816.231.4646
Facsimile: 816.231.4343
URL: http://www.cfi-installers.org
E-mail Address: cfiguy@earthlink.net

33. INTERNATIONAL CODE COUNCIL (ICC)
5203 Leesburg Pike, Suite 600
Falls Church VA 22041-3405
Voice: 703.931.4533
Facsimile: 703.379.1546
URL: http://www.intlcode.org

34. [THE] MASONRY SOCIETY (TMS)
3970 Broadway, Suite 201-D
Boulder CO 80304-1135
Voice: 303.939.9700
Facsimile: 303.541.9215
URL: http://www.masonrysociety.org
E-mail Address: info@masonrysociety.org

35. MIDWEST INSULATION CONTRACTORS ASSOCIATION (MICA)
2017 South 139th Circle
Omaha NE 68144-2149
Voice: 402.342.3463
Facsimile: 402.330.9702
URL: http://www.micainsulation.org
E-mail Address: info@micainsulation.org

36. NACE INTERNATIONAL
(formerly, NATIONAL ASSOCIATION OF CORROSION ENGINEERS)
1440 South Creek Drive
Houston TX 77084-4906
Voice: 800.797.6223
Facsimile: 281.228.6300
URL: http://www.nace.org
E-mail Address: firstservice@nace.org

37. NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)
Architectural Metal Products (AMP) Division or
Hollow Metal Manufacturers Association (HMMA) Division
8 South Michigan Avenue, Suite 1000
Chicago IL 60603-3452
Voice: 312.332.0405
Facsimile: 312.332.0706
URL: http://www.naamm.org

38. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
1300 North 17th Street, Suite 1847
Rosslyn VA 22209-3801
Voice: 703.841.3200
Facsimile: 703.841.3300
URL: http://www.nema.org/
E-mail Address: jas_peak@nema.org

39. NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)
10255 West Higgins Road, Suite 600
Rosemont IL 60018
Voice: 847.299.9070
Facsimile: 847.299.1183
URL: http://www.nrca.net

40. NFPA INTERNATIONAL
(formerly, NATIONAL FIRE PROTECTION ASSOCIATION)
Shipping Address: 1 Batterymarch Park
Quincy MA 02269-7422
Mailing Address: PO Box 9101
Quincy MA 02269-9101
Voice: 617.770.3000
Facsimile: 617.770.0700
URL: http://www.nfpa.org

41. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)
United States Department of Labor (USDOL)
200 Constitution Avenue, NW
Washington DC 20210

Order publications from:

PO Box 37535
Washington DC 20013-7535
Voice: 202.693.1888
Facsimile: 202.693.2498
URL: http://www.osha.gov

42. OHIO DEPARTMENT OF COMMERCE (ODOC)
Division of Industrial Compliance
Board of Building Standards
Shipping Address: 6606 Tussing Road
Reynoldsburg OH 43068-4004
Mailing Address: PO Box 4009
Reynoldsburg OH 43068-9009
Voice: 614.644.2223
Facsimile: 614.644.2618
URL: http://www.com.state.oh.us/dic/
E-mail Address: ic@com.state.oh.us

43. OHIO DEPARTMENT OF TRANSPORTATION (ODOT)
Office of Construction Administration
1980 West Broad Street
Columbus OH 43223
Voice: 614.387.2173
Facsimile: 614.644.7175
URL: http://www.dot.state.oh.us/construction/OCA/default.htm

44. OHIO ENVIRONMENTAL PROTECTION AGENCY (Ohio EPA)
Division of Air Pollution Control (DAPC)
122 South Front Street
Columbus OH 43215-3425
Voice: 614.644.2270
Facsimile: 614.644.3681
URL: http://www.epa.state.oh.us/dapc/files/files.html

45. PORTLAND CEMENT ASSOCIATION (PCA)
5420 Old Orchard Road, Building A
Skokie IL 60077-1083
Voice: 847.966.6200
Facsimile:847.966.8389
URL: http://www.cement.org
E-mail Address: info@cement.org

46. SAFETY GLAZING CERTIFICATION COUNCIL (SGCC)
P.O. Box 730
Sackets Harbor NY 13685-0730
Voice: 315.646.2234
Facsimile: 315.646.2297
URL: http://www.sgcc.org
E-mail Address: staff@amscert.com

47. SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)
4201 Lafayette Center Drive
Chantilly VA 20151-1209
Voice: 703.803.2980
Facsimile: 703.803.3732
URL: http://www.smacna.org
E-mail Address: info@smacna.org

48. SOCIETY FOR PROTECTIVE COATINGS (SSPC)
(formerly, STEEL STRUCTRUES PAINTING COUNCIL)
40 24th Street, Sixth Floor
Pittsburgh PA 15222-4656
Voice: 877.281.7772
Facsimile: 412.281.9992
URL: http://www.sspc.org

49. STEEL DOOR INSTITUTE (SDoI)
30200 Detroit Road
Cleveland OH 44145-1967
Voice: 440.899.0010
Facsimile: 440.892.1404
URL: http://www.steeldoor.org

50. TILE COUNCIL OF AMERICA (TCA)
100 Clemson Research Boulevard
Anderson SC 29625-6548
Voice: 864.646.8453
Facsimile: 864.646.2821
URL: http://www.tileusa.com
E-mail Address: literature@tileusa.com

51. TURFGRASS PRODUCERS INTERNATIONAL (TPI)
(formerly, AMERICAN SOD PRODUCERS ASSOCIATION (ASPA))
2 East Main Street
East Dundee IL 60118
Voice: 800.405.8873
Facsimile: 847.649.5678
URL: http://www.turfgrasssod.org
E-mail Address: info@turfgrasssod.org

52. UNDERWRITERS LABORATORIES (UL) INCORPORATED
333 Pfingsten Road
Northbrook IL 60062-2096
Voice: 847.272.8800
Facsimile: 847.272.8129
URL: http://www.ul.com/
E-mail Address: northbrook@us.ul.com

53. UNITED STATES ARMY CORPS OF ENGINEERS (USACE or COE)

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54. UNITED STATES CONSUMER PRODUCT SAFETY COMMISSION (CPSC)
4330 East-West Highway
Bethesda MD 20814-4408
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55. UNITED STATES DEPARTMENT OF AGRICULTURE (USDA)

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56. UNITED STATES DEPARTMENT OF COMMERCE (USDOC or DOC)
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National Institute of Science and Technology
100 Bureau Drive, Stop 2320
Gaithersburg MD 20899-2320
Voice: 301.975.6776
Facsimile:
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E-mail Address: srmorder@nist.gov

57. UNITED STATES DEPARTMENT OF DEFENSE (USDoD or DoD)

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E-mail Address: orders@ntis.fedworld.gov

58. UNITED STATES DEPARTMENT OF JUSTICE (USDOJ)
Civil Rights Division
Disability Rights Section – NYAV
950 Pennsylvania Avenue, NW
Washington DC 20530-0001
Voice: 800.514.0301
Facsimile: 202.307.1198
URL: http://www.usdoj.gov

59. UNITED STATES DEPARTMENT OF TRANSPORTATION (USDOT)
Federal Highway Administration (FHWA)
Office of Transportation Operations (HOTO)
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Washington DC 20590
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60. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA)
Ariel Rios Building
1200 Pennsylvania Avenue, NW
Washington DC 20460
Voice: 202.272.0167
URL: http://www.epa.gov

61. UNITED STATES GENERAL SERVICES ADMINISTRATION (GSA)
1800 F Street, NW
Washington DC 20405-0002
Voice: 202.501.0705

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Arlington VA 22202
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or http://www.gpoaccess.gov/cfr/retrieve.html
E-mail Address: gpoaccess@gpo.gov

63. Window Covering Manufacturers Association Incorporated (WCMA)
355 Lexington Avenue, 17th Floor
New York NY 10017-6603
Voice: 212.297.2122
URL: http://www.wcmanet.org

END OF SECTION 01 42 00

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. These requirements supplement the General Conditions. Refer to General Conditions for additional requirements.

1.2 PRODUCTS

A. Products include materials, equipment and systems.

B. Products incorporated into the work:

1. Comply with specifications and referenced standards as minimum requirements.
2. Comply with size, make, type, and quality specified, or as specifically accepted in writing by the Contracting Officer
3. Manufactured and fabricated products:
   a. Design, fabricate and assemble in accordance with the best engineering and shop practices.
   b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
   c. Two or more items of the same kind shall be identical, by the same manufacturer.
   d. Products shall be suitable for service conditions.
   e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing by the Contracting Officer.
4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.
5. New and unused, except as otherwise indicated.

1.3 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accordance with construction schedules, coordinate to avoid conflict with work and conditions at the site.

1. Transport products by methods to avoid product damage.
2. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
3. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and accepted submittals, and that products are properly protected and undamaged.

B. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

C. Each contractor shall provide suitable weathertight storage sheds of sufficient size to hold materials required on the site at one time, for storage of materials which might be damaged by the weather. Outdoor storage of materials shall be confined to the areas within the construction fence.

1.4 STORAGE AND PROTECTION

A. Store products in accordance with manufacturer's instructions with seals and labels intact and legible.
   1. Store products subject to damage by the elements in weather tight enclosures.
   2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.

B. Exterior Storage
   1. Store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. Cover products which are subject to deterioration with impervious coverings. Provide adequate ventilation to avoid condensation.
   2. Store loose granular materials in a well drained area on solid surfaces to prevent mixing with foreign materials.

C. Arrange storage in a manner to provide access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage.

D. Protection After Installation: Provide coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 73 29 - CUTTING AND PATCHING

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, – including, but not limited to – the following.

1. SECTION 01 00 00 – GENERAL REQUIREMENTS.
2. SECTION 01 33 00 – SUBMITTAL PROCEDURES: Substitutions.

1.2 SUMMARY

A. This Section includes the responsibility for cutting, fitting, and patching.

1. Make the several parts of a material, system, or finish fit together properly.
2. Uncover portions of the Work to provide for installation of ill-timed work.
3. Remove and replace defective work.
4. Remove and replace work not conforming to requirements of the Contract Documents.
5. Remove samples of installed work as specified for testing.
6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.

B. Related Sections:

1. SECTION 02 41 19.13 – SELECTIVE BUILDING DEMOLITION.
2. Individual sections in Divisions 03 through 33: PRODUCT and EXECUTION requirements specific to the Work of each of those respective sections.

1.3 SUBMITTALS

A. Submit a written request to the Contracting Officer well in advance of executing any cutting or alteration that affects:

1. Work of the Government or separate contractors.
2. Structural value or integrity of any element of the Project.
3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
4. Efficiency, operational life, maintenance, or safety of operational elements.
5. Visual qualities of elements exposed to view.

B. Include in the request:

1. Identification of the Project.
2. Description of affected work.
3. The necessity for cutting, alteration or excavation.
4. The anticipated effect on:
   a. The Government's operations.
   b. The integrity of the structure.
   c. The weather-tightness of the Project.
   d. The work of separate contractors.
5. Include in the description of proposed work the:
   a. Scope of cutting, patching, alteration, or excavation.
   b. Trades who will execute the Work.
   c. Products proposed to be used.
   d. Extent of refinishing to be done.
6. Alternatives to cutting and patching.
7. Cost proposal, when applicable.
8. Written permission of any separate contractor whose work will be affected.

C. Should conditions of the Work or the schedule indicate a change of products from the original installation, submit a request for substitutions as specified in the section referenced above.

D. Submit a written notice to the Contracting Officer designating the date and the time the Work will be uncovered.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Comply with specifications and standards for each specific product involved. See PRODUCT and EXECUTION requirements in their respective individual sections.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Inspect existing conditions of the Project, including elements subject to damage or to movement during cutting and patching.

B. After uncovering work, inspect conditions affecting installation of products, or performance of the Work.

C. Report unsatisfactory or questionable conditions to the Contracting Officer in writing; do not proceed with the Work until the Contracting Officer has provided further instructions.

3.2 PREPARATION

A. Provide adequate temporary support as necessary to assure the structural value or integrity of affected portions of the Work.

B. Provide devices and methods to protect other portions of the Project from damage.

C. Provide protection from the elements for portions of the Project that might be exposed by cutting and patching work. Maintain excavations free from water.

3.3 PERFORMANCE

A. Execute cutting and demolition by methods that will:

1. Prevent damage to other work.
2. Provide proper surfaces to receive installation of repairs.

B. Execute excavating and backfilling by methods that will prevent:

1. Settlement.
2. Damage to other work.

C. Employ the original Installer or Fabricator to perform cutting and patching for:

1. Weather-exposed or moisture-resistant elements.
2. Finished surfaces exposed to view.

D. Execute fitting and adjustment of products to provide a finished installation to comply with specified:

1. Products.
2. Functions.
3. Tolerances.
4. Finishes.

E. Restore work that has been cut or removed. Install new products to provide completed Work per the requirements of the Contract Documents.

F. Fit work airtight to:

1. Pipes.
2. Sleeves.
3. Ducts.
4. Conduit.
5. Other penetrations through surfaces.

G. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes.

1. For continuous surfaces: Refinish to nearest intersection.
2. For an assembly: Refinish entire unit.

END OF SECTION 01 73 29

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Special requirements for waste management during demolition and construction operations.
a. Protect the environment, both on-site and off-site, during demolition and construction operations.
b. Prevent environmental pollution and damage.
c. Maximize source reduction, reuse and recycling of solid waste.

1.2 DEFINITIONS

A. Definitions pertaining to sustainable development: As defined in ASTM E2114.

1.3 QUALITY ASSURANCE

A. Maximize use of source reduction and recycling procedures outlined in ASTM D5834.

B. Diversion Goals: A minimum 75 percent by weight of total project solid waste to be diverted from landfill.

C. Report monthly the waste diversion cumulative totals.

1.4 PRECONSTRUCTION MEETING

A. After award of Contract and prior to the commencement of the Work, General Contractor shall schedule and conduct meeting with the Contracting Officer and Architect to discuss the proposed Waste Management Plan and to develop mutual understanding relative to details of environmental protection.

1.5 SUBMITTALS

A. Solid Waste Management Plan: Not later than 10 days before the Pre-construction meeting, prepare and submit a Solid Waste Management Plan including, but not limited to, the following:
1. List of the recycling facilities, reuse facilities, municipal solid waste landfills and other disposal area(s) to be used. Include:
a. Name, location, and phone number.
b. Copy of permit or license for each facility.

2. Identify materials that cannot be recycled or reused. Provide explanation or justification.
3. Revise and resubmit Plan as required by Contracting Officer.
   a. Approval of Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations.

B. Progress Documentation: Document solid waste disposal and diversion. Include the quantity by weight of waste generated; waste diverted through sale, reuse, or recycling; and waste disposed by landfill or incineration.

1. Document quantities and destinations. Identify landfills, recycling centers, waste processors, and other organizations that process or receive the solid waste.
2. Submit report showing waste management process in place, diverted materials photos with captions, project name, contractor name, and date in pdf format.
3. With each Application for Payment, submit updated Documentation for solid waste disposal and diversion.
4. With each Application for Payment, submit log of manifests, weight tickets, receipts, and invoices specifically identifying the Project and waste material; produce said receipts on request.

C. Record Submittals: With Record Submittals as specified in Section 01 78 39 submit the following:

1. Summary of solid waste disposal and diversion.

PART 2 PRODUCTS – not used

PART 3 EXECUTION

3.1 SOLID WASTE MANAGEMENT

A. Develop and implement a waste management program in accordance with ASTME1609 and as specified herein.

B. Collection: Implement a recycling/reclamation program that includes at a minimum wood, metals, glass, and cardboard.

1. Identify sorting requirements and post appropriate signage
2. Review requirements at regular contractor project meetings and in all safety orientation meetings.

C. Recycling/Reuse: Maximize recycling and reuse of materials.

1. Recycling/Reuse on project site: Coordinate with Contracting Officer to include materials from demolition of structures outside of new construction contract

3.2 SITE IMPLEMENTATION

A. All Contractors working onsite must comply with Construction Waste Management Plan (CWMP).

B. CWMP to be posted and readily available for inspection in job trailer.

C. Requirements of CWMP to be reviewed during regular construction meetings.

END OF SECTION 01 74 19

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SECTION 02 41 19 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of building
2. Demolition and removal of selected site elements.

B. See Division 01 Section "Construction Waste Management and Disposal" for disposal of demolished materials.

C. See Division 31 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate detailed sequence of selective demolition and removal work, with starting and ending dates for each activity, interruption of utility services, use of elevator and stairs, and locations of temporary partitions and means of egress.

B. Pre-demolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before Work begins.

C. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1. Comply with submittal requirements in Division 01 Section "Construction Waste Management and Disposal."

1.4 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241.

E. Pre-demolition Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

E. Hazardous Materials: It is unknown whether hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

F. Hazardous Materials: Hazardous materials are present in construction to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.

2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

G. Storage or sale of removed items or materials on-site is not permitted.

H. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs

1. Comply with requirements specified in other Division "Photographic Documentation."

G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris- removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

3.4 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
5. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled**,** reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

SECTION 06 16 00 - 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.

B. Related Requirements:

1. Division 06 Section “Cold Formed Metal Framing” for wall framing.
2. Division 06 Section " Miscellaneous Rough Carpentry" for plywood backing panels.
3. Division 07 Section "Plastic Sheet Air Barriers" for water-resistive barrier applied over wall sheathing.

1.3 ACTION 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 a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For following products, from ICC-ES:

1. Preservative-treated plywood.

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 WOOD PANEL PRODUCTS

A. Plywood: Either DOC PS 1 or DOC PS 2 unless otherwise indicated.

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.

2.2 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

- 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.

2.3 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 (3.2 m) beyond the centerline of the burners at any time during the test.

- Use treatment that does not promote corrosion of metal fasteners.
- 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.

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 plywood indicated on Drawings.

2.4 WALL SHEATHING

A. Plywood Wall Sheathing: Exterior, Structural I sheathing.

- Span Rating: Not less than 16/0.
- Nominal Thickness: Not less than 1/2 inch (13 mm).

B. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.

- Products: Subject to compliance with requirements, provide one of the following:

  - CertainTeed Corporation; GlasRoc.
  - G-P Gypsum Corporation; Dens-Glass Gold.
  - Temple-Inland Inc.; GreenGlass
  - United States Gypsum Co.; Securock.

- Type and Thickness: Regular, 1/2 inch (13 mm) thick.
- Size: 48 by 96 inches, (1219 by 2438 mm) 48 by 108 inches, or (1219 by 2743 mm) 48 by 120 inches (1219 by 3048 mm) for vertical installation.

2.5 SUBFLOORING AND UNDERLAYMENT

A. Plywood Subflooring: Exterior, Structural I single-floor panels or sheathing.

- Span Rating: Not less than 16 o.c. or 32/16.
- Nominal Thickness: Not less than 23/32 inch (18.3 mm).

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

- For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

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.

- For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

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, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

- For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C 1002.
- For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

2.7 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. 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.

- Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), 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.

2.8 MISCELLANEOUS MATERIALS

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. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

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 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. Subflooring:
   - Glue and nail to wood framing.
   - Screw to cold-formed metal framing.
   - Space panels 1/8 inch (3 mm) apart at edges and ends.

2. Wall Sheathing:
   - Screw to cold-formed metal framing.
   - Space panels 1/8 inch (3 mm) apart at edges and ends.

3.3 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.
   1. Fasten gypsum sheathing to cold-formed metal framing with screws.
   2. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
   3. Install boards with a 1/4-inch (6.4-mm) 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 boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.

1. pace fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.

D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.
   1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion 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.

END OF SECTION 06 16 00

SECTION 06 16 43 GYPSUM SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Fiberglass-mat faced, moisture and mold resistant gypsum sheathing.

B. Related Sections:

1. Section 05 41 00 Structural Metal Stud Framing.

2. Section 09 22 16 Non-Structural Metal Framing

3. Section 06 10 00 Rough Carpentry.

1.2 REFERENCES

A. ASTM International (ASTM):

1. ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products.
2. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
3. 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.
4. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
5. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.
6. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an EnvironmentalChamber.
7. ASTM D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers.
8. ASTM E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
9. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

B. Gypsum Association (GA): GA-253 Application of Gypsum Sheathing.

1.3 SUBMITTALS

A. Product Data: Manufacturer's specifications and installation instructions for each product specified.

1.4 WARRANTY

A. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay) commencing with the date of installation of the product in such structure.

B. Manufacturer's Warranty:

1. Five years against manufacturing defects from the date of completion of the product for installation 12 years against manufacturing defects when used as a substrate in architecturally specified EIFS.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufactures

a. Georgia-Pacific Gypsum.
b. USG.
c. American Gypsum.

2.2 MATERIALS

A. Fire-Rated Fiberglass-Mat Faced Gypsum Sheathing: ASTM C1177, Type X:

1. Thickness: 5/8 inch.
2. Width: 4 feet.
3. Length: [8 feet] [9 feet] [10 feet].
4. Weight: 2.5 lb/sq. ft.
5. Edges: Square.
6. Surfacing: Fiberglass mat on face, back, and long edges.
7. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 654 pounds per square foot, dry.
8. Flexural Strength, Parallel (ASTM C1177): 100 lbf, parallel.
9. Humidified Deflection (ASTM C1177): Not more than 1/8 inch.
10. Permeance (ASTM E96): Not less than 17 perms.
11. R-Value (ASTM C518): 0.67.
12. Mold Resistance (ASTM D3273): 10, in a test as manufactured.
13. Microbial Resistance (ASTM D6329, UL Environmental GREENGUARD 3-week protocol): Will not support microbial growth.
14. Basis of Design:

a. 5/8 inch DensGlass Fireguard Sheathing, Georgia-Pacific Gypsum LLC.

2.3 ACCESSORIES

A. Screws: ASTM C1002, corrosion resistant treated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Inspection: Verify that project conditions and substrates are acceptable, to the installer, to begin installation of work of this section.

3.2 INSTALLATION

A. General: In accordance with GA-253, ASTM C1280 and the manufacturer's recommendations.

3.3 PROTECTION

A. Protect gypsum board installations from damage and deterioration until date of Substantial Completion.

END OF SECTION

SECTION 06 20 23 - FINISH CARPENTRY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. WORK INCLUDED: Provide all labor, tools, equipment, fasteners, adhesives, necessary to perform finish carpentry and other items not specifically described as being installed under other sections of these specifications including but not restricted to finish lumber, wood trim, doors, door frames, hardware, fire extinguishers.

B. RELATED WORK: Other documents affecting work of this section include, but are not necessarily limited to:
1. Section 06 10 00 Rough Carpentry
2. Section 07 92 00 Joint Sealants
3. Section 08 12 13 Metal Frames
4. Section 08 70 00 Door Hardware

1.2 QUALITY ASSURANCE AND STANDARDS

A. The Contractor shall employ experienced, skilled tradesmen for the work, who are familiar with the methods, materials, and requirements for the proper performance of the work specified in accordance with the following standards:

1. AWI Architectural Woodworker Institute "Quality Standards, Guide Specifications and Quality Certification Program" Quality Standards.
2. AWI Architectural Woodworker Institute "Guide to Wood Species Selection".
3. FS MM-L736 Hardwood Lumber.
4. Western Wood Products Assoc.
5. ANSI B18.6.1 Fasteners
6. NEMA LD3 High Pressure Melamine Decorative Laminates.
7. PS 58 Basic Hardwood

B. All referenced codes and standards, including all revisions and commentaries, shall be the most currently adopted as of the date of these contract documents.

PART 2 - PRODUCTS

2.1 MATERIALS

A. SOFTWOOD LUMBER: PS 20; premium grade AWI Standards as detailed.

B. HARDWOOD LUMBER: PS 58; FS MM-L-736; premium grade AWI Standards, S4S oak and/or birch as and in thickness as detailed.

C. PLYWOOD: PS 51 Hardwood Plywood as detailed.

D. NAILS: Size and type to suit application.

E. ADHESIVES: Contact type, FS MMM-A-130; PL 400, Silicone Adhesives

F. CAULKING: Section 07 92 00.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Produce joints which arc true, tight and well nailed with all members assembled in accordance with the Drawings.

B. Install all pieces in as long a dimension as possible.

C. Members in direct contact with concrete or masonry shall be preservative treated.

3.2 JOINTING

A. Make all joints to conceal shrinkage; miter exterior, cope interior, scarf end to end joints. Produce joints which are true, tight and well nailed in accordance with AWI quality.

3.3 FASTENING

A. Fasten items straight to solid backup blocking true, plumb, level securely anchored with proper fasteners.

B. Nail trim with properly sized finishing nails firmly attaching to blocking backup without splitting of wood. Drill if necessary. Set nails for filling.

C. Sandpaper finished wood surfaces thoroughly as required to produce a uniformly smooth surface, always sanding in grain direction. Do not sand rough sawed finished materials.

D. NO coarse grained sandpaper mark, hammer marks or other imperfections will be accepted.

E. Set putty or fill all finish nail holes.

3.4 SCHEDULE

This schedule is an indicator of the areas of finish carpentry. Because a specific item is

not named does not relieve the contractor of providing and/or installing same.

A. Install the following, provided by other Sections:
   1. All Doors and Frames
   2. All Hardware
   3. Wall Hung Work Surfaces

END OF SECTION

SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

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. This Section includes the following:

1. Plastic-laminate cabinets.
2. Solid surface countertops, sinks and lavatories.

B. Related Sections include the following:

1. Division 06 Section “Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated including cabinet hardware and accessories handrail brackets and finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers and other items installed in architectural woodwork.

C. Product Certificates: For each type of product, signed by product manufacturer.

D. Qualification Data: For fabricator.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

B. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers .

C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Products: Comply with the following:

1. Hardboard: AHA A135.4.
2. Medium-Density Fiberboard: ANSI A208.2, Grade MD.
3. Particleboard: ANSI A208.1, Grade M-2.
4. Softwood Plywood: DOC PS 1.

C. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

1. Basis-of-Design Product: Subject to compliance with requirements, provide products shown on Finish Schedule drawings or equal. Equal products must be equal to basis-of-design products as determined by Contracting Officer in physical characteristics, material composition, color, finish and pattern.

2.2 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

E. Shelf Rests: BHMA A156.9, B04013 metal.

F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

G. Drawer Slides: BHMA A156.9, B05091.

1. Standard Duty (Grade 1, Grade 2, and Grade 3): Side mounted full-extension type; zinc-plated steel with polymer rollers.
2. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.

3. Box Drawer Slides: Grade 1 or Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.

H. Metal Counter Support Brackets:

1. At 24" counters: Rakks No. EH-1818 (18” x 18”) or equal. Aluminum with prime finish.

2. At shower benches: Rakks No. EH-1209 (12" x 9") or equal. Aluminum mill finish.

I. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

J. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 SOLID-SURFACING-MATERIAL COUNTERTOPS, SINKS AND LAVATORIES

A. Grade: Custom.

B. Solid-Surfacing-Material Thickness: 1/2 inch.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
1. Refer to Finish Schedule drawings.

D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
1. Fabricate tops with shop-applied edges of materials and configuration indicated.
2. Fabricate tops with loose backsplashes for field application.

E. Drill holes in countertops for plumbing fittings in shop.

F. Double Sink at Kitchen and Break Room Counters: Corian Double Sink 850. Color: Cameo White. Mounting: Undermount.

G. Single Lavatories at Toilet Rooms: Corian Bathroom Sink 810. Color: Cameo White. Mounting: Undermount.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

D. Adhesive for Bonding Plastic Laminate: Contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive.

2.5 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom grade interior woodwork complying with referenced quality standard.

B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.

C. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

D. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

2.6 PLASTIC-LAMINATE CABINETS

A. Grade: Custom.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: Grade HGS.
2. Vertical Surfaces: Grade VGS.
3. Edges: Grade VGS matching laminate in color, pattern, and finish.

D. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
   a. Edges of Plastic-Laminate Shelves and for semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.
2. Drawer Sides and Backs: Thermoset decorative panels.
3. Drawer Bottoms: Thermoset decorative panels.

E. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

F. Colors, Patterns, and Finishes: Refer to Color Schedule Drawings.

G. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

2. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
3. Secure backsplashes and to walls with adhesive.
4. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 40 23

SECTION 06 65 10 SOLID SURFACING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Solid surfacing window sills.

B. Adhesives and sealants.

1.2 RELATED REQUIREMENTS

A. Section 05 50 00 Metal Fabrications.

B. Section 06 20 23 Finish Carpentry.

C. Section 06 40 23 Interior Architectural Woodwork.

1.3 REFERENCES

A. Reference Standards:

1. ASTM C 834: Standard Specification for Latex Sealants.
2. ASTM C 920: Standard Specification for Elastomeric Joint Sealants.
3. ASTM D 256: Standard Test Methods for Determining the Izod Pendulum Impact

B. Resistance of Plastics.

1. ASTM D 570: Standard Test Method for Water Absorption of Plastics.
2. ASTM D 638: Standard Test Method for Tensile Properties of Plastics
3. ASTM D 696: Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30oC and 30oC with a Vitreous Silica Dilatometer.
4. ASTM D 790: Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
5. ASTM D 792: Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
6. ASTM D 2583: Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
7. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
8. ASTM G 21: Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
9. ASTM G 22: Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Bacteria.
10. ASTM G 155: Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.

11. NEMA LD-3: High Pressure Decorative Laminates.
12. NSF/ANSI Standard 51: Food Equipment Materials.
13. SCAQMD Rule 1168: Adhesive and Sealant Applications.
14. UL 2818: GREENGUARD Certification Program for Chemical Emissions for Building Materials, Finishes and Furnishings.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00 Submittal Procedure.

B. Product Data:

1. Submit product data for each specified product. Include manufacturer's technical data sheets and published instruction instructions.
2. Submit Material Safety Data Sheets (MSDS) for adhesives and sealants.

C. Shop Drawings:

1. Submit fully dimensioned shop drawings showing window sill layouts, joinery, terminating conditions, substrate construction, cutouts and holes. Show plumbing installation provisions. Include elevations, section details, and large scale details.

D. Samples:

1. Submit selection and verification samples for each color, pattern, and finish required.

E. Quality Assurance Submittals:

1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties, if required.
2. Warranty: Specimen copy of specified warranty.

F. Maintenance Data: Submit manufacturer's published maintenance manual with closeout submittals.

1.5 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with the U.S. Architectural & Transportation Barriers Compliance Board ADA-ABA Accessibility Guidelines for Buildings and Facilities.

B. Adhesives, Sealants, and Sealant Primers:

1. SCAQMD (South Coast Air Quality Management District) Rule 1168.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Fabricator Qualifications: Minimum of three years documented experience in fabricating solid surfacing countertops similar in scope and complexity to this Project. Currently certified by the manufacturer as an acceptable fabricator.
2. Installer Qualifications: Minimum of three years documented installation experience for projects similar in scope and complexity to this Project, and currently certified by the manufacturer as an acceptable installer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver sinks in original containers.

B. Storage and Protection: Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer. Store sheet materials flat on pallets or similar rack-type storage to preclude damage.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements and openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

B. Adhesive: Acclimatize adhesives to occupancy room temperatures with maximum temperature not to exceed 75 deg F.

1.9 WARRANTY

A. Manufacturer's Limited Warranty: Provide manufacturer's standard 10 Year Commercial Limited Warranty against defects in solid surface sheet materials.

PART 2 - PRODUCTS

A. MANUFACTURER

1. Acceptable Manufacturers:

a. Wilsonart LLC.
b. Corian
c. Formica

2.2 SOLID SURFACE SHEET MATERIAL

A. Composition: Acrylic resins, fire-retardant mineral fillers, and proprietary coloring agents.

B. Through-the-body color for full thickness of sheet material.

C. Material Thickness: 1/2 inch, nominal. D. Conformance

Standards: 1. UL 2818:

a. GREENGUARD - Emission levels in UL 2818, Section 7.1 are applicable for furniture products.
b. GREENGUARD Gold - Emission levels in UL 2818, Section 7.2 are applicable for building materials, finishes, and furnishings.

D. Physical Characteristics:

1. Tensile Strength: 6800 psi; ASTM D 638.
2. Tensile Modulus: 1.5 x 106 psi; ASTM D 638.
3. Tensile Elongation: 0.4 percent minimum; ASTM D 638.
4. Flexural Strength: 10,400 psi; ASTM D 790.
5. Flexural Modulus: 1.73 x 106 psi; ASTM D 790.
6. Thermal Expansion Coefficient: 1.37 x 105 in./in.oF; ASTM D 696.
7. Hardness (Barcol Impressor): 60; ASTM D 2583.
8. Impact Resistance: 144 in. drop with no fracture; NEMA LD-3, Method
9. Izod Impact: 0.28 (ft-lb.)/in.; ASTM D 256, Method A.
10. Light Resistance - Xenon: No effect; NEMA LD-3, Method 3.3.
11. Stain Resistance: Pass; ANSI Z 124.3, modified.
12. Wear and Cleanability: Pass; ANSI Z 124.3.
13. Fungi Resistance: Pass; ASTM G 21.
14. Bacterial Resistance: Pass; ASTM G 22.
15. Boiling Water Resistance: No effect; NEMA LD-3, Method 3.5.
16. High Temperature Resistance: No effect; NEMA LD-3, Method 3.6.
17. Weatherability: Delta E less than 5; ASTM G 155.
18. Moisture Absorption: Less than 0.25 percent; ASTM D 570, long term.
19. Specific Gravity:1.7 gram/cm3; ASTM D 792.
20. Weight: 4.4 lb./ft2.
21. Surface Burning Characteristics: Class I and Class A; ASTM E 84.

E. Edge Detail: double ¼” rounded.

F. Basis of Design Color, Pattern, and Finish Design:

1. SS-1: Wilson Art Solid Surface Frosty White Mirage, 1573MG; matte.

2.3 ACCESSORY MATERIALS

A. Joint Adhesive: Methacrylate-based adhesive for chemically bonding solid surfacing seams. Color complementary to solid surfacing sheet material. UL 2818 GREENGUARD Gold certified and complies with SCAQMD Rule 1168.

1. Basis of Design Product: “Wilsonart Hard Surface Adhesive.”

B. Elastomeric Sealant: Mildew-resistant silicone sealant for filling gaps between countertops and terminating substrates in wet environment applications. Complies with ASTM C 920, Type S (single component), Grade NS (nonsag).

1. Product: Acceptable to countertop manufacturer.
2. Color: Selected from sealant manufacturer’s standard offerings.

C. Siliconized Acrylic Sealant: Siliconizedacrylic latex sealant. For general applications to fill gaps between countertops and at terminating substrates. Complies with ASTM C 834, Type OP, Grade NF, and SCAQMD Rule 1168.

1. Basis of Design Product: ”Wilsonart Color Matched Caulk”.
2. Color: Selected from sealant manufacturer’s standard offerings.

D. Construction Adhesive: Countertop manufacturer’s recommended silicone-based construction adhesive for backsplashes, end splashes, and other applications according to manufacturer’s published fabrication instructions.

2.4 FABRICATION

A. Fabricate components in shop, to greatest extent practicable, in sizes and shapes indicated according to approved shop drawings and Wilsonart published fabrication requirements.

B. Form joint seams between solid surfacing components with specified seam adhesive. Completed joints inconspicuous in appearance and without voids. Provide joint reinforced if required by manufacturer for particular installation conditions.

C. Provide holes and cutouts indicated on approved shop drawings. Rout cutouts and complete by sanding all edges smooth.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions that could adversely affect the work of this Section.

B. Substrates must be sound, flat, smooth, and free from dust or other

surface contaminants.

1. Commencement of work will constitute acceptance of substrates and conditions to receive the work.

3.2 WINDOW SILL INSTALLATION

A. Install window sills for full length of each window unit, securing to substrates with concealed fasteners and specified adhesive.

B. Provide minimum 1/8 inch expansion gap on both sides of window sills. Fill gap with specified joint sealant.

C. Completed work to be plumb, level, and true, with edges eased and sanded smooth.

3.3 REPAIRS

A. If permissible to the Architect/Engineer, minor surface marring for solid surfacing components may be repaired according to manufacturer's published installation instructions.

B. Remove and replace solid surfacing components that are damaged and cannot be satisfactorily repaired.

3.4 CLEANING AND PROTECTION

A. Clean solid surfacing components according to manufacturer's published maintenance instructions. Completely remove excess adhesives and sealants from finished surfaces.

B. Protect completed work from damage during remainder of construction period.

END OF SECTION

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

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. Standard hollow metal doors and frames.

B. Related Sections:

1. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
2. Division 09 Sections "Painting" for field painting hollow metal doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the work, include, but are not limited to, the following:

1. Amweld Building Products, LLC.
2. Benchmark; a division of Therma-Tru Corporation.
3. Ceco Door Products; an Assa Abloy Group company.
4. Curries Company; an Assa Abloy Group company.
5. Steelcraft; an Ingersoll-Rand company.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard, polystyrene, polyurethane, or polyisocyanurate core.
3. Vertical Edges for Single-Acting Doors: Beveled edge.
   a. Beveled Edge: 1/8 inch in 2 inches (3 mm in 50 mm).
4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Frames for Level 2 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
4. Frames for Wood Doors: 0.053-inch- (1.3-mm-) thick steel sheet.

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
5. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
      1) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.

b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
   1) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
   2) Two anchors per head for frames above 42 inches (1066 mm) wide and mounted in metal-stud partitions.
c. Compression Type: Not less than two anchors in each jamb.
d. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.

6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

D. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 16 Sections.

2.7 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
   a. Install frames with removable glazing stops located on secure side of opening.
   b. Install door silencers in frames before grouting.
   c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   d. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
   e. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

4. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.

c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).

b. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.

c. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 08 11 13

SECTION 08 14 16 - FLUSH 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 wood-veneer.
2. Factory finishing flush wood doors.

B. Related Sections:

1. Division 08 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire-protection ratings for fire-rated doors.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

C. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."

1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

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 or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT 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 the remainder of the construction period.

1.7 WARRANTY

A. Special 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 (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
   b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) 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

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the work, include, but are not limited to, the following:

1. Algoma Hardwoods, Inc.
2. Buell Door Company Inc.
3. Chappell Door Co.
4. Eggers Industries.
5. Graham; an Assa Abloy Group company.
6. Marshfield Door Systems, Inc.
7. Mohawk Flush Doors, Inc.; a Masonite company.
8. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-1 or Grade LD-2.
2. Blocking: Provide wood blocking in particleboard-core doors as follows:
   a. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
   b. 5-inch (125-mm) bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
   c. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Hollow-Core Doors:

1. Grade: Custom (Grade A faces).
2. Species: Select white maple.
3. Cut: Plain sliced (flat sliced).
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Balance match.
6. Pair and Set Match: Provide for doors hung in same opening.
7. Exposed Vertical Edges: Same species as faces or a compatible species.
8. Core: Particleboard.

9. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.

2.4 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.

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 requirements in NFPA 80 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, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."

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.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory.

C. Transparent Finish:

1. Grade: Custom.
2. Finish: AWI catalyzed polyurethane (TR-6).
3. Staining: Refer to Finish Schedule Drawings for door stain.
4. Effect: Semi-filled finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that 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 Division 08 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

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 (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
   a. Comply with NFPA 80 for fire-rated doors.
2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.

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 08 14 16

SECTION 08 31 00 - ACCESS DOORS AND PANELS

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. This Section includes standard formed-metal hinged access doors/panels and frames.

B. Related Sections:

1. Section 09 29 00 – Gypsum Board: Substrate and framing to receive access doors/panel and frame.
2. Section 09 30 00 – Tiling: Preparation of adjacent work to receive access doors/panel and frame.

1.3 REFERENCES

A. Definitions:

1. Or approved equal = Products similar to those listed immediately above and equivalent in quality, function, durability, and longevity (as determined by the Contracting Officer).

B. Reference Standards: The publications listed below form a part of this Section to the extent referenced. The publications are referred to within the text by the basic designation only.

1 ASTM International:

a. Standard Specification for Stainless and Heat-Resisting Chromium-Nickel-Steel Plate, Sheet, and Strip (ASTM A-167-99).
b. Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, Baked Hardenable (ASTM A-1008 / A-1008-05).
c. Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability (ASTM A-1011 / A-1011M-05).
d. Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (ASTM B-209-00).
e. Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (ASTM B-221-00).

1.4 ACTION SUBMITTALS

B. Action Submittals: Product Data.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. The design is based on the products of Milcor Incorporated, Gibraltar Company, Lima OH (Website: www.milcorinc.com, Voice: 800.528.1411). Subject to compliance with the requirements of this Section - and the Buy America Act, provide either the named products or comparable products by one of the following Access Door Manufacturers:

1. Karp Associates, Incorporated, Maspeth NY (Website: www.karpinc.com, Voice: 800.888.4212).
2. Larsen's Manufacturing Company, Minneapolis MN (Website: www.larsensmfg.com, Voice: 800.527.7367).
3. Nystrom Building Products, Minneapolis MN (Website: www.nystrom.com, Voice: 800.547.2635).
4. Williams Brothers Corporation of America, Front Royal VA (Website: www.wbdoors.com, Voice: 800.255.5515).
5. Or approved equal.

2.2 MATERIALS

A. Fabricate doors/panels from:

1. Stainless steel per ASTM A-167.

2.3 MANUFACTURED UNITS

A. Standard Type:

1. Access Panel Type:
   a. In Gypsum Board Ceilings: DW by Milcor.
   b. In Gypsum Wallboard Walls: MS by Milcor.
   a. In Ceramic Tile Walls: MS by Milcor.

2.4 FABRICATION

A. General: Access doors/panels and frames shall be the Access Door Manufacturer's standard unit consisting of door/panel, frame, hardware, accessory parts, anchors, and fasteners.

1. Fabricate frame from specified metal with:
   a. Stiffened edges.
   b. Welded joints ground smooth.

c. Welded attachments for anchoring/securing to construction.

2. Fabricate door/panel hinged to frame. Provide the number of latches/locks recommended by the Access Door Manufacturer for the size furnished. Furnish plastic or metal grommet to protect holes made for access to latch/lock.

B. Type of Access Door/Panel:

1. Door/panel and frame shall be 16-gauge stainless steel. Provide two steel hinges and the Access Door Manufacturer's standard flush cylinder lock(s).

2.5 FINISHES

A. Provide stainless steel in a brushed finish.

1. Exception for Ceilings: Provide factory-finished white.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install access door/panel and frame per the Access Door Manufacturer's recommendation. Install face flush with adjacent surfaces.

3.2 ADJUSTING

A. Adjust hardware and door for proper operation.

END OF SECTION 08 31 13

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SECTION 08 51 13 - ALUMINUM WINDOWS

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. This Section includes operable aluminum-framed windows for exterior locations.

1.3 DEFINITIONS

A. Performance class designations according to AAMA/WDMA 101/I.S.2/NAFS:

1. HC: Heavy Commercial.

B. Performance grade number according to AAMA/WDMA 101/I.S.2/NAFS:

1. Design pressure number in pounds force per square foot (pascals) used to determine the structural test pressure and water test pressure.

C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.

D. Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.4 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:

1. Mullion details, including reinforcement and stiffeners.
2. Joinery details.
3. Expansion provisions.
4. Flashing and drainage details.

5. Weather-stripping details.
6. Thermal-break details.
7. Glazing details.
8. Window System Operators: Show locations, mounting, and details for installing operator components and controls.

C. Samples for Initial Selection: For units with factory-applied color finishes.

1. Include similar Samples of hardware and accessories involving color selection.

D. Samples for Verification: For aluminum windows and components required, prepared on Samples of size indicated below.

1. Main Framing Member: 12-inch- (300-mm-) long, full-size sections of extrusions with factory-applied color finish.
2. Window Corner Fabrication: 12-by-12-inch- (300-by-300-mm-) long, full-size window corner including full-size sections of extrusions with factory-applied color finish, weather stripping, and glazing.
3. Operable Window: Full-size unit with factory-applied finish.
4. Hardware: Full-size units with factory-applied finishes.
5. Weather Stripping: 12-inch- (300-mm-) long sections.

E. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

F. Informational Submittals:

1. Certificates: Submit the following certification from the Aluminum Window Manufacturer.

   "The window proposed in this submittal has been tested or analyzed and shown to meet the minimum requirements cited in Paragraphs B-3.1.1 and B-3.1.2 of Appendix B of UFC 4-010. The windows will satisfy the general intent of UFC 4-010 – and in general, a Low-Hazard Level-of-Protection consistent with UFC 4-010 – provided the adequate anchoring systems and glazing are provided as required by UFC 4-010."
2. Test Reports: From an AAMA-accredited laboratory.
3. Delegated Design Submittal:
   a. For each size of window, submit proposed methods of connecting the frame to the surrounding construction that will resist the static design loads specified in Design Criteria below.
   b. Support with drawings and design calculations prepared under the direct supervision and seal of a professional structural engineer experienced in the design of this Work and licensed, registered, or otherwise legally qualified to practice in the State of Ohio.
      1) Under no circumstances shall subsequent review of the engineer's design be construed as approval by the Government.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility.

B. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

C. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements." Do not modify size and dimensional requirements.

1. Do not modify intended aesthetic effects, as judged solely by Contracting Officer, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Contracting Officer for review.

E. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.

1. Provide AAMA, WDMA-certified aluminum windows with an attached label.

F. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Failure to meet performance requirements.
   b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
   c. Faulty operation of movable sash and hardware.

d. Deterioration of metals, other materials, and metal finishes beyond normal weathering.
e. Failure of insulating glass.

2. Warranty Period:
   a. Window: Three years from date of Substantial Completion.
   b. Glazing: 10 years from date of Substantial Completion.
   c. Metal Finish: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide EFCO Corporation Series 511, 2-7/16" Thermal Impact Grade Casement Window or a comparable product by one of the following:

1. Graham Architectural Products Corp.
2. Kawneer; an Alcoa Company.
3. TRACO.
4. Wausau Window and Wall Systems.
5. Winco Window Company.

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength, not less than 16,000-psi (110-MPa) minimum yield strength, and not less than 0.062-inch (1.6-mm) thickness at any location for the main frame and sash members.

B. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.

1. Reinforcement: Where fasteners screw anchor into aluminum less than 0.125 inch (3.2 mm) thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.
2. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

E. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and for complete concealment when aluminum window is closed.

1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA 101/I.S.2/NAFS.

F. Replaceable Weather Seals: Comply with AAMA 701/702.

G. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

2.3 WINDOW

A. Window Type: Casement.

B. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 48 (frame) and 63 (glass).

C. Thermal Transmittance: Provide aluminum windows with a whole-window, U-factor maximum indicated at 15-mph (24-km/h) exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.

1. U-Factor: 0.56 Btu/sq. ft. x h x deg F (3.17 W/sq. m x K) or less.

D. Air Infiltration: Maximum rate not more than indicated when tested according to ASTM E283 at a static air pressure difference of 6.24 psf (299 Pa).

1. Maximum Rate: 0.10 cfm/sq. ft.

E. Water Resistance: No water leakage when tested according to ASTM E331 at a static air pressure difference of 12.0 psf (575 Pa).

F. Forced-Entry Resistance: Comply with Performance Grade 10 requirements when tested according to ASTM F 588.

G. Life-Cycle Testing: Test according to AAMA 910 and comply with AAMA/WDMA 101/I.S.2/NAFS.

H. Operating Force and Auxiliary (Durability) Tests: Comply with AAMA/WDMA 101/I.S.2/NAFS for operating window types indicated.

2.4 GLAZING

A. Glass and Glazing Materials: Refer to Division 08 Section "Glazing" for glass units and glazing requirements applicable to glazed aluminum window units.

B. Glass Clear, insulating-glass units, argon gas filled, with low-E coating pyrolytic on second surface or sputtered on second or third surface.

C. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal and complies with requirements for force protection.

2.5 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals. Where exposed, provide extruded, cast, or wrought aluminum.

B. Locks and Latches: Designed to allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.

C. Gear-Type Rotary Operators: Comply with AAMA 901 when tested according to ASTM E 405, Method A.

1. Operation Function: All ventilators move simultaneously and securely close at both jambs without using additional manually controlled locking devices.

D. Casement Windows: Provide the following operating hardware:

1. Operator: Gear-type rotary dual-arm operator located on jamb at sill.
   a. Rating: Provide rotary operator rated C-HC40 according to AAMA 901.
   b. Handle: Standard crank.
2. Hinge: Heavy-duty, five-knuckle butt hinge with nylon bushings.
3. Lock: Lift-type throw, cam-action lock with keeper; one per ventilator.

2.6 INSECT SCREENS

A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Fabricate insect screens to fully integrate with window frame. Locate screens on inside of window and provide for each operable exterior sash or ventilator.

1. Aluminum Tubular Frame Screens: Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," Architectural C-24 class.
2. Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," for minimum standards of appearance, fabrication, attachment of screen fabric, hardware, and accessories unless more stringent requirements are indicated.

B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

1. Extruded-Aluminum or Aluminum Tubular Framing Sections and Cross Braces: Not less than 0.040-inch (1.0-mm) wall thickness.
2. Finish: Match aluminum window members.

C. Aluminum Wire Fabric: 18-by-16 (1.1-by-1.3-mm) mesh of 0.011-inch- (0.28-mm-) diameter, coated aluminum wire.

1. Wire-Fabric Finish: Charcoal gray.

D. Wickets: Provide hinged wickets, framed and trimmed for a tight fit and for durability during handling.

2.7 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.

C. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.

1. Provide thermal-break construction that has been in use for not less than three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.
2. Provide thermal barriers tested according to AAMA 505; determine the allowable design shear flow per the appendix in AAMA 505.
3. Provide hardware with low conductivity or nonmetallic material for hardware bridging thermal breaks at frame or vent sash.

D. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.

E. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

F. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration.

G. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.

H. Subframes: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062-inch- (1.6-mm-) thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window units. Provide subframes capable of withstanding design loads of window units.

I. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section "Glazing" and with AAMA/WDMA 101/I.S.2/NAFS.

J. Glazing Stops: Provide snap-on glazing stops coordinated with Division 08 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

1. Color: Dark bronze to match existing as determined by Contracting Officer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.

1. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

F. Connect automatic operators to building electrical system.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

E. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION 08 51 13

SECTION 08 71 00 - DOOR HARDWARE

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. Mechanical door hardware for the following:
   a. Swinging doors.

B. Related Sections:

1. Division 08 Section "Hollow Metal Doors and Frames" for door silencers provided as part of hollow-metal frames.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Other Action Submittals:

1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
   b. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page. Use same door numbers as in the Contract Documents.
   c. Content: Include the following information:
      1) Identification number, location, hand, size, and material of each door and frame.
      2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.

3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
4) Fastenings and other pertinent information.
5) Explanation of abbreviations, symbols, and codes contained in schedule.
6) Mounting locations for door hardware.
7) List of related door devices specified in other Sections for each door and frame.

2. Keying Schedule: Prepared by or under the supervision of Installer, detailing the Government's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

1. Scheduling Responsibility: Preparation of door hardware and keying schedules.

B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as follows:

C. Source Limitations: Obtain each type of door hardware from a single manufacturer.

D. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
2. Comply with the following maximum opening-force requirements:
   a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

1.6 COORDINATION

A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled on Drawings to comply with requirements in this Section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products, products equivalent in function and comparable in quality to named products and products complying with BHMA designations referenced.

2.2 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Baldwin Hardware Corporation.
   b. Bommer Industries, Inc.
   c. Hager Companies.
   d. IVES Hardware; an Ingersoll-Rand company.
   e. McKinney Products Company; an ASSA ABLOY Group company.
   f. Stanley Commercial Hardware; Div. of The Stanley Works.

2.3 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule.

B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Bored Locks: Minimum 1/2-inch (13-mm) latchbolt throw.

C. Lock Backset: 2-3/4 inches (70 mm), unless otherwise indicated.

D. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

E. Bored Locks: BHMA A156.2; Grade 1; Series 4000.

1. Entrance Function: Series 4000, Grade 1 with lever style to match existing (similar and equivalent in quality, function, and durability (as determined by the Contracting Officer) to 93K-7AB-15D-S3 by Best).
   a. Do not discard the tailpiece that comes in each lockset box. They will be required with the permanent core in each lockset.

2.4 LOCK CYLINDERS AND KEYING

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.

B. Security: Locksets for this Project shall include both construction ("CC") cores and permanent seven-pin cores from Best Lock Corporation dba Best Access Systems, part of the Access Controls Group of The Stanley Works, 19579 Progress Drive, Strongsville OH 44136-3203 (Voice: 800.758.2378).

1. Master Keying (BHMA A-156.28): Key the lock cores to a master key system as directed by the Contracting Officer by Best Corporation.
2. Best shall furnish the Contractor with "CC" cores along with control and operating keys. Use the "CC" cores during the construction phase.
3. Upon acceptance by the Government of beneficial occupancy of the facility, the Contractor shall assume sole responsibility for removal and return of the "CC" cores and control and operating keys to Best.
4. Best shall ship the permanent seven-pin combinated cores and their keys to the Base Realty Specialist. The Base Locksmith will install the permanent cores.

2.5 OPERATING TRIM

A. Operating Trim: BHMA A156.6; stainless steel, unless otherwise indicated.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated below or comparable product by one of the following:
   a. Hager Companies.
   b. Hiawatha, Inc.
   c. IVES Hardware; an Ingersoll-Rand company.
   d. Rockwood Manufacturing Company.
   e. Trimco.
2. Pull Handles (ANSI J-401): Provide stainless-steel cast or forged pull handles from the Hardware Manufacturer's standard designs (similar and equivalent in quality, function, and durability (as determined by the Contracting Officer) to 137 by Rockwood).
   a. 5 ½ -inch center-to-center.

b. 6-inch overall height.
c. 2-inch projection.
d. 1 ½ -inch knuckle clearance.
e. Mount 1 ¼-inch wide by 5/8-inch high bases with through-bolts.
f. Backup pull handle with plates equivalent to push plates specified below (ANSI J-405).

3. Push Plates (ANSI J-301): Provide 4-inch wide by 16-inch high by 0.050-inch thick stainless-steel (brushed) door push plates with four beveled edges and Phillips oval-headed stainless-steel sheet metal screws plated to match finish (similar and equivalent in quality, function, and durability (as determined by the Contracting Officer) to 70-C by Rockwood).

2.6 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

1. Basis-of-Design Product: Subject to compliance with requirements, provide LCN 4041 Super Smothee or comparable product by one of the following:
   a. Arrow USA; an ASSA ABLOY Group company.
   b. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
   c. DORMA Architectural Hardware; Member of The DORMA Group North America.
   d. Dor-O-Matic; an Ingersoll-Rand company.
   e. Norton Door Controls; an ASSA ABLOY Group company.
   f. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
   g. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
   h. Yale Security Inc.; an ASSA ABLOY Group company.

2.7 MECHANICAL STOPS AND HOLDERS

A. Wall Stops: BHMA A156.16; polished cast brass, bronze, or aluminum base metal.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Rockwood 400 Series or comparable product by one of the following:
   a. Architectural Builders Hardware Mfg., Inc.
   b. Baldwin Hardware Corporation.
   c. Hager Companies.
   d. Hiawatha, Inc.
   e. IVES Hardware; an Ingersoll-Rand company.
   f. Rockwood Manufacturing Company.
   g. Stanley Commercial Hardware; Div. of The Stanley Works.
   h. Trimco.

2.8 OVERHEAD STOPS AND HOLDERS

A. Overhead Stops and Holders: BHMA A156.8.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Glynn Johnson 90-H Series with Angle Jamb J or comparable product by one of the following:
   a. Architectural Builders Hardware Mfg., Inc.
   b. Rockwood Manufacturing Company.
   c. SARGENT Manufacturing Company; an ASSA ABLOY Group company.

2.9 METAL PROTECTIVE TRIM UNITS

A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- (1.3-mm-) thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Baldwin Hardware Corporation.
   b. Hiawatha, Inc.
   c. IVES Hardware; an Ingersoll-Rand company.
   d. Rockwood Manufacturing Company.
   e. Trimco.
2. Stainless steel (brushed): 0.050-inch thick, with beveled edges on top and sides, and countersunk holes for stainless-steel tamperproof and self-drilling screws:
   a. Kickplates (ANSI J-102): Width of door leaf less 2 inches by 16-inches high.

2.10 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for

installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
3. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.11 FINISHES

A. Provide finishes complying with BHMA A156.18.

1. Finish: Brushed chrome (US 26D).
   a. Exception: Brushed stainless steel (US 32D) will be accepted on stainless steel items (hinges, exit devices, kickplates, etc.).

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Lock Cylinders: Install construction cores to secure building and areas during construction period.

E. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

B. Arrange for a meeting at the site with the Government's designated maintenance personnel to train them in the adjusting of door hardware to satisfy the requirements of the ADAAC.

END OF SECTION 08 71 00

SECTION 08 80 00 - GLAZING

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. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Doors.

B. Related Sections include the following:

1. Division 08 Section "Mirrors."

1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

C. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

D. Qualification Data: For installers.

E. Product Test Reports: For each of the following types of glazing products:

1. Glazing gaskets.

F. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass and insulating glass.

C. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

D. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.

1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

E. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired glass, ANSI Z97.1.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.
2. Where glazing units, including Kind FT glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. (0.84 sq. m) in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. (0.84 sq. m) or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS

A. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

2.2 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.3 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.4 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.

C. Grind smooth and polish exposed glass edges and corners.

2.5 MONOLITHIC FLOAT-GLASS UNITS

A. Uncoated Clear Float-Glass Units MG-1: Class 1 (clear) Kind FT (fully tempered) float glass where scheduled.

1. Thickness: 6.0 mm.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm) as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

J. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08 80 00

SPECIFICATION
SECTION 08 8810: FIRE RATED GLASS & FRAMING
SuperLite® II-XL 120 minute and
SuperLite® II-XL 120 minute with Starphire Ultra-Clear® Glass by Vitro

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Fire rated glazing
   1. SuperLite® II-XL 120 fire resistive, safety rated glazing material for interior and exterior applications.
   2. Applications of fire rated glazing includes:
      a. Fire rated glazing as sidelites, borrowed lites, windows, transoms and transparent wall applications in fire rated frames.

B. Related sections:
   1. Section 01 3323: Shop Drawings, Product Data and Samples.
   2. Section 08 8000: Glazing.
   3. Section 08 5130: Steel Window.
   4. Section 08 1110: Steel Doors and Frames.
   5. Section 08 1400: Wood Doors and Frames.
   6. Section 08 1120: Aluminum Doors and Frames.
   7. Section 08 5110: Aluminum Windows.
   8. Section 08 1113: Hollow Metal Doors and Frames.
   9. Section 08 7000: Finish Hardware.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E119: Methods for Fire Tests of Building Construction and Materials.
   2. ASTM E152: Methods for Fire Tests of Door Assemblies.
   3. ASTM E163: Methods for Fire Tests of Window Assemblies.
   4. ASTM E2074: Standard Test Method for Fire Tests of Door Assemblies, including Positive Pressure Testing of Side-hinged and Pivoted Swinging Door Assemblies.
   5. ASTM E2010-1: Standard Test for Positive Pressure of Fire Tests of Window Assemblies.

B. National fire Protection Association (NFPA):
   1. NFPA 80: Fire Doors and Windows.
   2. NFPA 251: Fire Tests of Building Construction and Materials.
   3. NFPA 252: Fire Tests of Door Assemblies.
   4. NFPA 257: Fire Tests of Window Assemblies.

C. Underwrites Laboratories, Inc. (UL):
   1. UL 9: Standard for Safety of Fire Tests of Window Assemblies.
   2. UL 10 B: Standard for Safety of Fire Tests of Door Assemblies.
   3. UL 10 C: Standard for Safety of Positive Pressure Tests of Door Assemblies.
   4. UL 263: Fire Tests of Building Construction and Materials.

D. Standard Council of Canada:
   1. ULC Standard CAN4-S101: Fire Tests of Building Construction and Materials.
   2. ULC Standard CAN4-S104: Fire Tests of Door Assemblies.
   3. ULC Standard CAN4-S106: Fire Tests of Window Assemblies.

E. Consumer Product Safety Commission (CPSC):
   1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials.

F. Glass Association of North America (GANA)
   1. GANA – Glazing Manual.
   2. FGMA – Sealant Manual.

G. National Fenestration Rating Council (NFRC)
   1. NFRC 100: Procedure for Determining Fenestration Product U-Factors.
   2. NFRC 200: Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

H. [American Recovery and Reinvestment Act
   1. Section 1605, Title XVI Buy American Provision]

I. [Insert building code used by Authority Having Jurisdiction]

1.03 SYSTEM DESCRIPTION

A. Performance Requirements: Provide a fire rated glazing manufactured, fabricated and installed to maintain performance criteria stated by manufacturer without defects, damage, or failure.
   1. Fire Rating: 120 minutes with hose stream.
   2. Fire resistive, safety rated glazing tested in accordance with ASTM E119, NFPA 80, NFPA 251, NFPA 252, NFPA 257, UL 9, UL 10B, UL 10C and UL 263.
   3. Testing Laboratory: Fire tests shall be conducted by a nationally recognized independent testing laboratory.

B. Listings and Labels:
   1. Fire rated glazing shall be under current follow-up services by a nationally recognized independent testing laboratory approved by OSHA and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.

1.04 SUBMITTALS

A. Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedure Section.
1. Shop Drawings: Submit shop drawings showing layouts, profiles and product components.
2. Samples: Submit 12x12 glass samples.
3. Technical Information: Submit latest edition of manufacturer's product data.

1.05 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

C. Delivery: Deliver materials to specified destinations in manufacturer or distributor's packaging.

D. Storage and Protection: Store off ground, under cover, protected from weather and construction activities and at temperature conditions recommended by manufacturer.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements for openings by field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.07 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document. Manufacturer's warranty is not intended to limit other rights that the Owner may have under the Contract Documents.
1. Warranty Period: 5 years from date of shipping.

PART 2 PRODUCTS

2.01 FIRE RATED GLAZING

A. Material: SuperLite® II-XL 120 minute fire resistive glazing with hose stream.

B. Manufacturer: SuperLite® II-XL as manufactured and distributed by SAFTI *FIRST*.
   1. Contact: 100 N Hill Drive, Suite 12, Brisbane, CA 94005; Telephone 888.653.3333; Fax 888.653.4444; email info@safti.com; Web site www.safti.com
   2. Fire rated glass and framing must be provided by a single-source, US manufacturer. Distributors of fire rated glass and framing are not to be considered as manufacturers.

C. Design Requirements:
   1. Make-up: Must be comprised of an inboard and outboard lite of [clear tempered glass] [Starphire Ultra-Clear® Glass by Vitro] protecting a clear, fire resistive, intumescent interlayer.
   2. Thickness: 1-3/4" (45 mm) standard profile.
   3. Weight: 16 lbs/sq. ft. in 1-3/4" (45 mm) standard profile.
   4. Dimensions: Must meet max. clear view area of 4,876 sq. in., measuring at least 124 in. on the long side.
   5. Appearance: Must be tint-free, optically clear fire rated glazing.
   6. Visible Transmittance: Must meet [0.777 with standard clear tempered] [0.878 with Starphire Ultra-Clear® glass by Vitro] make-up.
   7. Fire Rating: Must be fire rated to 120 minutes with hose stream and meet ASTM E-119.
   8. Impact Safety Resistance: CPSC 16 CFR 1201 Cat. I & II.
   9. Hard Body Impact Classification: Must meet ASTM C1629/C1629M Level 3.
   10. Soft Body Impact Classification: Must meet ASTM E695 Level 3.
   11. Surface Abrasion Resistance: Must meet ASTM D4977 Level 3.
   12. Customization: Available in insulated, energy performance, bullet-resistant, blast-resistant, hurricane-resistant, laminated, tinted, patterned, frosted, mirrored, reflective, segmented, decorative and more.

D. Manufacturer's Fire Rating Glazing Material:
   1. Each piece of fire-rated glazing material shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory, fire rating period and safety glazing standards.
   2. Glazing materials installed in Hazardous Locations, subject to human impact, shall be certified and permanently labeled as meeting applicable requirements reference in NFPA 80:
      a. CPSC 16 CFR 1201 Cat. I & II

E. Substitutions: No substitutions allowed.

2.02 MATERIALS

A. Glazing Accessories: Manufacturer recommended fire rated glazing accessory as follows:
   1. Glazing with EPDM tape or other listed flame resistant gasket material and calcium silicate setting blocks.

2.03 RELATED PRODUCTS
****
Note: Basis of design for fire rated framing system is GPX® Framing as manufactured by SAFTI *FIRST*®
****

A. Glazing shall be installed in an equally rated framing system.

B. Pressure glazing is allowed.

2.04 SOURCE QUALITY

A. Obtain fire rated glazing products from a single manufacturer.

B. Fabrication Dimensions: Fabricate to approved dimensions. The general contractor shall guarantee dimensions where practicable within required tolerances.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data including product technical bulletins and installation instructions.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, have been previously installed under other sections, and are acceptable for product installation in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Installation shall be in strict accordance with the fire glazing material manufacturer's specifications. Field cutting or tampering is strictly prohibited.

3.04 CLEANING AND PROTECTION

A. Protect glass from contact with contaminating substances resulting from construction operations. Remove such substances by method approved by manufacturer.

B. Wash glass on both faces not more than four days prior to date schedule for inspections intended to establish date of Substantial Completion. Wash glass by method recommended by glass manufacturer.

C. Remove temporary coverings and protection of adjacent work areas.

D. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

In the interest of continuous improvement of its product line, SAFTI*FIRST*® reserves the right to modify its products' composition, colors, textures, sizes, and other physical and performance attributes and these guide specifications at any time. SAFTI*FIRST*® makes no expressed or implied warranties regarding content, errors, or omissions in the information presented. Specifications modified or rewritten not in conformance with manufacturer's standard processes, products, and procedures may void warranties and related remedies.

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

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. Non-load-bearing steel framing systems for interior gypsum board assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Recycled Content:

1. Product Data: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized, unless otherwise indicated.

B. Studs and Runners: ASTM C 645. Use dimpled steel studs and runners.

1. Dimpled Steel Studs and Runners:
   a. Minimum Base-Metal Thickness: 20 gage.
   b. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide the following:

1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
      2) MBA Building Supplies; FlatSteel Deflection Track.
      3) Steel Network Inc. (The); VertiClip SLD Series.
      4) Superior Metal Trim; Superior Flex Track System (SFT).
      5) Telling Industries; Vertical Slip Track.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 25 gage.
2. Depth: As indicated on Drawings.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

1. Space studs as follows:
   a. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
   b. Tile Backing Panels: 16 inches (406 mm) o.c. unless otherwise indicated.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

a. Install two studs at each jamb unless otherwise indicated.
b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

D. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

END OF SECTION 09 22 16

SECTION 09 22 26 METAL SUSPENSION SYSTEMS

PART 1 - GENERAL

2.1 RELATED DOCUMENTS

A. Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

2.2 SUMMARY

A. Section Includes

1. Suspension System Framing and Furring for Plaster and Gypsum Board Assemblies
2. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

B. Related Selections

1. Section 09 20 00 - Gypsum Board
2. Section 09 50 01 Wood Panel Ceilings
3. Sections 23 - HVAC Air Distribution
4. Sections 26 - Electrical

2.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
2. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
3. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability"
4. ASTM D 610 Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces
5. ASTM B 117 Standard Practice for Operating Salt Spray (Fog) Apparatus
6. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
7. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
8. ASTM C 1858 Standard Practice for Design, Construction, and Material Requirements for Direct Hung Suspended T-bar Type Ceiling Systems Intended to Receive Gypsum Panel Products in Areas Subject to Earthquake Ground Motions
9. ASTM C 645 Standard Specification for Nonstructural Steel Framing Members
10. ASTM C 754 Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board

11. ASTM C1002 Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
12. ASTM E 119 Standard Test Method for Fire Tests of Building Construction and Material (if applicable).
13. NOA #07-0119.02 Miami/Dade Wind Uplift.
14. NAO #09-0512.02 Miami/Dade Impact.
15. ESR-1289 ICC-ES Evaluation Report.

2.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical literature.

B. Samples: 8 inch long samples of suspension system components, including main runner, cross tees and angle molding.

C. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

2.5 QUALITY ASSURANCE

A. Single-Source Responsibility: To ensure proper interface, all drywall furring components shall be produced or supplied by a single manufacturer.

B. All accessory components from other manufacturers shall conform to ASTM standards.

C. Fire Resistance Ratings: As indicated by reference to design designations in UL Fire Resistance Directory, for types of assemblies in which drywall ceilings function as afire protective membrane and tested per ASTM E 119. Installation in accordance with the UL Design being referenced.

D. Coordination of Work:

1. Coordinate drywall furring work with installers of related work including, but not limited to acoustical ceilings, building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

2. All work above the ceiling line should be completed prior to installing the drywall sheet goods. There should be no materials resting against or wrapped around the suspension system, hanger wires or ties.

2.6 DELIVERY, STORAGE AND HANDLING

2.7 Deliver materials to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

2.8 WARRANTY

A. Suspensions System: Submit a written limited warranty executed by the manufacturer, agreeing to repair or replace grid components that are supplied with a hot-dipped galvanized coating or aluminum base material. Failures include, but are not limited to:

1. The occurrence of 50% red rust as defined by ASTM D 610 test procedures as a result of defects in materials or factory workmanship.

B. Warranty Period:

1. Grid: Ten years from date of installation.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 3 - PRODUCTS

3.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Armstrong World Industries, Inc.
2. USG Corp.
3. CertainTeed Corp.

3.2 COMPONENTS:

A. Main Beam: Shall be double-web construction (minimum 0.0179 inch prior to protective coating, ASTM C645), hot dipped galvanized (per ASTM A653).

B. Primary Cross Tees: Shall be double-web steel construction (minimum 0.0179 inch prior to protective coating, ASTM C645), hot dipped galvanized (minimum G40 or G90 per ASTM A653)

C. QuikStix Soffits DGS: Shall be double web steel construction (minimum 0.0179 inch prior to protective coating, ASTM C645), Tees designed for creating soffits; 1-1/2 inch web height. 1-1/2 inch flange, flattened bulb, bending crimp, knockouts and alignment holes to facilitate creating 15, 30, 45, 60 and 90 degree angles; available with G40 or G90 hot dipped galvanization.

D. Transition Molding: Drywall to Acoustical ceiling.

1. Pre-Painted Armstrong Global White integral acoustical flange and drywall taping flange, hot dipped cold rolled steel.
2. Axiom Aluminum extrusion Pre-Painted Armstrong Global White integral acoustical flange and drywall taping flange.

E. Screws for wallboard application shall be bugle head screws in accordance with thickness of material used.

F. Metal Trim or Plastic Members (by others):

1. Corner bead: Minimum #26 gauge, zinc alloy or plastic square edge type with expanded flanges.
2. Casing bead: Minimum #24 gauge, zinc alloy or plastic square edge type with expanded flanges.
3. Control Joints: Minimum #26 gauge, roll-formed zinc alloy, extruded aluminum or plastic with expanded flanges.
4. Special Trim Shapes: As detailed on plans, extruded aluminum with acrylic coating by Fry Reglet or approved equal.
5. Metal Lath: 3.4 lbs/square yard, galvanized 3/8 inch diamond mesh or flat rib lath; security lath for applications requiring high degree of security.

3.3 STRUCTURAL CLASSIFICATION:

A. Main Beam shall be heavy duty per ASTM C 635.

B. Classification can require wires to be closer together for additional loading when used to support double layer gypsum, verticals, slopes, domes, half barrels, circles, soffits, canopies, and step conditions which call for loading or unusual designs and shapes in drywall construction. Using cross tees in the construction of circles, barrels, etc. is common in order to hold the radius.

C. Deflection of fastening suspension system supporting light fixtures, ceiling grilles, access doors, verticals and horizontal loads shall have a maximum deflection of 1/360 of the span.

PART 4 - EXECUTION

4.1 INSTALLATION - GENERAL

A. Install suspension system and panels in accordance with the manufacturer's instructions, in compliance with ASTM installation standard, and with applicable codes as required by the authorities having jurisdiction.

B. The Armstrong Drywall Grid System can be installed in interior or exterior applications.

C. To secure to metal clips, concrete inserts, steel bar joist or steel deck, use power actuated fastener, or insert. Coordinate placement for hanger wire spaced as required for expected ceiling loads and layout.

D. Install hanger wire as required with necessary on center spacing to support expected ceiling load requirements, following local practices, codes and regulations. Provide additional wires at light fixtures, grilles, and access doors where necessary. A pigtail knot shall be used with three tight wraps at top and bottom fastening locations.

E. Add additional wire as needed when using compatible clips and accessories.

F. Control Joints: Roll formed zinc alloy, aluminum, or plastic as required for expansion and contraction as shown on drawings.

G. Expansion Joints: Roll formed zinc alloy, aluminum, or plastic as required for expansion and contraction as shown on drawings.

H. Main beams shall be suspended from the overhead construction with hanger wire, spaced as required for expected ceiling loads, along the length of the main beams.

I. Install cross tees at on center spacing as specified by the drywall manufacturer. Typical drywall cross tee spacing:

1. 16 inches on center with 5/8 or 1/2 inch gypsum board
2. 24 inches on center with 5/8 inch gypsum board

J. Other items such as wood, sheet metal, or plastic panels should be screwed to comply with deflection limit equivalent to that of the ceiling installation.

K. Use channel molding or angle molding to interface with Drywall Grid System toprovide perimeter attachment or to obtain drop soffits, verticals, slopes, etc.

L. To suspend a second ceiling beneath a new or existing drywall ceiling, without breaching the integrity of the upper ceiling, use the Drywall Clip. To form a transition from a drywall ceiling to an acoustical ceiling, use the Drywall Transition Clips spaced as required for expected loads.

M. For light fixtures (Type G, Type F) use secondary framing cross tees as required to frame opening.

N. Single cross tees in a route hole to be secured by 7/16 inch framing screw or alternative methods.

3.3 INSTALLATION - INTERIOR APPLICATIONS

A. Install main beams and cross tees at the on center spacing required for ceiling loading, and location of in-ceiling services.

B. Additional bracing as required by code.

END OF SECTION

SECTION 09 29 00 - GYPSUM BOARD

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. Interior gypsum board.
2. Tile backing panels.

B. Related Requirements:

1. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
2. Division 09 Section "Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Recycled Content:

1. Product Data: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Gypsum.
2. CertainTeed Corp.
3. Georgia-Pacific Gypsum LLC.
4. Lafarge North America Inc.
5. National Gypsum Company.
6. USG Corporation.

B. Gypsum Wallboard: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

2.3 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. CertainTeed Corp.; FiberCement BackerBoard.
   b. National Gypsum Company, Permabase Cement Board.
   c. USG Corporation; DUROCK Cement Board.
2. Thickness: 5/8 inch (15.9 mm).
3. Mold Resistance: ASTM D 3273, score of 10.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:
   a. Cornerbead.
   b. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
   a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use drying-type compound.
4. Finish Coat: For third coat, use drying-type compound.

D. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

C. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

D. Form control and expansion joints with space between edges of adjoining gypsum panels.

E. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

F. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

G. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

H. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Single-Layer Application:

1. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
2. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at showers, and locations indicated to receive tile.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings**.**

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints**,** rounded or beveled edges**,** and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.

3. Level 4: At panel surfaces that will be exposed to view.
   a. Primer and its application to surfaces are specified in other Division 09 Sections.
4. Level 5: Skim-coating at existing surfaces where wallcovering has been removed.
   a. Primer and its application to surfaces are specified in other Division 09 Sections.

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 30 00 - TILING

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. This Section includes the following:

1. Paver tile.
2. Glazed wall tile.
3. Crack-suppression membrane for thin-set tile installations.
4. Metal edge strips installed as part of tile installations.

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.
2. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

B. Facial Dimension: Actual tile size (minor facial dimension as measured per ASTM C 499).

C. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.
2. Step Treads: Minimum 0.6.
3. Ramp Surfaces: Minimum 0.8.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each type of ceramic tile and grout.

C. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.

1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:

1. Joint sealants.
2. Metal edge strips.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store liquid latexes and emulsion adhesives in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

1. As indicated by manufacturer's designations.

D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.2 TILE PRODUCTS

A. Basis-of-Design Products: Subject to compliance with requirements, provide products shown on Finish Schedule drawings or equal. Equal products must be equal to basis-of-design products as determined by Contract Officer in physical characteristics, material composition, color, finish and pattern.

B. Manufacturers/Products: Refer to Color Schedule Drawings for tile products.

2.3 CRACK-SUPPRESSION MEMBRANES FOR THIN-SET TILE INSTALLATIONS

A. General: Manufacturer's standard product that complies with ANSI A118.10.

B. Unreinforced, Fluid-Applied Product: Liquid-latex rubber in a consistency suitable for trowel application and intended for use as waterproofing.

1. Products:
   a. Custom Building Products; Regard Waterproofing and Anti-Fracture Membrane.

2.4 SETTING AND GROUTING MATERIALS

A. Manufacturers:

1. Custom Building Products or equal.

B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:

1. Porcelain tile fortified thin set mortar. Prepackaged dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive.

C. Organic Adhesive: Omnigrip ANSI A136.1, Type I.

D. Prism Grout: ANSI A118.6, color as indicated.

2.5 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: As shown on Color Schedule Drawings.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

D. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.

1. Products:
   a. Custom Building Products; Tile Lab, Surfaceguard Penetrating Grout Sealer or equal.

2.6 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Provide concrete substrates for tile floors installed with thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.

1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

H. Grout tile to comply with requirements of the following tile installation standards:

1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.

3.4 CRACK-SUPPRESSION MEMBRANE INSTALLATION

A. Install crack-suppression membrane to comply with manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.

B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 SHOWER KIT INSTALLATION

A. Install shower kit with all accessories and components according to manufacturers instruction.

3.6 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.

1. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.
   a. Tile floors in wet areas.
   b. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
   c. Tile floors composed of rib-backed tiles.

B. Joint Widths: Install tile on floors with the following joint widths:

1. Paver Tile: 1/8”.

C. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

D. Grout Sealer: Apply grout sealer to cementitious grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

3.7 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

B. Install metal lath and scratch coat for walls to comply with ANSI A108.1A, Section 4.1.

C. Joint Widths: Install tile on walls with the following joint widths:

1. Glazed Wall Tile: 1/16 inch (1.6 mm).

3.8 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.9 FLOOR TILE INSTALLATION SCHEDULE

A. Tile Installation CT.1 & CT.2: Interior floor installation on waterproof crack-suppression membrane over concrete; thin-set mortar; TCA F122 and ANSI A108.5.

1. Tile Type: Unglazed ceramic mosaic Unglazed paver tile.
2. Thin-Set Mortar: Latex-portland cement mortar.
3. Grout: Polymer-grout.

3.10 WALL TILE INSTALLATION SCHEDULE

A. Tile Installation: Interior wall installation over gypsum board on metal studs; organic adhesive; TCA W242 and ANSI A108.4.

1. Tile Type: Glazed wall tile.
2. Grout: Polymer-modified grout.

END OF SECTION 09 30 00

SECTION 09 50 00 – ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes

1. Acoustical ceiling panels
2. Exposed grid suspension system
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings
4. Perimeter Trim

B. Related Selections

1. Section 092000 - Gypsum Board
2. Sections 23 - HVAC Air Distribution
3. Sections 26 - Electrical

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Re- verberation Room Method
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acousti- cal Tile and Lay-in Panel Ceilings
6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
7. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
8. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Build- ing Materials
9. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material

10. ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Mod- erate Seismic Restraint

11. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems

12. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
13. ASTM E 1264 Classification for Acoustical CeilingProducts

B. International Building Code

C. ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality

D. NFPA 70 National Electrical Code

E. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures

F. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components

G. International Code Council-Evaluation Services Report - Seismic Engineer Report

1. ESR 1308 - Armstrong Suspension Systems

H. International Association of Plumbing and Mechanical Officials - Seismic Engineer Re- port

1. 0244 - Armstrong Single Span Suspension System

1.4 SYSTEM DESCRIPTION

A. Continuous/Wall-to-Wall

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

C. Shop Drawings: Layout and details of acoustical ceilings show locations of items that are to be coordinated with, or supported by the ceilings.

D. Certifications: Manufacturer's certifications that products comply with specified re- quirements, including laboratory reports showing compliance with specified tests

and standards. For acoustical performance, each carton of material must carry an ap- proved independent laboratory classification of NRC, CAC, and AC.

E. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an in- dependent or NVLAP approved laboratory for testing, at the Architect/Engineer's dis- cretion. All products not conforming to manufacturer's current published values must

be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

1. Fire Performance Characteristics: Identify acoustical ceiling components with ap- propriate markings of applicable testing and inspecting organization.
2. Surface Burning Characteristics: As follows, tested per ASTM E 84 and comply- ing with ASTM E 1264 Classification.
3. Fire Resistance: As follows tested per ASTM E119 and listed in the appropriate floor or roof design in the Underwriters Laboratories Fire Resistance Directory.

B. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, andsprinklers.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from mois- ture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.8 PROJECT CONDITIONS

A. Do not install interior ceilings until space is enclosed and weatherproof; wet work in place is completed and nominally dry; work above ceilings is complete; and ambient conditions of temperature and humidity are continuously maintained at values near those intended for final occupancy. Building areas to receive ceilings shall be free of construction dust and debris.

B. For humidity resistant ceiling systems, building areas to receive ceilings shall be free of construction dust and debris. Performance and hot dipped galvanized steel, aluminum or stainless steel suspension systems can be installed up to 120°F (49°C) and in spaces before the building is enclosed, where HVAC systems are cycled or not oper- ating. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact with the ceiling.

1.9 ALTERNATE CONSTRUCTION WASTE DISPOSAL

A. Ceiling material being reclaimed must be kept dry and free from debris.

B. Contact the manufacturer a consultant will verify the condition of the material and that it meets the requirements for recycling. The manufacturer's consultant will provide assis- tance to facilitate the recycling of the ceiling.

1.10 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:

1. Acoustical Panels: Sagging and warping
2. Grid System: Rusting and manufacturer's defects

B. Warranty Period:

1. Acoustical panels: Ten (10) years from date of final completion per Section 017823.
2. Grid: Ten (10) years from date of final completion per Section 017823.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concur- rent with other warranties made by the Contractor under the requirements of the Con- tract Documents.

1.11 MAINTENANCE

A. Extra Materials: Deliver extra materials to Architect/Engineer. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ceiling Panels:

1. Acceptable Manufacturers:

a. Armstrong World Industries, Inc.
b. USG Corp.
c. CertainTeed Corp.

B. Suspension Systems:

1. Acceptable Manufacturers:

a. Armstrong World Industries, Inc.
b. USG Corp.
c. CertainTeed Corp.

2.2 ACOUSTICAL CEILING UNITS

A. Acoustical Panels Type AP, ACT-1:

1. Surface Texture: Fine .
2. Composition: Mineral Fiber.
3. Color: White.
4. Size: 24IN x 24IN.
5. Edge Profile: Beveled Tegular 9/16IN for interface with 9/16" Exposed Tee grid.
6. Noise Reduction Coefficient (NRC), ASTM C 423: 0.80.
7. Ceiling Attenuation Class (CAC), ASTM C 1414: 35.
8. Sabin: N/A.
9. Articulation Class (AC): ASTM E 1111; 170 .
10. Flame Spread: ASTM E 1264; Class A (UL).
11. Light Reflectance White Panel, ASTM E 1477: 87%.
12. Dimensional Stability: high humidity applications.
13. Basis of Design: Ultima High-NRC, 1912HRC as manufactured by Armstrong World Industries.

2.3 METAL SUSPENSION SYSTEMS, GRD-1

A. Tee System, GRD-2

1. Basis of Design: Suprafine XL 9/16" Exposed Tee color Blizzard White as manu- factured by Armstrong World Industries.
2. Tee Width: 9/16”.
3. Color: White Powder-Coat to match panel.

B. Tee System, GRD-3

1. Tee System Basis of Design: SONATA 9/16" Dimensional Tee color Blizzard White as manufactured by Armstrong World Industries.
2. Edge Basis of Design: SONATA Shadow Molding color Blizzard White as manu- factured by Armstrong World Industries.
3. Tee Width: 9/16” with center extrusion.
4. Color: White Powder-Coat to match panel.

C. Components: Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.

a. Structural Classification: ASTM C 635 Heavy Duty

D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

E. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least time three design load, but not less than 12 gauge.

F. Edge Moldings and Trim:

1. 12ft Wall

Molding PART 3 -

EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at bor- ders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

3.3 INSTALLATION

A. Follow manufacturer installation instructions.

B. Install suspension system and panels in accordance with the manufacturer's

instruc- tions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.

C. Suspend main beam from overhead construction with hanger wires spaced 4-0 on cen- ter along the length of the main runner. Install hanger wires plumb and straight.

D. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

E. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border ar- eas and vertical surfaces.

F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting sur- faces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and sus- pension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove any ceiling products that cannot be successfully cleaned and or repaired. Replace with attic stock or new product to eliminate evidence of damage.

C. Before disposing of ceilings, contact the manufacturer to review with a consultant the condition and location of building where the ceilings will be removed. The consultant will verify the condition of the material and that it meets the manufacturer’s require- ments for recycling if so desired.

END OF SECTION

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

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 acoustical panels and exposed suspension systems for ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Recycled Content:

1. Product Data: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

C. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) in size.

1.4 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. Acoustical Ceiling Panels: Full-size panels equal to 7 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. 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: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

A. Source Limitations:

1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
2. Suspension System: Obtain each type from single source from single manufacturer.

B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

C. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface according to ASTM E 795.

D. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL PANELS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Armstrong World Industries, Inc.
2. CertainTeed Corp.
3. Chicago Metallic Corporation.
4. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type III, mineral base with painted finish**;** Form 2, water felted.

C. Color: White.

D. Edge/Joint Detail**:** Reveal sized to fit flange of exposed suspension-system members.

E. Thickness: 3/4 inch (19 mm).

F. Modular Size: 24 by 24 inches (610 by 610 mm).

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

E. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.

2.5 METAL SUSPENSION SYSTEM

A. Manufacturer: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the work include, but are not limited to, the following:

1. Armstrong World Industries, Inc.

2. CertainTeed Corp.
3. Chicago Metallic Corporation.
4. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation; with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.

1. Structural Classification: Intermediate-duty system.
2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
3. Face Design: Flat, flush.
4. Cap Material: Steel cold-rolled sheet.
5. Cap Finish: Painted white.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
7. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels as follows:
   a. As indicated on reflected ceiling plans.
   b. Install panels with pattern running in one direction parallel to short axis of space.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
5. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

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. Resilient base.
2. Resilient molding accessories.
3. Resilient stair accessories.

B. Related Sections:

1. Division 09 Section "Resilient Sheet Flooring" for resilient sheet floor coverings.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.6 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base: Refer to Finish Schedule Drawings Basis-of-Design for resilient base products.

B. Basis-of-Design Product: Subject to compliance with requirements, provide products shown on Finish Schedule drawings or equal. Equal products must be equal to basis-of-design products as determined by Contracting Officer in physical characteristics, material composition, color, finish and pattern.

C. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TP (rubber, thermoplastic).
2. Manufacturing Method: Group I (solid, homogeneous).
3. Style: Cove (base with toe).

D. Minimum Thickness: 0.125 inch (3.2 mm).

E. Height: 4-inches.

F. Lengths: Coils in manufacturer's standard length.

1. Cove Base: 120 feet.

G. Outside Corners:

1. Cove Base: Preformed.

H. Inside Corners:

1. Cove Base: Job formed.

I. Colors and Patterns: As shown on Finish Schedule Drawings.

2.2 RESILIENT STAIR ACCESSORIES

A. Resilient Stair Accessories: Refer to Finish Schedule Drawings Basis-of-Design for resilient stair accessories products.

B. Basis-of-Design Product: Subject to compliance with requirements, provide products shown on Finish Schedule drawings or equal. Equal products must be equal to basis-of-design products as determined by Contracting Officer in physical characteristics, material composition, color, finish and pattern.

C. Resilient Stair Treads Standard: ASTM F 2169.

1. Material Requirement: Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic).
   a. Class 2, Pattern: Raised-disc design.

D. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.

E. Nosing Height: 1-1/2 inches (38 mm).

F. Thickness: ¼ inch (6 mm) and tapered to back edge.

G. Size: Lengths and depths to fit each stair tread in one piece.

H. Risers: Smooth, flat, coved-toe, 7 inches (178 mm) high by length matching treads, produced by same manufacturer as treads and recommended by manufacturer for installation with treads.

1. Thickness: 0.125 inch (3.2 mm).

2.3 RESILIENT MOLDING ACCESSORY

A. Description: As shown on Finish Schedule Drawings.

B. Material: Rubber.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

C. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. Preformed Corners: Install preformed corners before installing straight pieces.

G. Job-Formed Corners:

1. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
2. Tightly adhere to substrates throughout length of each piece.
3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products until Substantial Completion.

END OF SECTION 09 65 13

SECTION 09 68 13 - TILE CARPETING

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 modular carpet tile.

B. Related Requirements:

1. Section 024119 "Selective Structure Demolition" for removing existing floor coverings.
2. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
   a. Review delivery, storage, and handling procedures.
   b. Review ambient conditions and ventilation procedures.
   c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations for each type of substrate.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.9 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Products: Refer to Finish Schedule Drawings for carpet tile products.

2.2 INSTALLATION ACCESSORIES

A. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. For raised access flooring systems, verify the following:

1. Access floor substrate is compatible with carpet tile and adhesive if any.
2. Underlayment surface is flat, smooth, evenly planed, tightly jointed, and free of irregularities, gaps greater than 1/8 inch (3 mm), protrusions more than 1/32 inch (0.8 mm), and substances that may interfere with adhesive bond or show through surface.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

C. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders and as shown on Finish Schedule drawings.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

SECTION 09 91 00 - PAINTING

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 surface preparation and the application of paint systems on substrates:

1. Interior steel other than that scheduled for painting under Section 09 96 00 "High-Performance Coatings".
2. Interior gypsum board.

B. Related Sections:

1. Section 09 96 00 - "High-Performance Coatings".

C. Related Requirements:

1. Division 08 Sections for shop priming of metal substrates with primers specified in this Section.

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
3. VOC content.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.

1. Nonflat Paints and Coatings: 150 g/L.
2. Primers, Sealers, and Undercoaters: 200 g/L.

D. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Colors: As indicated in Finish Schedule Drawings.

2.3 PRIMERS/SEALERS

A. Primer Sealer, Interior, Institutional Low Odor/VOC: MPI #149.

2.4 METAL PRIMERS

A. Primer, Alkyd, Quick Dry, for Metal: MPI #76.

2.5 WATER-BASED PAINTS

A. Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 2): MPI #144.

B. Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (Gloss Level 5): MPI #147.

C. Latex, Exterior Semi-Gloss (Gloss Level 5): MPI #11.

2.6 SOLVENT-BASED PAINTS

A. Alkyd, Exterior, Semi-Gloss (Gloss Level 5): MPI #94.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Masonry (CM): 12 percent.

2. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Existing Painted Steel Substrates: Remove paint, rust, loose mill scale, and shop primer, if any. Clean using the following method:
1. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:
   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Plastic conduit.
   g. Tanks that do not have factory-applied final finishes.
   h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
2. Paint the following work where exposed in occupied spaces:
   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Plastic conduit.
   g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   h. Other items as directed by Architect.
3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

A. CMU Substrates:

1. Institutional Low-Odor/VOC Latex System:
   a. First Coat (over existing paint): Latex, interior, institutional low odor/VOC, matching topcoat.
   b. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.

B. Steel Substrates:

1. Alkyd System:
   a. Prime Coat: Touch-up shop primer or metal primer for existing steel.
   b. Intermediate Coat: Alkyd exterior semi-gloss match topcoat..
   c. Topcoat: Alkyd exterior semi-gloss (Gloss Level 5) MPI #94.

C. Gypsum Board and Skim-Coated Substrates:

1. Institutional Low-Odor/VOC Latex System:
   a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
   b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
   c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

END OF SECTION 09 91 23

SECTION 10 14 00 – SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Panel Signs

1.2 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for signs.

1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.

C. Samples: For each sign type and for each color and texture required.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, coated on both surfaces with abrasion-resistant coating:

1. Impact Resistance: 16 ft-lbf/in. per ASTM D 256, Method A.
2. Tensile Strength: 9000 lbf/sq. in. per ASTM D 638.
3. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. per ASTM D 790.
4. Heat Deflection: 265 deg F at 264 lbf/sq. in. per ASTM D 648.
5. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.Min. thickness: 3/8” overall

B. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.

1. Panel Material: Opaque acrylic sheet.
2. Raised-Copy Thickness: Not less than 1/32 inch.

C. Engraved Copy: Machine engrave letters, numbers, symbols, and other graphic devices into panel sign on face indicated to produce precisely formed copy, incised to uniform depth.

1. Engraved Plastic Laminate: Engrave through exposed face ply of plastic-laminate sheet to expose contrasting core ply.

D. Subsurface Engraved Acrylic Sheet: Reverse-engrave back face of clear acrylic sheet. Fill resulting copy with enamel. Apply opaque background color coating over enamel-filled copy.

E. Colored Coatings for Acrylic Sheet: For copy colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are UV and water resistant for five years for application intended.
1. Color: Reviewed by the Contracting Officer and as selected from manufacturer's full range when not scheduled.

2.2 SIGNAGE

A. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:

1. Aluminum Sheet: See drawings.
2. Edge Condition: See drawings.
3. Corner Condition: See drawings.
4. Mounting: See drawings.

a. Wall mounted with concealed anchors
b. Manufacturer's standard anchors for substrates encountered.

5. Color and Graphics: See drawings.

2.3 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.

2.4. ACRYLIC SHEET FINISHES

Colored Coatings for Acrylic Sheet: For copy colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five years for application intended.

2.5 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ACE Sign Systems, Inc.
2. Advance Corporation; Braille-Tac Division.
3. Allen Industries Architectural Signage
4. Allenite Signs; Allen Marking Products, Inc.
5. APCO Graphics, Inc.
6. Appenx, Inc., 1-800-443-6032, www.appenx.com
7. ASI-Modulex, Inc.
8. Best Sign Systems Inc.
9. Bunting Graphics, Inc.
10. Fossil Industries, Inc.
11. Gemini Incorporated.
12. Grimco, Inc.
13. Innerface Sign Systems, Inc.
14. InPro Corporation
15. Matthews International Corporation; Bronze Division.
16. Mills Manufacturing Company.
17. Mohawk Sign Systems.
18. Nelson-Harkins Industries.
19. Seton Identification Products.
20. Signature Signs, Incorporated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects inappearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.

Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.

1. Hook-and-Loop Tapes: Mount signs to smooth, nonporous surfaces.

2. Magnetic Tape: Mount signs to smooth, nonporous surfaces.

3. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces.

4. Flush Mounting: Mount characters with backs in contact with wall surface.

5. Concealed anchors and fasteners as recommended by manufacturer.

END OF SECTION 10 14 00

SECTION 16075

ELECTRICAL IDENTIFICATION

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 electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.03 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Schedule of Nomenclature: An index of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate color, lettering style, and graphic features of identification products.

1.04 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70.

C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.01 RACEWAY AND CABLE LABELS

A. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.

1. Not less than 6 inches wide by 4 mils thick (152 mm wide by 0.102 mm thick).

2. Compounded for permanent direct-burial service.

3. Embedded continuous metallic strip or core.

4. Printed legend indicating type of underground line.

2.02 NAMEPLATES AND SIGNS

A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face.

2. Punched or drilled for mechanical fasteners.

C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4-inch (6.4-mm) grommets in corners for mounting.

D. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.03 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch (5 mm).

2. Tensile Strength: 50 lb (22.3 kg) minimum.

3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).

4. Color: According to color-coding.

B. Paint: Formulated for the type of surface and intended use.

1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.

2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.

3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.

4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Install painted identification according to manufacturer's written instructions and as follows:

1. Clean surfaces of dust, loose material, and oily films before painting.

2. Prime surfaces using type of primer specified for surface.

3. Apply one intermediate and one finish coat of enamel.

E. Color Banding Raceways and Exposed Cables: Band exposed and accessible raceways of the systems listed below:

1. Apply the following colors to the systems listed below:

a. Fire Alarm System: Red.

b. Fire-Suppression Supervisory and Control System: Red and yellow.

c. Combined Fire Alarm and Security System: Red and blue.

d. Security System: Blue and yellow.

e. Mechanical and Electrical Supervisory System: Green and blue.

f. Telecommunication System: Green and yellow.

F. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.

G. Circuit Identification Labels on Boxes: Install labels externally.

1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.

2. Concealed Boxes: Plasticized card-stock tags.

3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.

H. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm) overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

I. Color-Coding of Secondary Phase Conductors: Use the following colors for service, feeder and branch-circuit phase conductors:

1. 208/120-V Conductors:

a. Phase A: Black.

b. Phase B: Red.

c. Phase C: Blue.

2. 480/277-V Conductors:

a. Phase A: Yellow.

b. Phase B: Brown.

c. Phase C: Orange.

3. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:

a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch- (25-mm-) wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.

b. Colored cable ties applied in groups of three ties of specified color to each wire at each terminal or splice point starting 3 inches (76 mm) from the terminal and spaced 3 inches (76 mm) apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

J. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, manholes, and switchboard rooms.

1. Legend: 1/4-inch- (6.4-mm-) steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.

2. Tag Fasteners: Nylon cable ties.

3. Band Fasteners: Integral ears.

K. Apply identification to conductors as follows:

1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.

2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.

3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

L. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch- (9-mm-) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

M. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high lettering on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Panelboards, electrical cabinets, and enclosures.

2. Access doors and panels for concealed electrical items.

3. Electrical panelboards.

4. Emergency system boxes and enclosures.

5. Disconnect switches.

6. Enclosed circuit breakers.

7. Motor starters.

8. Push-button stations.

9. Power transfer equipment.

10. Contactors.

11. Remote-controlled switches.

12. Dimmers.

13. Control devices.

14. Transformers.

15. Power-generating units.

16. Telephone switching equipment.

17. Fire alarm master station or control panel.

END OF SECTION

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SECTION 16 12 00

CONDUCTORS AND CABLES

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 building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For testing agency.

C. Field Quality-Control Test Reports: From a qualified testing and inspecting agency engaged by Contractor.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

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.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.02 CONDUCTORS AND CABLES

A. Manufacturers:

1. American Insulated Wire Corp.; a Leviton Company.

2. General Cable Corporation.

3. Rome.

4. Southwire Company.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Material: Copper complying with NEMA WC 5, stranded.

D. Conductor Insulation Types: Type THW, THHN-THWN.

2.03 CONNECTORS AND SPLICES

A. Manufacturers:

1. AFC Cable Systems, Inc.

2. AMP Incorporated/Tyco International.

3. Hubbell/Anderson.

4. O-Z/Gedney; EGS Electrical Group LLC.

5. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 – EXECUTION

3.01 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway

C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: Type THHN-THWN, single conductors in raceway.

E. Exposed Branch Circuits, including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

H. Underground Feeders and Branch Circuits: Type UF multiconductor cable.

I. Fire Alarm Circuits: Type THHN-THWN, in raceway.

J. Class 1 Control Circuits: Type THHN-THWN, in raceway.

K. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.02 INSTALLATION

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."

F. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."

G. Identify and color-code conductors and cables according to Division 16 Section "Basic Electrical Materials and Methods".

3.03 CONNECTIONS

A. 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 and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.04 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality control testing:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.

2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B Test Reports: Prepare a written report to record the following:

1. Test procedures used.

2. Test results that comply with requirements.

3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

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SECTION 16130

RACEWAYS AND BOXES

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 raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. See Division 7 Section "Through-Penetration Firestop Systems" for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.

C. See Division 16 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.

D. See Division 16 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.03 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets indicated.

B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.

1.04 QUALITY ASSURANCE

A. 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.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.02 METAL CONDUIT AND TUBING

A. Manufacturers:

1. AFC Cable Systems, Inc.

2. Alflex Inc.

3. Anamet Electrical, Inc.; Anaconda Metal Hose.

4. Electri-Flex Co.

5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.

6. Manhattan/CDT/Cole-Flex.

7. O-Z Gedney; Unit of General Signal.

8. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. EMT and Fittings: ANSI C80.3.

1. Fittings: Compression type, 1-1/2-inch and above, set screw type below 1-1/2-inch.

E. FMC: Zinc-coated steel.

F. LFMC: Flexible steel conduit with PVC jacket.

G. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.03 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers:

1. American International.

2. Anamet Electrical, Inc.; Anaconda Metal Hose.

3. Arnco Corp.

4. Cantex Inc.

5. Certainteed Corp.; Pipe & Plastics Group.

6. Lamson & Sessions; Carlon Electrical Products.

7. RACO; Division of Hubbell, Inc.

8. Thomas & Betts Corporation.

B. RNC Fittings: NEMA TC 3; match to conduit type and material.

2.04 METAL WIREWAYS

A. Manufacturers:

1. Hoffman.

2. Square D.

B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1 or 3R.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Screw-cover type.

F. Finish: Manufacturer's standard enamel finish.

2.05 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.

2. Emerson/General Signal; Appleton Electric Company.

3. Hoffman.

4. Hubbell, Inc.; Killark Electric Manufacturing Co.

5. O-Z/Gedney; Unit of General Signal.

6. RACO; Division of Hubbell, Inc.

7. Robroy Industries, Inc.; Enclosure Division.

8. Scott Fetzer Co.; Adalet-PLM Division.

9. Spring City Electrical Manufacturing Co.

10. Thomas & Betts Corporation.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

E. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

F. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

G. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.08 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

B. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid steel.

2. Concealed: Rigid steel.

3. Underground, Single Run: Encased PVC, Sch. 40.

4. Underground, Grouped: Encased PVC, Sch. 40.

5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

6. Boxes and Enclosures: NEMA 250, Type 3R.

B. Indoors:

1. Exposed: EMT.

2. Concealed: EMT.

3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.

4. Damp or Wet Locations: Rigid steel conduit.

5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:

a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

C. Minimum Raceway Size: 1/2-inch trade size or as per drawings.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. RGSC: Use threaded rigid steel conduit fittings, unless otherwise indicated.

2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

3. EMT: Use compression fittings for 1/2-inch conduit and above. Below 1-1/2-inch use set screw type fittings.

E. Do not install aluminum conduits embedded in or in contact with concrete.

3.02 INSTALLATION

A. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."

D. Install temporary closures to prevent foreign matter from entering raceways.

E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.

F. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

2. Space raceways laterally to prevent voids in concrete.

3. Run conduit larger than 1-inch trade size (DN 27) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.

4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.

I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.

2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

J. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors.

K. Tighten compression fittings with suitable tools.

L. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.

2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

M. Install pull wires in empty raceways. 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.

N. Telephone and Signal System Raceways, 2-Inch Trade Size (DN 53) and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet (45 m) and with a maximum of two 90-deg ree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

O. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, 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 raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.

2. Where otherwise required by NFPA 70.

P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

Q. Flexible Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

R. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

S. Set floor boxes level and flush with finished floor surface.

T. Set floor boxes level. Trim after installation to fit flush with finished floor surface.

U. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.03 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

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SECTION 23 01 00

GENERAL HVAC REQUIREMENTS

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 SECTION INCLUDES:

A. General HVAC Requirements specifically applicable to all Division 23 Sections.

1.03 RELATED SECTIONS:

A. Bidding and Contract Requirements as well as Division 1 - General Requirements are applicable to this Section and to all other Sections of Division 23.

1.04 REFERENCES AND STANDARDS:

A. The latest editions of the following are hereby included in and made a part of Division 23:

NFPA	National Fire Protection Association
UL	Underwriters' Laboratories, Inc.
NEMA	National Electrical Manufacturer's Association
NEC	National Electric Code
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Contracting Officers
ARI	American Refrigeration Institute
AWWA	American Water Works Association
AMCA	Air Moving and Conditioning Association

AGA	American Gas Association
ASME	American Society of Mechanical Contracting Officers
AWS	American Welding Society
ANSI	American National Standards Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
GAMA	Gas Appliance Manufacturers Association
OSHA	Occupational Safety and Health Act
CISPI	Cast Iron Soil Pipe Institute

1.05 DRAWINGS AND SPECIFICATIONS:

A. With the exception of systems and equipment furnished by the Government if specified herein, it is intended that work covered by these specification and drawings include everything requisite and necessary to make the various systems complete and operative, irrespective of whether or not every item is specifically provided for. Any omission of direct reference herein to any essential item shall not excuse the Contractor from complying with the above intent.

B. In case of error or inconsistency, the most stringent requirement shall govern. Figured dimensions supersede scaled ones. The Contractor shall not take advantage of any error, omission or inconsistency in specifications and drawings, and shall promptly call the Contracting Officer's attention to any error, omission or inconsistency in the specifications and drawings.

C. Special attention is directed to requirements that equipment and materials called for in the specifications and/or indicated on the drawings shall be furnished, except if otherwise noted, completely installed, adjusted and left in safe and satisfactory operating condition. Accessories, appliances and connections necessary for operation of equipment shall be provided to the satisfaction of the Contracting Officer.

D. Materials, apparatus or equipment specified or otherwise provided for on drawings, addenda, or change orders issued subsequent to award of Contract, shall be same brand, type, quality and character originally specified, unless approved in writing by the Contracting Officer.

E. Layout of equipment, accessories, specialties and suspended, concealed, or exposed piping systems are diagrammatic unless dimensioned. In preparing shop drawings, Contractor shall check project conditions before installing work. If there are any interferences or conflicts, they shall be called to the attention of the Contracting Officer immediately for clarification.

F. The drawings indicate required size and points of termination of pipes and ducts and suggest routes to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that the drawings indicate all necessary offsets, and it shall be the responsibility of this Contractor to make the installation in such a manner as to conform to structure, avoid obstructions, preserve headroom and keep openings and passageways clear, without further instruction from or cost to the Government.

G. The Contractor shall fully inform himself regarding any and all peculiarities and limitations of the spaces available for the installation of all work and materials furnished and installed under the Contract. He shall exercise due and particular caution to determine that all parts of his work are made quickly and easily accessible.

1.06 RECORD DRAWINGS:

A. Each Contractor for Mechanical Work shall keep on the job one complete set of the Contract Working Drawings on which he shall record any deviations or changes from such contract drawings made during construction as stated in Division 1 - General Requirements. Record drawings shall show changes in:

1. Size, type, capacity, etc., of any material, device or piece of equipment.

2. Location of any device or piece of equipment.

3. Location of any outlet or source in Building Service Systems.

4. Routing of any piping, conduit, ducts, sewers or other building services.

B. These drawings shall also record the location of all concealed water piping, sewers, wastes, vents, ducts, conduit and other piping by indication of measured dimensions to each such line from readily identifiable and accessible walls or corners of the building. Drawings also shall show invert elevations of sewers and top of water lines.

C. These drawings shall be kept clean and undamaged, and shall not be used for any purpose other than recording deviations from the working drawings and exact locations of concealed work.

1.07 SHOP DRAWINGS:

A. Submit shop drawings for approval as described in Division 1 - General Requirements for items listed in each section of Division 23.

B. Prior to submitting shop drawings, check for dimensional correctness, interferences, and conformance to specifications and plans. Identify submittal data by project name and equipment identification number.

C. Each shop drawing shall bear the Contractor's stamp indicating that he has reviewed and approved that shop drawing. Shop drawings submitted without the Contractor's stamp will be rejected.

1.08 EXISTING UTILITIES:

A. Prior to beginning any work, especially excavation, notify the Utility Companies as required by law and determine the exact locations of existing utilities.

B. When unexpected utilities are encountered, report all damage to the utility company, the Government, and the Contracting Officer and alert neighbors of any hazards.

C. Conform to all requirements of each Utility Company or governing authority.

D. Active services encountered in work shall be protected and supported. If existing services not anticipated require relocation, Change Orders from the Contracting Officer will be issued. Inactive services encountered shall be removed or deactivated as shown or directed by the Contracting Officer. All costs for repair of damages to active services shall be paid by the contractor causing the damage.

1.09 UTILITY TIE-INS:

A. Make arrangements with the Contracting Officer, Utility Companies and enforcing governmental authorities for utility tie-ins for work in this Contract. B. Obtain all permits and pay fees connected with performing this work.

C. Arrange with all parties involved for shutdown and/or tie-ins with existing systems for minimum interruption of service.

D. Make application to local utility companies for permanent services and pay fees and charges.

1.10 INSPECTIONS:

A. Arrange and pay for all permits, fees and inspections required in connection with this installation. The Contractor must present the Contracting Officer with properly signed certificates of final inspection before the work will be accepted.

B. The Contractor shall call for all inspections when they become due, and shall not cover any work until approved.

1.11 ADHERENCE TO REGULATIONS:

A. Give notices and comply with laws, ordinances, rules, regulations and orders of any public authority bearing on the work. If Contractor observes that Contract Documents are at variance with such in any respect, promptly notify the Contracting Officer, in writing; necessary changes shall be adjusted by Change Order. If Contractor knowingly performs any work contrary to such without notice to the Contracting Officer, he shall assume full responsibility therefore and shall bear cost attributable thereto.

1.12 COORDINATED WORK:

A. Unless otherwise stipulated under a particular heading, the following rules relative to responsibilities of the Contractors will apply:

1. Fixed louvers in exterior building walls will be provided under other Sections of the Specifications. The Contractor for HVAC work shall provide dampers and shall make duct connections to each louver and shall blank off all unused portions. Closures shall be insulated and weathertight. Connections shall be watertight and shall drain to outside.

2. Door grilles will be provided under another Section of the Specifications.

3. Prefabricated roof curbs, equipment rails, and pipe curbs shall be provided by this Contractor and will be installed under another Section of the Specifications.

4. Flashing of curbed roof openings will be installed under another Section of the Specifications, but all counter-flashing shall be done by the Contractor for HVAC work.

5. Make-up water piping connections shall be provided by the Plumbing Contractor to within five (5) feet of the required point of connection to the equipment and there terminated with a shut-off valve. Each trade shall make the final connection to the equipment it installs.

6. Dampers and control valves in connection with automatic temperature control shall be furnished by the Temperature Control Contractor and installed by the HVAC Contractor.

7. Ceiling access panels will be installed by the General Contractor at locations determined by the HVAC and Plumbing Contractor.

8. Mechanical Contractor shall install all roughing-in pertaining to his trade for each item of equipment furnished under another Section of the Specifications or by the Government.

9. Plumbing and HVAC Contractors shall make final connections of equipment to roughing-in as specified in appropriate Sections of the Specifications.

1.13 TEMPORARY SERVICES:

A. Temporary services shall be provided as stated in Division 1 - General Requirements.

B. The work under Division 23 shall be coordinated with the work of other trades to prevent conflict or interference and to aid rapid completion of the overall project.

1.14 DAMAGE:

A. The Contractor will be held responsible for damage caused by his work or through neglect of his workmen. Repairing of damaged work shall be done by the Contractor as directed by the Contracting Officer. Cost of repairs shall be paid by the Contractor.

B. The Contractor is responsible for damages to the grounds, walks, roads, buildings, piping systems, electric systems and their equipment and contents, caused by leaks in the piping systems being installed or having been installed herein. He

shall repair, at his expense, all damage so caused. All repair work shall be done as directed by the Contracting Officer.

1.15 WARRANTY:

A. The Contractor shall warrant all materials and all work installed by him in accordance with Division 1 - General Requirements.

1.16 CLEANING UP:

A.Clean up shall be provided as stated in Division 1 - General Requirements.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS:

A. All equipment and materials shall be furnished in strict accordance with the equipment named and according to Specification requirements. Each bid shall be based upon one of materials or manufacturers specified.

B. Equipment and materials specified shall be considered to have prior approval, but submittal for approval is required. Furnish construction drawings to other Contractors when required to coordinate construction.

C. Where multiple manufacturers are named the drawings and specifications are based on the requirements and layouts for the equipment of the first named manufacturer. Any change required by the use of other named manufacturers such as revisions to foundations, bases, piping, controls, wiring, openings, and appurtenances shall be made by the Contractor at no additional cost to the Government.

2.02 MANUFACTURER'S NAMEPLATES:

A. Each unit of equipment shall be identified by a permanently attached nameplate of corrosion-resistant metal. Plates shall bear the following information:

1. Manufacturer's Name

2. Serial and Model Numbers

3. Rated Capacity

4. Temperature, Pressure or other Limitations

2.03 MOTORS:

A. All motors 1/2 HP and larger shall be high efficiency type for operation on power shown. Motors shall be selected for quiet operation and shall include a UL motor terminal box. All motors on belt driven equipment shall have adjustable rails.

B. Single phase motors 1/6 to 1/3 HP inclusive shall be capacitor type. Motors less than 1/6 HP shall be shaded pole type.

2.04 DRIVES AND GUARDS:

A. Belt drives should be based on a service factor of 1.5 as applied to the motor nameplate horsepower rating. Drives for less than one horsepower may use an adjustable drive sheave with adjustments plus or minus 12-1/2 percent. Drives for one horsepower and over shall use non-adjustable sheaves and have at least two belts. All multiple belt sets shall be matched.

B. Provide OSHA approved drive guards for each belt drive, secured to the equipment. Provide openings in skirt guards for insertion of revolution counter at drive sheave and driven centers. Provide conveniently removable coupling guard for direct driven equipment.

C. Provide a typed list of belt drives, listing each item, with size, bore size, keyway dimensions of each sheave and manufacturer's replacement belt numbers. Bind lists in the Maintenance Manual described in Article 3.16 in this Section of the Specifications.

PART 3 - EXECUTION

3.01 EQUIPMENT AND MATERIAL INSTALLATION:

A. All equipment and materials shall be installed in a neat and workmanlike manner by competent specialists for each subtrade. Materials shall be new. Seconds or damaged materials shall not be used. The installation of any equipment and materials not meeting these standards will be rejected by the Contracting Officer, and will be removed and reinstalled at no additional cost. The Contractor is responsible for the safety and good condition of the equipment, materials and systems installed until final acceptance by the Contracting Officer. All materials shall be stored in such a manner as to prevent any damage prior to installation. B. Safety devices shall be tested.

C. The Contractor shall be responsible for start-up, temporary operation, and shutdown of equipment prior to final acceptance by the Contracting Officer.

D. Field supervision and start-up service shall be provided by factory trained personnel authorized by the manufacturer.

E. Submit letters of certification to the Contracting Officer stating that equipment has been observed in operation, has been adjusted to perform as specified, and is installed in accordance with manufacturer's recommendations.

F. The Contracting Officer may require operation of parts or all of the installation prior to final acceptance. Cost of utilities for such operation shall be paid by the Contractor. Said operation shall not be construed as acceptance of the work.

3.02 PIPING INSTALLATION:

A. Piping systems shall be installed by competent workmen having skill in the trade.

B. Provide a union or flanges in piping connections at each valve, device, or item of equipment, and elsewhere as required to make-up or disconnect piping. Each union shall be installed to permit removal of parts and equipment, and in position permitting valve, device or equipment to be removed without disconnecting piping except at unions. Use di-electric unions at connections between dissimilar metals.

C. Do not use face and flush bushings, close nipples, or street ells unless authorized. Close nipples, when approved, shall be extra heavy.

D. Unless otherwise specified, branch connections in steel pipe less than 2/3 of main size may be made with weldolets, butt weld or threaded type. Branch connections 2/3 of main size and larger shall be made with weld tees, laterals or crosses. Shaped nipples are unacceptable.

E. Install piping to provide clearance for passages, headroom, operation of doors or windows, equipment, ductwork, electrical outlets, and Government's apparatus and equipment.

F. In pipe spaces to be entered for servicing, piping shall be offset so that all lateral runs are located either at the floor or 6'0" above and all vertical piping is held close to the walls through that height leaving maximum work space.

G. Piping containing liquids shall not be installed over electrical equipment unless approved by the Contracting Officer.

H. Install pipes, valves, fittings, etc. to be insulated, with 1/2" minimum clearance between the finished covering and other work, and between the finished covering of adjacent pipes.

I. Make changes in direction with fittings.

J. Install vertical lines plumb, and horizontal lines parallel, to building walls. Offset lines around columns, beams and other obstructions as required.

K. All lines shall be blown or flushed free of loose materials and strainer screens and sediment pockets shall be cleaned prior to being placed in service.

L. Install valves at service connections to equipment, at branch lines from main lines, at low points for draining each system, and at high points of equipment and piping to allow venting.

M. Install 1" pipe couplings with pipe plugs in pipe at each location where a pressure gauge or thermometer is to be located.

N. All valves shall be installed with their stems horizontal or above. All valves shall be of the same manufacture whenever possible.

O. All pressure piping systems installed shall conform to the requirements of the applicable piping and welding codes. Welding must be in accordance with ANSI B 31.1.

3.03 EQUIPMENT AND OPENING PROTECTION:

A. The Contractor shall provide various types of protection as follows:

1. Protect finished floors from chips and cutting oil by the use of metal chip receiving pan and oil-proof floor cover.

2. Protect equipment and finished surfaces from welding and cutting spatters with baffles and spatter blankets.

3. Use drop cloths to protect equipment and finished surfaces from paint droppings, insulation adhesive, sizing droppings, etc.

Construct/Maintain/Repair Various Rooms

B. All equipment shall be stored at the site with openings, bearings, etc., covered to exclude dust and moisture. All stockpiled pipe shall be placed on dunnage and protected from weather and from entry of foreign material.

C. Openings and excavations required for mechanical work shall be covered when work is not in progress, as follows:

1. Cover duct openings with visqueen.

2. Cap pipe openings with fittings or plugs.

3. Cover wall and ceiling openings with plywood, or visqueen covered framing.

4. Cover floor openings and excavations with structural material of adequate strength to support traffic in accordance with OSHA regulations.

3.04 CUTTING AND PATCHING:

A. Each Contractor shall do all cutting and patching as required for the installation of his work in accordance with Division 1 - General Requirements.

3.05 HOIST, RIGGINGS, TRANSPORTATION AND SCAFFOLDING:

A. Each Contractor shall provide all scaffolding, staging, cribbing, tackle, hoists and rigging necessary for placing all of his materials and equipment in their proper location on the project. All temporary work shall be removed from the premises when it is no longer required on the job.

B. Each Contractor shall pay all costs for transportation of materials and equipment to the job site and shall include such costs in his proposal.

C. Scaffolding and hoisting equipment shall comply with requirements of all pertinent Federal, State and Local Laws and Codes.

3.06 EQUIPMENT SUPPORTS, FOUNDATIONS, AND ANCHOR BOLTS:

A. Concrete equipment bases for floor mounted equipment shall be provided, by the Mechanical Contractor.

B. Provide anchor bolts, structural supports, platforms, braces, tie rods, etc. required to support or hang piping and equipment.

C. Where framed roof openings are required for equipment or ductwork and are not shown elsewhere, the Mechanical Contractor shall provide and install the required framing.

D. Machinery bases, bed plates, sole plates or vibration isolation units shall be carefully aligned, shimmed and leveled, then grouted in place with non-shrink grout.

3.07 ACCESSIBILITY AND ACCESS PANELS:

A. Install work so as to be readily accessible for operation, maintenance and repair.

B. Where valves, traps or other specialties are concealed in the construction or behind a wall or ceiling surface, the Contractor installing each item shall furnish an access panel of adequate size to permit adjustment or service.

C. Provide access doors in ductwork and equipment housings and wherever required for access to apparatus internals and fire dampers. Minimum door size 12" x 12" unless duct is less than 12" wide, then door size to be same as duct width.

D. The Contractor shall confer with other Contractors with respect to access panel locations and shall, wherever practical, group valves, traps, dampers, etc. in such a way as to be accessible from a single panel to eliminate as many access panels as possible.

E. Ceiling and wall access panels shall be as specified in Division 8.

3.08 LUBRICATION AND PACKING:

A. All equipment requiring lubrication shall be lubricated with the correct grade, type and quantity of lubricant before being placed in service.

B. Each shaft containing a packing gland shall be checked for condition by backing the packing gland off and examining for proper grade, amount and type of packing as recommended by the manufacturer.

C. Where lubricating points are not easily accessible, provide extensions.

D. Maintain all lubrication, gasket, and packing during construction, and assure that at the time of acceptance, all are in first class operating condition.

3.09 SLEEVES:

A. Where pipes pass through interior building walls, use machine cut Schedule 40 steel pipe sleeves 1" larger than outside diameter of pipe or pipe insulation. Set ends of sleeves flush with the finished wall surface. Fill space between pipe or pipe insulation and sleeve with fire-rated caulking to maintain the integrity of the wall.

B. Where pipes pass through floors use machine-cut Schedule 40 galvanized steel pipe sleeves 1" larger than outside diameter of pipe or pipe insulation with top of sleeve set 4" above finished floor. Fill space between pipe or insulation and sleeve with fire-rated caulking to maintain the integrity of the floor.

C. All sleeves shall be set true to line, grade, and plumb or level and shall be so maintained during construction by the installing Contractor. Where a sleeve is provided in concrete, Contractor setting sleeve shall inspect it while and after concrete is poured and correct any deviation from proper position.

3.10 PIPE ESCUTCHEONS:

A. Solid, malleable or cast iron escutcheons shall be used on pipes passing through outside walls. Escutcheon shall be secured to pipe with set screws; Ritter 101 or Fee & Mason 290.

B. Split type chrome escutcheons shall be used for exposed piping passing through finished walls, floors or ceilings. Escutcheons shall be brass, chromium plated, Ritter 3A; Fee & Mason 284, or Grinnell 13.

3.11 PIPE EXPANSION:

A. All piping shall be installed throughout the project with due regard for expansion to prevent damage to the building, equipment and piping. Provide anchors, loops, and guides where indicated or required for the accurate control of movement.

B. Branch connections to mains for heating risers and domestic hot water risers shall be made with minimum of two (2) 90 degree elbows.

C. Bulkhead connections in the return line of any piping service are expressly prohibited.

D. All loops, joints, compensators, etc., shall be supplemented with adequate guides as close to loops and joints as possible to preserve alignment and pitch.

3.12 POWDER ACTUATED ANCHORS:

A. Powder actuated anchoring devices will not be permitted without prior approval.

3.13 PAINTING:

A. Painting of mechanical items, unless otherwise specified, shall be done under Section 09 90 00. Contractor shall cooperate with and coordinate work with the Painting Contractor.

3.14 TEST AND ADJUSTMENTS:

A. Test Piping and Equipment as specified herein and elsewhere:

1. Equipment which would be damaged by required test pressure shall be isolated from system during test.

2. No piping work, fixtures, or equipment shall be concealed or covered until they have been inspected and approved by the proper inspector, who shall

   be notified when the work is ready for inspection. All work shall be completely installed, tested as required by these specifications, and shall be leaktight before an inspection is requested. All tests shall be repeated to the satisfaction of those making the inspection and the Contracting Officer.

3. In general, pressure tests shall be applied to piping only, before connection of equipment and appliances. In no case shall piping or appliances be subjected to pressures exceeding their ratings. Defective work shall be promptly repaired or replaced, and test shall be repeated until the particular system and component parts thereof receive approval of the Contracting Officer.

4. Any damage resulting from tests shall be repaired, or damaged materials replaced, to satisfaction of the Contracting Officer at no additional cost.

5. If Contractor does not promptly repair damages and defects, the Government reserves the right to remedy such damages and defects at the Contractor's expense.

6. Piping systems, except as modified hereinafter, shall be hydrostatically tested. When freezing temperatures are possible water shall have antifreeze added to prevent freezing at lowest temperature to be encountered.

7. Pneumatic tests may be substituted for hydrostatic tests only after approval by the Contracting Officer. Test shall be made by bringing system to 25 psi air pressure and checking for leaks with soap solution. After repair of leaks, system shall be pumped to test pressure and again checked for leaks. Each system shall be held at test pressure for 15 minutes prior to inspection for leaks.

8. See additional requirements for piping system tests in other Sections of Division 23.

B. At completion, the Contractor shall operate each system for a period of at least two days of eight hours each to demonstrate fulfillment of the requirements of the contract. During this time, all adjustments shall be made to the equipment so that it is in first class operating condition. The entire system is to be left in perfect operating condition acceptable to the Contracting Officer.

C. Final Operation:

1. Upon completion of the installation of the equipment, the Contractor shall place a competent person in charge, who shall operate the systems for a

   period of four (4) days, instructing the Government's personnel in all details of operation and maintenance.

2. System operation and instruction shall be two days during cooling season and two days during heating season.

3. Any required instructions from manufacturer's representative shall be given during these periods.

4. All arrangements for operation periods shall be made through the Contracting Officer.

3.15 MECHANICAL IDENTIFICATION: A.

Equipment:

1. Identify all mechanical equipment, systems and system components, in equipment rooms and on roof with permanent identification marking using equipment number listed in equipment schedules.

2. Markings to be made from engraved laminated black on gray plastic with letters not less than 1/4" high.

3. Identification markers shall be attached to equipment with brass screws or rivets. Adhesive attachments will not be permitted.

B. Piping:

1. All new exposed piping shall be identified as to service and direction of flow including that which is concealed in accessible spaces.

2. Use manufactured snap-on, pre-printed, color-coded plastic pipe markers which completely encircle and firmly grip pipe without the use of adhesives. Color-coding shall be in accordance with ANSI A13.1.

3. Indicate each pipe system by its designation as shown on the drawings, except drain and vent piping which may be indicated by color-coding only.

4. Install labels and flow arrows at the following locations:

    a. Equipment connections.

    b. Valves.

    c. 20 foot intervals on continuous pipe.

    d. Each branch connection.

    e. Each riser. C. Valves:

1. Identify all new valves, except those adjacent to fixtures and equipment, with brass numbered tags attached to valves with ring or chains. The use of wire to attach tags is unacceptable.

2. At completion of work provide valve directory, giving number of valve, service, building location by column coordinates, floor location, manufacturer's Fig. Number, size and equipment controlled. For service use designations shown on drawings. Directory to be placed in Maintenance Manual.

3.16 OPERATING INSTRUCTIONS AND MAINTENANCE MANUAL:

A. The Contractor shall carefully prepare two diagrams of all control systems with a full description and two service manuals for the entire heating and ventilating system. The

B. diagram shall be submitted for approval at least thirty (30) days before completion of the work. Failure to submit diagrams for approval will delay final inspection and acceptance of the work by the Contracting Officer.

C. The form in which the diagrams and Maintenance Manuals are to be presented shall be subject to the approval of the Contracting Officer.

D. After approval by the Contracting Officer, the control diagrams shall be mounted in a neat frame, with suitable backing under clear glass or plastic and installed where directed.

E. The following items together with any other necessary pertinent data shall be included in the manual. This list is not complete and is to be used as a guide only.

1. Manufacturer's name, nearest representative and model and serial numbers of components of system.

2. Operating instructions, start-up and shutdown procedure.

3. Maintenance and lubrication instructions.

4. Parts list with part numbers of all replaceable items.

5. Manufacturer's literature describing each piece of equipment.

6. One approved copy of each shop drawing submitted.

7. Valve directory indicting locations.

8. Written warranties.

9. Belt sizes, types, and lengths.

10. Control diagrams and operation sequence together with labeling of control piping, wiring, and instruments to match diagram.

11. Balance reports.

F. The Contractor shall also submit Maintenance Manuals for all plumbing and fire protection systems when applicable.

G. After approval of a copy of the manuals by the Contracting Officer, three (3) copies of each manual shall be furnished to the Government.

H. The Operating Instructions and Maintenance Manuals shall be considered a part of the final inspection and they shall be submitted for approval at least thirty (30) days in advance of the Contractor's request for final inspection.

3.17 REQUIREMENTS FOR FINAL INSPECTION:

A. All of the following items must be completed prior to final inspection. No exceptions will be made and no final payment will be made until all items are completed.

1. Thoroughly clean all fixtures and equipment. Exposed parts which are to be painted shall be thoroughly cleaned of cement, plaster and other materials and all oil and grease spots shall be removed.

2. Any factory finishes that have been damaged shall be cleaned, primed and touched up to match original finish.

3. Submission of Test and Balance reports.

4. Submission of Operating Instructions and Maintenance Manuals.

5. Submission of equipment warranties and manufacturer's written certificates.

6. Furnish one complete set of the following spare parts where applicable:

a. One set of gaskets for each pump.

b. Pump packing, mechanical seal.

c. Glass for each water gauge.

d. One set of all filters. (Does not include filters used during construction.)

e. Special keys, wrenches, etc.

END OF SECTION 23 01 00

SECTION 23 05 29

PIPE HANGERS AND SUPPORTS FOR HVAC PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES:

A. Pipe hangers and supports.

1.03 RELATED SECTIONS:

A. Section 23 01 00 - General HVAC Requirements

F. Section 23 07 19 - HVAC Piping Insulation

G. Section 23 23 00 – Refrigerant Piping

1.04 SUBMITTALS:

A. Shop drawings and product data in accordance with Section 230100.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Grinnell

B. Michigan

C. Unistrut

2.02 PIPE HANGERS AND SUPPORTS:

A. All hangers and supports shall be galvanized or cadmium plated except those

indicated as copper plated.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel split ring.

C. Hangers for Pipe Sizes 2 to 4 Inches and Cold Pipe Sizes 6 Inches and Over: Carbon steel, adjustable, clevis.

D. Hangers for Hot Pipe Sizes 6 inches and Over: Adjustable steel yoke, cast iron roll, double hanger.

E. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for hot pipe sizes 6 inches and over.

F. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

G. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll for hot pipe sizes 6 inches and over.

H. Vertical Support: Steel riser clamp.

I. Floor Support for Pipe Sizes to 4 Inches and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.

J. Floor Support for Hot Pipe Size 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

K. Copper Pipe support: Carbon steel ring, adjustable, copper plated.

L. Shield for Insulated Piping 2 Inches and Smaller: Eighteen (18) gauge galvanized steel shield over insulation in 180 degrees segments, minimum 12 inches long at pipe support.

M. Shield for Insulated Piping 2-1/2 Inches and Larger (Except Cold Water Piping): Pipe covering protective saddles.

N. Shields for Insulated Cold Water Piping 2-1/2 Inches and Larger: Hard block non-conducting saddles in 90 degrees segments, 12 inch minimum length, block thickness same as insulation thickness.

2.03 HANGER RODS:

A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded. Rods shall be galvanized.

2.04 INSERTS:

A. Malleable iron case over galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms: size inserts to suit threaded hanger rods.

PART 3 - EXECUTION

3.01 INSERTS:

A. Provide inserts for placement in concrete formwork by others.

B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Where concrete slabs form finished ceilings, provide inserts to be flush with slab surface.

3.02 PIPE HANGERS AND SUPPORTS:

A. Support horizontal piping as follows:

PIPE SIZE	ROD DIAMETER	STEEL PIPE SPACING	COPPER PIPE SPACING	PVC PIPE SPACING
Through 1"	3/8"	8'	6'	5'
1-1/4"	3/8"	10'	10'	5'
1-1/2"	3/8"	10'	10'	5'
2"	3/8"	12'	10'	5'
2-1/2"	1/2"	12'	12'	5'
3"	1/2"	12'	12'	5'

4"	5/8"	16'	12'	5'
6"	3/4"	16'	N/A	5'
8"	7/8"	20'	N/A	5'
10"	1"	20'	N/A	5'

END OF SECTION

SECTION 23 07 13

DUCTWORK INSULATION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES:

A. Ductwork insulation and jackets.

1.03 RELATED SECTIONS:

A. Section 23 01 00 – HVAC Requirements.

B. Section 23 31 13 – Ductwork and Accessories.

1.04 SUBMITTALS:

A. Submit Product Data in accordance with Section 23 01 00.

B. Include product description, list of materials and thickness for each service, and locations.

C. Submit manufacturer's installation instructions.

1.05 QUALITY ASSURANCE:

A. Installer shall be a company specializing in insulation application with three (3) years minimum experience.

B. Materials shall have a flame spread/smoke developed rating of 25/50 in accordance with ASTM E-84, NFPA 255 and UL 723.

PART 2 – PRODUCTS

2.01 MANUFACTURERS:

A. Owens-Corning.

B. CertainTeed.

C. Knauf.

2.02 MATERIALS:

A. Type A: Flexible glass fiber all service duct wrap with a "K" value of 0.25 at 75 degrees F, foil scrim vapor barrier facing, and a density of 1.5 pcf.

B. Type B: Rigid glass fiber duct board insulation with a "K" value of 0.24 at 75 degrees F, factory applied ASJ white vapor barrier jacket, and a density of 6.0 pcf.

C. Type C: Flexible glass fiber duct liner with a "K" value of 0.24 at 75 degrees F, and a density of 1.5 pcf. Liner shall be coated air side for a maximum 6,000 ft./min. air velocity.

D. Adhesives: Waterproof fire-retardant type.

E. Indoor Jacket: Factory-applied.

F. Outdoor Jacket: Coated glass fiber sheet, 30 lbs/sq. yd.

G. Lagging Adhesive: Fire resistive to ASTM E-84, NFPA 255 and UL 723.

H. Impale Anchors: Galvanized steel, 12 gauge, self-adhesive pad.

I. Joint Tape: Glass fiber cloth, open mesh to match jacket.

PART 3 – EXECUTION

3.01 PREPARATION:

A. Install materials after ductwork has been tested and approved.

B. Clean surfaces for adhesives.

3.02 INSTALLATION:

A. Install materials in accordance with manufacturer's instructions.

B. Supply airducts concealed above ceilings shall be insulated with 1-1/2" thick Type A insulation as follows:

1. Insulation shall be applied with edges tightly butted. Where duct width exceeds 18", bottom of the insulation shall be additionally held in place with a row of pins and clips down the center on 18" centers.

2. All joints shall be sealed by taping with 3" wide vapor barrier tape. Patches of tape shall be applied where pins protrude through the facing.

3. Duct insulation shall have an installed insulation value of R-6.

C. Supply, return and outside air ducts exposed in Mechanical Equipment Roomsand unconditioned spaces shall be insulated with 1" thick Type B insulation as follows:

1. Insulation shall be fastened to duct with mechanical fasteners. Fasteners shall be spaced 12" to 8" on center with a minimum of two rows per side of duct. Secure insulation in place with washers firmly embedded in insulation.

2. Seal all joints, breaks and punctures with fire retardant vapor barrier adhesive reinforced with a 3" wide vapor barrier strip similar to that of the facing.

D. Supply and return ducts exposed in conditioned spaces shall not be insulated. See Architectural reflected ceiling plans for areas with finished ceilings.

E. Exhaust ductwork shall not be insulated unless noted otherwise.

END OF SECTION 23 07 13

SECTION 26 05 00 - BASIC ELECTRICAL MATERIALS AND METHODS

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.

B. The construction, installation, workmanship, equipment and materials shall be in accordance with the latest issues of the following standards and regulations insofar as they apply:

Occupational Safety and Health Act (OSHA)
National Fire Protection Association (NFPA)
National Electric Manufacturers Association (NEMA)

1.02 SUMMARY

A. This Section includes the following:

1. Raceways.
2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Electrical identification.
5. Electrical demolition.
6. Touchup painting.

1.03 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. RGSC: Intermediate metal conduit.

D. LFMC: Liquid-tight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit.

F. RGSC: Rigid galvanized steel conduit.

G. "Provide" is defined as "furnish new, install, and make operational".

H. "Replace" is defined as "remove, furnish new, install in same location, and make operational".

I. "Relocate" is defined as "remove existing, install existing in different location, and make operational".

J. "Reinstall" is defined as "remove, install in same location, and make operational".

1.04 SUBMITTALS

A. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.

B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.05 QUALITY ASSURANCE

A. 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.

B. Comply with NFPA 70.

C. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of exterior underground utilities and services.

2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

1.06 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

D. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 – PRODUCTS

2.01 RACEWAYS

A. EMT: ANSI C80.3, zinc-coated steel, with compression fittings.

B. FMC: Flexible metal conduit.

C. RGSC: ANSI C80.6, zinc-coated steel, with threaded fittings.

D. LFMC: Zinc-coated steel with sunlight-resistant and mineral-oil-resistant plastic jacket.

E. RNC: NEMA TC 2, Schedule 40 PVC, with NEMA TC3 fittings.

F. RGSC: ANCI C80.1, galvanized steel

G. Raceway Fittings: Specifically designed for the raceway type with which used.

2.02 CONDUCTORS

A. Conductors, No. 10 AWG and Smaller: Stranded copper.
B. Conductors, Larger Than No. 10 AWG: Stranded copper.
C. Insulation: Thermoplastic, rated at 75 deg C minimum.
D. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

2.03 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch (14-mm) diameter slotted holes at a maximum of 2-inches (50-mm) on center, in webs.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable iron casting with hot-dip galvanized finish.

G. Expansion Anchors: Carbon steel wedge or sleeve type.

H. Toggle Bolts: All-steel springhead type.

I. Powder-Driven Threaded Studs: Heat-treated steel.

J. Supporting devices mounted in finished/public areas or as instructed by the Contracting Officer shall be painted. Coordinate type and color of paint with the Contracting Officer.

2.04 ELECTRICAL IDENTIFICATION

A. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1-inch wide by 3-mils thick (25-mm wide by 0.08-mm thick).

C. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:

1. Not less than 6-inches wide by 4-mils thick (150-mm wide by 0.102-mm thick).

2. Compounded for permanent direct-burial service.

3. Embedded continuous metallic strip or core.

4. Printed legend that indicates type of underground line.

D. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

E. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.

F. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch (1.6-mm) minimum thickness for signs up to 20 sq. in. (129 sq. cm) and 1/8-inch (3.2-mm) minimum thickness for larger sizes. Engraved legend in white letters on black background.

G. Interior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Preprinted, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.

H. Fasteners for Nameplates and Signs: Self-tapping, stainless steel screws or No. 10/32 stainless steel machine screws with nuts and flat and lock washers.

2.05 TOUCHUP PAINT

A. For Equipment: The Equipment Manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by the Item Manufacturer.

PART 3 – EXECUTION

3.01 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.02 RACEWAY APPLICATION

A. Use the following raceways for outdoor installations:

1. Exposed: RGSC.
2. Concealed: RGSC.
3. Underground, Single Run: Encased PVC, Schedule 40.
4. Underground, Grouped: Encased PVC, Schedule 40.
5. Connection to Vibrating Equipment: LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.
7. RGSC: As required by NFPA 70.

B. Use the following raceways for indoor installations:

1. Exposed: EMT.
2. Concealed: EMT.
3. Connection to Vibrating Equipment: FMC.

   a. Exception in wet or damp locations: Use LFMC.
4. Damp or Wet Locations: RGSC.
5. Boxes and Enclosures: NEMA 250, Type 1, unless otherwise indicated.
6. RGSC: As required by NFPA 70. 96 inches above finished floor in exposed areas.

3.03 RACEWAY AND CABLE INSTALLATION

A. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.

B. Install raceways and cables at least 6-inches (150-mm) away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.

C. Use temporary raceway caps to prevent foreign matter from entering.

D. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

E. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.

F. Install raceways embedded in slabs in middle third of slab thickness where practical, and leave at least 3-inch (75-mm) concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

2. Space raceways laterally to prevent voids in concrete.

3. Install conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.

4. Transition from PVC to RGSC before rising above floor. RGSC to stub above floor a minimum of six inches.

5. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.

G. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-pound (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of the pull wire.

H. Install telephone and signal system raceways, 2-inch trade size and smaller, in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.

I. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inch (1830-mm) flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.

J. Set floor boxes level and trim after installation to fit flush to finished floor surface.

3.04 WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS

A. Feeders: Type THHN/THWN insulated conductors in raceway

B. Underground Feeders and Branch Circuits: Type THWN or single-wire, Type UF insulated conductors in raceway.

C. Branch Circuits: Type THHN/THWN insulated conductors in raceway.

D. Remote-Control Signaling and Power-Limited Circuits: Type THHN/THWN insulated conductors in raceway for Classes 1, 2, and 3, unless otherwise indicated.

3.05 WIRING INSTALLATION

A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

B. Install wiring at outlets with at least 12 inches (300 mm) of slack conductor at each outlet.

C. Connect outlet and component connections to wiring systems and to ground. Tighten electrical connectors and terminals, according to the Equipment Manufacturer's published torque-tightening values. If the Equipment Manufacturer's torque values are not indicated, use those specified in UL 486A.

3.06 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with the Support Manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-pound (90-kg) design load.

3.07 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable iron pipe hangers or clamps.

F. Install 1/4-inch (6-mm) diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable iron hangers for 1 1/2-inch (38-mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-resistance-rated gypsum walls and of all other fire-resistance-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.

2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.

3. Existing Concrete: Expansion bolts.

4. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.

5. Steel: Welded threaded studs or spring-tension clamps on steel.

   a. Field Welding: Comply with AWS D1.1.

6. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.

7. Light Steel: Sheet metal screws.

8. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.08 IDENTIFICATION MATERIALS AND DEVICES

A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

C. Identify raceways and cables with color banding as follows:

1. Colors: As follows:

a. Fire Alarm System: Red.
b. Security System: Blue and yellow.
c. Telecommunication System: Green and yellow.

D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

E. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6- to 8-inches (150- to 200-mm) below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm), overall, use a single line marker.

F. Color-code 208/120-volt system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:

1. Phase A: Black.
2. Phase B: Red.
3. Phase C: Blue.
4. Equipment Ground: Green.
5. Neutral: White or Gray.

G. Color-code 480/277-volt system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:

1. Phase A: Yellow.
2. Phase B: Brown.
3. Phase C: Orange:
4. Equipment Ground: Green
5. Neutral: White or Gray

H. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

J. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch (9-mm) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.09 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-resistance-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."

3.10 DEMOLITION

A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.

B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.

C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2-inches (50-mm) below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

D. Remove demolished material from Project site and dispose of in accordance with all applicable laws.

E. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.11 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.12 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:
   1. Raceways.
   2. Building wire and connectors.
   3. Supporting devices for electrical components.
   4. Electrical identification.
   5. Electrical demolition.
   6. Cutting and patching for electrical construction.
   7. Touchup painting.

3.13 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."

   1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.

   2. Follow the Paint Manufacturer's written instructions for surface preparation and for timing and application of successive coats.

   3. Repair damage to galvanized finishes with zinc-rich paint recommended by the Item Manufacturer.

   4. Repair damage to PVC or paint finishes with matching touchup coating recommended by the Equipment Manufacturer.

3.14 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

3.15 TEMPORARY ELECTRICAL POWER

A. Provide necessary equipment and materials to supply temporary 480-volt, three-phase, and 120-volt, single-phase power for lighting and tools.

B. All work to be in accordance with Article 305 of the NFPA 70.

A. Daily type use extension cords, work lights, etc. will be provided by other trades.

B. This Contractor shall furnish temporary power to a maximum of 60 amps. Additional temporary power requirements above 60 amps shall be negotiated with the requesting contractor.

C. Contracting Officer will assume the cost of the electrical energy used.

D. The temporary power system shall remain in place until the permanent power system is in operation. This Contractor shall then remove all materials and equipment previously installed.

END OF SECTION

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves and sleeve seals for cables.

1.03 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.04 QUALITY ASSURANCE

A. 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.

B. Comply with NFPA 70.

1.05 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.01 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy American Act, provide products from one of the manufacturers listed below:

Alcan Products Corporation; Alcan Cable Division.

1. American Insulated Wire Corp.; a Leviton Company.

2. General Cable Corporation.
3. Senator Wire & Cable Company.
4. Southwire Company.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.

2.02 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements this section and with the provisions of the Buy American Act, provide products from one of the manufacturers listed below:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.03 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052or 0.138-inch thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping as specified.

2.04 SLEEVE SEALS

Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy American Act, provide products from one of the manufacturers listed below:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Carbon steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper, Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, 75 degree C, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHNTHWN, 75 degree C. single conductors in raceway

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, 75 degree C. single conductors in raceway.

D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHNTHWN, 75 degree C. single conductors in raceway

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."

F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.04 CONNECTIONS

A. 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 and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.05 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping as specified.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
2. For sleeve rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both wall surfaces.

G. Extend sleeves installed in floors 6 inches above finished floor level.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials as specified.

K. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.06 SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.07 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

3.08 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 26 05 19

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

1. This Section includes methods and materials for grounding systems and equipment.

1.03 QUALITY ASSURANCE

A. 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.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.01 CONDUCTORS

A. Insulated Conductors: tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. 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 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.

5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.02 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.03 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad, 3/4 inch by10 feet in diameter.

PART 3 - EXECUTION

3.01 APPLICATIONS

A. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches below grade.

2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.

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.

3.02 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.

2. Lighting circuits.

3. Receptacle circuits.

4. Single-phase motor and appliance branch circuits.

5. Three-phase motor and appliance branch circuits.

6. Flexible raceway runs.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

3.03 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.

2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.

3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

D. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

E. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

3.04 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

END OF SECTION 26 05 26

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. RMC: Rigid metal conduit.

1.03 PERFORMANCE REQUIREMENTS

A. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.04 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.05 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements as specified.

PART 2 - PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

B. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. Allied Tube & Conduit.
2. Cooper B-Line, Inc.; a division of Cooper Industries.
3. ERICO International Corporation.
4. GS Metals Corp.
5. Thomas & Betts Corporation.
6. Unistrut; Tyco International, Ltd.
7. Wesanco, Inc.

C. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

D. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

E. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

F. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

G. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

H. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

I. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:
1. Hilti Inc.
2. ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
3. MKT Fastening, LLC.
4. Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

J. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

K. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

L. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

M. Toggle Bolts: All-steel springhead type.

N. Hanger Rods: Threaded steel.

2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.01 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.02 SUPPORT INSTALLATION

A. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.

B. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.04 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 4000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements as specified.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnishedwith items to be embedded.
2. Install anchor bolts to elevations required for proper attachment tosupported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.05 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 29

SECTION 26 05 33 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.03 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. NBR: Acrylonitrile-butadiene rubber.

H. RNC: Rigid nonmetallic conduit.

1.04 QUALITY ASSURANCE

A. 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.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 METAL CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.

B. Rigid Steel Conduit: ANSI C80.1.

C. EMT: ANSI C80.3.

D. LFMC: Flexible steel conduit with PVC jacket.

E. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: set-screw below 2 ½" or compression type 2 ½" and above.

F. Joint Compound for Rigid Steel Conduit: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.02 METAL WIREWAYS

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of Buy America Act, provide products from one of the manufacturers listed below:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type

E. Finish: Manufacturer's standard enamel finish.

2.03 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act,, provide products from one of the manufacturers listed below:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The). B.Sheet Metal

Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

E. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

F. Hinged-Cover Enclosures: 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.

2.04 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052or 0.138-inch thickness as indicated and of length to suit application.

PART 3 - EXECUTION 3.01

RACEWAY APPLICATION

A.

1. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
2. Boxes and Enclosures, Aboveground: NEMA 250, Type 4.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: ENT.
2. Exposed, Not Subject to Severe Physical Damage: EMT
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit

4. Concealed in Ceilings and Interior Walls and Partitions: EMT
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: Rigid steel conduit. C. Minimum Raceway

Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.02 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hotwater pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

I. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.

J. 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.

3.03 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 Division 31 Section "Earth Moving" for pipe less than 6 inches in nominal diameter.

2. Install backfill

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 of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.

3.04 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.03 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 POWER RACEWAY IDENTIFICATION MATERIALS.

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

2.02 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

2.03 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.04 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2.05 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

2.06 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.07 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.

2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.

3. Temperature Range: Minus 40 to plus 185 deg F.

4. Color: Black.

2.08 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainlesssteel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Colors for 208/120-V Circuits:
   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.

2. Colors for 480/277-V Circuits:
   a. Phase A: Brown.
   b. Phase B: Orange.
   c. Phase C: Yellow.

G. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.

H. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.

I. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

J. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Equipment to Be Labeled:

   a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
   b. Enclosures and electrical cabinets.
   c. Access doors and panels for concealed electrical items.
   d. Switchgear.
   e. Switchboards.
   f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
   g. Emergency system boxes and enclosures.
   h. Motor-control centers.
   i. Enclosed switches.
   j. Enclosed circuit breakers.
   k. Enclosed controllers.
   l. Variable-speed controllers.

m. Push-button stations.
n. Power transfer equipment.
o. Contactors.
p. Remote-controlled switches, dimmer modules, and control devices.

END OF SECTION 26 05 53

SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following lighting control devices:

1. Time switches.

2. Outdoor photoelectric switches.

3. Indoor occupancy sensors.

4. Lighting contactors.

B. Related Sections include the following:

1. Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.03 DEFINITIONS

A. LED: Light-emitting diode.

B. PIR: Passive infrared.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.05 QUALITY ASSURANCE

A. 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.

1.06 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.01 TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. Area Lighting Research, Inc.; Tyco Electronics.

2. Grasslin Controls Corporation; a GE Industrial Systems Company.

3. Intermatic, Inc.

4. Leviton Mfg. Company Inc.

5. Lightolier Controls; a Genlyte Company.

6. Lithonia Lighting; Acuity Lighting Group, Inc.

7. Paragon Electric Co.; Invensys Climate Controls.

8. Square D; Schneider Electric.

9. TORK.

10. Watt Stopper .

B. Electronic Time Switches: Electronic, solid-state programmable units with alphanumeric display; complying with UL 917..

1. Program: 8 on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.

2. Astronomic Time: Selected channels.

3. Battery Backup: For schedules and time clock.

2.02 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. Area Lighting Research, Inc.; Tyco Electronics.

2. Grasslin Controls Corporation; a GE Industrial Systems Company.

3. Intermatic, Inc.

4. Lithonia Lighting; Acuity Lighting Group, Inc.

5. Novitas, Inc.

6. Paragon Electric Co.; Invensys Climate Controls.

7. Square D; Schneider Electric.

8. TORK.

9. Watt Stopper.

B. Description: Solid state, with DPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lx), with an adjustment for turn-on and turn-off levels within that range and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.

2. Time Delay: 15-second minimum, to prevent false operation.

3. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for Category A1 locations.

4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to directsensor to the north sky exposure.

2.03 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. Watt Stopper.

2. Hubbell Lighting.

3. Leviton Mfg. Company Inc.

4. Lithonia Lighting; Acuity Lighting Group, Inc.

5. Sensor Switch, Inc.

B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.

3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.

4. Mounting:
   a. Sensor: Suitable for mounting in any position on a standard outlet box.
   b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
   c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.

C. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.

1. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).

2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

3. Detection Coverage (Corridor): Detect occupancy within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling.

D. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.

1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).

2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. (56 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. (186 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling in a corridor not wider than 14 feet (4.3 m).

E. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.

2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum

3. movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).

4. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch-(2440-mm-) high ceiling.

2.04 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. Allen-Bradley/Rockwell Automation.

2. ASCO Power Technologies, LP; a division of Emerson Electric Co.

3. Eaton Electrical Inc.; Cutler-Hammer Products.

4. GE Industrial Systems; Total Lighting Control.

5. Grasslin Controls Corporation; a GE Industrial Systems Company.

6. Hubbell Lighting.

7. Lithonia Lighting; Acuity Lighting Group, Inc.

8. MicroLite Lighting Control Systems.

9. Square D; Schneider Electric.

10. TORK.

11. Watt Stopper.

B. Description: Electrically operated and electrically held, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 10 percent or less total harmonic distortion of normal load current).

2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.

3. Enclosure: Comply with NEMA 250.

4. Provide with control and pilot devices as **indicated on Drawings**, matching the NEMA type specified for the enclosure.

2.05 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.01 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.02 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.03 WIRING INSTALLATION

A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 1/2 inch (13 mm).

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.04 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.

2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.05 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.

2. Operational Test: Verify operation of each lighting control device, and adjust time delays.

B. Lighting control devices that fail tests and inspections are defective work.

3.06 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.07 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices. Provide a minimum of 4 hours of training. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 26 09 23

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Snap switches.
3. Wall-switch occupancy sensors.
4. Wall-switch timer switches.

B. Related Sections include the following:

1.03 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

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.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.02 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

B. GFCI receptacles, 125 V. 20A, feed- through type, include indicator light that is lighted when device is tripped.

2.03 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A,

1. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

2.04 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- thick, satin-finished stainless steel
3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.

2.05 OCCUPANCY SENSORS

A. Wall-Switch Sensors:

1. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

a. Watt Stopper
b. Cooper; 6111 for 120 V, 6117 for 277 V.
c. Hubbell; WS1277.
d. Leviton; ODS 10-ID.
e. Pass & Seymour: WS3000.

2.06 TIMER SWITCHES

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. Leviton Mfg. Company Inc.
2. Lightolier Controls; a Genlyte Company.
3. Lithonia Lighting; Acuity Lighting Group, Inc..
4. Watt Stopper (The).

B. Timer Switches: Adjustable from 5 minutes to 12 hours.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.

4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

3.02 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

END OF SECTION 26 27 26

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SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. Section Includes:
1. Nonfusible switches.
2. Molded-case circuit breakers (MCCBs).
3. Enclosures.

1.03 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.04 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

C. Field quality-control reports.
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements. D. Manufacturer's field service report.

E. Operation and Maintenance Data: For enclosed switches and circuit breakers 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. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
   2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. 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.

E. Comply with NFPA 70.

1.06 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.01 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   3. Siemens Energy & Automation, Inc.
   4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   3. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.02 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   3. Siemens Energy & Automation, Inc.
   4. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

E. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I^2t response.

F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and letthrough ratings less than NEMA FU 1, RK-5.

G. Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical or Compression type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

2.03 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. As noted on drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02

INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Comply with NECA 1.

3.03 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.04 FIELD QUALITY CONTROL.

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.05 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 26 28 16

SECTION 26 50 00

FIRE ALARM

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 fire alarm systems with manual stations, detectors, signal equipment, controls, and devices.

1.03 DEFINITIONS

A. FACP: Fire alarm control panel.

B. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.04 SYSTEM DESCRIPTION

A. General: Noncoded, addressable-analog system with manual and automatic alarm initiation; automatic sensitivity control of certain smoke detectors; and multiplexed signal transmission dedicated to fire alarm service only.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operating Instructions: For mounting at the FACP.

C. Product Certificates: Signed by manufacturers of system components certifying that products furnished comply with requirements.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Comply with NFPA 72.

F. Maintenance Data: For fire alarm systems to include in maintenance manuals specified in Division 1. Comply with NFPA 72.

G. Submissions to Authorities Having Jurisdiction: In addition to distribution requirements for Submittals specified in Division 1 Section "Submittals," make an identical submission to authorities having jurisdiction. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to the Contracting Officer for review.

H. Certificate of Completion: Comply with NFPA 72.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is an authorized representative of the FACP manufacturer for both installation and maintenance of units required for this Project.

B. Manufacturer Qualifications: A firm experienced in manufacturing systems similar to those indicated for this Project and with a record of successful in-service performance.

C. Source Limitations: Obtain fire alarm system components through one source from a single manufacturer.

D. Compliance with Local Requirements: Comply with applicable building code, local ordinances and regulations, and requirements of authorities having jurisdiction.

E. Comply with NFPA 72.

1.07 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but not less than one unit.

2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but not less than one unit.

3. Smoke Detectors and Heat Detectors: Quantity equal to 10 percent of amount of each type installed, but not less than one unit of each type.

4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but not less than one unit of each type.

56. Keys and Tools: One extra set for access to locked and tamperproofed components.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products as indicated on drawings:

2.02 FUNCTIONAL DESCRIPTION OF SYSTEM

A. Control of System: By the FACP.

B. System Supervision: Automatically detect and report open circuits, shorts, and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.

C. Priority of Signals: Automatic alarm response functions resulting from an alarm signal from one zone or device are not altered by subsequent alarm, supervisory, or trouble signals. An alarm signal is the highest priority. Supervisory and trouble signals have second- and third-level priority. Higher-priority signals take precedence over signals of lower priority, even when the lower-priority condition occurs first. Annunciate and display all alarm, supervisory, and trouble signals regardless of priority or order received.

D. Noninterference: A signal on one zone shall not prevent the receipt of signals from other zones.

E. System Reset: All zones are manually resettable from the FACP after initiating devices are restored to normal.

F. Transmission to Remote Alarm Receiving Station: Automatically route alarm, supervisory, and trouble signals to a remote alarm station by means of a digital alarm communicator transmitter and telephone lines.

G. Transmission to Remote Alarm Receiving Station: Automatically route alarm, supervisory, and trouble signals to a remote alarm receiving station by means of a radio alarm transmitter.

H. System Alarm Capability during Circuit Fault Conditions: System wiring and circuit arrangement prevent alarm capability reduction when a single ground occurs in an initiating device circuit, signal line circuit, or notification-appliance circuit.

I. System Alarm Capability during Circuit Fault Conditions: System wiring and circuit arrangement prevent alarm capability reduction when a single ground or open circuit occurs in an initiating device circuit, signal line circuit, or notification-appliance circuit.

J. System Alarm Capability during Circuit Fault Conditions: System wiring and circuit arrangement prevent alarm capability reduction when an open circuit, ground or wire-to-wire short occurs, or an open circuit and a ground occur at the same time in an initiating device circuit, signal line circuit, or notification-appliance circuit.

K. Loss of primary power at the FACP initiates a trouble signal at the FACP. The FACP indicates when the fire alarm system is operating on the secondary power supply.

L. Loss of primary power at the FACP initiates a trouble signal at the FACP and the annunciator. An emergency power light is illuminated at both locations when the system is operating on the secondary power supply.

M. Basic Alarm Performance Requirements: Unless otherwise indicated, operation of a manual station, automatic alarm operation of a flame or heat detector, operation of a sprinkler flow device, or verified automatic alarm operation of a smoke detector initiates the following:

N. Basic Alarm Performance Requirements: Unless otherwise indicated, operation of a manual station, automatic alarm operation of a smoke or flame or heat detector, or operation of a sprinkler flow device initiates the following:

1. Notification-appliance operation.
2. Identification at the FACP and the remote annunciator of the zone originating the alarm.

3. Identification at the FACP and the remote annunciator of the device originating the alarm.
4. Transmission of an alarm signal to the remote alarm receiving station.

5. Unlocking of electric door locks in designated egress paths.
6. Release of fire and smoke doors held open by magnetic door holders.
7. Shutdown of fans and other air-handling equipment serving zone when alarm was initiated.
8. Recording of the event in the system memory.
9. Recording of the event by the system printer.

O. Alarm Silencing, System Reset and Indication: Controlled by switches in the FACP.

P. Alarm Silencing, System Reset and Indication: Controlled by switches in the FACP and the remote annunciator.

1. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

Q. Water-flow alarm switch operation initiates the following:

1. Notification-appliance operation.
2. Flashing of the device location-indicating light for the device that has operated.

R. Operating a heat detector in the elevator shaft shuts down elevator power by operating a shunt trip in a circuit breaker feeding the elevator.

S. Smoke detection for zones or detectors with alarm verification initiates the following:

1. Audible and visible indication of an "alarm verification" signal at the FACP.
2. Activation of a listed and approved "alarm verification" sequence at the FACP and the detector.
3. Recording of the event by the system printer.
4. General alarm if the alarm is verified.

5. Cancellation of the FACP indication and system reset if the alarm is not verified.

T. Sprinkler valve-tamper switch operation initiates the following:

1. A supervisory, audible, and visible "valve-tamper" signal indication at the FACP and the annunciator.
2. Flashing of the device location-indicating light for the device that has operated.
3. Recording of the event by the system printer.
4. Transmission of supervisory signal to remote alarm receiving station.

U. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system initiates the following:

1. A supervisory, audible, and visible "sprinkler trouble" signal indication at the FACP and the annunciator.
2. Flashing of the device location-indicating light for the device that has operated.
3. Recording of the event by the system printer.
4. Transmission of trouble signal to remote central station.

V. Removal of an alarm-initiating device or a notification appliance initiates the following:

1. A "trouble" signal indication at the FACP and the annunciator for the device or zone involved.
2. Recording of the event by the system printer.
3. Transmission of trouble signal to remote alarm receiving station.

W. FACP Alphanumeric Display: Plain-English-language descriptions of alarm, supervisory, and trouble events; and addresses and locations of alarm-initiating or supervisory devices originating the report. Display monitoring actions, system and component status, system commands, programming information, and data from the system's historical memory.

2.03 MANUAL PULL STATIONS

A. Description: Fabricated of metal or plastic, and finished in red with molded, raised-letter operating instructions of contrasting color. Device to match existing or as indicated on drawings.

2.04 DETECTORS

A. Device to match existing, or as indicated on drawings.

2.05 RADIO ALARM TRANSMITTER

A. Devices existing, or as indicated on drawings.

2.06 WIRE

A. Wire to be per manufacturer's recommendations.

PART 3 - EXECUTION

3.01 EQUIPMENT INSTALLATION

B. Connect the FACP with a disconnect switch with lockable handle or cover.

C. Manual Pull Stations: Mount semiflush in recessed back boxes.

D. Water-Flow Detectors and Valve Supervisory Switches: Connect for each sprinkler valve station required to be supervised.

E. Ceiling-Mounted Smoke Detectors: Not less than 4 inches (100 mm) from a side wall to the near edge. For exposed solid-joist construction, mount detectors on the bottom of joists. On smooth ceilings, install not more than 30 feet (9 m) apart in any direction.

F. Smoke Detectors near Air Registers: Install no closer than 60 inches (1520 mm).

G. Duct Smoke Detectors: Comply with manufacturer's written instructions.

1. Verify that each unit is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
2. Install sampling tubes so they extend the full width of the duct.

H. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit.

I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling.

J. Device Location-Indicating Lights: Locate in public space near the device they monitor.

K. FACP: Surface mount with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

L. Antenna for Radio Alarm Transmitter: Mount to building structure as recommended by manufacturer. Use mounting arrangement and substrate connection that will resist 100-mph (160-km/h) wind load with a 1.3 gust factor without damage.

3.02 WIRING INSTALLATION

A. Wiring Method: Install wiring in metal raceway according to Division 16 Section "Raceways and Boxes." Conceal raceway except in unfinished spaces and as indicated.

B. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by the manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

C. Cable Taps: Use numbered terminal strips in junction, pull and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

D. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

E. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signal from other floors or zones.

F. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.03 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 16 Section "Basic Electrical Materials and Methods."

B. Identify system components, wiring, cabling, and terminals according to Division 16 Section "Electrical Identification."

C. Install instructions frame in a location visible from the FACP.

D. Paint power-supply disconnect switch red and label "FIRE ALARM."

3.04 GROUNDING

A. Ground cable shields and equipment according to system manufacturer's written instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes of type, size, location, and quantity as indicated. Comply with installation requirements in Division 16 Section "Grounding."

D. Ground equipment and conductor and cable shields. For audio circuits, minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

E. Ground radio alarm transmitter system and equipment as required by the Air Force AFI.

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and connections and to supervise pretesting, testing, and adjustment of the system. Report results in writing.

B. Pretesting: After installation, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the compliance of the system with requirements of Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones, and retest

until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

C. Report of Pretesting: After pretesting is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of witnesses to preliminary tests.

D. Final Test Notice: Provide a minimum of 10 days' notice in writing when the system is ready for final acceptance testing.

E. Minimum System Tests: Test the system according to procedures outlined in NFPA 72. Minimum required tests are as follows:

1. Verify the absence of unwanted voltages between circuit conductors and ground.
2. Test all conductors for short circuits using an insulation-testing device.
3. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on record drawings.
4. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.
5. Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
6. Test each initiating and indicating device for alarm operation and proper response at the control unit. Test smoke detectors with actual products of combustion.
7. Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications. Observe all voice audio for routing, clarity, quality, freedom from noise and distortion, and proper volume level.
8. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.

F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets Specifications and complies with applicable standards.

G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log on the satisfactory completion of tests.

H. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.

3.06 CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

3.07 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, adjusting, and maintaining equipment and schedules. Provide a minimum of 8 hours' training.
2. Training Aid: Use the approved final version of the operation and maintenance manual as a training aid.
3. Schedule training with Contracting Officer, with at least seven days' advance notice.

3.08 ON-SITE ASSISTANCE

A. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit actual occupied conditions. Provide up to three requested visits to Project site for this purpose.

END OF SECTION

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SECTION 26 51 00

INTERIOR LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Exterior and Interior lighting fixtures, lamps, and ballasts.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

1.03 DEFINITIONS

A. BF: Ballast factor.

B. CCT: Correlated color temperature.

C. CRI: Color-rendering index.

D. HID: High-intensity discharge.

E. LER: Luminaire efficacy rating.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.04 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions, emergency battery and charger.

B. Installation instructions.

1.05 QUALITY ASSURANCE

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.

1.06 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.07 WARRANTY

A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Fluorescent Ballast and Batteries: Five years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining four years.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. Daybrite
2. Lithonia
3. Cooper

B. Lighting fixtures are scheduled on the drawings

2.02 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

B. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

   a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
   b. UV stabilized.

G. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and ballast characteristics:

   a. "USE ONLY" and include specific lamp type.
   b. Lamp diameter code (T-4, T-5, T-8, etc.), tube configuration (twin, quad, triple, etc.), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
   c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
   d. Start type (preheat, rapid start, instant start, etc.) for fluorescent and compact fluorescent luminaires.
   e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
   f. CCT and CRI for all luminaires.

2.03 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. General Requirements for Electronic Ballasts:

1. Comply with UL 935 and with ANSI C82.11.
2. Designed for type and quantity of lamps served.
3. Ballasts shall be designed for full light output

B. Electronic Programmed-Start Ballasts for T5 Lamps: Comply with ANSI C82.11 and the following:

1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
2. Automatic lamp starting after lamp replacement
3. Ballast Manufacturer Certification: Indicated by label.

C. Ballasts for Low-Temperature Environments:

1. Temperatures 0 Deg F and Higher: Electronic type rated for 0 deg F starting and operating temperature with indicated lamp types.

2.04 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:

1. Lamp end-of-life detection and shutdown circuit.
2. Automatic lamp starting after lamp replacement.
3. Sound Rating: Class A.
4. Total Harmonic Distortion Rating: Less than 10 percent.
5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: 1.7 or less.
8. BF: 0.95 or higher unless otherwise indicated.
9. Power Factor: 0.98 or higher.
10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

2.05 EMERGENCY FLUORESCENT POWER UNIT

A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.

1. Emergency Connection: Operate one fluorescent lamp continuously at an output of 1100 lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.

2.06 BALLASTS FOR HID LAMPS

A. Electronic Ballast for Metal-Halide Lamps: Include the following features unless otherwise indicated:

1. Minimum Starting Temperature: Minus 20 deg F for single-lamp ballasts.
2. Rated Ambient Operating Temperature: 130 deg F.
3. Lamp end-of-life detection and shutdown circuit.
4. Sound Rating: Class A.
5. Total Harmonic Distortion Rating: Less than 20 percent.
6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
7. Lamp Current Crest Factor: 1.5 or less.
8. Power Factor: 0.90 or higher.

2.07 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

a. Battery: Sealed, maintenance-free, nickel-cadmium type.
b. Charger: Fully automatic, solid-state type with sealed transfer relay.
c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of dischargecycle.

2.08 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type.

2. Charger: Fully automatic, solid-state type with sealed transfer relay.

3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.09 FLUORESCENT LAMPS

A. T5HO rapid-start, high-output lamps, rated 54 W maximum, nominal length of 45.2 inches, 5000 initial lumens (minimum), CRI 85 (minimum), color temperature 5000 K, and average rated life of 20,000 hours unless otherwise indicated.

B. T5 rapid-start lamps, rated 28 W maximum, nominal length of 45.2 inches, 2900 initial lumens (minimum), CRI 85 (minimum), color temperature 5000 K, and average rated life of 20,000 hours unless otherwise indicated.

C. T5 rapid-start lamps, rated 14 W maximum, nominal length of 22 inches, 1350 initial lumens (minimum), CRI 85 (minimum), color temperature 4100 K, and average rated life of 20,000 hours unless otherwise indicated.

D. Compact Fluorescent Lamps: 4-Pin, CRI 82 (minimum), color temperature 4100 K, average rated life of 10,000 hours at three hours operation per start, unless otherwise indicated.

1. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).

2.10 HID LAMPS

A. Metal-Halide Lamps: ANSI C78.43, with minimum CRI 65, and color temperature 4000 K.

2.11 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.

2. Install lamps in each luminaire.

B. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.

1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches from lighting fixture corners.

2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.

3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.02 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.03 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

END OF SECTION 26 51 00

SECTION 27 05 00

COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Communications equipment coordination and installation.
2. Sleeves for pathways and cables.
3. Sleeve seals.
4. Grout.
5. Common communications installation requirements.

1.03 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.04 COORDINATION

A. Coordinate arrangement, mounting, and support of communications equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting pathways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for communications items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping.

PART 2 - PRODUCTS

2.01 SLEEVES FOR PATHWAYS AND CABLES

A. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).

b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.02 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.

1. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.

3. Pressure Plates: Stainless steel. Include two for each sealing element.

4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.03 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.

PART 3 - EXECUTION

3.01 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.02 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors **2 inches (50 mm)** above finished floor level.

G. Size pipe sleeves to provide **1/4-inch (6.4-mm)** annular clear space between sleeve and pathway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint.

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials.

K. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using stainless-steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

3.03 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.04 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly.

END OF SECTION 27 05 00

SECTION 27 15 00

COMMUNICATIONS CABLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Pathways.
2. UTP cabling.
3. 62.5/125-micrometer, optical fiber cabling.
4. Coaxial cable.
5. Multiuser telecommunications outlet assemblies.
6. Cable connecting hardware, patch panels, and cross-connects.
7. Telecommunications outlet/connectors.
8. Cabling system identification products.
9. Cable management system.

1.03 DEFINITIONS

A. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.

B. BICSI: Building Industry Consulting Service International.

C. Channel Cable Tray: A fabricated structure consisting of a one-piece, ventilated-bottom or solid-bottom channel.

D. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.

E. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

F. EMI: Electromagnetic interference.

G. IDC: Insulation displacement connector.

H. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).

I. LAN: Local area network.

J. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/connectors.

K. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

L. RCDD: Registered Communications Distribution Designer.

M. Solid-Bottom or Nonventilated Cable Tray: A fabricated structure consisting of longitudinal side rails and a bottom without ventilation openings.

N. Trough or Ventilated Cable Tray: A fabricated structure consisting of longitudinal side rails and a bottom having openings for the passage of air.

O. UTP: Unshielded twisted pair.

1.04 CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
2. Horizontal cabling shall contain no more that one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
3. Bridged taps and splices shall not be installed in the horizontal cabling.
4. Splitters shall not be installed as part of the optical fiber cabling.

B. A work area is approximately 100 sq. ft. (9.3 sq. m), and includes the components that extend from the telecommunications outlet/connectors 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. The maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) in the horizontal cross-connect.

1.05 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

B. Testing Agency Qualifications: An NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

C. 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.

D. 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.

E. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

F. Grounding: Comply with ANSI-J-STD-607-A.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cables to determine the continuity of the strand end to end. Use optical fiber flashlight or optical loss test set.

2. Test optical fiber cables 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.

3. Test each pair of UTP cable for open and short circuits.

1.08 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.

1.09 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.1 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for two years.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.01 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-A.

B. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

C. Cable Trays: As specified in Section 260536.

2.02 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm). Comply with requirements in Division 06 Section "Rough Carpentry" for plywood backing panels.

2.03 UTP CABLE

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. Belden CDT Inc.; Electronics Division.
2. Berk-Tek; a Nexans company.
3. CommScope, Inc.
4. Draka USA.
5. Genesis Cable Products; Honeywell International, Inc.
6. KRONE Incorporated.
7. Mohawk; a division of Belden CDT.
8. Nordex/CDT; a subsidiary of Cable Design Technologies.
9. Superior Essex Inc.
10. SYSTIMAX Solutions; a CommScope, Inc. brand.
11. 3M.
12. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Description: 100-ohm, 4-pair UTP, formed into 25-pair, binder groups covered with a blue thermoplastic jacket.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following

types:

a. Communications, Plenum Rated: Type CMP complying with NFPA 262.
b. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.

2.04 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. American Technology Systems Industries, Inc.
2. Dynacom Corporation.
3. Hubbell Premise Wiring.
4. KRONE Incorporated.
5. Leviton Voice & Data Division.
6. Molex Premise Networks; a division of Molex, Inc.
7. Nordex/CDT; a subsidiary of Cable Design Technologies.
8. Panduit Corp.
9. Siemon Co. (The).
10. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

1. Number of Jacks per Field: One for each four-pair UTP cable plus spares and blank positions adequate to suit specified expansion criteria.

F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

G. Patch Cords: Factory-made, four-pair cables in 48-inch (1200-mm) lengths; terminated with eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.

2.05 OPTICAL FIBER CABLE

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. Berk-Tek; a Nexans company.
2. CommScope, Inc.
3. Corning Cable Systems.
4. General Cable Technologies Corporation.
5. Mohawk; a division of Belden CDT.
6. Nordex/CDT; a subsidiary of Cable Design Technologies.
7. Optical Connectivity Solutions Division; Emerson Network Power.
8. Superior Essex Inc.
9. SYSTIMAX Solutions; a CommScope, Inc. brand.
10. 3M.
11. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Description: Multimode, 62.5/125-micrometer, minimum 24-fiber, tight buffer, optical fiber cable.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA/EIA-568-B.3 for performance specifications.
3. Comply with TIA/EIA-492AAAA-A for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

a. General Purpose, Nonconductive: Type OFN or OFNG.
b. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
c. Riser Rated, Nonconductive: Type OFNR complying with UL 1666.

d. General Purpose, Conductive: Type OFC or OFCG.
e. Plenum Rated, Conductive: Type OFCP, complying with NFPA 262.
f. Riser Rated, Conductive: Type OFCR, complying with UL 1666.

5. Conductive cable shall be steel armored type.
6. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.

7. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

C. Jacket:

1. Jacket Color: Orange for 62.5/125-micrometer cable.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

2.06 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. ADC.
2. American Technology Systems Industries, Inc.
3. Berk-Tek; a Nexans company.
4. Corning Cable Systems.
5. Dynacom Corporation.
6. Hubbell Premise Wiring.
7. Molex Premise Networks; a division of Molex, Inc.
8. Nordex/CDT; a subsidiary of Cable Design Technologies.
9. Optical Connectivity Solutions Division; Emerson Network Power.
10. Siemon Co. (The).

B. 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.

C. Patch Cords: Factory-made, dual-fiber cables in 36-inch (900-mm) lengths.

D. Cable Connecting Hardware:

1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.

2. Quick-connect, simplex and duplex, Type SC, Type ST, Type LC or Type MT-RJ connectors. Insertion loss not more than 0.75 dB.

3. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.07 COAXIAL CABLE

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. Alpha Wire Company.
2. Belden CDT Inc.; Electronics Division.
3. Coleman Cable, Inc.
4. CommScope, Inc.
5. Draka USA.

B. Cable Characteristics: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.

C. RG-11/U: NFPA 70, Type CATV.

1. No. 14 AWG, solid, copper-covered steel conductor.
2. Gas-injected, foam-PE insulation.
3. Double shielded with 100 percent aluminum polyester tape and 60 percent aluminum braid.
4. Jacketed with sunlight-resistant, black PVC or PE.
5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.

D. RG59/U: NFPA 70, Type CATVR.

1. No. 20 AWG, solid, silver-plated, copper-covered steel conductor.

2. Gas-injected, foam-PE insulation.
3. Triple shielded with 100 percent aluminum polyester tape and 95 percent aluminum braid; covered by aluminum foil with grounding strip.
4. Color-coded PVC jacket.

E. RG-6/U: NFPA 70, Type CATV or CM.

1. No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum-foil shield and 60 percent aluminum braid.
3. Jacketed with black PVC or PE.
4. Suitable for indoor installations.

F. RG59/U: NFPA 70, Type CATV.

1. No. 20 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum polyester tape and 40 percent aluminum braid.
3. PVC jacket.

G. RG59/U (Plenum Rated): NFPA 70, Type CMP.

1. No. 20 AWG, solid, copper-covered steel conductor; foam fluorinated ethylene propylene insulation.
2. Double shielded with 100 percent aluminum-foil shield and 65 percent aluminum braid.
3. Copolymer jacket.

H. NFPA and UL compliance, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:

1. CATV Cable: Type CATV.
2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.
3. CATV Riser Rated: Type CATVR, complying with UL 1666.
4. CATV Limited Rating: Type CATVX.

2.08 COAXIAL CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. Aim Electronics; a brand of Emerson Electric Co.
2. Leviton Voice & Data Division.
3. Siemon Co. (The).

B. Coaxial-Cable Connectors: Type BNC, 75 ohms.

2.09 CONSOLIDATION POINTS

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. American Technology Systems Industries, Inc.
2. Chatsworth Products, Inc.
3. Dynacom Corporation.
4. Hubbell Premise Wiring.
5. Molex Premise Networks; a division of Molex, Inc.
6. Nordex/CDT; a subsidiary of Cable Design Technologies.
7. Ortronics, Inc.
8. Panduit Corp.
9. Siemon Co. (The).

B. Description: Consolidation points shall comply with requirements for cable connecting hardware.

1. Number of Terminals per Field: One for each conductor in assigned cables.
2. Number of Connectors per Field:
   a. One for each four-pair UTP cable indicated.
   b. One for each four-pair conductor group of indicated cables, plus 25 percent spare positions.
3. Mounting: Recessed in ceiling, wall, Desk or Furniture.
4. NRTL listed as complying with UL 50 and UL 1863.

5. When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

2.10 MULTIUSER TELECOMMUNICATIONS OUTLET ASSEMBLY (MUTOA)

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:

1. Chatsworth Products, Inc.
2. Hubbell Premise Wiring.
3. Molex Premise Networks; a division of Molex, Inc.
4. Nordex/CDT; a subsidiary of Cable Design Technologies.
5. Ortronics, Inc.
6. Panduit Corp.
7. Siemon Co. (The).

B. Description: MUTOAs shall meet the requirements for cable connecting hardware.

1. Number of Terminals per Field: One for each conductor in assigned cables.
2. Number of Connectors per Field:
   a. One for each four-pair UTP cable indicated.
   b. One for each four-pair conductor group of indicated cables, plus 25 percent spare positions.
3. Mounting Recessed in ceiling, wall, Desk or Furniture.
4. NRTL listed as complying with UL 50 and UL 1863.
5. Label shall include maximum length of work area cords, based on TIA/EIA-568-B.1.
6. When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

2.11 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.

B. Workstation Outlets: Two or Four port-connector assemblies mounted in

single or multigang faceplate.

1. Plastic Faceplate: High-impact plastic. Coordinate color with Division 26 Section "Wiring Devices."
2. Metal Faceplate: Stainless steel complying with requirements in Division 26 Section "Wiring Devices."
3. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.
   a. Flush mounting jacks, positioning the cord at a 45-degree angle.
4. Legend: Factory labeled by silk-screening or engraving for stainless steel.
5. Legend: Machine printed, in the field, using adhesive-tape label.
6. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.12 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

2.13 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

2.14 CABLE MANAGEMENT SYSTEM

A. Manufacturers: Subject to compliance with requirements of this section and with the provisions of the Buy America Act, provide products from one of the manufacturers listed below:
   1. iTRACS Corporation.
   2. Telsoft Solutions.
   3.

B. Description: Computer-based cable management system, with integrated database and graphic capabilities.

C. Document physical characteristics by recording the network, TIA/EIA details,

and connections between equipment and cable.

D. Information shall be presented in database view.

E. System shall interface with the following testing and recording devices:

1. Direct upload tests from circuit testing instrument into the personal computer.
2. Direct download circuit labeling into labeling printer.

2.15 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.

C. Factory test UTP cables according to TIA/EIA-568-B.2.

D. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.

E. Factory-sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.

F. Cable will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

PART 3 - EXECUTION

3.01 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.02 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, in attics, and in 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 Division 26 Section "Raceway and Boxes for Electrical 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 to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.03 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.

B. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

C. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

D. Install manufactured conduit sweeps and long-radius elbows whenever possible.

E. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits **3 inches (76 mm)** above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

F. Backboards: Install backboards with 96-inch (2440-mm) dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.04 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. MUTOA shall not be used as a cross-connect point.
5. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:
   a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
   b. Locate consolidation points for UTP at least 49 feet (15 m) from communications equipment room.
6. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
7. Cables may 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.
8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
10. 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.
11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
12. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
13. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of

termination to maintain cable geometry.

D. Optical Fiber Cable Installation:

1. Comply with TIA/EIA-568-B.3.
2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable 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.

F. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable **6 feet (1800 mm)** long not less than **12 inches (300 mm)** in diameter below each feed point.

G. Outdoor Coaxial Cable Installation:

1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X. Install corrosion-resistant connectors with properly designed O-rings to keep out moisture.
2. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches (915 mm).

H. Group connecting hardware for cables into separate logical fields.

I. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A for separating unshielded copper voice and data 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 (610 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 and 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).

3.05 FIRESTOPPING

A. Comply with TIA/EIA-569-A, Annex A, "Firestopping."

B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.06 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

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.

3.07 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

1. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

B. Using cable management system software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable and asset management software shall reflect as-built conditions.

C. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration, including optional identification requirements of this standard.

D. Cable Schedule: Post in 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, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.

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 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 being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
   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.
6. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.

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/EIA-606-A.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.08 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. Visually inspect UTP and optical fiber cable 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/EIA-568-B.1.
2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

D.

1. Test UTP backbone copper 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 not cross-connection.

   a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. 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.

2. Optical Fiber Cable Tests:

   a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.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 1 direction according to TIA/EIA-526-14-A, 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 that calculated according to equation in TIA/EIA-568-B.1.

3. UTP Performance Tests:

   a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:

      1) Wire map.
      2) Length (physical vs. electrical, and length requirements).
      3) Insertion loss.
      4) Near-end crosstalk (NEXT) loss.
      5) Power sum near-end crosstalk (PSNEXT) loss.
      6) Equal-level far-end crosstalk (ELFEXT).
      7) Power sum equal-level far-end crosstalk (PSELFEXT).
      8) Return loss.
      9) Propagation delay.
      10) Delay skew.

4. Optical Fiber Cable Performance Tests: Perform optical fiber end-to-end link tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.3.

5. Final Verification Tests: Perform verification tests for UTP and optical fiber systems after the complete communications cabling and workstation

outlet/connectors are installed.

a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.

b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

E. Document data for each measurement. 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.

F. End-to-end cabling will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

END OF SECTION 27 15 00