Tanana Chiefs Conference
Rampart Health Clinic
Rampart, Alaska

Final Construction Documents

For:
Tanana Chiefs Conference
122 First Avenue
Fairbanks, Alaska 99701

April 23, 2026

Design Alaska

Tanana Chiefs Conference
Rampart Health Clinic
Rampart, Alaska

Final Construction Documents

Table of Contents

- **Specifications**
- **Calculations & Cut Sheets**
- **Allowable Bearing Capacity Letter**
- **Appendix 1 - Geotechnical Report**

By:
Design Alaska, Inc.
601 College Road
Fairbanks, AK 99701

April 23, 2026

DIVISION 05	METALS
05 12 00	Structural Steel Framing
DIVISION 06	WOOD, PLASTICS, AND COMPOSITES
06 10 00	Rough Carpentry
06 17 53	Shop-Fabricated Wood Trusses
06 18 00	Glued-Laminated Construction
06 41 00	Architectural Wood Casework
DIVISION 07	THERMAL AND MOISTURE PROTECTION
07 21 00	Thermal Insulation
07 25 00	Building Envelope Barriers
07 41 13	Metal Roof Panels
07 42 13	Metal Wall Panels
07 84 00	Firestopping
DIVISION 08	OPENINGS
08 11 13	Hollow Metal Doors and Frames
08 14 16	Flush Wood Doors
08 33 23	Overhead Coiling Doors
08 54 13	Fiberglass Windows
08 71 00	Door Hardware
DIVISION 09	FINISHES
09 21 16	Gypsum Board Assemblies
09 51 00	Acoustical Ceilings
09 65 00	Resilient Flooring
09 68 13	Tile Carpeting
09 72 00	Wall Coverings
09 91 13	Exterior Painting
09 91 23	Interior Painting
DIVISION 10	SPECIALTIES
10 14 23	Panel Signage
10 28 00	Toilet, Bath, and Laundry Accessories
10 44 00	Fire Protection Specialties
DIVISION 12	FURNISHINGS
12 36 00	Countertops

DIVISION 20	MECHANICAL
20 01 00	Operation and Maintenance for Mechanical
20 05 00	Common Work Results
20 05 11	Common Submittal Requirements for Mechanical
20 05 13	Common Motor Requirements for Mechanical
20 05 29	Hangers and Supports for Mechanical
20 05 48	Seismic Controls for Mechanical
20 05 53	Identification for Mechanical
20 07 00	Insulation for Mechanical
DIVISION 22	PLUMBING
22 05 00	Common Work Results for Plumbing
22 05 23	General Duty Valves for Plumbing
22 11 16	Domestic Water Piping
22 11 19	Domestic Water Specialties
22 13 16	Sanitary Waste and Vent Piping
22 13 19	Sanitary Waste Piping Specialties
22 33 36	Electric Domestic Water Heaters
22 42 13	Commercial Water Closets and Urinals
22 42 16	Commercial Lavatories and Sinks
22 42 19	Commercial Bathtubs
22 42 39	Commercial Faucets, Supplies, and Trim
DIVISION 23	HEATING, VENTILATING, AND AIR CONDITIONING
23 05 00	Common Work Results for HVAC
23 05 23	General Duty Valves for HVAC
23 05 93	Testing, Adjusting, and Balancing for HVAC
23 09 33	Standalone Control System for HVAC
23 09 93	Control Systems Sequence of Operation
23 11 13	Facility Fuel Oil Piping
23 13 23	Facility Aboveground Fuel Oil Storage Tanks
23 21 13	Hydronic Piping
23 21 16	Hydronic Piping Specialties
23 21 23	Hydronic Circulating Pumps
23 23 00	Refrigerant System Piping and Specialties
23 31 13	HVAC Ducts and Casings
23 33 11	Air Duct Accessories
23 33 13	Dampers
23 33 46	Flexible Ducts
23 37 13	Diffusers, Registers and Grilles
23 51 00	Breechings, Chimneys, and Stacks
23 52 23	Forced Draft Cast Iron Boilers
23 72 33	Air-to-Air Energy Recovery Equipment – Residential

23 81 11	Ductless Air Conditioners
23 82 16	Air Coils
23 82 36	Finned Tube Radiation – Commercial
23 82 39	Unit Heaters
23 82 43	Cabinet Unit Heaters
DIVISION 26	ELECTRICAL
26 05 01	General Provisions
26 05 19	Wire Conductors and Cable
26 05 26	Grounding and Bonding
26 05 33	Raceways
26 05 34	Outlet Boxes
26 05 35	Pull and Junction Boxes
26 05 53	Identification
26 05 90	Fastening Hardware
26 24 18	Branch Circuit Panelboards
26 27 13	Service Entrance
26 27 26	Wiring Devices and Plates
26 27 30	Heating Cable
26 28 15	Disconnects
26 28 16	Overcurrent Protection Devices
26 29 01	Motor Starters
26 36 23	Automatic Transfer Switches
26 50 00	Lighting
26 51 02	Automatic Lighting Control Devices
DIVISION 27	COMMUNICATIONS
27 20 00	Telecommunications System
DIVISION 31	EARTHWORK
31 10 00	Site Clearing
31 20 00	Earth Moving
31 66 19	Refrigerated Foundations
DIVISION 33	UTILITIES
33 11 00	Water Utility Piping
33 31 00	Sanitary Utility Piping

PART 1 GENERAL

1.1 SCOPE: SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

A. Section Includes:

1. Structural steel.

2. Entry way decks, stairs, and ramps.

1.2 SUBMITTALS

A. Product Data: For the following, as applicable:

1. Primer

2. Paint

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.

2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.

3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.

C. Inspector Qualifications: Tests and Inspections shall be performed by an AWS Certified Weld Inspector (CWI) with the proper AWS certifications to be able to conduct such tests and inspections.

D. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."

2. AISC's "Load and Resistance Factor Design (LFRD) Specification for Structural Steel Buildings."

3. ASTM A 6 "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."

4. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

5. Research Council on Structural Connections' (RCSC) "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel."

1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone rectification.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

C. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.

2. Clean and relubricate bolts and nuts that become dry or rusty before use.

3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.5 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. Angles and Plates: ASTM A 572 Grade 50.

B. Channels: ASTM A 992.

C. Square/Rectangular and round HSS: ASTM A 500 Grade C.

D. Steel Pipe: ASTM A 53, Type E or S, Grade B.

1. Weight Class: Standard unless noted otherwise on drawings.

E. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

2.3 PRIMER

A. Primer: Steel shall be delivered shop primed, except for surfaces to be galvanized or field welded.

2.4 FABRICATION

A. Member Splices are not permitted without prior approval by Engineer, except at locations noted in drawings.

B. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.

2. Mark and match-mark materials for field assembly.

3. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

D. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

2. Baseplate Holes: Cut, drill, or punch holes perpendicular to steel surfaces.

3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.5 SHOP CONNECTIONS

A. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.6 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces to be field welded.

2. Galvanized surfaces.

B. Shop Primer: Epoxy primer, MPI #108

1. Basis of Design: Sherwin-Williams; Macropoxy 646, fast cure epoxy mastic.

C. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the coating manufacturer's requirements but not less than following specifications and standards:

1. SSPC-SP 3, "Power Tool Cleaning."

D. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Apply 1 coat of shop primer unless noted otherwise.

2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.7 FIELD PAINTING

A. Apply finish coating to structural steel to be painted following erection.

B. Field paint the following structural steel:

1. Stair and ramp framing

2. Deck framing, including roof support columns.

C. Shop Primer: Polyurethane, Two-Component

1. Basis of Design: Sherwin-Williams Acrolon 218 HS, B65-650 Series.

2. Color per architectural material schedule.

D. Touchup Priming: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

E. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection.

F. Apply finish paint coatings in accordance with manufacturer's written instructions.

G. Clean surfaces immediately of overspray, splatter, and excess material.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.

2. Galvanize the following structural steel:

a. Beam saddles and posts.

b. Base plate fabrications, including cross bracing foundation tie double-angles.

2.9 FABRICATOR QUALITY CONTROL

A. Testing Agency: Engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports. Minimum testing agency qualifications per Part 1 of this specification.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

2. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.

a. All shop welds are to be visually inspected.

3. Inspections listed above are not required where the work is done on the premises of a fabricator registered and approved to perform such work without special inspection, AWS Certified Fabricator or approved equivalent.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

1. Additional testing, at Contractor’s expense, will be performed to determine compliance of corrected Work with specified requirements.

PART 3 EXECUTION

3.1 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.2 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

C. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

D. Splice members only where indicated.

E. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.3 FIELD CONNECTIONS

A. No splices will be permitted unless prior approval is obtained from Engineer.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to inspect high strength bolted connections. Minimum testing agency qualifications per Part 1 of this specification.

B. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

3.5 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 06 41 00 - ARCHITECHTURAL WOOD CASEWORK

A. This section includes the following:

1. Specially fabricated cabinet units.

2. Hardware.

3. Preparation for installing utilities.

1.2 RELATED REQUIREMENTS

A. Section 12 36 00 - Countertops.

1.3 REFERENCE STANDARDS

A. AWI (QCP) - Quality Certification Program Current Edition.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards 2014, with Errata (2018).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1 2017, with Errata (2019).

D. BHMA A156.9 - American National Standard for Cabinet Hardware 2015.

E. NEMA LD 3 - High-Pressure Decorative Laminates 2005.

1.4 SUBMITTALS

A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details and accessories.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.6 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.1 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.2 LAMINATE MATERIALS

A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.3 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

2.4 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section, as well as dental and medical equipment for compatibility.

3.2 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 06 17 53 - FABRICATED WOOD TRUSSES

A. Section Includes:

1. Wood roof trusses.
2. Wood floor trusses.
3. Wood truss bracing.
4. Metal truss accessories.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for roof sheathing and subflooring.

1.2 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

B. Qualified Professional Engineer: Professional Civil Engineer or Structural Engineer, licensed in the State of Alaska.

1.3 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
5. Show splice details and bearing details.

B. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

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

2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Engineer and authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in TPI BCSI**,** "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.

2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.

3. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer as defined within Part 1 of this specification to design metal-plate-connected wood trusses.

B. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

1. Design Loads: As indicated.

2. Maximum Deflection Under Design Loads:

a. Roof Trusses:

1) Live or snow load vertical deflection of 1/240 of span.

2) Total load vertical deflection of 1/180 of span.

b. Floor Trusses:

1) Live load vertical deflection of 1/480 of span.

2) Total load vertical deflection of 1/360 of span.

C. Comply with applicable requirements and recommendations of the following publications:

1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."

2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."

3. TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.2 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.

2. Provide dressed lumber, S4S.

3. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

B. Minimum Chord Size for Trusses: 2 by 6 inches nominal for both top and bottom chords.

C. Minimum Specific Gravity for Top Chords: 0.42.

D. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 06 10 00 "Rough Carpentry."

2.3 METAL CONNECTOR PLATES

A. Source Limitations: Obtain metal connector plates from single manufacturer.

B. General: Fabricate connector plates to comply with TPI 1.

C. Hot-Dip Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.

1. Use for interior locations unless otherwise indicated.

2.4 FASTENERS

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

1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.

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

2.5 METAL FRAMING ANCHORS AND ACCESSORIES

A. Provide truss ties, straps, clips, and collectors as indicated on Drawings, substitutions shall be approved by Engineer.

B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

C. Roof Truss Clips: Angle clips for bracing bottom chord of roof trusses at non-load-bearing walls, 1-1/4 inches wide by 0.050-inch thick. Clip is fastened to truss through slotted holes to allow for truss deflection.

D. Roof Truss Bracing/Spacers: U-shaped channels, 1-1/2 inches wide by 1-inch deep by 0.040-inch thick, made to fit between two adjacent trusses and accurately space them apart, and with tabs having metal teeth for fastening to trusses.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight.

2.7 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.

C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install trusses and temporary bracing according to the latest edition of the BCSI booklet.

E. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

1. Bracing material to comply with Section 06 10 00 "Rough Carpentry." Install bracing according to the latest edition of the BCSI booklet, including BCSI-B3 “Permanent Restraint/Bracing of Chords & Web Members”.

F. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

G. Space trusses as indicated; adjust and align trusses in location before permanently fastening.

H. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.

I. Install wood trusses within installation tolerances in TPI 1.

J. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.

K. Replace wood trusses that are damaged or do not meet requirements.

1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Engineer.

3.2 REPAIRS AND PROTECTION

A. Protect wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 06 18 00 - GLUED-LAMINATED CONSTRUCTION

A. Section includes framing using structural glued-laminated timber.

1.2 DEFINITIONS

A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

1.3 SUBMITTALS

A. Product Data: For each type of product.

1. Include data on lumber, adhesives, fabrication, and protection.

2. For connectors. Include installation instructions.

B. Certificates of Conformance: Issued by a qualified testing and inspecting agency indicating that structural glued-laminated timber complies with requirements in AITC A190.1.

C. Research/Evaluation Reports: For structural glued-laminated timber and timber connectors, from ICC-ES.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: An AITC- or APA-EWS-licensed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with provisions in AITC 111.

B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Structural glued-laminated timber and connectors shall withstand the effects of structural loads shown on Drawings without exceeding allowable design working stresses listed in AITC 117 or determined according to ASTM D 3737 and acceptable to authorities having jurisdiction.

B. Seismic Performance: Structural glued-laminated timber and connectors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 STRUCTURAL GLUED-LAMINATED TIMBER

A. General: Provide structural glued-laminated timber that complies with AITC A190.1 and AITC 117 or research/evaluation reports acceptable to authorities having jurisdiction.

1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA-EWS trademark. Place mark on surfaces that are not exposed in the completed Work.

2. Provide structural glued-laminated timber made from single species.

3. Provide structural glued-laminated timber made from solid lumber laminations; do not use laminated veneer lumber.

4. Provide structural glued-laminated timber made with wet-use adhesive complying with AITC A190.1.

B. Appearance Grade: Architectural complying with AITC 110.

1. For Premium and Architectural appearance grades, fill voids as required by AITC 110

2.3 TIMBER CONNECTORS

A. Subject to compliance with requirements, provide products and fabrications indicated on Drawings or comparable product.

B. Materials: Unless otherwise indicated, fabricate from the following materials:

1. Structural-steel shapes, plates, and flat bars complying with ASTM A 36/A 36M.

C. Hot dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A 123/A 123M or ASTM A 153/A 153M.

2.4 MISCELLANEOUS MATERIALS

A. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

B. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

2.5 FABRICATION

A. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.

B. End-Cut Sealing: Immediately after end cutting each member to final length, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.

C. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit except for preservative-treated wood where treatment included a water repellent.

2.6 FACTORY FINISHING

A. Clear Finish: Manufacturer's standard, two-coat, clear varnish finish; resistant to mildew and fungus.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. General: Erect structural glued-laminated timber true and plumb and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.

1. Handle and temporarily support glued-laminated timber to prevent surface damage, compression, and other effects that might interfere with indicated finish.

B. Install timber connectors as indicated.

1. Unless otherwise indicated, install bolts with same orientation within each connection and in similar connections.

3.3 ADJUSTING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by Engineer.

3.4 PROTECTION

A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose, including protection from weather, sunlight, soiling, and damage from work of other trades.

1. Coordinate wrapping removal with finishing work. Retain wrapping where it can serve as a painting shield.

2. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 06 41 00 - ARCHITECHTURAL WOOD CASEWORK

A. This section includes the following:

1. Specially fabricated cabinet units.

2. Hardware.

3. Preparation for installing utilities.

1.2 RELATED REQUIREMENTS

A. Section 12 36 00 - Countertops.

1.3 REFERENCE STANDARDS

A. AWI (QCP) - Quality Certification Program Current Edition.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards 2014, with Errata (2018).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1 2017, with Errata (2019).

D. BHMA A156.9 - American National Standard for Cabinet Hardware 2015.

E. NEMA LD 3 - High-Pressure Decorative Laminates 2005.

1.4 SUBMITTALS

A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details and accessories.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.6 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.1 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.2 LAMINATE MATERIALS

A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.3 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

2.4 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section, as well as dental and medical equipment for compatibility.

3.2 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 07 21 00 - THERMAL INSULATION

A. This section includes the following:

1. Board insulation at exterior wall behind ventilated metal panel wall finish.

2. Batt insulation in exterior wall and floor construction.

3. Blown insulation in attic construction.

1.2 RELATED REQUIREMENTS

A. Section 07 25 00 - Building Envelope Barriers: Separate vapor retarder materials.

B. Section 07 25 00 - Building Envelope Barriers: Separate air and water-resistive barrier materials.

1.3 REFERENCE STANDARDS

A. ASTM C764 - Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation; 2019.

B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2019.

C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.

F. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C 2019a.

G. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies 2018.

1.4 SUBMITTALS

A. Product Data: Provide data on product characteristics and performance criteria.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

PART 2 PRODUCTS

2.1 APPLICATIONS

A. Insulation in Wood Framed Walls and Floors: Batt insulation with no vapor retarder.

B. Insulation in Wood Framed Attic Structure: Blown insulation with separate vapor retarder.

C. Insulation continuous on exterior face of Wood Framed Walls: Expanded polystyrene (EPS), unfaced.

2.2 FOAM BOARD INSULATION MATERIALS

A. Expanded Polystyrene (EPS) Board Insulation: Complies with ASTM C578.

1. Facing materials are prohibited.

2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.

3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.

4. Board Size: 48 inch by 96 inch.

5. Board Thickness: 2 inch and 3 inch.

6. Board Edges: Square.

7. Type: Type II, unfaced or Type IX, unfaced.

8. Water Vapor Permeance: 2 perm-inch, minimum, when tested in accordance with ASTM E96.

9. Thermal Resistance, R-value: 4.0, minimum, per 1 inch thickness at 75 degrees F mean temperature.

10. Products:

a. InsulFoam LLC; InsulFoam unfaced EPS: www.insulfoam.com.

2.3 BATT INSULATION MATERIALS

A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.

1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.

2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.

3. Combustibility: Non-combustible, when tested in accordance with ASTM E136.

4. Formaldehyde Content: Zero.

5. Thermal Resistance: R-value as indicated in drawings.

6. Thickness: as indicated in drawings.

7. Facing: Unfaced.

8. Products:

a. CertainTeed Corporation: www.certainteed.com.

b. Johns Manville: www.jm.com/#sle.

c. Owens Corning Corporation: www.ocbuildingspec.com.

C. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.

2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.

3. Thermal Resistance: R-value as indicated in drawings.

4. Thickness: as indicated in drawings.

5. Products:

a. Knauf Insulation; EcoBatt Insulation: www.knaufinsulation.com.

b. ROCKWOOL (ROXUL, Inc); COMFORTBATT: www.rockwool.com.

c. Thermafiber, Inc; SAFB: www.thermafiber.com.

2.4 BLOWN INSULATION

A. Thermal Resistance (R-value): Provided minimum values as indicated in drawings.

B. Blown Insulation: ASTM C764, fiberglass type, bulk for pneumatic placement.

1. Installed Thickness: As required to achieve indicated R-value.

C. Products:

1. CertainTeed Corporation: www.certainteed.com.

2. Johns Manville: www.jm.com.

2.5 ACCESSORIES

A. Roof Ventilation Baffles: Prefabricated ventilation channels for placement under roof sheathing with baffles to prevent wind-washing and blockage of ventilation cavity.

1. Material: Polystyrene or cardboard.

B. Sheet Vapor Retarder (at ceiling only): See Section 07 25 00 - Building Envelope Barriers.

C. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive. See Section 07 25 00 - Building Envelope Barriers.

D. Insulation Fasteners: Lengths of galvanized high carbon spring steel with chisel or mitered tips, held in place by tension, length to suit insulation thickness and substrate, capable of securely supporting insulation in place.

E. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of fins or irregularities.

C. Verify spaces are unobstructed to allow for proper placement of insulation.

3.2 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install rigid insulation to wood studs or exterior grade sheathing with manufacturer recommended mechanical fasteners and spacing.

B. Install boards horizontally on walls.

1. Install in running bond pattern.

2. Butt edges and ends tightly to adjacent boards and protrusions.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

D. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.

3.3 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install in exterior wall and raised floor spaces without voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Retain insulation batts in place with wire mesh secured to framing members or staples at wall top plate.

F. Coordinate work of this section with construction of air barrier seal, see Section 07 25 00 - Building Envelope Barriers .

3.4 BLOW-IN INSULATION

A. Install insulation and ventilation baffle in accordance with ASTM C1015 and manufacturer's instructions.

B. Place insulation pneumatically to completely fill attic spaces to the indicated R-value.

C. Place insulation against baffles, and do not impede natural attic ventilation to soffit.

D. Completely fill intended spaces leaving no gaps or voids.

3.5 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 07 25 00 - BUILDING ENVELOPE BARRIERS

A. Building Envelope Barriers: Materials that form a system to stop passage of air, liquid water, or water vapor through all exterior building surfaces, including walls, roofs, and floors, transitions thereof, and all exterior openings and penetrations.

1. The specified properties of each building envelope barrier function collectively to prevent moisture accumulation in floor, wall, and roof assemblies. Only approved product substitutions are allowed.

2. Barrier materials may serve more than one of the functions defined below.

1.2 DEFINITIONS

A. Air Barrier: Airtight barrier made of material that is relatively air impermeable to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.

1. All air barrier materials have specified degrees of vapor permeability, and as such may or may not be classified as vapor retarders.

2. Some air barrier materials may also serve the purpose of a water-resistive barrier, as defined below.

B. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water.

1. Some water-resistive barrier materials may also be water vapor impermeable, to the degree specified.

C. Vapor Retarder: Airtight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.

1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

1.3 REFERENCE STANDARDS

A. AAMA 711 – Material Standard for Self-Adhering Flashing Surrounding Exterior Wall Fenestration; 2013.

B. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2014.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

E. ASTM E1827 – Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door; 2017.

F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

G. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; ICC Evaluation Service, Inc; 2013.

H. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; ICC Evaluation Service, Inc; 2011.

I. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; ICC Evaluation Service, Inc; 2015.

J. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012.

1.4 SUBMITTALS

A. Product Data: Provide data on performance criteria.

1. BE-4 - Air Barrier Sheeting, Mechanically Fastened: Air and Vapor Barrier.

2. BE-5 - Air Barrier Sheet, Self-Adhered: Air and Water-Resistive Barrier.

3. BE-7 – Roof Underlayment, Self-Adhered: Air and Water-Resistive Barrier.

4. Sealants.

5. Tapes.

6. Flexible Flashing.

7. Liquid Flashing.

B. Manufacturer’s Installation Instructions: Indicate preparation and installation methods.

C. Air Barrier Quality Control Inspector Qualifications.

D. Air Barrier Quality Control Reports.

E. Air Barrier Coordinator: name, company, and contact information.

F. Air Leakage Testing Agency Qualifications.

G. Air Leakage Testing Report.

1.5 QUALITY ASSURANCE

A. Air Barrier Coordinator: A member of the General Contractor's Quality Control staff shall be responsible for coordinating air barrier system installation across multiple subcontractors. This person, referred to as the Air Barrier Coordinator, is responsible for ensuring proper sequencing of air barrier component installation, and clarifying air barrier sealing scope for subcontractors at locations that traditionally cause confusion, such as air barrier penetrations and transitions from one subcontractor to another, such as wall to roof transitions. Coordinator shall schedule, monitor, and report status of air barrier installation, quality control inspections, and testing.

B. Preparatory Phase or Pre-Construction Conference

1. Air Barrier Coordinator shall organize pre-construction conferences between the air barrier inspector and the sub-contractors involved in the construction of, or penetration of, the air barrier system. The intent of these meetings is to discuss where the work of each sub-contractor begins and ends, the sequence of installation, and each sub-contractor's responsibility to ensure airtight joints, junctures, penetrations, and transitions between materials. Discuss the products, and assemblies of products specified in the different sections to be installed by the different sub-contractors. Discuss air barrier details to ensure common understanding of installation requirements. Discuss air barrier inspection procedures and scheduling.

C. Air Barrier Quality Control Inspector (ABQC): Contractor's Quality Control staff shall perform air barrier quality control inspections as described in this section. Qualification for the ABQC are as follows:

1. Meet at least one of the below requirements:

a. Air Barrier Field Auditor from the Air Barrier Association of America (ABAA) or other third-party air barrier association.

b. Experience coordinating and instructing personnel involved in the installation, joining, and sealing of air barrier materials and components for at least five years.

c. Experience inspecting air barrier installations for new construction or renovation projects on at least five commercial projects.

D. Whole-Building Air leakage Testing Agency:

1. Air Leakage Testing shall be performed by a third-party agency that is not affiliated with any other company participating in work on this contract. Testing Agency shall have at least 2 years of experience performing whole-building air leakage testing, including at least five commercial projects.

1.6 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.1 BE-4 - AIR BARRIER SHEETING, MECHANICALLY FASTENED: AIR AND VAPOR BARRIER.

A. Location: Installed on the interior face of the exterior ceiling assembly system, as indicated in drawings.

B. General: Provide vapor retarder sheet, conforming to ASTM D4397 polyethylene film, clear.

C. Performance Criteria:

1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.

2. Water Vapor Permeance: 0.06 perms, maximum, when tested in accordance with ASTM E96/E96M, Procedure B.

3. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.

4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.

D. Seam and Perimeter Tape: As recommended by sheet manufacturer.

E. Seam and Perimeter Sealant: Acoustic Sealant

F. Material:

1. ASTM D4397 polyethylene film, clear.

2. Thickness: 6 mil, minimum.

2.2 BE-5 - AIR BARRIER SHEET, SELF-ADHERED: AIR AND WATER-RESISTIVE BARRIER.

A. Location: Installed on the exterior face of the exterior wall system, as indicated in drawings.

B. General: Must exhibit no visible water leakage when tested in accordance with ASTM E331 and must perform as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration.

C. Performance Criteria:

1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.

2. Water Vapor Permeance: 28 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.

3. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.

4. Tensile Strength: Not less than 20 lb/in., when tested in accordance with ASTM D828.

5. Water Penetration Resistance: No water penetration after 90 minutes at 6.24 psf or 15 minutes at 15 psf, when tested in accordance with ASTM E 331.

6. Water Penetration Resistance around Nails: Pass, when tested in accordance with ASTM D1970/D1970M (modified).

7. Smoke Developed Index Rating not higher than 100

D. Seam and Perimeter Sealant: As recommended by sheet manufacturer.

E. Manufacturers:

1. VaproShield WrapShield SA: www.vaproshield.com

2. Or equal

2.3 BE-7 – ROOF UNDERLAYMENT, SELF-ADHERED: AIR AND WATER-RESISTIVE BARRIER.

A. Location: Installed as part of roofing system, as indicated in drawings.

B. General: Provide fully self-adhering, water-resistive, air barrier membrane. Self-adhering roof underlayment must exhibit no visible water leakage when tested in accordance with ASTM E331. Use regular or low temperature formulation depending on site conditions, within temperature ranges specified by manufacturer.

C. Performance Criteria:

1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.

2. Water Vapor Permeance: 25 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.

3. Water Penetration Resistance around Nails: Pass, when tested in accordance with ASTM D1970/D1970M (modified).

4. Tensile Strength: Not less than 16 lb/in (MD) or 8 lb/in. (XMD), when tested in accordance with ASTM D2523).

5. Ultimate Elongation: Not more than 40% (MD or XMD), when tested in accordance with ASTM D2523.

6. Puncture Resistance: Not less than 80 lbs, when tested in accordance with ASTM D5602.

7. Cold Temperature: meet one of the following criteria:

   a. Cold bending: Not less than minus 45 degrees, when tested in accordance with ASTM D5147.

   b. Cold temperature pliability: Pass, when tested in accordance with ASTM D1970.

8. Lap Adhesion: Not less than 2.5 lbs per inch when tested in accordance with ASTM D1876.

9. Peel Adhesion: Not less than 5.0 lbs per inch with plywood substrate, when tested in accordance with ASTM D903.

10. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.

11. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.

D. Seam and Perimeter Tape: As recommended by sheet manufacturer.

E. Substrate Primer: As recommended by sheet manufacturer.

F. Manufacturers:

1. VaproShield SlopeShield Plus SA: www.vaproshield.com

2. Or Equal.

2.4 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Sealing Air Barrier to Adjacent Substrates: As indicated in drawings or as recommended by air barrier manufacturer.

B. Sealants, Tapes, and Accessories for Sealing Water-Resistive Barrier and Sealing Water-Resistive Barrier to Adjacent Substrates: As indicated in drawings or as recommended by Water-Resistive Barrier manufacturer.

C. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.

1. Composition: Self-adhered, spun-bonded polypropylene or polyethylene with butyl-based adhesive. Asphaltic/bitumen adhesive materials not allowed.

2. Ensure chemical compatibility with all receiving materials.

3. Ultraviolet (UV) Light and Weathering Exposure: In accordance with ICC-ES AC 148.

4. Peel Adhesion: Pass, when tested in accordance with ASTM D 3330 Method F.

5. Cold Temperature Pliability: Pass, when tested in accordance with ASTM D 1970, AAMA 711.

6. Air Leakage: Less than 0.004 cfm/ft2 at a pressure difference of 1.57 lb/ft2 when tested in accordance with ASTM E2178.

7. Water Leakage: meet one of the following criteria:

a. No leakage when tested to AATCC 127 at 550mm hydrostatic head for 5 hours;

b. Class A when tested to AAMA 711-13

8. Manufacturers:

a. As indicated by Air Barrier manufacturer

b. If air barrier manufacturer does not indicate suitable flashing products, submit product that meets the above criteria.

D. Liquid Flashing: One part, fast curing, non-sag, elastomeric, gun grade, trowel-able liquid flashing.

1. Composition: per material manufacturer. Ensure chemical compatibility.

2. Manufacturers:

a. As indicated by material manufacturer.

E. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.2 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and primers in accordance with manufacturer's instructions.

3.3 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water.

D. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.

E. Mechanically Fastened Sheets – Air and Vapor Barrier On Interior at Ceiling (BE-4):

1. Seal entire perimeter to structure and penetrations.

2. Provide continuous bead of acoustical sealant across entire perimeter of each sheet.

a. Lap joints:

1) Lap sheets minimum of 12 inches.

2) Locate laps at a framing member, concrete structure, or similar rigid surface to prevent movement due to differential air pressures.

3) For framed walls, fasten one sheet to framing member then seal and tape overlapping sheet to first sheet.

4) Apply continuous bead of sealant within 6 inches of lap.

5) Apply vapor-resistive tape at edge of lap.

b. Terminations:

1) Apply continuous bead of sealant within 2 inches of sheet edge.

2) Mechanically fasten edge of sheet to structural elements to prevent movement due to differential air pressures.

a) Bottom of wall: Extend sheet minimum 1” beyond wall-to-floor joint. Apply sealant to joint between subfloor and wall bottom plate.

3. Where electrical boxes that have gasketed rings penetrate BE-4:

a. Seal sheet to box gasket with acoustic sealant.

4. Where sheet metal electrical boxes penetrate the BE-4:

a. Completely cover the exterior surfaces of the box with overlapped application of vapor-barrier tape to effectively seal all unused knockouts and other holes against vapor migration. The edges of the hole in the vapor barrier shall be securely sealed to the lip of the box with vapor barrier tape and approved sealant.

5. Seal tears and cuts with vapor-resistive tape, making airtight seal.

6. Seal at openings and penetrations as indicated in drawings, and as described in sections below.

F. Self-Adhered Sheets - Air and Water-Resistive Barrier On Exterior at Roof and Walls (BE-5 and BE-7):

1. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.

2. Install sheets shingle-fashion to shed water, with seams generally horizontal.

3. Overlap seams as recommended by manufacturer, but at least 3 inches.

4. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.

5. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.

6. At wide joints, provide extra flexible membrane allowing joint movement.

7. Seal entire membrane to structure, window and door frames, and other penetrations.

8. Seal tears and cuts per manufacturer's instructions.

9. Seal at openings and penetrations as indicated in drawings, and as described in sections below.

G. Door, Window, and Louver Openings in Air- and Water-Resistive Barriers:

1. Wrap exterior air-and water-resistive barrier (BE-5) into rough opening at sill and jamb, and seal to framing.

2. Install flexible flashing over sill, covering entire sill frame member, extending at least 5 inches onto air- and water-resistive barrier (BE-5) at exterior face of wall and at least 6 inches up jambs. At sill corners, use weather-lapped reinforcing strips or flexible sill flashing in accordance with manufacturer instructions.

3. At jamb of openings, install flexible flashing over air- and water-resistive barrier (BE-5) at exterior face of wall, completely lapping over sill flashing at least 4 inches.

4. At head of openings, install flexible flashing under air- and water-resistive barrier (BE-5) at exterior face of wall, extending at least 4 inches beyond face of jambs and completely lapping over flexible flashing installed at jambs.

5. Seal air- and water-resistive barrier (BE-5) to flexible flashing at head.

6. At interior face of openings, insulate and seal gap between window/door frame and rough framing, using joint sealant over low-expansion foam insulation.

H. Penetrations in Air- and Water-Resistive Barriers:

1. Pipes, Ducts, Structural Members, and Other Penetrations in above-grade assemblies:

a. Form flexible flashing around penetrating item and seal, in weather-lapped fashion, to air- and water-resistive barrier (BE-5) at exterior face of wall sheathing.

2. Pipes, Ducts, Structural Members, and Other Penetrations in roof assemblies:

a. Form flexible flashing around penetrating item and seal, in weather-lapped fashion, to air- and water-resistive barrier (BE-7) at exterior face of roof sheathing.

3.4 FIELD QUALITY CONTROL

A. Coordination of Air Barrier Inspections:

1. Provide Air Barrier inspection described below.

2. Notify Project Manager and General Contractor in writing of schedule for air barrier work and allow adequate time for General Contractor inspection.

3. Allow access to air barrier work areas and staging.

4. Do not cover air barrier work until inspected and accepted.

B. Take digital photographs of each portion of the installation prior to covering up.

C. Air Barrier Inspections:

1. Conduct the following tests and inspections as applicable in the presence of the Project Manager during installation of the air barrier system and submit quality control reports as indicated below.

a. Provide, at minimum, three inspections during construction.

b. Inspect to assure continuity of the air barrier system throughout the building enclosure and that all gaps are covered, the covering is structurally sound, and all penetrations are sealed allowing for no infiltration or exfiltration through the air barrier system.

c. Inspect to assure structural support of the air barrier system to withstand design air pressures.

d. Inspect and test to assure site conditions for application temperature and humidity are within manufacturer’s guidelines.

e. Inspect and test to assure substrate conditions for temperature, cleanliness, and moisture content are within manufacturer’s guidelines.

f. Inspect to assure substrate surfaces are properly primed if applicable and in accordance with manufacturer's instructions. Priming must extend at least 2 inches beyond the air barrier material to make it obvious that the primer was applied to the substrate before the air barrier material.

g. Inspect to assure laps in materials are as indicated in drawings, and specified by this section and manufacturer instructions, shingled in the correct direction.

h. Inspect to assure that a roller has been used to enhance adhesion. Identify any defects such as fishmouths, wrinkles, areas of lost adhesion, and improper curing. Note the intended remedy for the deficiencies.

i. Inspect to assure that the correct materials are installed for compatibility.

j. Inspect to assure proper transitions for change in direction and materials.

k. Provide written test reports of all tests and inspections performed.

l. Inspected areas to include wall-to-floor interface; wall penetrations; window head, sill and jamb seal; door head and jamb seal; wall corners, wall-to-roof interface at eave and rake conditions; roof penetrations; and other similar conditions.

D. Whole-Building Air leakage Testing:

1. Testing shall be performed by a fan pressurization technique in accordance with ASTM E779 or ASTM E1827.

2. Building shall be tested with a single fan pressurization test and represent the leakage rate for the entire structure.

3. Test shall be conducted under the following conditions:

a. Ventilation fans and exhaust fans are turned off.

b. Combustion equipment using conditioned air shall be disabled or put in pilot position.

c. Prior to testing, all doors, fireplaces, windows, and operable windows shall be closed but not sealed.

d. Prior to testing, all intentional openings (dryer ducts, bath fans, fresh air ventilation systems, plumbing traps) shall be sealed.

e. Prior to testing, all interior doors shall be opened.

f. Heating and cooling supply and return ducts shall not be sealed.

4. Air Leakage Result Reporting

a. Air leakage results shall be reported as Cubic Feet per Minute per Square Foot of Air Barrier surface area when pressurized to 75 Pascals (cfm/sf75).

b. The surface area of the building’s air barrier shall be calculated from the location of the air barrier indicated in construction drawings. If significant changes occurred during construction, then the testing agency shall measure wall and ceiling locations to determine air barrier system dimensions and adjust surface area calculations accordingly.

5. Allowable Air Leakage Rate

a. The building shall not have an air leakage rate greater than 0.40 cfm/sf75.

1) If the air leakage rate is found to be greater than 0.4 cfm/sf75, then corrective actions shall be performed to the air barrier system.

2) Perform more air leakage testing until an acceptable air leakage rate is achieved.

3.5 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 07 41 13 - METAL ROOF PANELS

A. Reference Standards

1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.

2. ASTM A792/A792M - Standard Specification for Steel Sheet, 55 percent Aluminum-Zinc Alloy-Coated by the Hot-Dip Process 2022.

3. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference 2005 (Reapproved 2017).

1.2 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Storage and handling requirements and recommendations.

2. Installation methods.

3. Specimen warranty.

B. Test Reports: Indicate compliance of metal roofing system to specified requirements.

C. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.3 WARRANTY

A. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of five years from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:

1. Overall: Complete weathertight system tested and approved in accordance with ASTM E1592.

2. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.

2.2 ARCHITECTURAL METAL ROOF PANELS

A. Architectural Metal Panels: Factory-formed or field formed panels with factory-applied finish.

1. Steel Panels:

a. Zinc-coated steel complying with ASTM A653/A653M; minimum G60 galvanizing.

b. Aluminum-zinc alloy-coated steel complying with ASTM A792/A792M; minimum AZ50 coating.

c. Steel Thickness: Minimum 24-gauge, 0.024-inch.

2.3 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.4 FABRICATION

A. Panels: Provide factory fabricated panels or field fabricated and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

2.5 FINISHES

A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated aluminum surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009-inch; color and gloss as selected by Architect from manufacturer's standard line.

2.6 ACCESSORIES

A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, moldings, closure strips, and preformed crickets of the same material, thickness, and finish as used for the roofing panels.

B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of closed-cell synthetic rubber, neoprene, or PVC.

C. Sealants:

1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.

2. Concealed Sealant: Non-curing butyl sealant or tape sealant.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.

3.2 PREPARATION

A. Broom clean wood sheathing prior to installation of roofing system.

B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.

C. Remove protective film from surface of roof panels immediately prior to installation. Strip film carefully, to avoid damage to prefinished surfaces.

3.3 INSTALLATION

A. Overall: Install roofing system in accordance with panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.

1. Install roofing system with concealed clips and fasteners.

2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.

B. Accessories: Install all components required for a complete roofing assembly, including flashings, gutters, downspouts, trim, closure strips, preformed crickets, rib closures, ridge closures, and similar roof accessory items.

C. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.

1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by the panel manufacturer.

2. Install sealant or sealant tape, as recommended by panel manufacturer, at end laps and side joints.

3.4 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.5 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 07 42 13 - METAL WALL PANELS

A. This section includes the following:

1. Manufactured metal panels for exterior wall panels, interior liner panels, soffit panels, and subgirt framing assembly, with related flashings and accessory components.

1.2 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.

B. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process 2022.

1.3 SUBMITTALS

A. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:

1. Physical characteristics of components shown on shop drawings.

2. Installation instructions and recommendations.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

B. Prevent contact with materials that may cause discoloration or staining of products.

PART 2 PRODUCTS

2.1 MANUFACTURED METAL PANELS

A. Wall Panel System: Factory fabricated prefinished metal panel system; site assembled.

1. Provide exterior wall panels, soffit panels, and subgirt framing assembly.

2. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.

3. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.

4. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.

B. Exterior Wall Panels:

1. Profile: Vertical and horizontal, as indicated.

2. Material: Precoated steel sheet, 22-gauge, 0.0299-inch minimum thickness.

3. Color: As indicated on drawings.

C. Soffit Panels:

1. Profile: Style as indicated, with venting provided.

2. Material: Precoated steel sheet, 22-gauge, 0.0299-inch minimum thickness.

3. Color: As indicated on drawings.

D. Trim: Same material, thickness, and finish as exterior sheets; brake formed to required profiles.

2.2 MATERIALS

A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating. OR

B. Precoated Steel Sheet: Aluminum-zinc alloy-coated steel sheet, ASTM A792/A792M, Commercial Steel (CS)) or Forming Steel (FS), with AZ55/AZM165 coating; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.3 FINISHES

A. Exposed Surface Finish: Panel manufacturer's standard polyvinylidene fluoride (PVDF) coating, topcoat over primer.

2.4 ACCESSORIES

A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.

B. Concealed Sealants: Non-curing butyl sealant or tape sealant.

C. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.

D. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that exterior furring members are ready to receive panels.

3.2 INSTALLATION

A. Install panels on walls and soffits in accordance with manufacturer's instructions.

B. Fasten panels to structural supports; aligned, level, and plumb.

C. Locate joints over supports.

D. Lap panel ends minimum 2 inches.

3.3 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 07 84 00 - FIRESTOPPING

A. This section includes the following:

1. Firestopping systems.

1.2 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).

B. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies 2013 (Reapproved 2017).

1.3 SUBMITTALS

A. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

B. Product Data: Provide data on product characteristics, performance ratings, and limitations.

PART 2 PRODUCTS

2.1 MATERIALS

A. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.2 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.

B. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.3 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.

1. Fire Ratings: See drawings for required ratings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

3.3 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

3.4 CLEANING

A. Clean adjacent surfaces of firestopping materials.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

A. This section includes the following:

1. Non-fire-rated hollow metal doors and frames.
2. Hollow metal frames for wood doors.
3. Fire-rated hollow metal doors and frames.
4. Thermally insulated hollow metal doors with frames.
5. Hollow metal borrowed lites glazing frames.

1.2 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2011.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2011.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2019a.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable 2018.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

I. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

J. ITS (DIR) - Directory of Listed Products current edition.

K. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames 2007.

L. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.

M. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2017.

N. UL (DIR) - Online Certifications Directory Current Edition.

O. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:

1. Steel Sheet: Comply with one or more of the following requirements: galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.2 HOLLOW METAL DOORS

A. Exterior Doors: Thermally insulated.

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

a. Level 2 - Heavy-duty.

b. Physical Performance Level B 500 000 cycles; in accordance with ANSI/SDI A250.4.

c. Model 1 - Full Flush.

d. Door Face Metal Thickness: 18-gauge, 0.042-inch, minimum.

2. Door Core Material: Polyurethane, 1.8 lbs/cu ft minimum density.

a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.

3. Door Thermal Resistance: R-Value of 8.7, minimum, for installed thickness of polyurethane.

4. Door Thickness: 1-3/4 inches, nominal.

5. Top Closures for Out-swinging Doors: Flush with top of faces and edges.

6. Door Face Sheets: Flush.

7. Door Finish: Factory primed, and field finished.

B. Interior Doors, Non-Fire-Rated:

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

a. Level 2 - Heavy-duty.

b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.

c. Model 1 - Full Flush.

d. Door Face Metal Thickness: 18-gauge, 0.042-inch, minimum.

2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.

3. Door Thickness: 1-3/4 inches, nominal.

4. Door Face Sheets: Flush.

5. Door Finish: Factory primed and field finished.

C. Fire-Rated Doors:

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

a. Level 1 - Standard-duty.

b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.

c. Model 1 - Full Flush.

d. Door Face Metal Thickness: 20-gauge, 0.032-inch, minimum.

2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").

3. Provide units listed and labeled by UL (DIR) or ITS (DIR).

a. Attach fire rating label to each fire rated unit.

4. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.

5. Door Thickness: 1-3/4 inches, nominal.

6. Door Face Sheets: Flush.

7. Door Finish: Factory primed and field finished.

2.3 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Exterior Door Frames: Thermally Broken Hollow Metal.

1. Frame Metal Thickness: 18-gauge, 0.042-inch, minimum.

2. Weatherstripping: Separate, see Section 08 71 00.

D. Interior Door Frames, Non-Fire Rated: Knock-down type.

E. Door Frames, Fire-Rated: Full profile/continuously welded type.

1. Fire Rating: Same as door, labeled.

F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

G. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

2.4 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.5 ACCESSORIES

A. Door Window Frames: Door window frames with glazing securely fastened within door opening.

1. Glazing: 1/4-inch thick, tempered glass, in compliance with requirements of authorities having jurisdiction.

B. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

C. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Install door hardware as specified in Section 08 71 00.

3.3 ADJUSTING

A. Adjust for smooth and balanced door movement.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 08 14 16 - FLUSH WOOD DOORS

A. This section includes the following:

1. Flush wood doors; flush and flush glazed configuration; non-rated and acoustical.

1.2 RELATED REQUIREMENTS

A. Section 08 11 13 - Hollow Metal Doors and Frames.

1.3 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging and inspect for damage.

C. Protect doors with resilient packaging; do not store in damp or wet areas or areas where sunlight might bleach veneer; and break seal on site to permit ventilation.

PART 2 PRODUCTS

2.1 DOORS AND PANELS

A. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.

1. Provide solid core doors at each location.

2. Wood veneer facing with transparent finish as indicated on drawings.

2.2 DOOR AND PANEL CORES

A. Non-Rated Solid Core Doors: Type particleboard core (PC), plies and faces as indicated.

2.3 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

C. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

D. Provide edge clearances in accordance with the quality standard specified.

2.4 ACCESSORIES

A. Hollow Metal Door Frames: See Section 08 11 13.

B. Door Window Frames: Door window frames with glazing securely fastened within door opening.

1. Glazing: 1/4-inch thick, tempered glass, in compliance with requirements of authorities having jurisdiction.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Coordinate installation of doors with installation of frames and hardware.

3.3 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.4 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 08 33 23 - OVERHEAD COILING DOORS

A. Interior non-fire-rated coiling doors.

1.2 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2019a.

1.3 SUBMITTALS

A. Product Data: Provide general construction and component connections and details.

B. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

PART 2 PRODUCTS

2.1 COILING DOORS

A. Interior Non-Fire-Rated Coiling Doors: Steel slat curtain.

1. Single Thickness Slats: Manufacturer's standard.
2. Finish: Factory painted, white color.
3. Manual push up operation.
4. Mounting: Within framed opening.
5. Locking Devices: Lock and latch handle on outside.

2.2 MATERIALS AND COMPONENTS

A. Metal Curtain Construction: Interlocking slats.

1. Curtain Bottom for Slat Curtains: Fitted with angles to provide reinforcement and positive contact in closed position.
2. Steel Slats: Minimum thickness, ; ASTM A653/A653M galvanized steel sheet.

B. Guide Construction: Continuous, of profile to retain door in place, mounting brackets of same metal.

C. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.

1. Factory primed and painted - color to match door.

D. Lock Hardware:

1. Latchset Lock Cylinders: Standard mortise cylinder.

a. Keying: Match keying for facility.

2. Latch Handle: Manufacturer's standard.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Install enclosure and perimeter trim.

3.2 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 08 54 13 - FIBERGLASS WINDOWS

A. This section includes the following:

1. Factory fabricated fiberglass windows with fixed and operating sash.

2. Operating hardware.

3. Insect screens.

1.2 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights 2017.

B. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures for submittal procedures.

B. Product Data: Provide component dimensions, anchors, fasteners, glass, and internal drainage details.

C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, installation requirements.

D. Manufacturer's Certificate: Certify that products of this section meet or exceed specified requirements.

E. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:

1. Evidence of AAMA Certification.

2. Evidence of WDMA Certification.

3. Evidence of CSA Certification.

4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

B. Jig, brace, and box the window frame assemblies for transport to minimize flexing of members or joints.

1.6 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and after installation of sealants.

1.7 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of color finish.

PART 2 PRODUCTS

2.1 WINDOW UNITS

A. Fiberglass Windows: Hollow, tubular, multi-layer fiber reinforced material; factory fabricated; with vision glass, related flashings, anchorage, and attachment devices.

1. Configuration: As indicated on drawings .

2. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

3. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

2.2 PERFORMANCE REQUIREMENTS

A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:

1. Performance Class (PC): R.

B. Fenestration Assembly Thermal Transmittance (U-value): Comply with ASHRAE Std 90.1 I-P for building envelope requirements for applicable climate zone.

2.3 COMPONENTS

A. Frames: Profile per Manufacturer; flush glass stops of screw fastened type.

1. Type: Nailing flange (for new windows).

B. Grilles: Between-the-glass:

C. Insect Screen and Frame: Per Manufacturer's standard.

2.4 HARDWARE

A. Casement and Awning Sash: Zinc die-cast steel worm-gear operator with Painted finish.

B. Finish For Exposed Hardware: Match window finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify wall openings and adjoining water-resistive barrier seal materials are ready to receive work of this section.

3.2 INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

3.3 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.4 CLEANING

A. Remove protective material from pre-finished surfaces.

B. Wash surfaces by method recommended and acceptable to window manufacturer, rinse and wipe surfaces clean.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 08 71 00 - DOOR HARDWARE

A. Hardware for wood and hollow metal doors.

B. Hardware for fire-rated doors.

1.2 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks 2014.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.

E. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2017.

F. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

B. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.

1. Provide complete description for each door listed.

2. Provide manufacturers and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.

3. Include account of abbreviations and symbols used in schedule.

PART 2 PRODUCTS

2.1 DOOR HARDWARE

A. See drawings for Door Hardware Groups and basis of design.

2.2 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:

1. Applicable provisions of federal, state, and local codes.

2. Accessibility: ADA Standards and ICC A117.1.

3. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.

2.3 LOCK CYLINDERS

A. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.

1. Contractor shall provide construction cores only for the duration of the project and shall provide the owner with (3) copies of construction keys upon core installation. Owner will install cores following Final Completion and will coordinate keying with users.

2. Provide conventional and full size interchangeable core (FSIC) type cylinders, Grade 1, with six-pin core in compliance with BHMA A156.5 at locations indicated.

3. Provide cylinders from same manufacturer as locking device.

4. Provide cams and/or tailpieces as required for locking devices.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

C. Use templates provided by hardware item manufacturer.

D. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.

E. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.2 ADJUSTING

A. Adjust hardware for smooth operation.

B. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

A. This section includes the following:

1. Performance criteria for gypsum board assemblies.
2. Metal stud wall framing.
3. Acoustic insulation.
4. Gypsum wallboard.
5. Joint treatment and accessories.

1.2 REFERENCE STANDARDS

A. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2020.

B. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base 2019.

C. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.

D. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).

E. ASTM E413 - Classification for Rating Sound Insulation 2022.

F. GA-216 - Application and Finishing of Gypsum Panel Products 2021.

G. GA-600 - Fire Resistance and Sound Control Design Manual 2021.

1.3 SUBMITTALS

A. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

B. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:

1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:

1. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.

2.2 METAL FRAMING MATERIALS

A. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.

B. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.

C. Non-structural Framing Accessories:

1. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.

2.3 BOARD MATERIALS

A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.

2. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly.

3. At Assemblies within 3 feet of a plumbing fixture or in wet areas (toilet, laundry): Use Mold and Moisture resistant Gypsum Wallboard

4. Thickness:

a. Vertical Surfaces: 5/8-inch.

b. Ceilings: 5/8-inch.

5. Gypsum Wallboard ACCESSORIES

B. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: full depth of wall cavity.

C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.

1. Expansion Joints:

a. Type: V-shaped metal with factory-installed protective tape.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.2 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Studs: Space studs at 24 inches on center.

1. Extend partition framing to structure in all locations.

2. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

D. Blocking: Install wood blocking for support of:

1. Wall-mounted cabinets.

2. Plumbing fixtures.

3. Toilet accessories.

4. ADA Grab Bars

3.3 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.4 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

3.5 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

1. Not more than 30 feet apart on walls and ceilings over 50 feet long.

B. Corner Beads: Install at external corners, using longest practical lengths.

3.6 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:

1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.

2. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

1. Feather coats of joint compound so that camber is maximum 1/32-inch.

3.7 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8-inch in 10 feet in any direction.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 09 51 00 - ACOUSTICAL CEILINGS

A. This section includes the following:

1. Suspended metal grid ceiling system.

2. Acoustical units.

1.2 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2022.

C. ASTM E1264 - Standard Classification for Acoustical Ceiling Products 2022.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

1.4 SUBMITTALS

A. Product Data: Provide data on suspension system components and acoustical units.

B. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.5 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D, E, or F and complying with the following:

2.2 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Panels: Painted mineral fiber, with the following characteristics:

1. Classification: ASTM E1264 Type III.

2. Size: 24 by 24 inches.

3. Suspension System: Exposed grid.

2.3 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.2 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.3 INSTALLATION - SUSPENSION SYSTEM

A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

B. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4-inch clearance between grid ends and wall.

C. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

D. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

E. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

F. Do not eccentrically load system or induce rotation of runners.

3.4 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:

1. Make field cut edges of same profile as factory edges.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 09 65 00 - RESILIENT FLOORING

A. This section includes the following:

1. Resilient sheet flooring.
2. Resilient tile flooring.
3. Static control resilient tile flooring.
4. Installation accessories.

1.2 REFERENCE STANDARDS

A. ASTM F1913 - Standard Specification for Vinyl Sheet Floor Covering Without Backing 2019.

1.3 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns, and colors available; and installation instructions.

B. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

1.5 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.1 SHEET FLOORING

A. Vinyl Sheet Flooring: Homogeneous without backing, with color and pattern throughout full thickness.

1. Minimum Requirements: Comply with ASTM F1913.

2. Thickness: 0.080 inch nominal.

3. Seams: Heat welded.

4. Integral coved base with cap strip.

5. Color: As indicated on drawings.

B. Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color matching field color.

2.2 TILE FLOORING

A. Static Control Tile: Homogeneous; color and pattern throughout thickness.

1. Electrical Resistance:

a. Dissipative Tile: Resistance between 1.0 megohms and 1000 megohms as tested in accordance with ASTM F150.

2. Tile Size: 12 by 12-inch.

3. Color: As indicated on drawings.

2.3 ACCESSORIES

A. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

B. Copper Grounding Strips: Type and size as recommended by static control flooring manufacturer.

C. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

3.2 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

3.3 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

3.4 INSTALLATION - SHEET FLOORING

A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.

B. Seal seams by heat welding where indicated.

C. Coved Base: Install as detailed on drawings, using coved base filler as backing at floor to wall junction. Extend sheet flooring vertically to height indicated, and cover top edge with metal cap strip.

3.5 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

3.6 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 09 68 13 - TILE CARPETING

A. This section includes the following:

1. Carpet tile, fully adhered.

PART 2 PRODUCTS

2.1 MATERIALS

A. Tile Carpeting, Walk off Mat - see drawings for basis of design.

2.2 ACCESSORIES

A. Carpet Tile Adhesive: Recommended by carpet tile manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

3.2 INSTALLATION

A. Install carpet tile in accordance with manufacturer's instructions.

B. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

C. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

D. Trim carpet tile neatly at walls and around interruptions.

E. Complete installation of edge strips, concealing exposed edges.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 09 72 00 - WALL COVERINGS

A. This section includes the following:

1. Surface preparation.
2. Wall covering.
3. Corner Guards.

1.2 SUBMITTALS

A. Product Data: Provide data on wall covering, adhesive, and corner guards.

B. Manufacturer's Installation Instructions: Indicate special procedures.

C. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Protect packaged adhesive from temperature cycling and cold temperatures.

1.4 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

PART 2 PRODUCTS

2.1 WALL COVERINGS

A. Wall Covering: Fiberglass Reinforced Panel, see drawings for basis of design.

B. Corner Guards: See drawings for basis of design.

C. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.

D. Trim: Per manufacturer.

E. Substrate Primer and Sealer: As required by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work and comply with requirements of wall covering manufacturer.

3.2 INSTALLATION

A. Apply adhesive and wall covering in accordance with manufacturer's instructions.

B. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.

C. Butt edges tightly.

D. Wall covering is required behind fin tube cabinets where both occur.

E. Install termination trim.

3.3 CLEANING

A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.

B. Reinstall wall plates and accessories removed prior to work of this section.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 09 91 13 - EXTERIOR PAINTING

A. This section includes the following:

1. Surface preparation.

2. Field application of paints.

3. Scope: Finish Exterior Doors.

4. Do Not Paint or Finish the Following Items:

a. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.

b. Items indicated to receive other finishes.

c. Items indicated to remain unfinished.

d. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.

e. Floors, unless specifically indicated.

f. Glass.

g. Concealed pipes, ducts, and conduits.

1.2 REFERENCE STANDARDS

A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

1.3 SUBMITTALS

A. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").

2. MPI product number (e.g., MPI #47).

3. Cross-reference to specified paint system products to be used in project; include description of each system.

PART 2 PRODUCTS

2.1 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Supply each paint material in quantity required to complete entire project's work from a single production run.

3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

3.2 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Apply each coat to uniform appearance.

C. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 09 91 23 - INTERIOR PAINTING

A. This section includes the following:

1. Surface preparation.

2. Field application of paints.

3. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

4. Do Not Paint or Finish the Following Items:

a. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.

b. Items indicated to receive other finishes.

c. Items indicated to remain unfinished.

d. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.

e. Floors, unless specifically indicated.

f. Glass.

g. Concealed pipes, ducts, and conduits.

1.2 REFERENCE STANDARDS

A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.3 SUBMITTALS

A. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").

2. MPI product number (e.g., MPI #47).

3. Cross-reference to specified paint system products to be used in project; include description of each system.

PART 2 PRODUCTS

2.1 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Supply each paint material in quantity required to complete entire project's work from a single production run.

3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

3.2 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 10 14 23 - PANEL SIGNAGE

A. Panel signage.

1.2 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.

B. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.

B. Shop Drawings:

1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.

2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

a. When room names to appear on signs differ from those on drawings, include the drawing room name on schedule.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.2 PANEL SIGNAGE

A. Panel Signage

1. Application: Room signs.

2. Description: Flat signs with engraved panel media, tactile characters.

3. Sign Size: As indicated on drawings.

4. Material: Laminated colored plastic engraved through face to expose core as background color, color indicated on drawings.

5. Braille: Grade II, ADA-compliant.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

A. Commercial toilet accessories.

1.2 SUBMITTALS

A. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.1 COMMERCIAL TOILET ACCESSORIES

A. See drawings for basis of design. Provide in-wall backing as required.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

3.2 INSTALLATION

A. Install plumb and level, securely and rigidly anchored to substrate.

B. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.3 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

A. This section includes the following:

1. Fire extinguishers.

2. Fire extinguisher cabinets.

1.2 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers 2017, with Errata (2018).

1.3 SUBMITTALS

A. Product Data: Provide extinguisher ratings and classifications.

PART 2 PRODUCTS

2.1 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. FE-36 Clean Agent Type Fire Extinguishers: Stainless steel tank, with pressure gauge.

1. Class: A:B:C type.

2. Size: 5 pound.

2.2 FIRE EXTINGUISHER CABINETS

A. Cabinet Construction: Non-fire rated.

1. Formed steel sheet; 0.036 inch thick base metal.

B. Cabinet Configuration: Recessed type.

C. Finish of Cabinet Exterior Trim and Door: Baked enamel, white color.

D. Finish of Cabinet Interior: White colored enamel.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 36 inches from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 12 36 00 - COUNTERTOPS

A. This section includes the following:

1. Countertops for manufactured casework.

2. Wall-hung counters and vanity tops.

3. Interior windowsills.

1.2 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards 2014, with Errata (2018).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1 2017, with Errata (2019).

C. ISFA 2-01 - Classification and Standards for Solid Surfacing Material 2013.

D. NEMA LD 3 - High-Pressure Decorative Laminates 2005.

E. PS 1 - Structural Plywood 2009.

1.3 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.5 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 COUNTERTOPS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Solid Surfacing Countertops and Windowsills: Solid surfacing sheet or plastic resin casting over continuous substrate.

1. Flat Sheet Thickness at Countertops: 1/2-inch, minimum.

2. Flat Sheet Thickness at Windowsills: 1/4-inch, minimum.

3. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.

a. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.

b. Color and Pattern: As indicated on drawings.

4. Exposed Edge Treatment: As indicated on drawings .

5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.

6. Skirts: As indicated on drawings.

2.2 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4-inch thick; join lengths using metal splines.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

C. Joint Sealant: Mildew-resistant silicone sealant, white.

2.3 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.

1. Join lengths of tops using best method recommended by manufacturer.

2. Fabricate to overhang fronts and ends of cabinets 1-inch except where top butts against cabinet or wall.

3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.

1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.

2. Height: 4 inches, unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.

3.4 CLEANING

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 20 01 00 - OPERATION AND MAINTENANCE FOR MECHANICAL

A. This Section covers form, content, and submittal of mechanical system Operation and Maintenance Manuals.

PART 2 PRODUCTS

2.1 FORM

A. Arrange operation and maintenance data sequentially by Specification Section.

B. Provide two indexes at the front of the binder that locates individual items by tab number. The first by Specification Section. The second, an alphabetical index of all items without regard to Specification Section.

C. Separate each item with consecutively numbered heavy stock divider sheets with plastic index tab. Type item number on both sides of paper inserts.

D. Precede each item with a completed Item Data Sheet. See required format attached to the end of this Specification Section.

E. Material included shall indicate the specific item(s) utilized for this Project. Delete or cross out all other items.

F. Provide complete operation and maintenance manual submittals. Partial or incomplete submittals required under this Section will be returned without review.

2.2 DATA

A. Provide data for all items, equipment, and equipment components specified or indicated under this Division, so that the Owner's maintenance personnel will have complete service and replacement information required for routine maintenance and repair and to provide maximum usable life. Include data not only for maintainable and repairable items, but also for replaceable but not repairable items. Typical items for which information is required include:

1. Equipment including all components and accessories such as motors, pulleys, belts, couplings, switches, etc.

2. Valves, meters, steam traps, thermometers, pressure gauges, strainers, filters, and other piping accessories.

3. Plumbing fixtures including fixtures, faucets, flush valves, floor drains, cleanouts, roof drains, and other components.

4. Heating and ventilation system terminal units including finned tube radiation, VAV boxes, unit heaters, etc.

5. Storage tanks and accessories.

6. Filters and duct accessories.

7. Control components and a complete set of As-built point-to-point Control Drawings. Provide a copy of the Sequence of Operations with Control Drawings.

B. Include the following data for each item as applicable. Some of these data can be extracted from equipment review submittals and included with the Operation and Maintenance Manuals.

1. Manufacturer's catalog literature and illustrations.

2. Operating characteristics including capacity data, performance curves, flow rates, pressure drops, etc.

3. Electrical characteristics and wiring diagrams.

4. Dimensions and connection sizes.

5. Installation and adjustment instructions, requirements, and recommendations.

6. Parts lists and assembly Drawings.

7. Maintenance, operational, and troubleshooting instructions.

8. Warranty data.

C. Data shall be as provided by the equipment manufacturer or supplier.

D. Data are required for all component items of equipment whether or not the components are products of the equipment manufacturer.

E. All material must be clearly readable. "Faxed" then photocopied information is not acceptable.

F. Include a chart, neatly typed, and arranged by system, summarizing periodic inspections and maintenance recommended by equipment manufacturers and/or required to properly maintain the facility's new mechanical systems. The periodic maintenance summary chart shall include equipment name, identification symbol, location, type of maintenance or inspection required, and recommended time interval.

G. Include an equipment schedule, neatly typed, and arranged by system, listing new equipment with equipment symbol, nomenclature, function, and area served, location, manufacturer, nameplate data including model and serial number and motor data including full load amps, horsepower, volts and phase.

H. Include a valve schedule, neatly typed, and arranged by system, listing new valve tags with information required on valve tag plus location and normal position, open or closed.

I. Include a clearly annotated floor plan and map of valves with correlating valve tags.

J. Include a report of startup and testing of each boiler to include the tag number and location; the appliance nameplate information; the burner nameplate information; the nozzle size, type, and angle; the connector temperature, combustion efficiency, draft, percent CO2, and smoke (on a scale of one to five), include high and low fire ratings where applicable; the parts per million of CO for gas fired operation where applicable; and inlet and outlet heated medium temperature.

K. Include a report of all tests, sterilization, cleaning, flushing, and refilling of mechanical systems. Report shall include the date, time, and time interval of each test; test results; a brief description of method of tests, and list of witnesses to the tests.

L. Include a certificate of conformance with bacteriological quality standards for domestic water piping.

2.3 BINDING

A. Bind the Operation and Maintenance Manuals in three ring, D-ring style binders with page lifters and vinyl covers. Expandable catalog type two hole binders with soft board covers and metal prong fasteners will not be accepted.

B. Provide multiple binders as required to limit single binder thickness to three inches. Divide binders at logical points. Do not overfill binders.

C. Controls system Operation and Maintenance Manuals may be bound and submitted for review as separate manuals.

D. Label the front cover and end panel. Label to include Project title, Project number, date, and facility name.

PART 3 EXECUTION

3.1 REQUIRED COPIES AND TIMING

A. Review Submittals:

1. Submit one electronic copy (PDF format) of the Operation and Maintenance Manual for review and acceptance by the Contracting Officer. Electronically Index (Bookmark) each section and item, by item data number and name within the electronic submittal.

2. Submit for review not less than thirty days prior to Substantial Completion Inspection.

B. Final Operation and Maintenance Manuals:

1. Provide five complete, reviewed, corrected and accepted Operation and Maintenance Manuals to the Contracting Officer a minimum of five working days prior to Project Substantial Completion Inspection and 5 working days prior to any scheduled training on equipment covered by the Operations and Maintenance Manual.

2. Provide three complete digital copy's (PDF format) of the accepted Operation and Maintenance Manuals to the Contracting Officer as part of the Final Operation and Maintenance Manual submittal. Provide digital copies on Compact Disc (CD) or USB compatible memory card (Flash).

END OF SECTION

ATTACHMENT: ITEM DATA SHEET

ITEM DATA SHEET

1. Item name/Drawing equipment number:

2. Specification section/Drawing number:

3. Manufacturer/model number:

4. Size/capacity:

5. Use and location: (1)

6. Spare parts source:

7. Providers of warranty service:

8. Other Contractor comments:

(1) This information must be provided for all items. Be specific as possible.

PART 1 GENERAL

1.1 SCOPE: SECTION 20 05 00 - COMMON WORK RESULTS

A. This Section covers general mechanical requirements for Work covered under Divisions 20, 22, and 23.

B. All Work and services specifically covered under this Division is supplementary to that covered under other Divisions of these Contract Documents. The requirements of this Division which are more stringent than that covered under other parts of these Contract Documents apply to Work covered under this Division.

C. All incidental Work required but not specified under this Division shall comply with the Division in which it is specified.

D. Review the Drawings and Specifications of all other Divisions for additional Work under Division 20.

1.2 GENERAL REQUIREMENTS

A. Provide the Owner with complete, coordinated, operating, balanced, tested, and adjusted mechanical systems.

B. Place all equipment in operation and instruct the Owner's maintenance personnel as to the proper operation, periodic maintenance, and lubrication of new mechanical equipment and systems.

C. The Drawings are somewhat diagrammatic and do not attempt to show all offsets or fittings required for installation of the mechanical system. Furnish and install pipes and ducts with fittings required for complete and proper installation of mechanical systems specified or required under this Division.

D. Provide piping, ductwork, equipment, and accessories indicated on the Drawings unless it is specifically indicated that the piping, ductwork, equipment, or accessory is existing.

E. Install piping, ductwork, and equipment in accordance with manufacturer's recommendations, with accessories recommended by the manufacturer for service intended, and with accessories indicated. Should recommendations conflict with Contract Documents, contact Contracting Officer for clarification before proceeding.

F. Coordinate the installation of the mechanical systems with the Work of other trades and existing conditions. Route mechanical systems as required to avoid interference with the Work of other trades and existing conditions.

G. Provide access to concealed piping accessories, duct accessories, and equipment requiring access for periodic maintenance, inspection, replacement, or adjustment. Furnish access panels/doors of the proper type and size for the application. See Division 08.

H. Do not scale the Mechanical Drawings. Verify dimensions as construction progresses.

I. Refer to the Architectural and Structural Drawings in regard to partition thicknesses, dimensions, and other details of the building construction.

J. Report any errors, discrepancies, or ambiguities to the Contracting Officer, who will answer all questions and interpret intended meaning of these Contract Documents. Accept Contracting Officer's interpretation as final.

K. Perform Work in a neat and workmanlike manner with skilled craftsmen specializing in said Work.

L. Provide new equipment and materials direct from the manufacturer unless specifically indicated otherwise. Remanufactured equipment and materials are specifically not acceptable.

M. Provide the product of only one manufacturer for each item or type of item provided in quantity.

N. Where the selection of materials or methods is left to the discretion of the Contractor, faithfully pursue the use of the best available materials or methods suitable for the purpose intended.

O. Install Owner furnished fixtures, appliances, and equipment indicated to be Contractor installed, and furnish and install all piping and/or ductwork required to connect Owner furnished fixtures, appliances, and equipment to the Mechanical systems, in accordance with the fixture, appliance, or equipment manufacturer's recommendations and as indicated.

1.3 PERMITS, TESTING, AND INSPECTIONS

A. Apply, obtain, pay for, and comply with the requirements of all permits, fees and inspections by public authorities required for the Work covered under this Division of the Specifications.

B. Transmit copies of permit applications, permits received, and public authority inspection reports to the Contracting Officer.

C. Test mechanical systems in accordance with the most restrictive procedures as defined under applicable codes or as specified elsewhere under this Division.

1. Provide a minimum of five working days' notice to Contracting Officer and public authorities prior to performance of test.

2. If less than required notice is given, the Contracting Officer may require the Contractor to repeat the test at no additional cost to the Owner.

3. Test Work prior to insulating or concealing. If less than required notice is given prior to insulating or concealing, the Contracting Officer may require the Contractor to uncover such Work for inspection and recover same at no additional cost to the Owner.

4. Submit certificate of compliance for all tests indicating system tested, results of tests, witnesses and dates prior to calling for Substantial Completion and final inspections.

5. During testing, isolate piping system equipment and accessories that are not rated to withstand test pressures or perform test prior to connection of such equipment and accessories to the piping system.

D. Substantial Completion and Final Inspections:

1. Provide minimum of 14 calendar days' notice to Contracting Officer and public authorities of intent to have Work ready for inspection. Confirm that Work will be ready for inspection a minimum of 5 working days' notice prior to requested inspection.

2. Prior to inspection:

a. Deliver to the Contracting Officer required equipment, Drawings, and records.

b. Clean fixtures and equipment. Remove manufacturer's stickers and leave free of dust and dirt.

c. Remove boxes, scrap, and other debris.

d. Touch up holidays or damaged painted surfaces.

e. Contractor's Mechanical Administrator, licensed by the State of Alaska, shall review mechanical systems installation for conformance with Contract Documents. With request for inspection, Contractor's Mechanical Administrator shall verify in writing that this review has been performed and note anything not conforming to Contract Documents.

f. With request for re-inspection of Work previously inspected, provide the Owner's previous inspection's deficiency list accompanied by an item by item statement of measures taken to correct the previously listed deficiencies.

g. Deliver to Owner personnel all special tools and devices furnished by the manufacturer with items, specialties or equipment to allow installation, disassembly, adjustment, repair or maintenance. Identify special tools or devices as to item to which it is applicable.

h. Provide mechanical receivables that the Owner is to receive upon completion of the Project. Turn over an inventory list of materials provided for the Owner's use to the Contracting Officer prior to scheduling substantial completion and final inspections.

i. Deliver to the Contracting Officer a Certificate of Instruction signed by all Owner personnel receiving instruction, all Contractor personnel providing instruction, and indicating dates of instruction.

3. During inspection:

a. Provide complete and up-to-date set of current record drawings for use during inspection.

b. Provide complete and operating systems suitable for the season.

c. Demonstrate that the mechanical system performs in accordance with the Contract Documents. Provide material and personnel required to perform the demonstration.

d. Provide assistance to inspection personnel required for a complete and thorough inspection.

1.4 CODES, ORDINANCES, AND STANDARDS

A. Federal, State, and local Codes and Ordinances take precedence over these Specifications and Drawings where conflicts occur unless the Drawings or Specifications call for more stringent requirements. Notify the Contracting Officer in writing of conflicts.

B. Follow latest adopted editions of Code of Federal Regulations, Alaska Administrative Code, International Building Code, International Mechanical Code, International Fuel Gas Code, Uniform Plumbing Code, International Fire Code, National Electrical Code, ADA Accessibility Guidelines, NFPA, ASME, NEMA, ASHRAE, SMACNA, etc. as applicable.

C. Comply with all applicable laws, building and construction codes, OSHA Safety and Health Regulations and applicable requirements of any governmental agency under whose jurisdiction this Work is being performed.

1.5 TEMPORARY HEAT & VENTILATION

A. During construction and until the Work is accepted as substantially complete by the Owner, provide such temporary heating and ventilating equipment, piping, wiring, power, fuel, vents, stacks and related items as necessary to carry on the Work and to protect personnel, Work and materials from such damage or injury as can be caused by dampness, cold, and fumes.

B. The system or parts of the system shall be complete in all respects prior to consideration of use.

C. The Contractor retains responsibility for all damage or harm to material, equipment, Work, personnel, etc. that might result from use of temporary heating and ventilating equipment.

D. Provide temporary equipment of sufficient number and size to maintain the temperature and ventilation requirements for Work, or a minimum temperature of 50 degrees F, whichever is higher.

E. Provide temporary ventilation of enclosed areas to cure materials, to disperse humidity, and to prevent accumulation of dust, fumes, vapors, and gases.

F. Non-vented or open flame heating/ventilating equipment is not permitted.

G. Electric heaters may be utilized with approval from the Owner.

H. Return steam condensate to central utility system. Wasting steam condensate to drain is specifically not permitted.

1.6 MECHANICAL COMPLIANCE RECORD

A. Record the performance of all tests, sterilization, cleaning, flushing and refilling of mechanical systems required under this Division.

B. Include date, time and time interval, test results, brief description of method of tests, and witnesses.

C. All tests shall be witnessed by the General Contractor.

D. Submit this record to the Contracting Officer prior to scheduling Substantial Completion and final inspections.

1.7 INSTRUCTION OF OWNER'S PERSONNEL

A. Instruct designated Owner personnel in the proper operation, periodic maintenance and lubrication of the project's mechanical systems, equipment and accessories utilizing an accepted Operations and Maintenance Manual.

B. As instructors, include journeymen plumbers, pipe fitters, sheet metal workers, electricians, and control technicians, each fully knowledgeable of the project's mechanical systems and equipment.

C. Instruct only those Owner personnel specifically designated by the Contracting Officer. Instruction of other Owner personnel will not meet the requirements of this Section.

D. Include system operations; periodic maintenance including locations and techniques; periodic lubrication including materials, methods and locations; location of concealed valves, instruments, dampers, etc.; location of electrical breakers and disconnects associated with mechanical equipment; and location of control items.

E. Include a thorough orientation of the Control Drawings accompanied by a demonstration of the interrelationships of all control devices including sensors, relays, controllers, operators, etc. Locate control equipment shown in the Control Drawings and demonstrate full operation of control devices and systems.

F. Instruct Owner personnel for a minimum of eight hours plus that required by other sections of this Division of the Specifications.

G. Schedule the instruction period in the same manner as for system tests. The Contractor is obligated to only one instruction period. The instruction period may be divided into more than one period with the concurrence of the Contracting Officer.

1.8 RECORD DOCUMENTS

A. When submitting record documents required by Section 01 70 00 “Contract Closeout,” also submit reproducible As-built Drawings of Contractor designed systems such as fire suppression systems and control systems.

B. Add the following to the list of items required by Section 01 70 00 “General Requirements” that be legibly marked on Contract Drawings:

1. Changes made to equipment identification assignments, replacing Contract Document assigned equipment designations, at each location that designation occurs.

2. Valve numbering for each valve assigned a number at each location shown on the Drawings.

1.9 WARRANTY

A. All manufacturer and supplier standard equipment, item or accessory warranties covered under this Division shall be the Contractor's responsibility under Project warranty period.

B. Equipment, item, or accessory warranties shall commence upon the date of Final Acceptance by the Owner.

C. Transfer all manufacturer and supplier standard equipment, item or accessory warranties to the Owner upon expiration of Project warranty period.

D. Any warranties, more stringent than manufacturer's standard, specified or indicated under this Division remain the responsibility of the Contractor before and after expiration of Project warranty period.

E. Minimum manufacturer or supplier warranty is that of the manufacturer or supplier used as the basis of design.

1.10 ASBESTOS FREE MECHANICAL SYSTEMS

A. Provide mechanical systems that do not contain asbestos or asbestos-containing materials.

1.11 PROJECT COMPLETION DOCUMENTATION AND MATERIAL TURN OVER

A. See individual specification sections for required project completion documentation, and required maintenance or spare parts to be turned over to the Contracting Officer, including the following:

1. Record documents and reports:

a. Record documents – Section 20 05 00 “Common Work Results.”

b. Testing, Adjusting and Balancing Report – Section 23 05 93 “Testing, Adjusting and Balancing for HVAC.”

c. Boiler inspection report – Section 23 52 23 “Forced Draft Cast Iron Boilers.”

d. Sterilization testing certificate – Section 22 11 16 “Domestic Water Piping.”

e. Conformed O&M manuals – Section 20 01 00 “Operation and Maintenance for Mechanical.”

f. Test performance records for sterilization, cleaning, flushing, and refilling of mechanical systems – Section 20 05 00 “Common Work Results.”

g. Conformed control O&M – Section 23 09 33 “Standalone Control Systems for HVAC.”

2. Training completion record:

a. Mechanical instructions training completion record – Section 20 05 00 “Common Work Results.”

b. Mechanical access panels and marker familiarization training completion record – Section 20 05 00 “Common Work Results.”

c. Digital control systems training completion record – Section 23 09 33 “Standalone Control Systems for HVAC.”

3. Equipment and Devices:

a. Glycol testing devices – Section 23 21 13 “Hydronic Piping.”

4. Extra Stock:

a. Particulate Air filters – Section 23 73 13 “Modular Air Handling Units.”

b. Control system spare fuses – Section 23 09 33 “Standalone Control Systems for HVAC.”

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 20 05 11 - COMMON SUBMITTAL REQUIREMENTS FOR MECHANICAL

A. This Section covers required mechanical equipment review submittals of material, equipment, items, and accessories covered under this Division for review by the Contracting Officer to determine conformance with the Project design concepts and Contract documents prior to commencement of Work under this Division.

PART 2 PRODUCTS

2.1 FORM

A. Each equipment review submittal or resubmittal shall be indexed, tabbed, and bound copies of data, Drawings, and materials lists. Alphabetize the index by item name and list the Specification Section and item number under which each item is submitted.

B. Submittal information is required for all material and equipment specified or indicated on the Drawings.

C. Organize submittals by Specification Section. Separate each Section by a heavy stock divider sheet with plastic index tab. Type Specification Section numbers on both sides of paper inserts.

D. Identify each item of the submittal with an item number. Number the first item within a Specification Section "#1", the second item within a Specification Section "#2", and so forth. Restart numbering sequence with each Specification Section. Further separate Section 21 13 00 “Fire Suppression Sprinkler System” and Section 23 09 23 “Direct Digital Control System for HVAC” by divider sheets with plastic index tabs between each item. Type item numbers on both sides of paper inserts.

E. Include equipment indicated on the Drawings, but not covered by a Specification Section, with the appropriate volume under a tab marked "Drawings." Rules for item numbering and item data sheets apply.

F. Precede each item with a completed Item Data Sheet. See required format attached to the end of this Specification Section.

G. Material submitted shall indicate the specific item(s) proposed for this Project. Delete or cross out all other items.

H. The mechanical equipment review submittal may be divided and submitted in the following volumes. Simultaneous submittal of all volumes is not required. Further division of the submittal into separate volumes is not permitted.

1. Section 20.

2. Section 22.

3. Section 23 except Section 23 09 33 “Standalone Control Systems for HVAC.”

4. Section 23 09 33 “Standalone Control Systems for HVAC.”

I. Include application, hanger, insulation, piping, valve, and damper schedules as indicated in submittal requirements, example schedule format attached indicating “Application Schedule.”

J. Long lead mechanical equipment may be submitted for review in a separate volume. Include all long lead items in a single volume that is indexed, tabbed and bound as required for regular mechanical equipment review submittals. Maintain the long lead item submittal as a separate volume throughout the submittal review process; do not incorporate into the regular mechanical equipment review volumes.

K. Each submittal or resubmittal of each volume shall be complete and shall contain all previously submitted material except that being replaced by new or revised material which shall be removed. Partial or improperly indexed or tabbed submittals or resubmittals shall be rejected without review or comment.

L. With each resubmittal include a complete summary of all changes and additions made to the equipment review submittal since the previous submittal. Only those items included in the summary will be reviewed with the resubmitted package.

M. Do not submit "updates" for previous submittal packages with resubmittals. Previous submittals will not be updated.

2.2 DATA

A. Include the following data for each item as applicable:

1. Manufacturer and model number.

2. Drawing equipment number.

3. Catalog literature.

4. Operating characteristics including capacity data, performance curves, flow rates, pressure drops, etc.

5. Electrical characteristics and wiring diagrams.

6. Dimensions and connection sizes.

7. Installation and adjustment instructions, requirements, and recommendations.

8. Color samples.

9. Warranty data.

B. A list of minimum submittals required is provided in each Section. These lists are not necessarily complete or all-inclusive and the Contractor is responsible for complete submittal.

PART 3 EXECUTION

3.1 REQUIRED COPIES AND TIMING

A. Submit one electronic copy (PDF format) of the Mechanical Equipment Review Submittal or resubmittal for review and acceptance by the Contracting Officer. Electronically Index (Bookmark) each section and item within the electronic submittal.

3.2 REQUIRED COPIES AND TIMING

A. Materials submitted shall be reviewed and accepted by the Contracting Officer before Contractor releases material for fabrication or shipment.

END OF SECTION

ATTACHMENT: ITEM DATA SHEET

ITEM DATA SHEET

1. Item number:

2. Item name/Drawing equipment number:

3. Specification section/Drawing number:

4. Manufacturer/model number:

5. Use and location: (1)

6. Spare parts source:

7. Providers of warranty service:

8. Proposed deviations from the Contract Documents: (2)

9. Other Contractor comments:

10. Contractor Certification: (3)

The undersigned Contractor Representative certifies that he has reviewed the attached information and has determined that the proposed material complies with the requirements of the Contract Documents; he has coordinated installation of the material with the work of other trades and existing conditions; he has determined and verified field measurements, field construction criteria, manufacturer's installation requirements affecting the proposed material; and has notified the Contracting Officer of conflicts.

_____

Contractor Representative's Signature

(1) Unless otherwise indicated, provide this information only when the product's use and location is not obvious. Provide this information for all items provided under Specification Sections 21 13 00 "Fire Suppression Sprinkler System" and 23 09 23 "Direct Digital Control Systems for HVAC."

(2) If this section is left blank it will be assumed that proposed equipment is exactly as specified and indicated on the Drawings.

(3) The Contractor referenced here is the General Contractor for the project. The signature of a subcontractor representative is not acceptable.

ATTACHMENT: APPLICATIONS SCHEDULE

APPLICATION SCHEDULE (EXAMPLE)

APPLICATION	**PRODUCT**	**MATERIAL**	**SIZE**

Contractor Comments:

PART 1 GENERAL

1.1 SCOPE: SECTION 20 05 13 - COMMON MOTOR REQUIREMENTS FOR MECHANICAL

A. This Section covers selection and installation of electric motors and starters provided under this Division as an integral part of specified equipment.

PART 2 PRODUCTS

2.1 ELECTRIC MOTORS

A. Provide electric motor driven equipment being furnished and installed under Division 22 and 23, complete with electric motors unless otherwise indicated. US Motors, TECO Westinghouse, ABB/Baldor, or equal.

B. Motor bearings: Ball type, permanently lubricated and sealed or greased with zerk type lubricating fittings extended to an easily accessible, single point location for field servicing. 100,000 hour, L-10 life.

C. Except for direct connected motors, provide motors complete with adjustable slide rails.

D. Single speed, 1750 RPM unless indicated otherwise.

E. Sized to meet the horsepower requirements of driven unit at design characteristics including all start-up, V-belt and/or drive and coupling losses, which are incurred without loading the motor beyond its nameplate horsepower rating. Minimum motor size shall be that scheduled or otherwise indicated.

F. Provide with motor horsepower nameplate ratings not less than 110 percent of the driven unit brake horsepower requirements where V-belt drives are employed.

G. Rated for continuous duty at 100 percent of rated capacity with temperature rise based on an ambient temperature of 40 degrees C.

H. Single phase electric motors: Thermally protected, open drip proof, unless otherwise required to meet UL listing for use to which it is put or location in which it is installed. Capacitor start-capacitor run type or of equal high efficiency design, when commercially available. When unavailable, manufacturer's standard. Designed for use with indicated voltage, 60 Hertz alternating current.

I. Three phase electric motors: Open drip proof, unless otherwise indicated or unless otherwise required to meet UL listing for use to which it is put or location in which it is installed. Squirrel cage induction type, designed for use with indicated voltage, 3-phase, 60 Hertz alternating current.

J. Provide premium efficiency rated motors with base mounted circulating pumps and air handling equipment requiring motors one horsepower and larger. Baldor, TECO Westinghouse, U.S. Motor, or equal.

K. Electronically commutated motors (ECM): Brushless permanent magnet design incorporating an integral electronic speed controller. Provide with Permanently lubricated with heavy duty bearings to match fan or pump load and pre-wired to the specific voltage and phase. Internal motor circuitry shall convert AC power supplied to the equipment to DC power to operate the motor.

L. Hostile Environment Motors: Corrosion resistant epoxy finish, extra-large cast iron conduit box, Forsheda shaft seal on frame size 254T and larger, copper windings, stainless steel shaft, Class F insulation.

2.2 MAGNETIC STARTERS

A. Provided under Division 26, except where specifically described or indicated as being provided as a part of the equipment specified under this Division.

PART 3 EXECUTION

3.1 INSTALLATION

A. Conform to the requirements of Division 26 and the National Electric Code.

B. Mount motors driving vibration isolated equipment on the same rigid frame and isolated with associated equipment.

3.2 OPERATION

A. Motors shall draw less than nameplate amperage (not service factor amperage) when operating driven equipment within both mechanical and electrical design parameters for this Project.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 20 05 29 - HANGERS AND SUPPORTS FOR MECHANICAL

A. This Section covers selection, installation, and adjustment of equipment and material used to hang and/or support mechanical systems and equipment.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and Selections for equipment and accessory items.

2. Submit concrete anchors used in each application with installation instructions and ICC evaluation report or other third party test report showing seismic rating (where applicable).

B. Application Schedule: Submit a schedule of hangers and supports listing the application, product, material, and size proposed for each application.

C. Test Reports:

1. Third party reports or certifications where indicated.

2. Copy of the standard form used for Special Inspection of concrete anchors.

D. Shop Drawings for fabricated pipe or equipment hangers or supports including:

1. Dimensions.

2. Construction details.

3. Materials.

4. Deflection for spring hangers.

5. Rated or design load, actual load, and safety factors.

6. Applications.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide factory standard hangers and supports complete with necessary inserts, bolts, nuts, rods, washers, and other accessories.

B. Acceptable manufacturer's: B-Line, Anvil, Tolco or equal.

2.2 PIPE HANGERS

A. Pipe hangers placed in direct contact with pipe:

1. Pipe hangers for 8 inches and smaller cast iron and steel pipe: Swivel loop style, galvanized carbon steel, similar to B-Line Figure 2 .

2. Pipe hangers for 6 inches and smaller copper pipe: Swivel loop style, carbon steel, epoxy coated or felt lined, copper colored Similar to B-Line Figure 200F .

3. Pipe hangers for 6 inches and smaller plastic: Swivel loop style, galvanized carbon steel similar to B-Line B3170NF.

B. Pipe hanger placed around insulation:

1. Clevis ring style, electro-galvanized carbon steel similar to B-Line B3100 .

2. J-Hanger, electro-plated steel, used with B-Line B3151 shield. B-Line B3690 or similar.

3. Adjustable band hanger, pre-galvanized steel, used with B-Line B3151 shield. B-Line 3170 or similar.

2.3 RISER CLAMPS

A. Riser clamps for cast iron and steel pipe: Electro-galvanized carbon steel. Similar to B-Line B3373 .

B. Riser clamps for copper pipe: Copper-electro plated carbon steel similar to B-Line B33373CT .

C. Riser clamps for DWV pipe: Carbon steel. Similar to B-Line B3373 .

D. Riser clamps for plastic, glass, aluminum, brass, stainless, etc. pipe: Polyvinyl coated carbon steel similar to B-Line B3373C .

2.4 HANGER RODS

A. Electro-galvanized carbon steel similar to B-Line ATR .

B. Select equipment hanger rods as required to properly support the equipment in-service load. Select tank, coil, etc. supports assuming that they are full of water when in service.

C. Size equipment hangar rods as follows:

Load/rod	Hanger Rod
0 - 300 pounds	3/8 inch
301 - 600 pounds	1/2 inch
601 - 900 pounds	5/8 inch
901 - 1400 pounds	3/4 inch
1401- 1900 pounds	7/8 inch

D. Size pipe hanger rods as follows:

Pipe Size	Hanger Rod
1/2 to 2 inches	3/8 inch
2-1/2 to 4 inches	1/2 inch

2.5 CHANNEL STRUTS

A. Fabricated from 0.105 inch thick rolled mild steel. Unistrut, Erico Caddy, Power Strut, or equal. Select as follows for spans up to seven feet. For longer spans or greater loads submit Shop Drawing for review.

Total Load	Unistrut	Power Strut
0 - 245 pounds	P1000	PS 200
246 - 680 pounds	P1001	PS 200 2T3

B. Finish: Zinc plated electrostatically for interior applications and hot dipped galvanized after fabrication for exterior applications.

2.6 CONCRETE ANCHOR BOLTS

A. Provide concrete anchor bolts rated for cracked concrete, acceptable for use in all Seismic Design Categories, tested and listed by third party suitable for the applicable seismic loads. For exterior applications provide anchors rated for exterior application such as stainless steel anchors.

B. Wedge anchors: Hilti Kwik Bolt TZ, DeWalt Power Stud+ SD2, Simpson Strong-Bolt 2 or equal.

C. Drop-in or screw anchors: Powers Snake+, Simpson Titen HD, Hilti KH-EZ or equal.

PART 3 EXECUTION

3.1 GENERAL

A. Examine the Architectural and Structural Drawings and provide additional structural members or framing required to support the mechanical systems.

B. Hanger spacing:

Metallic Pipe Size (Inches)	Steel Pipe Maximum Spacing Between Supports (Feet)	Copper Tube Maximum Spacing Between Supports (Feet)
1/2	7	5
3/4	7	5
1	7	6
1-1/4	7	7
1-1/2	9	8
2	10	8
2-1/2	11	9
3	12	10
4	14	12

Plastic Pipe Material	Maximum Spacing Between Supports
ABS	48 inches
CPVC 1 inch and smaller	36 inches
CPVC 1-1/4 inch and larger	48 inches
PEX	32 inches

C. Provide additional support at pump bodies, valves, elbows, bends, and other locations where concentrated loads occur.

D. Where groups of three or more pipes occur, they may be supported with trapeze hangers constructed from channel strut and hanger rods. Space trapeze hangers for smallest pipe supported.

E. Do not support piping four inches size and larger from a single joist or structural member.

F. Support hub and no-hub cast iron piping at each joint, in accordance with above hanger spacing table, or in accordance with coupling manufacturer's recommendations, whichever is more stringent.

G. Support piping with sleeved couplings and grooved end piping at each length of pipe and at each fitting, in accordance with above hanger spacing table, or in accordance with coupling manufacturer's recommendations, whichever is more stringent.

H. Provide floor mounted channel strut racks to support piping, ductwork, and equipment that cannot be otherwise supported from structure overhead or from walls.

I. At piping penetrating wood framing, cut hole with hole saw and center piping in hole so that piping does not contact wood framing. Provide plastic isolation bushings at distances called for in "Hanger Spacing" table.

J. Seal all penetrations of vapor retarder or membranes vapor tight.

K. Adjust hangers and supports and place grout for concrete supports to bring support to proper elevations.

L. When copper piping is placed in direct contact with channel strut supports, wrap piping at point of contact with two wraps of dielectric pipe wrap.

M. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.

3.2 HANGERS ON INSULATED PIPING

A. Place hanger or support in direct contact with the pipe unless specifically indicated that piping is to have continuous insulation. When placed in direct contact install fiberglass insulation around the hangers.

B. For suspended piping required to have continuous insulation, provide calcium silicate insulation segments between supported piping and hangers / supports. In addition, provide galvanized iron shields between the insulation segments and hangers / supports. Fabricate shields for four inches and larger pipes of 16 gauge iron, 18 inches long. Shields for three inches and smaller pipes of 18-gauge material, 12 inches long. Match the radius of curvature of the shields with the outside radius of the insulation.

3.3 WALL MOUNTED PIPING

A. Unless otherwise indicated, support piping that is installed exposed on walls with channel strut and compatible pipe clamps. Space supports in accordance with "Hanger Spacing" table.

B. Support vertical piping drops within one foot of top of drop and within one foot of bottom of drop and in accordance with "Hanger Spacing" table.

C. Where groups of two or more pipes occur support piping from common channel strut.

D. Secure channel strut to poured concrete walls with expansion anchors, to CMU walls with expansion anchors in grouted cells, and to stud walls with screws into studs or blocking.

E. Cut multiple channel strut supports for a piping run or drop to consistent lengths.

3.4 SEISMIC PROTECTION FOR MECHANICAL SYSTEMS

A. Mechanical equipment shall be installed in accordance with ASCE 7 as referenced by IBC. Section 20 05 48 “Seismic Controls for Mechanical” summarizes the requirements of ASCE 7 for this Project.

3.5 WOOD STRUCTURES

A. Unless otherwise indicated, use coach screw rod or lag screwed into bottom chords of structural members. Provide one 3/8” screw rod or lag for up to 250 lbs of load, larger diameter fasteners shall be approved by Engineer. Prior to installation of rod or lag, find center of structural member and drill pilot hole. Install rod or lag in pilot hole with minimum 1-1/2 inch engagement.

B. Support 4-inch piping at a maximum of 10 foot spacing and spread hanger loads to include two trusses per hanger

C. Loads in excess of 250 lbs shall be spread to adjacent members such that no individual member experiences point loads greater than 250 lbs.

D. Where supports are exposed in public access areas, secure support to bottom chord of structural member or to wood blocking installed above finished surface. Use of exposed channel strut or other devices to span structural members is specifically not permitted in public access areas.

E. At manufactured wood chord joists, attached hangers and supports to joists in accordance with joist manufacturer’s recommendations.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 20 05 48 - SEISMIC CONTROLS FOR MECHANICAL

A. This Section covers calculations, installation, and materials used to seismically restrain mechanical systems and equipment.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections of components for packaged seismic restraint systems and equipment.

B. Substantial deviations:

1. Submit to the Contracting Officer Shop Drawings of any proposed substantial deviations in the seismic control systems for this facility from these documents for review and acceptance. Include four, plus the number required by the Contractor, copies of each Shop Drawing submitted.

2. Each equipment anchorage submittal and each submittal for piping and ductwork supports shall include the following data unless otherwise indicated:

a. Force calculations. Include equipment tag, equipment weight, center of gravity, seismic constants, and height within structure in calculations.

b. Catalog data indicating operating weight, dimensions, materials, and construction details with anchors adequate to resist calculated forces.

c. Where a seismic restraint detail is provided as part of the Contract Documents, that detail may be used for the indicated basis of design equipment without force calculations. Alternate equipment may also use these details, provided the alternate equipment operating weight is less than 110 percent of the scheduled operating weight, the base configuration is similar, and the height of the center of gravity is within 10 percent of the basis of design center of gravity height.

3. Any substantial deviations from these documents installed prior to Contracting Officer review and acceptance of submittal may be required by the Contracting Officer to be removed and the indicated system be installed at no additional cost to the Owner.

4. The Contracting Officer is the sole judge of what constitutes a substantial deviation and what is an acceptable alternate technique or method.

1.3 SEISMIC DESIGN

A. Project is designed in accordance with the adopted edition of IBC 2021. Chapter 16 structural provisions references ASCE 7 which cover the design of the structural system and the installation of mechanical equipment within the structure. See IBC Reference Standards for the appropriate year for ASCE 7.

B. Install mechanical equipment in accordance with ASCE 7. This section summarizes the requirements in Chapter 13 for this Project. The design constants for this Project include:

1. The Risk Category for this Project is **II**.

2. The Seismic Design Category for this Project is **D**.

3. Use value of **S_{DS} = 0.72** for seismic force calculations.

4. All systems that are not related to life safety or for continued operation are Ip=1.0.

5. Unless otherwise indicated seismic forces on mechanical components shall be determined by equation from ASCE 7 subject to the following:

a. Fp=0.4*ap* SDS* Ip* 1/Rp*(1+2*z/h)*Wp

Fp = seismic design force
S_{DS} = spectral acceleration
ap = component amplification
Ip = component importance factor
Wp = component operating weight
Rp = component response modification factor
z = height in structure of point of attachment
h = average roof height

b. Fp is not required to be taken as greater than Fp =1.6 SDS Ip Wp.

c. Fp shall not be taken as less than Fp = 0.3 SDS Ip Wp.

1.4 EQUIPMENT SEISMIC RESTRAIN

A. Equipment shall be supported and attached to withstand seismic forces.

B. The component importance factor, Ip, shall be taken as 1.5 if any of the following conditions apply:

1. The component contains hazardous materials.

C. Equipment exempted from seismic restraint by ASCE 7: Chapter 13:

1. All equipment with an Ip = 1.0 weighing 400 pounds or less, has a center of gravity at four foot or less above the adjacent floor level and flexible connectors between the components and associated ductwork, piping and conduit are provided.

2. All equipment with an Ip = 1.0 weighing 20 pounds or less or, for distribution systems, weighing five pounds per foot or less and flexible connectors between the components and associated ductwork, piping and conduit are provided.

1.5 PIPING SEISMIC RESTRAINT

A. General:

1. See Specification Section 20 05 29 “Hangers and Supports for Mechanical” for attachment and supports for non-seismic loading.

2. For seismic design purposes, a pipe run is defined as any straight run of pipe greater than ten feet in length with a maximum offset of 30 inches.

B. Piping exempted from seismic restraint by ASCE 7: Chapter 13:

1. All mechanical components with an Ip = 1.0 weighing less than 20 pounds with flexible connectors between the components and associated piping are provided.

2. Non-ductile piping systems with Ip = 1.0 weighing 5 pounds/foot or less (includes filled water weight):

a. 2-inch or less diameter cast iron piping.

b. 3-inch or less diameter Plastic piping (PVC, CPVC, etc).

3. High-deformability piping (Steel and Copper) is used with an Ip = 1.0; provisions are made to avoid impact with larger piping or mechanical components or to protect the piping in the event of such impact:

a. Nominal pipe size shall be 3-inch diameter or less.

C. General Pipe Bracing:

1. Bracing shall be omitted on pipe runs less than 10 feet in total length.

2. Seismic restraint is exempt if the trapeze supported pipe weight is ten pounds per foot or less.

3. Each run of pipe requires a minimum of two transverse braces at each end of the pipe run and one longitudinal brace.

    a. A transverse brace placed on the run section at the opposite side of an elbow or tee within 24 inches may act as a longitudinal brace and is labeled a “Dual Use” brace.

    b. When using a transverse brace as a “Dual Use” brace it shall be provided as the stronger of the longitudinal or transverse brace requirements, i.e. anchor and other component sizes.

4. Transverse bracing shall be provided at 40 foot maximum spacing and longitudinal bracing shall be provided at 80 foot maximum spacing for welded steel pipe, brazed copper pipe or grooved piping with UL 213 listed connections.

5. Transverse bracing shall be provided at 20 foot maximum spacing and longitudinal bracing shall be provided at 40 foot maximum spacing for threaded steel or copper pipe or NON-LISTED UL grooved connections.

6. Cast iron, No-Hub, Plastic, FRP and other pipe or constructed non-ductile material, shall have the maximum brace spacing reduced to one half of the maximum brace spacing for welded steel or brazed copper pipe. Maximum space may vary depending on pipe manufacturers’ requirements.

7. All bracing shall be located at or within 6 inches of the vertical pipe support, which may require a rod stiffener based on all thread rod length.

D. Trapeze supported piping:

1. The bracing shall be attached directly to the trapeze with piping secured to the trapeze with pipe straps or 2-pc clamps.

2. Trapeze spacing is determined by the maximum support spacing of the smallest pipe on the trapeze.

3. Longitudinal braces, when needed, are required at both ends of a seismically braced trapeze.

4. Two transverse braces and one longitudinal brace are required per run.

5. It is not necessary to install both transverse braces and longitudinal braces on the same trapeze support.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide seismic restraints for piping systems as required.

B. Provide factory seismic restraint systems complete with necessary inserts, bolts, nuts, rods, washers, and other accessories. Cooper B-Line, Eaton, Loos & Co or equal.

2.2 ANCHOR BOLTS

A. Provide lag or common bolts manufactured to A 307 quality or better.

B. Provide seismically rated hardware and equipment for equipment restraint within or upon equipment base.

PART 3 EXECUTION

3.1 GENERAL

A. Examine the Architectural and Structural Drawings and provide additional structural members or framing required to support the mechanical systems.

B. Structural attachments (beam clamps, anchors, bolting assemblies, etc.) must be rated for Seismic use when attaching transverse or longitudinal braces to a pipe or duct hanger.

C. Seal all penetrations of vapor retarder or membranes vapor tight. The general contractor shall confirm penetrations are sealed correctly in an acceptable manner.

D. Install anchor bolts in accordance with manufacturers' instructions and third party evaluation report including special inspection as required.

E. Install anchor bolts with a minimum embed depth of eight bolt diameters unless otherwise indicated.

F. Friction clips shall not be used for anchorage.

G. Powder driven fasteners shall not be used in tension load applications.

H. When connecting braces to trusses connect to top cord of truss unless otherwise indicated.

3.2 EQUIPMENT SEISMIC RESTRAINT

A. Provide equipment anchorage and housekeeping pads as required to transfer seismic forces from the equipment to the building structure. Seismic anchorage details in Construction Documents meet the requirement of ASCE 7 Chapter 13.

B. Vibration isolated equipment:

1. Install using vertical and horizontal snubbers. Snubbers may be in addition to or integral with vibration isolators. See equipment specification sections for specific requirements.

2. Where vibration isolators or snubbers are anchored to concrete and bolt hole spacing is less than minimum separation distance indicated in third party evaluation report for anchor bolt attach isolator using a secondary plate. Isolator may be bolted to plate or welded to plate if welding is indicated in isolator's installation instructions. Provide minimum 3/8 inch thick secondary plate.

C. Seismically restrain water heaters, floor mounted expansion tanks, and similar storage vessels.

1. Restrain vessels up to 50-gallon capacity with two each 1-1/2 inches by 16 gauge galvanized iron straps secured to wall or other suitable structure. Place one strap at upper third of vessel and one strap at lower third.

2. Restrain vessels up to 100-gallon capacity with two each 3-inch by 16 gauge galvanized iron straps secured to wall or other suitable structure. Place one strap at upper third of vessel and one strap at lower third.

3. Restrain vessels over 100-gallon capacity as indicated.

4. Install straps under insulation at vessels with field-applied insulation.

3.3 PIPING AND DUCTWORK

A. Where seismic restraint is required, provide in accordance with any of the following systems. If multiple systems are used on the same piping or duct run, use the spacing requirements of the most stringent system. Do not mix components of different systems on the same brace.

1. SMACNA Seismic Restraint Manual, Second Edition 2008.

2. Systems designed and signed by a professional engineer.

3. Manufactured systems with standard details designed and signed by a professional engineer.

4. Applicable details indicated on drawings.

B. 12 Inch Rule: Bracing is not required for systems where hangers in the pipe or duct run are 12 inches or less in length from the top of the pipe to the supporting structure and articulating hangers are provided to avoid bending of the hangers and their attachments.

1. All hangers of a run must comply with the 12 inch rule or bracing is required.

2. Example of articulating hangers would be rods equipped with eye sockets, cable hangers, or sheet metal straps used to hang piping.

C. Vibration isolated piping or ductwork that is seismically restrained shall be installed with slack cable bracing systems in accordance with manufacturer's instructions to prevent short circuiting the vibration isolation.

D. Inline equipment installed in ductwork with an operating weight less than 75 lbs that is isolated from other systems does not require seismic bracing.

E. Seismic bracing must tie back to structure. If multiple seismic attachments are combined; provide calculations to support seismic bracing load bearing path back to structure.

F. Bracing installed on smaller piping or ductwork shall not be used to brace larger piping of ductwork.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 20 05 53 - IDENTIFICATION FOR MECHANICAL

A. This Section covers the identification of mechanical systems and components.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and selections for identification products and accessory items.

B. Valve Tag Schedule: Submit a schedule of valve tags listing the valve number, service, location, and valve size for each tagged valve.

PART 2 PRODUCTS

2.1 PIPE MARKERS

A. Pressure-sensitive identification markers banded in place with color-coded tape incorporating direction of flow arrows similar to "Opti-Code" markers and "Arrows On a Roll". Seton Name Plate Corp., Brady, Brimar, or equal. Painted stencil markers are not acceptable.

B. Provide markers of length and with letter size indicated below. Diameter listed is outer diameter of insulation if piping is insulated.

Nominal Diameter	Marker Length	Letter Height
3/4 to 1-1/4 inch	8 inches	1/2 inch
1-1/2 to 2 inches	8 inches	3/4 inch
2-1/2 to 7 inches	12 inches	1-1/4 inch
8 to 10 inches	24 inches	2-1/2 inches
Over 10 inches	32 inches	3-1/2 inches

C. Provide marker with appropriately color-coded background and with a clearly printed legend to identify the contents of the pipe in conformance with the "Scheme for the Identification of Piping Systems" (ANSI A13.1).

2.2 VALVE TAGS AND COLD PIPING ACCESSORY TAGS

A. Laminated plastic with subsurface printing, heavy duty, brass bead chain, and appropriately colored border. Craftmark, Seton, Brimar, or equal.

B. Minimum of 2-inch diameter round tag or 2-inch square tag with maximum three text lines, 0.2-inch high characters, 8 characters per line.

C. On each tag, print valve number and message describing system, function, and equipment and/or area/room served. Message shall be as complete as possible within space available.

D. Number valves sequentially.

2.3 EQUIPMENT LABELS

A. Minimum 1-inch high by 1/16-inch thick, black, laminated plastic with white core. "Setonply" by Seton Nameplate Corp., Craftmark, Brimar, or equal.

B. Engraved with 3/8-inch high characters identifying the item or equipment by symbol and description indicated on the Drawings.

2.4 ACCESS PANEL AND CEILING IDENTIFICATION MARKERS

A. Color coded dots. Seton, Avery, Craftmark or equal.

B. Color coded tacks. Seton, Avery, Craftmark or equal.

C. Color code markers as follows:

1. Dampers and ventilation devices: Blue.

2. Plumbing valves and devices: Green.

3. Heating valves: Yellow.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

A. Identify new piping, valves, balancing cocks, and equipment in the facility whether concealed within accessible spaces or exposed.

B. Do not label piping or ductwork exposed to view in offices or in public access areas.

C. Identify insulated and uninsulated piping.

D. Locate identification so that it is readable by a person standing on the floor for exposed items or at point of access for concealed items.

3.2 PIPING

A. Provide identification at both sides of partitions and floors, at all branch takeoffs, at connections to equipment and at intermediate intervals not in excess of fifty feet.

B. Secure pipe pressure-sensitive vinyl markers in place with pressure-sensitive tape incorporating direction of flow arrows on both ends of label. At each end make two complete wraps around the pipe with tape so that tape is wrapped back on itself to assure attachment.

3.3 VALVES

A. Identify normally open valves and balancing cocks with valve identification tags. Unless otherwise noted, equipment isolation valves and balancing cocks that are located adjacent to equipment isolated are exempted from this requirement.

B. Identify equipment isolation valves located in ceiling plenums and raised floor plenums unless the equipment isolated is also located in the ceiling plenum or raised floor plenum and is adjacent to isolation valve.

C. Identify normally closed valves with valve identification tags and with a second valve tag reading "NORMALLY CLOSED" in 1/2-inch high letters.

D. Permanently mark, etched, or stamped, balancing cock setpoint readings on one and one-half inches diameter brass valve tags attached to balancing cocks with No. 6 bead chain.

3.4 EQUIPMENT

A. Identify equipment, i.e. fans, pumps, coils, tanks, control panels, etc., with equipment labels mounted in readily accessible and readable location.

B. Mechanically secure labels with a minimum of two screws, bolts, or rivets. Adhesive backing does not provide secure mounting.

3.5 ACCESS PANEL AND CEILING IDENTIFICATION MARKERS

A. Provide identification markers for accessible tile ceiling areas and on access panels to indicate the location of balancing cocks, valves, volume dampers, fire dampers and other concealed mechanical items that may require service or adjustment.

B. Apply markers to the exposed face of panel or the ceiling tee bar nearest the concealed item.

C. Familiarize the Owner's maintenance personnel with the location and function of the markers during the instruction period.

3.6 PIPING IDENTIFICATION SCHEDULE

A. Label piping in accordance with ASME A13.1 requirements as specified by the following schedule.

SERVICE	MARKER LABEL	LABEL/LETTER COLOR	BAND COLOR
Water:			
Cold Water	Cold Water	Green/White	Blue
Hot Water	Hot Water	Green/White	Red
Recirculating Hot Water	Recirculating Hot Water	Green/White	Red
Drain or Indirect Waste	Drain Water	Green/White	Brown
Air:			
Compressed Air	Compressed Air	Blue/White	
Vacuum	Vacuum	Blue/White	
Fuel:			
Fuel Oil Supply	Fuel Oil Supply	Yellow/Black	
Fuel Oil Return	Fuel Oil Return	Yellow/Black	
Fuel Oil Fill	Fuel Oil Fill	Yellow/Black	
Fuel Oil Vent	Vent	Yellow/Black	White
Other:			
Glycol Heating Water Supply	Glycol Htg. Supply	Green/White	Gold
Glycol Heating Water Return	Glycol Htg. Return	Green/White	Gold
Refrigeration Gas	(Gas ID)	Green/White	Blue
Refrigeration Liquid	(Liquid ID)	Green/White	Blue

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 20 07 00 - INSULATION FOR MECHANICAL

A. This Section covers selection and installation of insulation used in the mechanical systems.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections of insulation products and accessory items.

B. Application Schedule: Submit a schedule of insulation types listing the application, product, material, and thickness proposed for each application.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide interior insulation having UL listed composite fire and smoke hazard rating not exceeding:

1. Flame Spread: 25.

2. Smoke Developed: 50.

B. Provide accessories such as adhesives, mastics, cement, tapes, and jackets having the same component rating as listed above.

C. Lagging fabric: 100 percent textured silica yarn or 100 percent cotton fabric, eight ounce per square yard, with or without pre-applied re-wettable adhesive finish. Fattal's Thermocanvas, Zetex 300, Newtex, or equal.

D. Thermal Insulation Coatings: Washable, abrasion resistant coating for thermal insulation. Minimum continuous service rating of 180 degrees F. Maximum dry basis VOC level of 80 grams per liter. Used to adhere lagging fabric without pre-applied re-wettable adhesive finish to pipe and duct insulation. Foster #30-36 Sealfas, MEI, Fiberlock, or equal.

E. Insulating cements: Mineral fiber base with maximum 0.90 (BTU-inch)/(square foot-hour-Fahrenheit) conductivity at 200 degrees F mean temperature.

F. Vapor barrier coatings: Water based, fire resistive, flexible, maximum 0.08 perm water vapor permeability. Foster #30-80, MEI, Fiberlock, or equal.

G. Preformed plastic insulation covers and inserts: PVC with fiberglass inserts provided by cover manufacturer. Johns-Manville Zeston, Fuller Speedline, Proto, or equal.

H. Metal Jackets: 0.024 inch thick embossed aluminum jacket meeting ASTM B209 with 1/2-inch wide, 0.015 inch thick, annealed stainless steel bands.

2.2 INTERIOR, ABOVE GRADE, PIPING SYSTEM INSULATION

A. Fiberglass pre-formed by the manufacturer specifically for the size pipe or tubing on which it is to be installed unless otherwise indicated. Owens/Corning Fiberglass 25 ASJ, Johns-Manville Micro-Lok 650 with AP-T self-sealing jacket, Knauf ASJ, or equal.

B. Continuous service rating: 500 degrees F minimum.

C. Provide with vapor barrier jacket with maximum water vapor permeability of 0.02 perm and minimum beach puncture resistance rating of 50 units and a white kraft paper facing.

D. Conductivity: 0.28 (BTU-inch)/(square foot-hour-Fahrenheit) maximum at 100 degrees F mean temperature.

2.3 SPRAY APPLIED FOAM URETHANE - INTERIOR

A. Rigid closed cell, two component, spray applied. Huntsman Heatlok Soy 200, DOW Chemical, Preferred Solutions, Inc., or equal.

1. Water absorption: 0.3% maximum.

2. Compressive Strength: 20 psi minimum.

3. Nominal Density: 2 pcf.

4. Water Vapor Permeance: 1.0 perms maximum at 1.42”.

B. Fluid Applied Air, Water & Vapor Barrier Membrane. Air-Bloc 32MR, W.R. Meadows, Prosoco, or equal.

1. Water Vapor Permeance: 0.08 perms maximum.

2. VOC Content: 100 g/L maximum.

3. Service Temp: 150 degrees F.

C. Fire Proofing. Paint to Protect DC315, Flame Off, Contego International, Inc., or equal.

1. VOC Content: 50 g/L maximum.

2. Meets UL-1715 and complies with NFPA 286.

2.4 OUTSIDE, RELIEF, EXHAUST, AND COMBUSTION AIR DUCT INSULATION

A. Insulation:

1. Rectangular ductwork: Two inches thick, minimum three-pound density, semi-rigid or rigid fiberglass insulation. Johns-Manville 800-Series Spin-Glas/AP, Owens/Corning 700-Series/ASJ, Knauf Insulation Board/ASJ, or equal.

2. Round ductwork: Two inches thick, semi-rigid fiberglass insulation with end grain perpendicular to jacket. Johns-Manville Pipe and Tank Insulation with AP Jacket, Owens-Corning Pipe and Tank Insulation/ASJ or equal.

B. Provide with vapor barrier jacket with a maximum water vapor permeability of 0.02 perms, a minimum beach puncture resistance rating of 50, and a white kraft paper facing.

C. Conductivity: 0.30 (BTU-inch)/(square foot-hour-Fahrenheit) maximum at 100 degrees F mean temperature.

D. Continuous service rating: 250 degrees F minimum.

E. Provide pressure sensitive tape, used to seal seams and penetrations, constructed from same material as the vapor barrier jacket.

2.5 REFRIGERANT SUCTION AND HOT GAS PIPING INSULATION

A. One inch thick closed cell insulation pre-formed by the manufacturer specifically for the size pipe or tubing on which it is to be installed. Armstrong AP Armaflex, , Kflex USA, Insul-Lock or equal.

B. Continuous service rating: -40 degrees F to 220 degrees F minimum.

C. Water vapor permeability: 0.08 perms maximum.

D. Conductivity: 0.28 (BTU-inch)/(square foot-hour-Fahrenheit) maximum at 100 degrees F mean temperature.

PART 3 EXECUTION

3.1 GENERAL

A. Provide insulation for new piping for the systems indicated below unless otherwise indicated.

B. Replace existing insulation that is removed to accomplish Work with new insulation as specified in Part 2 of this Section or to match existing if not specified. Match existing thickness unless otherwise indicated.

C. Surface Preparation: Prior to insulation installation, clean and dry exterior surfaces of pipe and ductwork.

D. Patch insulation on existing pipe and ductwork mains at removed branches. Match existing insulation and finish.

E. Do not cover or obscure manufacturer or field applied identification tags, nameplates, information labels, etc.

F. Seal exposed ends and face of cuts in fiberglass insulation with thermal insulation coating.

G. At and within 6 feet of finished floor in mechanical rooms, ventilation rooms, janitor's closets and high abuse areas, provide aluminum jacket over outer layer of exterior insulation, joined with longitudinal slip joints with minimum 2 inch lap, and with seams and joints sealed to provide watertight jacket. Secure jacket with stainless steel bands at 9 inch centers. At fitting or other locations where bands cannot be used secure jacket with galvanized zinc plated screws at 4 inch centers along seams.

3.2 INTERIOR, ABOVE GRADE PIPING SYSTEMS INSULATION, GENERAL

A. Unless otherwise indicated insulate the following piping systems with insulation thickness, additional insulation covering and insulation with a continuous vapor barrier in accordance with ASHRAE 90.1. Details used by this standard are included in the following schedule:

1. Interior domestic cold water, plumbing vent through roof, and rainwater leader cold piping:

Pipe Size	Insulation Thickness {2}{3}	Lagging Fabric Required	Continuous Vapor Barrier Required
<1-1/2 inches	1/2 inch	{1}	No
1-1/2 inches and larger	1 inch	{1}	Yes

{1} Lagging required at exposed installations, including mechanical spaces
{2} Provide continuous insulation
{3} Provide 2" thickness for plumbing vent through roof.

2. Insulation not required on interior domestic cold water, and rain water leader cold piping constructed of plastic piping.

3. Interior domestic hot water, recirculated domestic hot water, and hot water heating systems with design operating temperatures from 105 degrees F to 140 degrees F hot piping:

Pipe Size	Insulation Thickness	Lagging Fabric Required	Continuous Vapor Barrier Required
<1-1/2 inches	1 inch	{1}	No
1-1/2 inches and larger	1-1/2 inch	{1}	No

{1} Lagging required at exposed installations, including mechanical spaces
{2} Provide continuous insulation.

4. Hot Water heating systems with design operating temperatures from 141 degrees F to 200 degrees F hot piping:

Pipe Size	Insulation Thickness	Lagging Fabric Required	Continuous Vapor Barrier Required
<2 inches	1-1/2 inch	{1}	No
2 inches and larger	2 inches	{1}	No

{1} Lagging required at exposed installations, including mechanical spaces
{2} Provide continuous insulation.

B. Where pipes are insulated with two layers, stagger the insulation joints.

C. Where insulation terminates, continue insulation jacketing to cover exposed insulating material and seal to adjoining pipe with vapor barrier coating for cold piping and thermal insulation coating for hot piping.

D. Insulate equipment and accessories with the same thickness as is called for on adjoining piping unless otherwise indicated.

E. Insulate pipe fittings to the same thickness as adjoining pipe insulation. Insulate fittings with preformed plastic insulation covers packed full with fitting manufacturer provided fiberglass insulation or with segmented sections of pipe insulation and 1/4 inch coat of insulating cement.

F. Insulate solder and threaded end gate, globe, and ball valve bodies with pipe insulation. Do not insulate valve bonnets or bonnet rings. Fill voids between cutouts and valve body with insulating cement.

G. Insulate flanged end gate and globe valve bodies with insulating cement. Do not insulate valve bonnets.

H. Insulate thermometer and aquastat wells with pipe insulation. Terminate insulation at the socket.

I. Insulate air separators and heat exchangers same as pipe.

J. Place hanger or support in direct contact with the pipe and install fiberglass insulation around the hangers when continuous insulation is not required.

K. To provide a continuous insulation on piping systems, place support or hanger around piping insulation, provide calcium silicate insulation segments between the pipes supported and the support. In addition, provide galvanized iron shields between the insulation segments and the supports.

3.3 INTERIOR, ABOVE GRADE PIPING SYSTEMS INSULATION, HOT PIPING

A. Insulate domestic hot water piping in which hot water is being recirculated. Insulation is not required on branch piping to fixtures through which hot water is not being recirculated.

B. Insulate heating water (glycol) supply and return piping. Insulation is not required on concealed branch line piping serving finned tube radiation.

C. Terminate insulation at wall and floor penetrations. Maintain minimum one-inch clearance to combustible construction. At exposed locations, size penetration so that butting insulation to wall trims out penetration.

D. Seal and secure seams and joints to provide a neat and evenly rounded finished surface. It is not necessary to seal penetrations if holes are neatly cut in the insulation and there is a tight fit between the insulation and the penetrating equipment. A complete vapor barrier envelope is not required.

E. At exposed installations, including mechanical spaces, cover piping insulation and ends with lagging fabric, which has been dipped in a thermal insulation coating. Lap lagging fabric over ends of preformed plastic insulation covers. In office areas and in areas exposed to public view, install lagging fabric neatly, with cut rather than torn edges, to give a clean architectural appearance.

F. Secure self-sealing lap on concealed piping insulation with outward clinching staples at a maximum spacing of one foot on center.

G. Insulation is not required on flexible connectors, check valves, pipe guides, anchors, strainers, traps, meters, and pump bodies and any section of pipe between them less than 6 inches in length.

H. When pipe insulation is installed around ring, clamp, and clevis type hangers place the seam at the hanger rod and slit the sealing lap to pass around the rod.

I. Notch pipe insulation at trapeze hangers and at angle iron floor and wall supports. Seal insulation exposed to atmosphere with a thermal insulation coating.

3.4 INTERIOR, ABOVE GRADE PIPING SYSTEMS INSULATION, COLD PIPING

A. Domestic cold water: Only that piping serving more than one plumbing fixture. Insulation is not required on cold water branch line piping serving a single fixture, except that piping serving hose bibbs and drinking fountains. Insulate cold water piping serving hose bibbs and drinking fountains full length. Insulation is not required on piping serving only trap primers or on piping from trap primers to floor drains.

B. Insulate Plumbing VTRs from top of vent pipe to a point 3 feet beyond cold ceiling space.

1. Insulation in cold ceiling space: 2 inches thick.

2. Insulation below cold ceiling space: 1/2-inch thick.

C. Continuous through walls, floors, and ceilings unless otherwise indicated.

D. Seal and secure seams, joints, and penetrations in order to provide a neat and evenly rounded finished surface and complete vapor barrier envelope. Fill gaps between insulation and penetrating equipment with insulating cement and coat with vapor barrier coating.

E. Cover piping insulation and ends with lagging fabric, which has been dipped in a thermal insulation coating. Lap lagging fabric over ends of preformed plastic insulation covers. In areas exposed to public view, install lagging fabric neatly, with cut rather than torn edges, to give a clean architectural appearance.

F. When pipe insulation is installed around ring, clamp, and clevis type hangers place the seam at the hanger rod and slit the sealing lap to pass around the rod. After installation, seal these slits with a vapor barrier coating. If notching of the insulation is required to accommodate the hanger, fill the notches with insulating cement and vapor barrier coating.

G. When trapeze hangers and angle iron wall or floor supports are used on piping systems place the pipes supported in direct contact with the hanger. Notch fiberglass insulation at these hangers and supports. Fill the notches with insulating cement and vapor barrier coating.

H. Support well water piping using continuous vapor barrier through piping hangers and supports.

I. Insulate check valves with insulating cement or with an oversized section of pipe insulation. If pipe insulation is used, the inside diameter shall equal the outside diameter of the adjoining pipe insulation. If insulating cement is used, do not insulate the cap, flanges, and the side plug provided for access to the hinge pin.

J. Insulate balancing cock and flow control valve bodies with pipe insulation. Insulation shall not interfere with use of the pressure sensing taps or the volume regulating mechanism. Fill voids between cutouts and valve body with insulating cement and vapor barrier coating.

K. Insulate control valves and isolation valves with an oversized section of insulation. The inside diameter shall equal the outside diameter of the adjoining pipe insulation. Fill any voids between insulation sections with insulating cement and vapor barrier coating to provide a continuous vapor barrier.

L. Insulate water meter and pressure reducing valve bodies with insulating cement. Insulation shall terminate at the bonnet flange and shall not interfere with removal of the flange.

M. Where inline piping equipment are covered by insulation and cannot be identified by an exposed item such as a valve handle or pressure taps, install a chain as indicated in Section 20 05 53 “Identification for Mechanical” for a connection of a tag outside the insulation. Seal chain where it penetrates the vapor barrier.

3.5 OUTSIDE, RELIEF, EXHAUST, AND COMBUSTION AIR DUCT INSULATION

A. Insulate outside air intake ductwork from exterior wall/roof penetration to its associated air handling equipment mixing box, to its associated air handling equipment heating coil casing on units without a mixing box, or as indicated.

B. Insulate exhaust and relief air ductwork from exterior wall/roof penetration to 3 feet upstream of its associated exhaust/relief air damper, back to its associated exhaust/relief fan casing if no exhaust/relief damper is indicated, or as indicated.

C. Adhere insulation to ducts with noncombustible adhesive in accordance with manufacturer's recommendations for 50 percent coverage.

D. Seal and secure seams, joints, and penetrations in order to provide a neat and evenly rounded finished surface and complete vapor barrier envelope.

E. Where ducts are insulated with two layers, stagger the insulation joints.

F. On rectangular ducts, additionally secure insulation to bottoms and sides over 24 inches across with mechanical fasteners spaced at 12 inches on center and within 3 inches of all edges and corners.

G. Continuous through walls, floors, and ceilings.

H. Clip pins on mechanical fasteners flush at the washer and cover pin and washer with vapor proof pressure sensitive tape.

I. Apply insulation with joints tightly butted and sealed with vapor proof pressure sensitive tape.

J. Seal penetrations with pressure sensitive tape.

K. Seal insulation ends to adjoining exterior air inlets and outlets, roofs, walls, floors, ceilings, ducts, equipment, and building vapor retarder or membrane with vapor retarder pressure sensitive tape and lagging fabric to provide a complete vapor barrier envelope.

L. Provide metal corner beads, USG or equal, at all corners and hold in place with vapor proof pressure sensitive tape.

M. After insulation, corner beads, and vapor barrier have been installed cover all work with a lagging fabric, which has been dipped in a thermal insulation coating. In areas exposed to public view, install lagging fabric neatly, with cut rather than torn edges, to give a clean architectural appearance.

3.6 REFRIGERATION SUCTION AND HOT GAS PIPING SYSTEM INSULATION

A. Insulate refrigeration system suction and hot gas piping with closed cell insulation either being slipped over the piping or split longitudinally and applied on the piping.

B. Seal and secure seams, joints, and penetrations in order to provide a neat and evenly rounded finished surface and complete vapor barrier envelope.

C. Fabricate insulation fittings from properly miter cut pieces.

D. Bond seams and joints together with adhesive in accordance with manufacturer's recommendations.

E. Continuous through walls, floors, and ceilings.

F. Insulate refrigeration suction piping supports and hangars.

G. Provide 0.016 inch thick embossed aluminum jacket over outer layer of exterior insulation with seams and joints sealed to provide watertight jacket. Secure jacket with 1/2 inch wide stainless steel bands at 9 inch centers. At fittings or other locations where bands cannot be used secure jacket with galvanized zinc plated screws at 4 inches centers along seams.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 05 00 - COMMON WORK RESULTS FOR PLUMBING

A. This Section covers selection and installation of basic pipe materials and specialties.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and selections for equipment and accessory items.

B. Balancing Cock Schedule: Submit a schedule of balancing valves listing the service, location, valve size, and flow setting (GPM) for each balancing valve.

C. Substantial deviations:

1. Submit to the Contracting Officer Shop Drawings of any proposed substantial deviations in the piping systems for this facility from these documents for review and acceptance. Include four, plus the number required by the Contractor, copies of each Shop Drawing submitted.

2. Any substantial deviations from these documents installed prior to Contracting Officer review and acceptance of submittal may be required by the Contracting Officer to be removed and the indicated system be installed at no additional cost to the Owner.

3. The Contracting Officer is the sole judge of what constitutes a substantial deviation and what is an acceptable alternate technique or method.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide all pipes, fittings, and accessories required for complete functioning installation of all piping systems specified and required under this Division.

B. Miscellaneous items specified and required under this Division are not necessarily indicated on the Drawings.

2.2 THERMOMETERS

A. Solar or light powered 1/2-inch LCD digital display, -40 to 300 degrees F range, adjustable position face. Weiss, Trerice, Miljoco or equal.

B. Pipe mounted with stainless steel separable socket or provide NSF 61 or equivalent lead free certified brass separable socket such as a Weiss E35-75BSLF. Stainless steel is considered to meet NSF requirements on a material basis and does not require certification.

C. Provide insulation extensions as required.

2.3 PRESSURE GAUGES

A. 4-1/2-inch diameter dial, bourdon tube type. Trerice, Weiss, Miljoco, or equal.

B. Provide NSF 61 or equivalent lead free certified gauge or provide gauge with stainless steel wetted parts. Stainless steel is considered to meet NSF requirements on a material basis and does not require certification.

C. Phosphor-bronze bourdon tube.

D. Movement: Brass rotary type with bronze bushings.

E. Case: Cast aluminum, style to suit application.

F. Provide combination pressure/vacuum gauges where gauges are called for, at suction side of pumps.

G. Select range so normal operating pressure falls near mid-range.

H. Provide impulse dampeners where gauges are called for at the suction and discharge side of pumps and similar locations.

I. Provide insulation extensions as required.

J. Provide with brass siphon, 250 psig rated, on steam service.

2.4 DRAIN VALVES

A. Unless otherwise indicated, provide 3/4-inch ball valve or 1/2-inch ball valve if line size is less than 3/4-inch. Provide with brass hose end fitting and cap.

2.5 BALANCING COCKS

A. Combination balancing cock and positive shutoff valve with check valved pressure sensing taps, drain tap, memory stop, and certified to ANSI/NSF-61 or ANSI/NSF-372 low-lead requirements. B & G Circuit Setter Plus, TA, Nibco, or equal.

B. Teflon seats, EPT checks, EPDM stem "O" ring.

C. 200 psig, 250 degrees F rated.

D. At time of instruction, provide differential pressure meter by the same manufacturer as balancing cock and with sensing connections to suit balancing cocks. Complete with calibrated curves and carrying case, capable of plus or minus 3 percent accuracy, and with reading range of 0 to 25 feet B & G Model R0-5 or equal.

2.6 FLEXIBLE CONNECTORS

A. Corrugated hose and single braid fabricated from carbon steel for iron or steel systems. Flexonics Series 100, Metraflex, Twin City Hose, or equal.

B. Corrugated hose and single braid fabricated from bronze for copper systems. Flexonics Series 300, Metraflex, Twin City, or equal.

C. Rated for 200 psig at 200 degrees F.

D. End fittings to suit installation.

E. Minimum live length is manufacturer's recommended length to allow 3/4 inch offset distance from centerline.

2.7 MECHANICAL PIPE SEALS

A. Watertight, modular mechanical type, consisting of interlocking links shaped to continuously fill the annular space between the pipe and wall opening. Thunderline Link-Seal, Metraflex, Flexicraft, or equal.

B. Loosely assembled links with carbon steel, galvanized plated bolts and nuts forming a continuous rubber belt around the pipe with a glass reinforced, nylon plastic pressure plate under each bolt head and nut.

C. Provide seal elements constructed from materials recommended by the manufacturer for the installed application.

D. Primer coated steel wall sleeve with continuously welded water stop plate of same manufacturer as links to assure proper size selection

2.8 DIELECTRIC PIPE PROTECTION

A. Polyvinyl, 20 mil, self-adhesive. Westape, Calpico, 3M, or equal.

B. Dielectric nipples and flanges only. Dielectric unions are specifically not allowed.

2.9 ESCUTCHEONS

A. Chrome plated brass or stainless steel, spring clip. Dearborne Brass Series 5300, Brasscraft, Viking, or equal.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION AND APPEARANCE

A. Conceal piping above ceilings or in walls unless otherwise noted. Expose piping in spaces without ceiling or furred-in enclosures.

B. Install piping in truss space in areas with exposed trusses unless otherwise noted.

C. Route piping within the facility vapor retarder and insulation boundary.

D. Ream pipes thoroughly and clean before installation.

E. Flush lines clear of debris, scale, and discoloration prior to startup. Clean out all strainers and drip pockets after flushing.

F. Run pipes with proper grade to provide for easy drainage and venting.

G. Support piping to provide an installation that is without sag or droops.

H. Provide pipe supports and offsets, loops, or accessories at equipment connections to minimize connection stress caused by normal system warm-up, cool-down and equipment operation.

I. Install parallel runs of non-insulated piping as required to provide a minimum of 6-inch clearance between piping.

J. Install parallel runs of insulated piping as required to provide a minimum of 4-inch clearance between insulation surfaces.

K. Install piping and equipment as required to provide minimum 6 feet 8 inches of headroom in mechanical rooms, piping within 12 inches of the ceiling in other spaces with exposed piping, and as required to not interfere with other items or access to equipment.

L. At piping penetrating wood or metal framing, cut hole with hole saw and center piping in hole so that piping does not contact wood framing. Provide plastic isolation bushings as required to adequately support piping.

M. At floor penetrations of mechanical rooms or other rooms containing floor drains, except slab on grade floors, seal piping floor penetrations watertight with waterproof fire stop sealant.

N. Provide escutcheons around pipes at finished floor, ceiling, or wall penetrations. Slip steel escutcheons onto piping prior to joining pipe. Set steel escutcheons with bead of paintable silicon sealant at perimeter, press tight to wall or floor, and remove excess sealant.

O. Coordinate building envelope penetrations with Architectural drawing and Division 07 Specifications.

3.2 FITTINGS, VALVES, AND ACCESSORIES

A. Make changes of direction, branches, and reductions in pipe size with fittings. Bushings are allowed only in non-pressurized tanks and similar equipment.

B. Provide isolation valves at pressure gauges.

C. At pressure reducing valves, control valves, and other devices whose size is less than adjoining pipe size, provide reducers immediately adjacent to the device.

D. Provide isolation valves in piping adjacent to equipment, including terminal units, and where indicated. Locate valves on system side of unions or flanges.

E. Provide unions or flanges at connections to equipment and control valves to allow maintenance. Locate unions or flanges to allow maintenance without removal of any additional piping other than that between the union or flange and the equipment. Use of dielectric unions is prohibited.

F. Provide drains valves at all low points in piping systems for drainage unless otherwise indicated.

1. Drains are not required at plumbing fixtures if stop valve forms the low point of the branch.

2. Provide threaded plug where space is not available to install a drain valve.

G. Install balancing cocks with test ports at or above the horizontal position. Permanently mark, etched or stamped, balancing cock setpoint scale readings and balanced flow in GPM on 1-1/2 inches diameter brass valve tags attached to balancing cock with No. 6 bead chain. This tag is in addition to valve identification tag called for elsewhere.

H. Provide flexible connectors where indicated and on all connections to vibration isolated equipment.

I. Provide mechanical pipe seals where indicated. Provide steel wall sleeves at wall penetrations where mechanical pipe seals are installed except penetrations of existing poured concrete walls which may be core drilled to manufacturers recommended diameter.

J. Install thermometers, gauges, and plugs above the horizontal axis on horizontal pipe and orientated such that they are easily readable by a person standing on the floor for exposed equipment or from point of access for concealed equipment. Provide insulation extensions where thermometers, gauges, and plugs are installed on insulated piping.

K. At 1-1/2 inches and smaller piping install thermometers in pipe tees one size larger than line size.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 05 23 - GENERAL DUTY VALVES FOR PLUMBING

A. This Section covers the selection and installation of manual valves.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and selections for valves and accessory items.

2. Data showing parts in contact with domestic water are ANSI/NSF 61 certified to current lead free requirements.

B. Application Schedule: Submit a schedule of valves listing the application, product, material, and size proposed for each application.

PART 2 PRODUCTS

2.1 GENERAL

A. Standardize on one make as much as possible but not to the extent of sacrificing quality listed. Nibco, no substitutions, no alternative brands.

B. Provide ball valves where indicated, in lieu of gate valves for domestic water systems in piping 2-inch and less in size. All valves, 2 inches and smaller, shall be of same type. Provide ball valves installed in insulated piping systems with extended stems to bring the handle clear of the insulation.

C. ASME Class 125 unless otherwise indicated.

2.2 DOMESTIC WATER SYSTEM VALVES

A. Valves 2 inches and smaller:

1. Isolation valves: ANSI/NSF-61 or ANSI/NSF-372 certified, full port ball valve, two-piece, bronze body with brass internals, chrome plated or stainless steel ball, reinforced Teflon seats and seals, non-blowout stem similar to Nibco S-585-66-LF/T585-66-LF.

2. Check valves installed in horizontal lines and vertical lines with upward flow: Bronze body and cap, renewable seat, and disc, teflon disc. ANSI/NSF -61 certified, swing check, Y-Pattern, with threaded cap that allows for removal of entire disc assembly through top of valve body similar to Nibco S-413-Y-LF/T-413-Y-LF.

B. Water Heater Vacuum Breakers:

1. Bronze body. Open on vacuum of not over 0.5 inch Hg. Rated working conditions: 200 psig at 250 degrees F similar to Watts N36.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide isolation valves in piping adjacent to equipment and where indicated. Locate valves on system side of unions or flanges.

B. Do not install valve stems below horizontal.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 11 16 - DOMESTIC WATER PIPING

A. This Section covers selection, installation, testing, and sterilization of domestic water systems and storage tanks.

1.2 SUBMITTALS

A. Manufacturer's Data, catalog cuts, and selections of pipe and fittings are not required unless otherwise indicated.

B. Application Schedule: Submit a schedule of piping and fittings listing the application, product, material, and size proposed for each application.

C. Submit certification documentation showing that pipe and fittings in contact with domestic water are ANSI/NSF 61 rated to current lead free requirements.

D. Submit certificate of conformance with bacteriological quantity standards.

PART 2 PRODUCTS

2.1 PIPE, FITTINGS, AND JOINTS

A. Interior, above ground, three inches and smaller:

1. ANSI/NSF-61 certified type L hard copper tubing with wrought copper solder fittings with lead free solder.

2. At contractor’s option 3” piping may be connected with copper Victaulic fittings.

3. PEX-A Piping:

a. ANSI/NSF-61 rated, barrier-free cross-linked polyethylene, Uponor, Rehau or equal. Provide fittings meeting manufacturer’s installation and warranty requirements.

b. Provide connection to equipment and valves using ANSI/NSF-61 certified copper or brass nipples. Provide copper rough in fittings, with support connection to structure of metal construction. Sioux Chief or equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Prior to performing Work on the existing domestic water system, isolate that portion of system requiring renovation from the rest of the facility's domestic water system. Do not reconnect the isolated portion of the domestic water system to the existing system until sterilization and testing are complete.

B. Install copper piping systems unless otherwise indicated. PEX piping may be installed within concealed or inaccessible locations.

C. Terminate PEX piping at valves or equipment using copper or brass fittings. Terminate at rough in using copper rough in fittings.

3.2 EXTERIOR PIPING

A. Connect to utility service or well as indicated.

3.3 TESTING

A. Hydrostatically test new system at 100 psig for one hour with no noticeable pressure drop or water leaks.

B. Firmly tap soldered fittings with a leather or rubber mallet during the pressure test to demonstrate soundness of soldered joints.

3.4 STERILIZATION

A. Flush piping clear of debris or discoloration prior to sterilization.

B. Thoroughly sterilize the domestic water system with sodium hypochlorite mixed in solution with water as required to achieve not less than 50 parts per million of available chlorine for a minimum of 24 hours.

C. Introduce the sterilizing solution into the system in a manner that will cause all parts of the system to come into contact with the solution. Operate all valves at least twice during the contact period.

D. After sterilization, flush the solution from the system with clean water until the residual chlorine content is less than 0.2 PPM throughout the system. During the flushing period, open and close all valves several times.

E. 24 hours after flushing the system, sample the water at each domestic water storage tank, at one lavatory in each bathroom, at each drinking fountain, at each breakroom or coffee sink, and at the kitchen pot sink and submit samples to an independent testing laboratory for bacteriological testing. Submit certificate of conformance with bacteriological quantity standards, by State of Alaska, Department of Environmental Conservation Drinking Water Regulations (18AAC80), to the Contracting Officer.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 11 19 - DOMESTIC WATER SPECIALTIES

A. This Section covers selection and installation of domestic water specialties.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and selections for equipment and accessory items.

B. Submit data showing that specialties and accessories in contact with domestic water are ANSI/NSF 61 or ANSI/NSF-372 certified for contact with potable water.

PART 2 PRODUCTS

2.1 SPECIALTIES

A. Trap primers:

1. Type 3: Integral with lavatory p-trap. Satin chrome plated bronze. JR Smith Prime-eze, Zurn, Mifab, or equal.

B. Clothes washer supply/waste box:

1. Complete with case, two-inch waste outlet, and two each, separately operated supply faucets. Oatey 384, Eastman, or equal.

2. Case: White finish, molded compound, thermset fire-rated plastic. Assembly shall be listed with UL rated fire wrap to meeting ASTM E814 requirements for a maximum 2-hour rated wall.

3. Faucets: Hose end with bronze body, bonnet, and stem, with integral water hammer arrestors. Renewable seat. Repackable under pressure.

C. Pressure Reducing Valve:

1. Bronze body construction, stainless steel integral strainers and renewable nickel alloy seat, NSF 372 or equivalent lead free certified. Select to accommodate reduced pressure setpoint indicated. Select for 10 psig maximum allowable fall off pressure at indicated peak flow. Watts LF223/N223B, Bell and Gossett, Zurn, or equal.

2.2 TEMPERING VALVES

A. TV- 1: ANSI/NSF-372 listed bronze body construction with minimum adjustment range 80F to 120F with +/-3F temperature control range at min flow rate of 0.5gpm. Provide with integral inlet filter washers and hot and cold water check valves, ASSE rated for application, Watts LFMMV Series, Symons, Powers, or equal.

B. TV-2: ANSI/NSF-372, ANSI Z358.1 listed, brass body construction with minimum adjustment range of 95F to 120F. Bradley S19-2010, no alternate brand, no substitutions.

2.3 HOSE BIBBS

A. HB-1 : Cast brass/copper alloy body, renewable Buna-N seat, hose end. Nibco-Scott No. 63, 72, 73, 74 or equal. Provide with vacuum breaker with breakaway set screw to allow permanent installation, Watts 8B, Zurn, Woodford, or equal.

2.4 DOMESTIC WATER BACKFLOW PREVENTER – DOUBLE CHECK VALVE ASSEMBLIES

A. Double check design meeting applicable AWWA, ASSE and ANSI/NSF-61 standards and UL listed. Watts 007, Zurn, Apollo, or equal.

B. Lead-free cast copper-silicon alloy body construction rated for 175 psig working pressure.

C. Complete with resilient seated ball-valves valves at inlet and outlet.

D. Factory assembled and backflow tested.

E. Constructed so that all internal parts, including seat rings, can be serviced from the top or side or removed while the device is in line.

F. Ability to be installed in horizontal or vertical orientation.

2.5 DIELECTRIC NIPPLES

A. Nipples specifically designed to dielectrically isolate dissimilar metal piping systems. Watts, Epco, Capitol, or equal.

2.6 DOMESTIC WATER THERMAL EXPANSION TANK

A. Steel shell with baked enamel finish, Amtrol Therm-X-Trol, Watts, Eastman, or equal.

C. Rated for 125 psig working pressure.

D. Pre-charged air chamber.

E. Heavy-duty butyl diaphragm.

F. Rigid polypropylene liner.

G. Standard tire valve charging connection.

PART 3 EXECUTION

3.1 SPECIALTIES

A. Provide fixture supply tubes, fixture stops, and fixture traps, tailpieces, and trap arms at all fixtures requiring same.

B. Stencil the following label in 1-inch high letters onto water heater insulation jackets in plain view of system operator:
MAINTAIN SETPOINT AT 120 DEG F OR LOWER. HIGHER SETPOINTS CAN RESULT IN PAINFUL SCALDING WITH POSSIBLE SERIOUS AND PAINFUL INJURY.

C. Install traps with no more than one slip or compression fitting between trap and rough-in.

D. Provide escutcheons over all fixture supply and trap tailpiece wall penetrations. Inside cabinet escutcheons may be primed and painted steel instead of chrome plated.

E. Provide one trap primer for each floor drain served. Distribution units are not permitted.

F. Install Type 1 trap primers with gate valve isolation, concealed, and accessible through wall access panels unless otherwise indicated.

G. Provide dielectric nipples or flanges with dielectric gaskets at flange faces, bolt heads, and nut faces at connections of dissimilar piping materials in the domestic water system including connections

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

A. This Section covers the selection, installation, and testing of waste piping systems.

1.2 SUBMITTALS

A. Manufacturer's Data, catalog cuts and selections of pipe and fittings are not required.

B. Application Schedule: Submit a schedule of piping and fittings listing the application, product, material, and size proposed for each application.

PART 2 PRODUCTS

2.1 WASTE AND VENT PIPING

A. Above ground:

1. Acrylonitrile-Butadiene-Styrene (ABS) DWV pipe and fittings with solvent welded joints conforming with ASTM D 2661.

2.2 VENT THROUGH ROOF FLASHING

A. Provide insulation flashing that extends full height of vent with joints and seams soldered watertight. Provide with inside diameter four inches larger than pipe O.D. to allow insulation installation similar to FlashCo Counter Flashing.

PART 3 EXECUTION

3.1 INSTALLATION

A. Pitch drainage piping down 1/4-inch per foot in direction of flow unless otherwise indicated.

B. Provide cleanouts where indicated, at the base of every stack, every 75 feet along buried interior runs, at every 200 feet along exterior runs, for each aggregate change of direction greater than 135 degrees, and where otherwise required by code. Provide access panels or grade cover boxes where required and as indicated.

C. Terminate vent ten inches above roof surface unless otherwise noted. For a pitched roof measure the ten inches from the short side. Provide each vent through roof with flashing that extends full height of vent. Terminate with counter flashing cap set in mastic.

3.2 TESTING

A. Test new waste and vent system by plugging all openings and filling system with water. Test with a minimum of ten feet of water head on all joints with no level drop in one half hour period.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

A. This Section covers the selection and installation of sanitary waste piping equipment, drains, cleanouts and their connection to the domestic waste and vent piping system.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for equipment and accessory items. Provide a separate complete submittal for each equipment package even though some accessory items may be repeated in several packages.

a. Rough-in data

B. Shop Drawings:

1. Shop Drawing: provide drawings and details for each trench drain installation, including an elevation view, indicating all components making up each trench drain.

2. Contractor fabricated items.

PART 2 PRODUCTS

2.1 FLOOR DRAINS

A. Floor drains in plywood floors: Cast iron body and flashing with four-inch wide flange and with round nickel bronze adjustable strainer head with secured square hole grate. Trap primer connection. Sioux Chief 832-25DNR, J. R. Smith DX 2005/2010-A-P or equal.

2.2 KITCHEN FLOOR DRAINS AND FLOOR SINKS

A. Floor Sinks: 6 inches deep, porcelain enamel coated cast iron body, flanged receptor body, and dome bottom strainer. 12 inches square drain with anti-splash dome strained. J.R. Smith 320, MIFAB, Josam or equal.

2.3 CLEANOUTS

A. Vinyl tile floors: Cast iron body and frame with round adjustable scoriated secured cast iron top. Spigot outlet with taper thread, bronze closure plug. J. R. Smith 4223, MIFAB, Josam or equal.

B. Walls: Extra heavy cast iron cleanout tee. Stainless steel shallow cover. Countersunk, taper thread, bronze plug. Vandal proof screws. J. R. Smith 4532-U, MIFAB, Josam or equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Connect waste to all items requiring same.

B. Refer to the Architectural Drawings for fixture locations and mounting heights.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 33 36 - ELECTRIC DOMESTIC WATER HEATERS

A. This Section covers selection and installation of electric water heaters.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and selections for equipment and accessory items.
2. Operating characteristics.
3. Dimensions.
4. Materials of construction.
5. Connection sizes and locations.
6. Relief valve size and capacity.
7. Electrical data.
8. Wiring diagrams.
9. Submit data showing that water storage tanks and accessories in contact with domestic water are third party rated to current lead free requirements.

PART 2 PRODUCTS

2.1 GENERAL

A. Residential grade, UL listed, Current version of ASHRAE 90.1 complying. Rheem, State Censible Duron, PVI, or equal.

2.2 TANK

A. Solid steel shell with porcelainized glass lining.

B. Rated for 150 psi hydrostatic working pressure.

C. Equipped with magnesium anode.

D. Insulated with fiberglass blanket or foam insulation and covered with steel jacket with baked enamel finish.

E. Provided with tapping to receive pressure and temperature relief valve.

2.3 CONTROLS

A. Provide automatic temperature control to maintain water temperature at setpoint temperature.

B. Provide over temperature protector that cuts power in the event that tank water temperature exceeds setpoint.

C. Wire multiple element heaters to prevent simultaneous operation.

2.4 ACCESSORIES

A. Provide minimum 20-gauge aluminum drain pan complete with integral drain fitting.

PART 3 EXECUTION

3.1 INSTALLATION

A. Pipe pressure and temperature relief valve discharge to within six inches of the floor or to adjacent floor drain or slop sink as indicated. Cut end of discharge at 45 degree angle.

B. Provide aluminum drain pan with minimum 1” tall lip fitted with PVC drain connection. Pan diameter shall be oversized by minimum 4” to outer diameter of water heater.

C. Pipe drain pan discharge to adjacent floor drain as indicated.

D. Stencil the following label in one-inch high letters onto the tank insulation jacket in plain view of system operator:
FOR LEGIONELLA CONSIDERATION MAINTAIN SETPOINT AT 140 DEGREES F AND USE A TEMPERING VALVE(S) TO CONTROL SUPPLY TEMPERATURE.

3.2 TANK AND LINING WARRANTY

A. Unlimited Warranty:

1. Tank and lining integrity shall be warranted for a period of one year from date of acceptance of Substantial Completion by Owner against manufacturing defects and shipping or installation damage. Warranty to include all labor, material, and other costs associated with tank replacement or repair. Repairs shall be performed by manufacturer's authorized representatives. One year warrantee period on repairs of original lining and tank or replaced tank shall commence at day one upon resumption of beneficial use by the Owner.

B. Limited Warranty:

1. Tank and lining integrity shall be warranted for a period of five years from date of acceptance of Substantial Completion by Owner against manufacturing defects and shipping or installation damage. Warranty shall include prorated tank replacement only.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 42 13 - COMMERCIAL WATER CLOSETS AND URINALS

A. This Section covers the selection and installation of water closet fixtures, urinal fixtures, bidet fixture, accessories, and their connection to the domestic water and waste piping system.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for fixtures and accessory items.

a. Provide a separate complete submittal for each fixture type even though some trim items may be repeated in several fixtures.

b. Rough-in data for each fixture.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide IAPMO and ADA complying products and installations.

B. Fixtures: Vitreous China and enameled cast iron fixtures shall be white and stainless steel fixtures natural polished satin finish without discoloration unless otherwise indicated.

2.2 FLOOR MOUNTED WATER CLOSETS

A. WC-1: ADA complying, flush tank water closet.

1. Configure and install to conform to ADA.

2. Close coupled, elongated bowl, vitreous China, water saver 1.28 gallons per flush, 2-1/8-inch minimum trapway, 3-inch minimum flush valve, aquaguard tank liner. Provide with trip lever on complying side. Kohler Wellworth Highline ADA, American Standard Champion, Sloan, or equal.

2.3 ACCESSORIES

A. Seat: White plastic, injection molded, open, less cover, stainless steel self-sustaining check hinge, for elongated bowl. Church 9400C, Bemis, Kohler, or equal to suit.

PART 3 EXECUTION

3.1 INSTALLATION

A. Connect water and waste to all items requiring same.

B. Refer to the Architectural Drawings for fixture locations and mounting heights.

C. Install fixtures tight to adjacent walls and/or floors.

D. Provide tight fitting sleeves over all exposed water rough-in nipples.

E. Caulk joints between fixtures and walls with non-hardening silicon caulking. Provide caulking with color matching fixture or wall finish.

F. Secure floor mounted fixture supports to floor with 1/2-inch diameter bolts.

G. Reinforce plywood flooring with additional 1-1/8 inches plywood glued to underside of floor at all floors mounted fixture supports.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 42 16 - COMMERCIAL LAVATORIES AND SINKS

A. This Section covers the selection and installation of lavatory and sink fixtures, accessories, and their connection to the domestic water and waste piping system.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for fixtures and accessory items.

a. Provide a separate complete submittal for each fixture type even though some trim items may be repeated in several fixtures.

b. Rough-in data for each fixture.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide IAPMO and ADA complying products and installations.

B. Fixtures: Vitreous china and enameled cast iron fixtures shall be white and stainless steel fixtures natural polished satin finish without discoloration unless otherwise indicated.

C. Rough-in sleeves: Polished chromium plated drawn brass tubing.

D. Wall mounted lavatory fixture supports: Floor mounted, concealed arms with positive mechanical locking device, four-by-four inch base supports with welded high strength steel uprights, adjustable sleeve. Arms fully adjustable after installation of wall finish. J.R. Smith, Josam, or equal.

2.2 COUNTER MOUNTED LAVATORIES

A. L-1: Counter mounted lavatory (ADA complying).

1. Vitreous china, 20 by 17-inch self-rimming lavatory with front overflow. Caitlin L1290-4, American Standard Aqualyn, Kohler Pennington, or Mansfield equal.

2.3 COUNTER MOUNTED SINKS

A. S-1: Single compartment, stainless steel sink: Sterile

1. Counter mounted, self-rimming, single compartment, type 302, 18-gauge, stainless steel sink with rear ledge, under coating, and hand blended highlighted satin finish. 25 by 22 inches overall with 21 by 15-1/2 by 8-inch bowl. Caitlin CS25223, Elkay Lustertone, Just, Kohler, or equal.

B. S-2: Single compartment, stainless steel sink: Exam

1. Counter mounted, self-rimming, single compartment, type 302, 18 gauge, stainless steel sink with rear ledge, under coating, and hand blended highlighted satin finish. 25 by 22 inches overall with 21 by 15-1/2 by 8-inch bowl. Caitlin CS25223, Elkay Lustertone, Just, Kohler, or equal.

C. S-3: Double compartment, stainless steel sink (ADA Complying):

1. Counter mounted, self-rimming, double compartment, type 302, 18 gauge, stainless steel sink with rear ledge, under coating, and hand blended highlighted satin finish. 33 by 21 inches overall with 13 by 16 by 8-inch bowls. Elkay Lustertone LRAD 221955-3, Just DL-2133-A-GR, Kohler, or equal.

D. S-5: Single compartment, stainless steel sink: Lab

1. Counter mounted, self-rimming, single compartment, type 302, 18-gauge, stainless steel sink with rear ledge, under coating, and hand blended highlighted satin finish. 25 by 22 inches overall with 21 by 15-1/2 by 8-inch bowl. Caitlin CS25223, Elkay Lustertone, Just, Kohler, or equal.

2.4 FLOOR OR WALL MOUNTED SINKS

A. S-4: Floor mounted service sink:

1. 24 by 24 by 10 inches high, molded stone sink with stainless steel drain body, three-inch outlet, and stainless steel wall guard. Powers Fiat Mop Service Basin MSB, Kohler, Acorn, or equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Connect water and waste to all items requiring same.

B. Refer to the Architectural Drawings for fixture locations and mounting heights.

C. Provide tight fitting sleeves over all exposed water rough-in nipples.

D. Caulk joints between fixtures and walls with non-hardening silicon caulking. Provide caulking with color matching fixture or wall finish.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 42 19 - COMMERCIAL BATHTUBS

A. This Section covers the selection and installation of commercial bathtub fixtures, drains, accessories, and their connection to the domestic water and waste piping system.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for fixtures and accessory items.

a. Provide a separate complete submittal for each fixture type even though some trim items may be repeated in several fixtures.

b. Rough-in data for each fixture.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide IAPMO and ADA complying products and installations.

2.2 BATHTUBS

A. BT-1: Bathtub, handicapped accessible:

1. Fixture: 60 by 30 inches, acid resisting enameled steel, one-piece recessed bath with end drain outlet, slip-resistant surface, styrofoam support, and sound deadening pad. Chrome plated, cast brass, tub spout with diverter and trip lever pop-up drain. Pop-up drain. Sterling Ensemble, American Standard Salem, Kohler, Mansfield or equal.

2.3 SHOWER-BATHTUB VALVES

A. Diaphragm operated; pressure balanced mixing valve with temperature limit stop. Limit stop job set to deliver 105 degrees Fahrenheit shower water. All exposed parts stainless steel or chrome plated. Provide with tub metal trim kit with diverter spout. Moen 62370 valve and Moen T9389 trim kit.

2.4 SHOWER HEADS

A. ADA Head: Handheld shower spray with 59-inch flexible stainless steel hose and post style mounting bracket. Moen 52740EP17

PART 3 EXECUTION

3.1 INSTALLATION

A. Connect water and waste to all items requiring same.

B. Refer to the Architectural Drawings for fixture locations and mounting heights.

C. Install fixtures tight to adjacent walls and/or floors. Wall hung fixtures shall not exhibit noticeable deflection when supporting 175 pounds weight on furthermost projection.

D. Provide tight fitting sleeves over all exposed water rough-in nipples.

E. Caulk joints between fixtures and walls with non-hardening silicon caulking. Provide caulking with color matching fixture or wall finish.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 42 39 - COMMERCIAL FAUCETS, SUPPLIES, AND TRIM

A. This Section covers the selection and installation of commercial faucets, supplies, trim, accessories, and their connection to the domestic water piping system.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for fixtures and accessory items.

a. Provide a separate complete submittal for each fixture type even though some trim items may be repeated in several fixtures.

b. Rough-in data for each fixture.

c. Data showing parts in contact with domestic water are ANSI/NSF 61 rated to current lead free requirements.

B. Application Schedule: Submit a schedule of faucets, supplies, and trim listing the application, product, material, and size proposed for each application.

PART 2 PRODUCTS

2.1 SUPPLIES AND TRIM

A. Fixture supply tubes – concealed applications: Braided stainless steel outer sheath, inner PVC tubing, ANSI/NSF-61 certified, rated to 125 psi from 40 to 140 degrees F. Brasscraft, Speedway, Eastman, or equal.

B. Fixture stops: Polished chromium plated, brass, compression disc, quarter turn, ANSI/NSF-61 or ANSI/NSF-372 certified, angle stop valves with inlet end connections to suit piping system. Fixed handle operated unless indicated otherwise. Brasscraft, Speedway, Eastman, or equal.

C. Fixture traps, tailpieces, and trap arms: Unless otherwise indicated provide polished, chromium plated, drawn brass tubing not less than 17-gauge. Dearborne Brass 701/704, Brasscraft, Eastman, or equal.

2.2 ACCESSORIES

A. Indirect Waste Box:

1. Complete with case, 2-inch waste outlet. Similar to Guy Gray Standard Model.

2. Case: 16-gauge steel with epoxy finish.

2.3 LAVATORY FAUCETS

A. F-1: Lavatory faucets:

1. ADA, 4-inch single lever faucet handle, aerator, chrome plated brass construction, ANSI/NSF-61 certified, renewable seats. Moen Chateau L64601 series, no alternate brands, no substitutions.

2.4 SINK FAUCETS

A. F-2: Double compartment sink faucets:

1. ADA complying, deck mounted single faucet with single lever handle, 8-inch reach spout, chrome plated brass construction, ANSI/NSF 61 certified, and renewable seats. Elkay LK100CR, no alternate brand, no substitutions.

B. F-3: Service sink faucets:

1. Chrome plated with vacuum breaker, integral stops, adjustable wall brace, four arm handles, pail hook, and 3/4-inch hose end spout. Moen 8230, no alternate brand, no substitutions.

a. Hose and Hose Bracket: 30 inches long flexible, heavy-duty 5/8-inch rubber hose, cloth reinforced, 3/4-inch coupling at one end similar to Powers-Fiat 832-AA.

b. Mop Hanger: 24 inches long by 3 inches wide, 18-gauge, type 302 stainless steel with 3 rubber tool grips similar to Powers-Fiat 889-CC.

c. Strainer: Type 302, 16-gauge, stainless steel combination dome strainer and lint basket. Attach with stainless steel screws.

d. Drain: Type 316 stainless steel crumb cup strainer, removable basket, rubber seat stopper, type 316 stainless steel 1-1/2-inch OD tailpiece similar to Just J35-316.

C. F-4: Clinic Sink Faucet

1. Single faucet with 4-inch wrist blade handles with colored indexes, 5-1/4-inch swing spout with laminar flow aerator, renewable seats, chrome plated brass construction, ANSI/NSF-61 certified. Chicago No. 1100 with No. 317 handles, GN2AH series gooseneck, and No. E26 1.0 GPM laminar aerator, no alternate brand, no substitutions.

D. F-5: Lab Sink Faucet with Eyewash

1. Single faucet with integrated eyewash, chrome plated brass construction, ANSI/NSF certified. Bradley S19-500M Series, no alternate brand, no substitutions.

PART 3 EXECUTION

3.1 SPECIALTIES

A. Provide fixture supply tubes, fixture stops, and fixture traps, tailpieces, and trap arms at all fixtures requiring same.

B. For fixtures with exposed supply tubes, provide polished brass. For concealed applications, braided stainless steel supply tubes may be used at Contractor's option.

C. Install traps with no more than one slip or compression fitting between trap and rough-in.

D. Provide escutcheons over all fixture supply and trap tailpiece wall penetrations. Inside cabinet escutcheons may be primed and painted steel instead of chrome plated.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

A. This Section covers selection and installation of basic pipe materials and specialties.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and selections for equipment and accessory items.

B. Balancing Cock Schedule: Submit a schedule of balancing valves listing the service, location, valve size, and flow setting (GPM) for each balancing valve.

C. Substantial deviations:

1. Submit to the Contracting Officer Shop Drawings of any proposed substantial deviations in the piping systems for this facility from these documents for review and acceptance. Include four, plus the number required by the Contractor, copies of each Shop Drawing submitted.

2. Any substantial deviations from these documents installed prior to Contracting Officer review and acceptance of submittal may be required by the Contracting Officer to be removed and the indicated system be installed at no additional cost to the Owner.

3. The Contracting Officer is the sole judge of what constitutes a substantial deviation and what is an acceptable alternate technique or method.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide all pipes, fittings, and accessories required for complete functioning installation of all piping systems specified and required under this Division.

B. Miscellaneous items specified and required under this Division are not necessarily indicated on the Drawings.

2.2 THERMOMETERS

A. Solar or light powered 1/2-inch LCD digital display, -40 to 300 degrees F range, adjustable position face. Weiss, Miljoco, Trerice, or equal.

B. Pipe mounted with brass separable socket.

C. Duct mounted provide 9-inch stem and duct mounting flange.

D. Provide insulation extensions as required.

2.3 PRESSURE GAUGES

A. 4-1/2-inch diameter dial, bourdon tube type. Trerice, Weiss, Miljoco, or equal.

B. Phosphor-bronze bourdon tube.

C. Movement: Brass rotary type with bronze bushings.

D. Case: Cast aluminum, style to suit application.

E. Provide combination pressure/vacuum gauges where gauges are called for, at suction side of pumps.

F. Select range so normal operating pressure falls near mid-range.

G. Provide impulse dampeners where gauges are called for at the suction and discharge side of pumps and similar locations.

H. Provide insulation extensions as required.

I. Provide with brass siphon, 250 psig rated, on steam service.

2.4 PRESSURE AND TEMPERATURE TEST PORTS

A. Solid brass plug with Nordel or EPDM core rated for zero leakage to 500 psig and 275 degrees F. Sisco P/T Plugs, Pete's Plug, Caleffi, or equal.

B. At time of instruction of Owner personnel, provide a test kit of same manufacturer as test ports with carrying case containing two each 2-1/2 inches dial face pressure gauges, with recalibrtator, range 0 - 60 psig: two each gauge adapters; and two each one-inch dial face, five inches stem thermometers, 0 to 220 degrees F.

C. Provide insulation extensions as required.

2.5 DRAIN VALVES

A. Unless otherwise indicated, provide 3/4-inch ball valve or 1/2-inch ball valve if line size is less than 3/4-inch. Provide with brass hose end fitting and cap.

2.6 BALANCING COCKS

A. Balancing cock with check valved pressure sensing taps, drain tap, and memory stop. B & G Circuit Setter Plus, Armstrong CBV, Taco Accu-Flow, TA Hydronics, or equal.

B. Teflon seats, EPT checks, EPDM stem "O" ring.

C. 200 psig, 250 degrees F rated.

D. At time of instruction, provide differential pressure meter by the same manufacturer as balancing cock and with sensing connections to suit balancing cocks. Complete with calibrated curves and carrying case, capable of plus or minus three percent accuracy, and with reading range of 0 to 25 feet B & G Model R0-5, Taco, Armstrong, or equal.

2.7 FLEXIBLE CONNECTORS

A. Corrugated hose and single braid fabricated from carbon steel for iron or steel systems. Flexonics Series 100, Metraflex, Twin City Hose, or equal.

B. Corrugated hose and single braid fabricated from bronze for copper systems. Flexonics Series 200, Metraflex, Twin City, or equal.

C. Rated for 200 psig at 200 degrees F.

D. End fittings to suit installation.

E. Minimum live length is manufacturer's recommended length to allow 3/8-inch minimum offset distance from centerline.

2.8 AIR VENTS

A. Automatic air vents: Non-ferrous, rated for 150 psig operating pressure at 240 degrees F. Spirotherm Spirotop VTP-38, Taco Hy Vent No 426, Bell and Gossett No. 87, or equal.

B. High capacity automatic air vents: Iron body and bonnet with stainless steel, brass, and EPDM internal components, rated for 150 psig at 240 degrees F. Bell and Gossett No. 107A, Sarco, or equal.

C. Manual air vents: "Coin-operated" air vent. B & G No. 4V or equal.

2.9 MECHANICAL PIPE SEALS

A. Watertight, modular mechanical type, consisting of interlocking links shaped to continuously fill the annular space between the pipe and wall opening. Thunderline Link-Seal, Metraflex, Flexicraft, or equal.

B. Loosely assembled links with carbon steel, galvanized plated bolts and nuts forming a continuous rubber belt around the pipe with a glass reinforced, nylon plastic pressure plate under each bolt head and nut.

C. Provide seal elements constructed from materials recommended by the manufacturer for the installed application.

D. Primer coated steel wall sleeve with continuously welded water stop plate of same manufacturer as links to assure proper size selection. Thunderline Link-Seal Model WS, Metraflex, Flexicraft, or equal.

2.10 DIELECTRIC PIPE PROTECTION

A. Polyvinyl, 20 millimeter, self-adhesive. Westape, Calpico, 3M, or equal.

B. Dielectric nipples and flanges only. Dielectric unions are specifically not allowed.

2.11 ESCUTCHEONS

A. Chrome plated brass or stainless steel, spring clip. Dearborne Brass Series 5300, Brasscraft, Viking, or equal.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION AND APPEARANCE

A. Conceal piping above ceilings or in walls unless otherwise noted. Expose piping in spaces without ceiling or furred-in enclosures.

B. Install piping in truss space in areas with exposed trusses unless otherwise noted.

C. Route piping within the facility vapor retarder and insulation boundary.

D. Ream pipes thoroughly and clean before installation.

E. Flush lines clear of debris, scale, and discoloration prior to startup. Clean out all strainers and drip pockets after flushing.

F. Run pipes with proper grade to provide for easy drainage and venting.

G. Support piping to provide an installation that is without sag or droops.

H. Provide pipe supports and offsets, loops, or accessories at equipment connections to minimize connection stress caused by normal system warm-up, cool-down, and equipment operation.

I. Install parallel runs of non-insulated piping as required to provide a minimum of six-inch clearance between piping.

J. Install parallel runs of insulated piping as required to provide a minimum of four-inch clearance between insulation surfaces.

K. Install piping and equipment as required to provide minimum 6 feet 8 inches of headroom in mechanical rooms, piping within 12 inches of the ceiling in other spaces with exposed piping, and as required to not interfere with other items or access to equipment.

L. At piping penetrating wood or metal framing, cut hole with hole saw and center piping in hole so that piping does not contact wood framing. Provide plastic isolation bushings as required to adequately support piping.

M. Provide escutcheons around pipes at finished floor, ceiling, or wall penetrations. Slip steel escutcheons onto piping prior to joining pipe. Set steel escutcheons with bead of paintable silicon sealant at perimeter, press tight to wall or floor, and remove excess sealant.

N. Coordinate building envelope penetrations with Architectural drawing and Division 07 Specifications.

3.2 FITTINGS, VALVES, AND ACCESSORIES

A. Make changes of direction, branches, and reductions in pipe size with fittings. Bushings are allowed only in non-pressurized tanks and similar equipment.

B. Provide isolation valves at pressure gauges.

C. At pressure reducing valves, control valves, and other devices whose size is less than adjoining pipe size, provide reducers immediately adjacent to the device.

D. Provide isolation valves in piping adjacent to equipment, including terminal units, and where indicated. Locate valves on system side of unions or flanges.

E. Provide unions or flanges at connections to equipment and control valves to allow maintenance. Locate unions or flanges to allow maintenance without removal of any additional piping other than that between the union or flange and the equipment. Use of dielectric unions is prohibited.

F. Provide drains valves at all low points in piping systems for drainage unless otherwise indicated.

1. Drains are not required at plumbing fixtures if stop valve forms the low point of the branch.

2. Drains are not required where screwed cap dirt legs are indicated.

3. Provide threaded plug where space is not available to install a drain valve.

G. Provide full port ball valves with threaded metal caps at strainer blow down connections. Valve size to match blow down connection size.

H. Provide air vents at high points in closed loop or recirculating piping systems. Install automatic air vents, with isolation valve, throughout the piping systems except where specifically indicated otherwise. Provide manual air vents, with valve, where air vents are required under finned tube radiation enclosures or where space will not allow installation of automatic air vent with isolation valve. Keep automatic air vent isolation valves closed except when purging air from system. Close isolation valves at end of Project.

I. Install balancing cocks with test ports at or above the horizontal position. Permanently mark, etched, or stamped, balancing cock setpoint scale readings and balanced flow in GPM on 1-1/2 inches diameter brass valve tags attached to balancing cock with No. 6 bead chain. This tag is in addition to valve identification tag called for elsewhere.

J. Provide flexible connectors where indicated and on all connections to vibration isolated equipment.

K. Provide mechanical pipe seals where indicated. Provide steel wall sleeves at wall penetrations where mechanical pipe seals are installed except penetrations of existing poured concrete walls which may be core drilled to manufacturers recommended diameter.

L. Provide pressure and temperature test ports where indicated and at the following locations:

1. At inlets to and outlets from hydronic system equipment and terminal units except finned tube radiation, reheat coils, unit heaters, and cabinet unit heaters.

M. Install thermometers, gauges, and plugs above the horizontal axis on horizontal pipe and orientated such that they are easily readable by a person standing on the floor for exposed equipment or from point of access for concealed equipment. Provide insulation extensions where thermometers, gauges, and plugs are installed on insulated piping.

N. At 1-1/2 inches and smaller piping, install thermometers in pipe tees one size larger than line size.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 05 23 - GENERAL DUTY VALVES FOR HVAC

A. This Section covers the selection and installation of manual valves.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and selections for valves and accessory items.

B. Application Schedule: Submit a schedule of valves listing the application, product, material, and size proposed for each application.

PART 2 PRODUCTS

2.1 GENERAL

A. Standardize on one make as much as possible but not to the extent of sacrificing quality listed. Nibco, no substitutions, no alternative brands.

B. Provide ball valves where indicate, in lieu of gate valves for heating systems in piping three-inch and less in size. All valves, three inches and smaller, shall be of same type. Provide ball valves installed in insulated piping systems with extended stems to bring the handle clear of the insulation.

C. ASME Class 125 unless otherwise indicated.

2.2 HYDRONIC SYSTEM VALVES

A. Valves 3 inches and smaller:

1. Ball valves for hydronic service: Full port, two piece, brass body with brass internals, chrome plated or stainless steel ball, reinforced Teflon seats and seals, non-blowout stem similar to Nibco S-FP-600A/T-FP-600A.

2. Automatic air vent, pressure gauge, pressure test port isolation valves, and finned tube element drain valves: Bronze body ball valve, Teflon seats, vitron O-ring stem seals, chrome plated brass ball, non-blow out stem. For finned tube element drains, provide with screw slot instead of handle similar to Jomar T-82 Mini.

    a. Check valves installed in horizontal lines and vertical lines with upward flow: Bronze body and cap, renewable seat, and disc, teflon disc. Swing check, Y-Pattern, with threaded cap that allows for removal of entire disc assembly through top of valve body similar to Nibco S-413-Y/T-413-Y.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide isolation valves in piping adjacent to equipment, including terminal units, and where indicated. Locate valves on system side of unions or flanges.

B. Do not install valve stems below horizontal.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

A. This Section covers balancing and adjusting of mechanical systems.

1.2 SUBMITTALS

A. Balancer Qualifications and Balancing Plan:

1. Name and address of balancing subcontractor.

2. Balancing subcontractor’s certificates, qualifications, and experience in balancing mechanical systems, located in Alaska, of comparable type and size to those associated with this Project.

3. Copies of standard data report forms proposed for use on this Project.

4. Project specific plan/procedures for balancing of mechanical systems.

1.3 QUALITY ASSURANCE

A. The balancing subcontractor shall be a firm, independent of the General Contractor or any other subcontractor, specializing in balancing mechanical systems, with at least five years’ experience in balancing mechanical systems, located in Alaska, of comparable type and size to those associated with this Project.

B. Comply with the applicable procedures and standards outlined in one of the following publications:

1. "National Standards for Total Systems Balance" 2002 by the Associated Air Balance Council.

2. "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," dated January 2005, by the National Environmental Balancing Bureau.

C. Instruments used in the balancing procedure must have been calibrated within a period of 12 months, or as otherwise recommended by the equipment manufacturer, and checked for accuracy prior to start of Work. Make maintenance and calibration records for all equipment available on request for examination by the Contracting Officer.

PART 2 PRODUCTS

2.1 BALANCING REPORTS

A. Bind, tab by system, number pages, and include a table of contents at the beginning of the report.

B. Label the front cover and end panel. Label to include Project title, Project number, date, and facility name.

C. Include a cover sheet containing the following information:

1. Project title, Project number, facility name, Contractor, and date.

2. Name and address of balancing agency performing Work.

3. Signature and seal of responsible member of balancing agency.

D. Provide list of balancing equipment used on this Project with date of last calibration indicated.

E. Summarize Work observed that does not conform to the Contract Documents and Work that does not allow the system to be balanced in accordance with the Contract Documents. Include opinions on why Work does not allow the system to be so balanced, collect data to support those opinions, and recommendations for corrective action that would allow the system to be so balanced.

F. Compile data on standard report forms submitted and accepted.

1. Identify equipment by the same symbol or number used on Contract Drawings.

2. Note Work observed that does not conform to the Contract Documents and installations that do not allow the system to be balanced in accordance with the Contract Documents on the report form.

2.2 REPORT DATA REQUIRED

A. Pumps and associated motors:

1. Tag No., location, and service.

2. Pump nameplate information.

3. Motor nameplate information.

4. Installed thermal overload heater rating.

5. Specified head (FT H2O).

6. Specified flow (GPM).

7. Operating head (FT H2O).

8. Operating flow (GPM).

9. Operating temperatures (degrees F).

10. Pump curve with operating point plotted.

11. Motor operating voltage and amperage.

B. Balance valves:

1. Valve no., terminal unit served, location, and size.

2. Specified flow (GPM).

3. Operating setpoint.

4. Operating flow (GPM).

5. Operating pressure drop (FT H2O).

C. Fans and associated motors:

1. Tag No., location, and service.

2. Fan nameplate information.

3. Motor nameplate information.

4. Installed thermal overload heater rating.

5. Specified capacity (CFM).

6. Specified static pressure (In H2O).

7. Specified fan speed (RPM).

8. Operating capacity (CFM). Submit duct or filter bank traverse data.

9. Operating static pressure (In H2O).

10. Pressure drop (In H2O) across each filter bank with clean filters at full capacity.

11. Operating fan speed (RPM).

12. Motor operating voltage and amperage.

13. Fan sheave and belt data.

14. Fan curve with plotted operating point.

15. Outside air quantity (CFM) at minimum outside air damper setting as specified in Section 23 09 23 “Direct Digital Control System for HVAC”. Submit duct traverse data.

D. Hydronic Coils:

1. Tag No., location, and service.

2. Face Area.

3. Specified capacity (CFM).

4. Actual capacity (CFM).

5. Specified flow (GPM).

6. Operating flow (GPM).

7. Operating pressure drop (FT H2O).

8. Entering Water Temperature (degrees F).

9. Leaving Water Temperature (degrees F).

10. Entering Air Temperature (degrees F).

11. Leaving Air Temperature (degrees F).

E. Room air outlets:

1. Tag No. and location.

2. Size and style.

3. Area factor (Ft2).

4. Specified capacity (CFM).

5. Actual face velocity (FPM).

6. Actual capacity (CFM).

PART 3 EXECUTION

3.1 GENERAL

A. Provide labor, instruments, and materials required to balance and adjust the facility's mechanical systems to obtain fully functional and properly operating systems.

B. Notify Contracting Officer in writing at least ten days in advance as to when balancing is scheduled to commence.

C. Prior to starting the balancing procedures verify that systems to be balanced are complete, operational, and that:

1. Filters and strainers are clean.

2. Controls system installation is complete and controlling systems to be balanced in accordance with the Contract Documents.

3. Isolation valves or dampers are full open.

4. All piping and ductwork has been cleaned of construction debris and scale.

D. Put all mechanical systems and equipment into full operation and continue the operation of same during each working day of balancing.

1. On systems with variable frequency drives (VFD) and belt driven equipment, set adjustable sheaves so that motor operates between 55 HZ to 63 HZ at call for full speed

2. Coordinate with technician responsible for VFD setup to ensure a maximum speed setting is set to prevent current draw above name plate amperage.

E. Keep informed of any major changes made during construction and obtain a complete set of As-Built Drawings, computer outputs, etc. before starting balancing.

F. Document Work observed that does not conform to the Contract Documents.

G. When Work does not allow the system to be balanced in accordance with the Contract Documents, collect system performance data that will help in determining why the system cannot be so balanced, offer possible corrective action, and otherwise cooperate with the Contracting Officer.

H. Prior to Substantial Completion Inspection, submit three copies of balancing report for review by the Contracting Officer.

I. Upon request, recheck random selections of up to ten percent of the data recorded in the balancing report in the presence of the Contracting Officer. Rebalance the mechanical systems, prepare, and submit for review a new report if more than twenty percent of the rechecked readings deviate more than ten percent from the recorded reading in the balancing report.

J. Upon acceptance of Work by the Contracting Officer, revise balancing report incorporating revised data, description of corrective measures taken to correct previously identified deficiencies, and other Contracting Officer review comments and deliver four record copies of the final report to the Contracting Officer.

K. Following final acceptance of the balancing report, permanently mark all dampers, valves, and other adjustment devices so that the adjustment can be restored if disturbed at any time.

3.2 HYDRONIC SYSTEMS PROCEDURES

A. Examine hydronic circulating systems to determine that the systems are at the proper pressures and temperatures and that air is removed from the equipment and piping.

B. Record voltage and amperage draw of each motor. Record flow and head for pumps. Plot flow and head on manufacturer's pump curve and include with report.

C. Adjust balancing cocks to obtain the design flows and mark resulting position on each cock. Record terminal unit served, location, type, size, design flow, actual flow, settings, and pressure drop. Flows shall be within ten percent of indicated design. If sufficient pump capacity is not available to obtain indicated flows, distribute shortfall equally amongst all terminal units.

D. Permanently mark, etched or stamped, balancing cock setpoint scale readings and balanced flow in GPM on one and one-half inch diameter brass valve tags attached to balancing cock with No. 6 bead chain. This tag is in addition to valve identification tag called for elsewhere.

A. For pumps using integral control algorithm and integral sensors balance document as follows:

1. With all valves open to heating position operate pump at maximum speed. Record head, current draw.

2. With all valves open, release pump into automatic control. Record head and current draw.

3. If algorithm programming requires a maximum head setpoint, obtain head by closing valve directly downstream of pump until design flow is reached. Record pressure just downstream of this throttling valve. Input this head setpoint into pump memory.

4. If algorithm requires a minimum head setting obtain setting with all control valves closed to heating. Confirm design flow through wild flow circuits and through three way valves.

3.3 AIR DISTRIBUTION SYSTEM PROCEDURES

A. Record voltage and amperage draw of each fan motor over 1/10 horsepower.

B. Verify that the air handling equipment performs as specified. Adjust variable type pulleys, volume, and control dampers. Provide required exchanges of pulleys, drives, belts and add dampers where required. Record sizes of final belts and drives.

C. Record required data for all fans over 100 CFM capacity. Measure flow by duct traverse at discharge duct or filter bank. Plot operating point on manufacturer's curve and include with report.

D. Adjust dampers, diffusers, registers, grilles, and fan speed to distribute the design flow within plus ten percent to minus ten percent of the indicated flow in the proper pattern. At least one volume damper in the system shall be one hundred percent open. Adjusting fan capacity by closing volume dampers is not acceptable.

1. Constant volume systems with filters:

a. If sufficient fan capacity is not available to obtain desired flow, distribute shortfall equally amongst all terminal units.

b. At completion of terminal unit balancing, measure clean filter pressure drop across each filter bank. Simulate dirty filter pressure drop of double the clean filter pressure drop at each installed filter. Record air handler CFM and static at that condition. Plot on curve with balanced condition.

2. Constant volume systems without filters (i.e. exhaust systems):

a. If sufficient fan capacity is not available to obtain desired flow, distribute shortfall equally amongst terminal units. Provide rated airflow in indicated hazardous or safety locations for electrical or health requirements.

E. Provide instrument test hole fittings in ductwork at locations where insertion of balancing devices into duct work is required.

F. Seal all holes in ductwork used for insertion of balancing devices with plastic or metal clip seals specifically manufactured for that purpose. Sealing holes with silicon sealant or duct tape is specifically not permitted.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 09 33 - STANDALONE CONTROL SYSTEM FOR HVAC

A. This Section covers the selection and installation of standalone control systems.

B. DDC systems are not allowed. Microprocessor-based single-loop controllers, unitary control system, and room thermostats may be used if the devices are manually configurable or configured through a menu list by the use of device firmware and require no software, or algorithms written by the Contractor for their application and use.

1.2 QUALITY ASSURANCE

A. The standalone control systems shall be installed by a control contractor who is regularly engaged in the installation of electric control systems in Alaska. The control contractor shall maintain an office in Fairbanks or Anchorage with parts and maintenance personnel to insure prompt response (24 hour maximum) to an emergency call during the warrantee period.

B. The control contractor shall be able to demonstrate that they have a minimum of five years' experience designing and installing electric control systems of comparable type and size to that called for in these Specifications.

C. Within two weeks after award of contract, submit to the Contracting Officer the following items for Contractor qualification:

1. Proof of Alaskan Office with full time service representative.

2. List of Alaskan buildings with names, addresses, and phone numbers of Owners, which are representative of the control systems that have been installed by the contractor. Include a brief description and approximate control system construction cost of each system submitted.

D. Acceptable Manufacturers:

1. As specified for indicated application.

2. Prolon.

3. Honeywell.

1.3 GENERAL SUBMITTAL REQUIREMENTS

A. Reference Division 1 for additional submittal requirements.

B. Coordinate submittal items with the submittal register as indicated or as revised by the Contractor.

C. If an item indicated on the submittal register is not used submit an item data sheet correlating to the appropriate item number, specification paragraph and indicate as “Not Used”. If a device or component is used that is not indicated on the submittal register or added after the original submittal provide a new submittal register item number appended to the end of the list within the appropriate section.

D. Prior to programming, ordering of equipment, or installation of any portion of the system submit a single tabbed and indexed submittal package for review by the Contracting Officer.

1.4 EQUIPMENT AND SHOP DRAWING REVIEW SUBMITTALS

A. Prior to ordering of equipment, or installation of any portion of the system, submit the following.

1. Diagram showing connected devices labeled with the application or zone served.

2. Controller configuration for each application or zone showing setpoints, delays, amplification factors, etc.

3. Sequences of operations keyed to schematic control diagrams.

4. Schematic control diagrams 11 inches by 17 inches minimum paper size with upper case lettering, minimum 1/16-inch high. Clearly indicate set points, reset schedules, switch over points, signal ranges, and other points required to completely describe the system. Show interface with any existing control systems. Depict circuitry to allow circuits to be traced from connection to connection using one of the following methods:

a. Diagram each wire or tube depicting full length of circuit from connection to connection.

b. Reference each wire to a uniquely labeled terminal.

5. Valve and damper schedules with Cv's and operating signal ranges.

6. Panel component layouts with panel face labels.

7. Control components symbol legend and identification by manufacturer's model, type, and part number.

8. Control components data sheets, installation, operation, and adjustment instructions. Further index and tab this section of the submittal by item number.

    a. Each control component shall be identified with a separate item number. Separate each item with a divider sheet with plastic index tabs.

    b. Precede each item with a completed Item Data Sheet. See required format attached to the end of Section 20 05 11 Common Submittal Requirements for Mechanical.

    c. Provide two alphabetical listings of all items included in the binder in an index at the front of the binder. One index shall list items by functional name. The other index shall list items by symbol used in the control diagrams.

    d. Each sheet or page shall indicate the specific item(s) proposed for this Project. Delete or cross out all other items.

1.5 CLOSEOUT SUBMITTALS

A. Closeout submittals must be submitted for review, reviewed by the Contracting Officer, corrected in accordance with review comments, and accepted by the Contracting Officer before a request for final or Substantial Completion Inspection will be considered by the Contracting Officer. Provide the following closeout submittal items:

1. Operation and Maintenance Manuals.

2. Orientation and training instruction schedule and course outlines.

1.6 OPERATIONS AND MAINTENANCE MANUALS

A. Operations and maintenance manuals must be submitted for review, reviewed by the Contracting Officer, corrected in accordance with review comments, and accepted by the Contracting Officer before a request for Substantial Completion or final inspection will be considered by the Contracting Officer.

B. The operations and maintenance manual shall include the information required for the equipment review submittal, updated as required to reflect current as-built conditions, plus the following:

1. Control components maintenance information, calibration information, and parts lists.

2. Complete system as-built wiring diagrams indicating the following:

    a. Wiring for all control and power circuits.

    b. Wiring labels.

c. Terminal number or code name for terminals at controllers and interface panels. Mark unused terminals "spare."

d. Location, identification tag, type, function, and wiring for sensors, switches, relays, damper and valve operators, and other control system components.

e. Other information required to properly troubleshoot and maintain the control system.

C. After the final inspection and subsequent punch list inspections, update each copy of the operations and maintenance manual to reflect final As-built conditions.

PART 2 PRODUCTS

2.1 GENERAL

A. Select miscellaneous components to meet the specific functional requirements of each application.

2.2 HEATING PLANT GATEWAY

A. Provide a web-enabled microprocessor-based gateway allowing for remote access to the connected HVAC controls system. Gateway shall allow users access to view and change settings for thermostats, schedules, boiler system temperatures, boiler control parameters, pump status, and notification/alerts. The gateway shall allow for communication via WiFi or Ethernet connection. Tekmar 485, no substitutions, no alternative brands.

2.3 BOILER SEQUENCER

A. Provide a UL listed, packaged, pre-engineered, pre-programmed, and pre-tested microprocessor-based control system for the operation and the sequence of the hot water heating system. Control system shall be configurable for multiple single-stage boiler operation, compatible with both condensing and non-condensing boilers, run time equalization, outside air temperature reset, primary pump stand-by controls, and heating setpoint adjustment. Tekmar 284, no substitutions, no alternative brands.

B. Provide user interface system display capable of displaying both numbers and characters and ability for configuration and set point adjustments. The control shall have the following user adjustable set points:

1. System and outdoor air temperature sensors.

2. Minimum water temperature.

3. Maximum water temperature.

4. Boiler rotation time.

5. Boiler staging

C. Provide a single pole double throw selector switch located adjacent to the packaged microprocessor controller. Label the switch REMOTE/LOCAL. Interlock the boiler wiring through selector switch. With the switch in LOCAL position, control to integral boiler operating limits. With the selector switch in REMOTE position, transfer control to the associated microprocessor controller.

2.4 ZONE CONTROLLER

A. Provide microprocessor-based zone control manager capable of energizing up to six zone valves and providing power for up to six TekmarNet 4 thermostats, and acting as the end switch communicate heating demand back to the central boiler plant manager. Zone controller shall be compatible with the TekmarNet protocol system and be configurable to integrate zone expansion modules to increase the zone controls as needed. Tekmar 315 or equal.

2.5 THERMOSTATS

A. Thermostat Guard

1. Where indicated provide vented guard with lockable cover. Similar to Kele BAPI.

B. Space Low Voltage Thermostats:

1. Unless otherwise indicated, provide electronic NTC thermistor space temperature sensor with user adjustable setpoint and digital display indicating space temperature, temperature setpoint, and heating mode enable. Tekmar 532 or equal.

2. Configurable for either two- or four-wire installation and compatible with TekmarNet communication protocol.

3. Covers: Factory white color, removable,

C. Space Line Voltage Thermostats:

1. Adjustable setpoint, room temperature indication, setpoint index.

2. Switching through SPDT contacts rated 16 amp inductive current at 120V.

3. Setpoint range: 50 degrees F to 80 degrees F minimum setpoint adjustment range.

4. Removable setpoint adjustment knob.

5. Covers: Removable and without temperature or setpoint indication unless specifically indicated otherwise.

6. Mount covers to bases with tamper proof fasteners.

7. Similar to Honeywell T6051A.

D. Remote Bulb Thermostats:

1. Adjustable setpoint, room temperature indication, setpoint index.

2. Switching through SPDT contacts rated 16 amp inductive current at 120V.

3. Setpoint range: 0 degrees F to 100 degrees F minimum setpoint adjustment range.

4. Five foot capillary length.

5. Similar to Honeywell T675A.

2.6 PROPORTIONAL CONTROLLERS

A. General:

1. Adjustable setpoint, adjustable sensitivity, adjustable calibration of setpoint.

B. Mixed air temperature controllers:

1. Duct mounted proportional temperature controller, vapor filled 24 feet copper averaging capillary, 0 degrees to 100 degrees F setpoint range.

C. Supply/return air temperature controller:

1. Duct mounted proportional temperature controller, vapor filled bulb with five feet copper capillary, 0 degrees to 100 degrees F setpoint range.

2.7 SWITCHES:

A. Low temperature limit:

1. Auto reset unless otherwise indicated.

2. Extended length insertion type element with any one foot sensing setpoint causing trip.

3. Freeze protection low limit minimum range 35 degrees to 60 degrees F. Suitable for ambient temperatures minus 50 to 240 degrees F.

4. Similar to Penn.

B. Differential Pressure Switch - Liquid:

1. Liquid differential pressure switch with range 150 percent of operating pressure range, plus or minus three percent accuracy over full range including linearity, repeatability and hysteresis.

2. Brass bellows operated single pole double throw switch. Restrain motion of the switch linkage by a calibrated spring that can be adjusted to set the exact pressure differential at which the electrical switch will be activated.

3. Where differential pressure is ten psi or less provide Similar to United Electric J21K Series.

4. Where differential pressure is greater than 10 psi provide Similar to Penn P-74FA-5.

5. Provide with gate or ball valve isolation.

C. Liquid level:

1. Mercury switch in polypropylene casing with appropriate length cable.

2. Similar to Flygt ENH-10.

D. Glycol mix tank low level alarm switch:

1. Glycol makeup tank integral float switch and standalone alarm panel with switched receptacle, dry alarm contacts, and audible alarm with test and silence buttons. Axiom float switch and RIA10-1-SAA or equal.

2.8 PACKAGED RELAYS

A. Packaged relay that includes relay, LED indicator, provisions for mounting, transient protection and housing. Similar to Functional Devices RIB.

B. Relays between class 2 and class 1 wiring shall be internally separated. RIB-T style or equal. Relays between class 2 and class 1 wiring shall not enter through one box nipple.

C. UL listed.

2.9 DUCT MOUNTED THERMOMETERS

A. Bi-metal, hermetically sealed, one percent accuracy full span, stainless steel construction. Similar to Ashcroft Series EIal.

B. Provide three-inch dial face with threaded back outlet connection or adjustable angle as required by application.

2.10 CONTROL VALVES

A. Three-way mixing hot water and chilled water control valves: Polished stainless steel stem, spring loaded teflon packing, constant total flow over full plug travel characteristics, and fully rated for 125 PSIG with 240 degrees F fluid temperature. Honeywell V5013N or equal.

B. Finned tube radiation control valves: Forged brass body, stainless steel base plate and bearing plate, chrome plated brass stem, paddle, and stem seal assembly compatible with heating system fluid, fully rated for 125 PSIG, 200 degrees F fluid temperature. Powerhead replaceable without removal of valve body from system. Maximum close-off pressure rating of 20 psi minimum. Minimum Cv rating of 3.5. Honeywell V4043 or equal.

2.11 WIRING AND RACEWAYS

A. Provide wiring and raceway complying with the National Electrical Code, Division 26, and State and Local Codes and Ordinances.

B. Raceways:

1. EMT, metal duct, IMC, rigid conduit, surface metal raceways, or totally enclosed metal trough with flexible metal tubing.

C. Wiring:

1. Provide wire with copper stranded conductors. Provide color or number coded jackets.

2. Low voltage wiring: 18-gauge minimum foil-shielded cable rated 100 VDC at 80 degrees C.

3. Provide plenum rated cable whenever wire is run without conduit.

4. Support or bundle wire with self-locking, UL listed cable ties. Provide cable ties incorporating a stainless steel locking insert. Similar to Thomas & Betts Ty-Rap.

5. Provide cable tie anchors designed for mechanical anchoring, allowing removal of cable tie without removal of anchor, capable of accepting at a minimum a number 8 screw. Adhesive cable tie anchors are allowed only on the interior surface of panel doors. Panduit TM series or equal.

2.12 PNEUMATIC TUBING

A. Provide color-coded, flame retarded, crack resistant, polyethylene tubing for installation in concealed areas, in control cabinets, and inside conduit raceways. Dekoron FR or equal.

1. Plenum Rated.

2. Environmental stress crack resistance: ASTM D 1693, 0 percent failure at 48 hours.

B. Concealed:

1. Polyethylene connected with serrated brass fittings.

2. Copper: Type "M" hard drawn with solder joints or brass compression fittings.

C. Exposed:

1. Type "M" hard drawn copper with solder joints and tube or brass fittings.

D. In Return Air Plenums:

1. Polyethylene connected with serrated brass fittings.

2. Copper: Type "M" hard drawn with solder joints and brass fittings.

2.13 PANELS

A. Enclosures: 16-gauge steel or aluminum extrusions of comparable rigidity braced with steel angle or formed stiffeners. Suitable for environment in which installed. Not over 24 inches wide by 42 inches high. Provide multi-section or multiple individual panels as required.

B. Fronts: Piano hinged with spring latch and lock and punched or stamped to receive front mounted switches, gauges, indicating lights and alarms.

C. Finish: Non-glare, baked enamel of manufacturer's standard color.

D. Concealed panels: Standard electrical boxes at Contractor's option.

E. Panel mounted indicating gauges/meters: Minimum face diameter of 2-1/2 inches, an accuracy of one percent of scale, with scale covering full operating range of monitored system. Capable of field alignment or calibration.

F. Panel indicating lamps: Long life type, rated for a minimum life of 10,000 hours.

G. Warning label: Provide every panel with the following warning label secured to the front outside of the panel:

H. WARNING
Complete de-energization of this control panel requires that disconnects supplying all equipment controlled by this panel be opened in addition to the control power circuit breaker.

I. The word "warning" shall be in one inch high letters. All other letters shall be 1/4 inch high.

2.14 TERMINAL STRIPS

A. Provide with terminal voltage and current ratings matching ratings of associated wire. AMP Flexi-Block or equal.

B. Labeled with permanent system integral to terminal strip.

2.15 CONNECTORS

A. Provide with voltage and current ratings matching ratings of associated wire. Thomas & Betts Sta-Kon terminals or equal.

PART 3 EXECUTION

3.1 GENERAL

A. Work is to be performed by trained mechanics and installed in a first-class, neat and orderly manner.

B. Control devices shall not be used in locations where they are subject to damage or malfunction due to normally encountered ambient temperatures.

C. Damper operators and other control devices mounted on insulated ductwork shall be mounted on secure brackets such that the device is external of the insulation.

D. Provide miscellaneous components such as sequencers, switches, relays, time delay relays and other components required for a complete functioning control system. All components not specifically indicated or specified, but necessary to make the system function within the intent of the Specification, are to be included.

E. Seal conduit penetrations at floor and wall penetrations with firestopping installed as indicated. Note that this applies to all floor and wall penetrations, not just fire barrier penetrations. At all mechanical rooms or other rooms containing floor drains, except those with slab on grade floors, make penetration watertight and extend sleeve 3 inches above the floor.

F. Seal conduit penetrations at rated walls with firestopping installed in accordance with firestopping manufacturer's UL listed installation requirements for indicated rating. See Architectural Drawings for rated wall locations and ratings.

G. Label control devices mounted in the field and within control cabinets with 1/4 inch high white embossed letters on black tape background. Dymo or equal. Symbol to match symbol used on Control Drawings.

H. Label control switches and panel mounted gauges with minimum 1/2 inch high by 1/16 inch thick, black, laminated plastic with white core. "Setonply" by Seton Nameplate Corp. or equal. Engrave with 1/4 inch high characters identifying the switch or gauge by the description indicated on the Control Drawings. Attach labels to panels with mechanical fasteners. Adhesive backing is not sufficient to provide secure mounting.

I. Schematics and diagrams, when indicated on the Control Drawings, show approximate functional relationships and sequences only. All required devices are not shown. Contractor is responsible for providing all components required for a complete functioning system selected to meet the specific functional requirements of each application.

J. After the final inspection and subsequent punch list inspections provide control diagrams with written sequence of operations, updated to reflect final as-built conditions, for all systems, 11 inches by 17 inches in size, reduced from the As-built Control Drawings. Provide one copy in each O&M manual and 1 copy, laminated in heavy clear plastic, at its applicable control panel.

3.2 WIRING

A. General:

1. Permanently label wiring and pneumatic tubing at each end in each of the following ways. This applies to junction boxes and terminal strips in addition to devices where each wire terminates. 3M Scotch Code Write On Marker System or equal.

    a. Matching numerical designations.

    b. Indicating terminal to which wire/tube is connected.

2. Provide as a minimum one gauge in each of the following pneumatic system locations: branch lines, lines from all controls, and at each controlled device.

3. Install piping and wiring in a neat and orderly manner generally running piping and wiring parallel to and along building lines.

B. Wiring:

1. Wire all electrical controls and switches furnished under this Section of the Specifications.

2. Make wire connections using factory fabricated jack assemblies, terminal strips, or solder connections. Use crimp connectors on stranded wire unless connecting to terminal strips approved for direct stranded wire connection. Insulate solder connections with heat shrink tubing. Field connections in control power wiring circuits may be made using wire nuts.

3. Install wiring in conduit.

4. Conceal wiring in finished areas. Unless otherwise noted, install wiring inside conduit or fully enclosed metallic raceway.

5. Install all wiring in accordance with National Electrical Code, Division 26, and State and Local Codes and Ordinances.

C. Piping:

1. Support and conceal piping in finished areas. Install polyethylene or copper tubing in concealed areas. Installed hard drawn rigid type M copper tubing for exposed areas. Polyethylene tubing may be used in control cabinets or where installed inside a fully enclosed metallic raceway in exposed areas. Pneumatic tubing shall not be run exterior of building vapor barrier or envelope.

2. Test high side of piping systems at 100 psig. Test low side of piping at 30 psig or 150 percent of the operating pressure, whichever is greater. System pressure drop not to exceed 5 psig for 24 hour test period.

3.3 PANELS

A. Mount control devices other than sensors and operators in panels.

B. Arrange panels and junction boxes in a clear, logical manner, installed to allow easy servicing and labeling.

C. Control devices mounted in control panels shall be wired through terminal strips.

D. Arrange control devices such that inadvertent operation of push buttons, switches, etc. will not result in a jammed or inoperable system caused by component or device failure.

E. Arrange push buttons in groups according to type of service, such as starting and stopping of fans, remote temperature indication, etc.

F. Provide plastic embossed nameplate/label for each control panel face mounted switch, gauge, or meter. Identification to correlate with control diagrams. Attached name plate/label to panel face with mechanical fasteners. Adhesive backing is not sufficient to provide secure mounting.

3.4 THERMOSTATS AND SWITCHES

A. Mount room thermostats and fan control switches so the operable portion is no higher than 48 inches, unless otherwise indicated. Where adjacent to light switches mount at same height as switches to provide a clean horizontal appearance.

B. Sense liquid or airflow across boilers, pumps, coils, heat exchangers, fans, etc. using differential pressure switches. Do not install balancing cocks or dampers in the system to create pressure drop for sensing purposes. "Sail" switches are not acceptable.

C. Connect freeze protection low limit switches directly to the control circuits at the controlled equipment's motor starter or, for equipment with no motor starter, to contacts of relays provided as required in the equipment's power circuit.

D. Fill immersion fluid temperature sensor wells with heat conducting compound. Wells shall be installed in oversize elbows or tees, 1-1/4 inches minimum, when installed in pipes with less than two inches nominal diameter.

E. Install thermostats on exterior surfaces with insulated bases such that actual room temperature not wall surface temperature is sensed.

F. Provide cast aluminum ventilating, non-breakable shields and mounting brackets for sensors that are indicated to have protective covers. Key sensor protection covers identically. Deliver two sets of keys to Owner.

G. Provide bulkhead adapters at airflow and filter differential pressure switch and sensor sensing line penetrations of ducts and fan casings.

3.5 CONTROL POWER SUPPLY

A. Provide electric power to control devices from power circuits derived from available space within electrical panels or from device or equipment being controlled.

B. Provide electric power to control devices controlling equipment served by emergency or standby power circuits from emergency/standby power circuits derived from emergency/standby distribution panel or from device or equipment being controlled.

C. Provide automatic battery standby sized for four hours where volatile memory or processing is utilized.

3.6 TESTING AND ADJUSTING

A. Upon completion of the installation, start up the system, perform necessary testing and run diagnostics, and adjust the system to ensure proper operation.

B. Coordinate the final adjustments and "fine tuning" of control functions and devices so that the building, the mechanical systems, and the control systems operate and respond as an integrated comfortable and energy efficient component of this facility.

3.7 SPECIAL TOOLS AND SPARE PARTS

A. Provide one set of special tools required to adjust control devices. This includes multimeters, Allen wrenches, and other special tools. This does not include common tools such as pliers, adjustable wrenches, flat blade, or Phillips screwdrivers. Provide set and demonstrate proper use during Owner instruction period.

B. Provide five spares of each size fuse and two spares of each size panel lamp used in the mechanical control system. Turn spares over to Owner at time of Owner instruction.

C. Provide one spare of each hydronic control valve model installed.

3.8 INSTRUCTION OF OWNER PERSONNEL

A. Give owner personnel a thorough orientation of the Control Drawings consisting of a demonstration of the interrelationships of all control devices including sensors, relays, controllers, operators, etc. During the orientation locate control equipment shown in the Control Drawings and demonstrate full operation of control devices and systems.

B. Include instruction in installation, start-up, operation, adjustment, and maintenance of all control system components.

3.9 INSPECTION REQUIREMENTS

A. Prior to any inspection, review and test installation for conformance with contract documents. Thoroughly field check sequence of operations for each system and piece of equipment including simulation of all possible modes of operation. With the call for inspection, verify in writing that this system review and test has been performed noting anything not conforming to contract documents.

B. During inspection, provide assistance to inspection personnel required for a complete and thorough inspection.

C. During inspection, demonstrate that the control system performs in accordance with the Contract Documents. Provide material and personnel required to perform the demonstration.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 09 93 - CONTROL SYSTEMS SEQUENCE OF OPERATIONS

A. This Section of the Specification covers the sequence of operation of the direct digital control and monitoring systems.

1.2 VENTILATION

A. Central Heat Recovery Ventilator Control: HRV-1

1. Commentary: The HRV unit is a constant volume, light-commercial grade unit with internal core defrosting bypass dampers, filters, aluminum heat recovery core, and multi-speed supply and exhaust fans. The integral manufacturer's controls manages the operation of the unit, the timing for core bypass for defrosting, and supply fans.

2. Operate HRV-1 through the manufacturer's controls to run continuously when the building is occupied. Occupancy to be Monday thru Friday 7 am to 7 pm.

3. Shutdown HRV-1 whenever the Boiler Room space temperature falls below setpoint of 50 degrees F (adjustable) as sensed from line voltage thermostat with user adjustable range from 45 degrees F to 80 degrees F. Provide label above thermostat to read, "HRV LOW TEMP SHUTOFF".

B. Ducted Reheat Coil Control: RHC-1

1. Commentary: HRV-1 supply air is provided with a ducted reheat coil to temper supply air to spaces to a neutral temperature to prevent sub-cooling.

2. Modulate RHC three-way control valve through a single loop proportional controller to maintain duct discharge temperature setpoint 65 degrees F.

C. Mechanical Room Ventilation: VF-1

1. Commentary: Cooling for the mechanical room is provided with the exhaust ventilation fan VF-1. VF-1 is ducted with an integral backdraft damper to minimize cold air infiltration when off. VF-1 is provided with a manual speed control dial to allow for fan speed adjustment and tuning to ensure fan operation does not overpower boiler operation.

2. Cycle VF-1 through line voltage thermostat to maintain room temperature below setpoint 75 degrees F.

D. Communications Room Ventilation: VF-2

1. Commentary: Cooling for the communications room is provided with the exhaust ventilation fan VF-2. VF-2 is ducted through a concentric duct with passive makeup air from the outer-wall ductwork. A backdraft damper is provided to minimize cold air infiltration when off. VF-2 is provided with a manual speed control dial to allow for fan speed adjustment and tuning to ensure fan operation does not overpower boiler operation.

2. Cycle VF-2 through line voltage thermostat to maintain room temperature 5 degrees F above the room IDU-1C setpoint.

1.3 HEATING

A. Hydronic Heating Control: B-1A, B-1B, P-1A, P-1B

1. Commentary: Boilers are sized to be fully redundant and not intended to operate simultaneously. Flow through both boilers are provided by primary-only redundant circulation pumps. Circulation pumps are provided with integral variable speed controls with load sensing capabilities.

2. Operate boilers B-1A and B-1B in lead-lag sequence upon a call for heat through a boiler manager controls system with outside air reset, automatic boiler sequencing, primary pump sequencing, run-time equalization, and boiler supply temperature sensing. Reset boiler supply glycol temperature based on outside air temperature based on the following reset schedule:

Outside Air Temperature	Boiler Supply Temperature
20 Degrees F	140 Degrees F
-20 Degrees F	180 Degrees F

3. Operate circulation pumps P-1A and P-1B in lead-lag sequence continuously to maintain minimum system differential pressure setpoint, 10 PSIG. Determine and adjust minimum differential pressure setpoint during system balancing. Configured integral variable speed controls to modulate pump speed to maintain the differential pressure setpoint.

1.4 UTILITY GLYCOL HEAT TRACE CONTROLS: P-2

A. Commentary: Freeze protection for the exterior water and waste piping within arctic pipe is provided by circulated hydronic fluid through heat trace PEX piping encased in the arctic pipe. The heat trace circulation pump is provided with integral variable speed control.

B. Operate heat trace circulation pump, P-2, continuously. Modulate pump speed through integral pump controls to maintain glycol return temperature setpoint, 55 degrees F. Provide pipe mounted temperature sensor and wire to circulation pump. Supply glycol is controlled by a wax-filled thermostatic mixing valve to maintain a supply temperature of 65 degrees F.

1.5 AIR CONDITIONING SYSTEM CONTROL: ODU-1, IDU-1A, IDU-1B, IDU-1C

A. Commentary: A multi-zone air conditioning system consisting of a central outdoor unit (ODU-1) and several indoor units (IDU) is provided to maintain select rooms space temperatures during summer operation.

B. Air conditioning system is provided with integral proprietary controls responsible for management of the refrigeration system condensing unit and room evaporators. Operate room IDU through manufacturer's programmable room thermostat to maintain space temperature setpoint 74 degrees F.

C. Provide line voltage thermostat ambient lock-out at the ODU to prevent operation below ambient air temperature setpoint, 40 degrees F.

1.6 TYPICAL ROOM TEMPERATURE CONTROL

A. Finned Tube Heating Control:

1. Cycle associated zone 2-position finned tube control valve to maintain space temperature setpoint 70 degrees F through low-voltage room thermostat.

B. Unit Heater Control: UH-1

1. Unit heater hydronic coil is wild flow. Cycle unit heater fan through line voltage thermostat to maintain space temperature setpoint, 55 degrees F.

C. Cabinet Unit Heater Control: CUH-1, CUH-2

1. Cabinet unit heater hydronic coil is wild flow. Cycle unit heater fan through line voltage thermostat to maintain space temperature setpoint, 68 degrees F.

1.7 DOMESTIC HOT WATER CONTROL: WH-1, P-3

A. Operate electric domestic hot water heater through integral aquastat to maintain tank temperature setpoint 140 degrees F. Individual fixture thermostatic mixing valves are provided at sinks and lavatories to provide maximum 120 degree F water to fixtures.

B. Operate recirculation hot water pump, P-3, to maintain return hot water temperature setpoint, 110 degrees F.

1.8 DENTAL EQUIPMENT CONTROLS:

A. Operation of the dental air compressor and dental vacuum are provided with integral manufacturer's controls and operate independent of the building HVAC system.

1.9 POINTS LIST

Point Name	Point Type	Remarks
Outside Air Temperature	Analog Input	Sensor wired to Boiler Manager
Boiler B-1A Start/Stop	Digital Output	From Boiler Manger
Boiler B-1B Start/Stop	Digital Output	From Boiler Manger
Boiler B-1A Supply Temperature	Analog Input	Senor wired to Boiler Manager
Boiler B-1B Supply Temperature	Analog Input	Senor wired to Boiler Manager
Boiler B-1A Return Temperature	Analog Input	Senor wired to Boiler Manager
Boiler B-1B Return Temperature	Analog Input	Senor wired to Boiler Manager
Pump P-1A Start/Stop	Digital Output	From Boiler Manger
Pump P-1B Start/Stop	Digital Output	From Boiler Manger
VF-1 Start/Stop	Digital Output	
HRV-1 Start/Stop	Digital Output	From HRV programmable controller
RHC-1 discharge air temperature	Analog Input	
RHC-1 Valve Position	Analog Output	
UH-1 Fan Start/Stop	Digital Output	
CUH-1 Fan Start/Stop	Digital Output	
CUH-2 Fan Start/Stop	Digital Output	
Utility Glycol Heat Trace Return Temperature	Analog Input	Wired to pump P-2
Recirculated Hot Water temperature	Analog Input	Wired to pump P-3

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 11 13 - FACILITY FUEL OIL PIPING

A. This Section covers the selection, installation, and testing of the fuel oil piping and accessories serving oil-fired equipment.

1.2 SUBMITTALS

A. Manufacturer's Data, Catalog cuts of pipe and fittings are not required.

1. Catalog cuts and selections of equipment and accessory items.

B. Application Schedule: Submit a schedule of piping and fittings listing the application, product, material, and size proposed for each application.

PART 2 PRODUCTS

2.1 PIPING AND FITTINGS

A. Above ground piping:

1. Piping exposed to damage or supported from pipe hangers: IPS schedule 40 black steel. Steel fittings with socket welded joints or malleable iron or steel fittings with screwed joints.

2. Ground joints unions.

B. Pipe dope for threaded fittings: Lead-free, non-hardening. Listed by the manufacturer as suitable for proposed use. Rated for exposure to temperatures ranging from minus 90 degrees F to 410 degrees F and to pressures up to 10,000 psig, Oatey Hercules grrip/grrip lite, Gasoila Soft-Set, Loctite PST B, or equal.

2.2 FILTERS

A. Wool felt or porous stone media with minimum 10 microns discrimination. Similar to General.

B. Spin on filter. 700 sq.in. filter area, 20 micron filtration grade. Gar-Ber 11V-R2000, no substitutions, no alternative brands.

C. Rated for minimum 25 GPH flow rate.

D. With filter restrictor indicator gauge.

E. UL listed for application.

2.3 OIL DEAERATOR

A. Self-venting, float operated level control, configured for connection to one pipe fuel oil distribution systems with fuel oil storage tank elevated above or below burner. Tigerholm Tiger Loop Ultra, no substitutions, no alternative brands.

B. Built-in check valve, aluminum body, plastic bowl, fusible valve, UL listed for application.

C. Rated for minimum 10 psig working pressure and continuous ambient temperature of 140 degrees F.

2.4 EMERGENCY FUEL SHUT-OFF VALVE

A. Line size, brass body, vitron seat, continuous duty molded class F coil, normally closed, UL approved. Similar to ASCO Red Hat for fuel oil service.

2.5 PIPING ACCESSORIES

A. Ball valve:

1. Class 150, threaded, floating ball, regular port, packing replaceable without removing valve from pipeline, plastic grip handle indicating valve position, lockable. Similar to Morrison 691, Milwaukee Valve, WKM Dynaseal 310 or equal.

2. Carbon steel body and tailpiece.

3. TFE seat and tailpiece gasket.

4. Chrome plated carbon steel ball, stem, and compression ring.

A. Fusible Globe valve: Brass body, bonnet, and stem construction, stainless steel spring, 165 degrees F fusible link. Similar to Morrison 939.

B. Flexible Connectors: Corrugated hose and single braid fabricated from series 300 stainless steel. Similar to Flexonics series 400M.

PART 3 EXECUTION

3.1 INSTALLATION

A. Connect fuel oil supply and return piping to oil-fired equipment and tanks, and install all accessories as indicated and in accordance with manufacturer's recommendations.

B. Make all tank connections with swing joints.

C. Pitch all piping back to tank for drainage unless otherwise indicated.

D. Seal all penetrations of building vapor barrier or membrane vapor tight.

E. Install oil fusible valve on supply piping immediately after building entry and at the inlet to oil deaerators.

F. Install fuel oil piping to provide full and complete access to the boiler combustion chamber without requiring disconnection of fuel oil piping.

3.2 TESTING

A. Test fuel oil piping with air at 5 psi. Demonstrate bubble tightness of joints using soap and water solution.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 13 23 - FACILITY ABOVEGROUND FUEL OIL STORAGE TANKS

A. This Section covers the selection, installation, and testing of above ground fuel storage tanks, associated tank fittings, and accessories.

1.2 SUBMITTALS

A. Manufacturer's Data, catalog cuts for tank piping and fittings are not required.

1. Catalog cuts and selections for tank components and accessories.

B. Shop Drawings: Provide shop drawing for above ground fuel storage tank(s) indicating layout, dimensions, construction details, materials, accessories, and installation details.

1. Include: Seismic calculations for tank support and connections with respect to seismic requirements in accordance with ASCE 7-5 and API requirements.

PART 2 PRODUCTS

2.1 TANK FITTINGS

A. Tank nipples and risers to vents, fill caps, pump outs, etc.: Schedule 40, A53, threaded, black steel pipe and fittings.

B. Pipe dope for threaded fittings: Lead-free, non-hardening. Listed by the manufacturer as suitable for proposed use. Rated for exposure to temperatures ranging from minus 90 degrees F to 410 degrees F and to pressures up to 10,000 psig. Hercules grrip/grrip lite, Gasoila Soft-Set, Loctite PST or equal.

C. Gasket material for flanges: Compatible with diesel fuel and minus 50 degrees F ambient temperatures. Similar to Durabla Duralon 8400.

2.2 ABOVEGROUND DOUBLE WALL STORAGE TANKS

A. Cylindrical steel primary storage tank, 300 degree wrap, surrounded by cylindrical steel outer tank and supported by welded steel support saddles. Entire assembly UL-142 labeled and constructed to meet seismic zone 4 requirements. Greer Tank, Anchorage Tank, Ace Tank & Equipment Company, Highland Tank, or equal.

B. Provide with integral steel skid support designed to allow dragging of tank without damage and complete visibility of exterior tank surfaces.

C. Factory fabricated with all openings required and indicated.

D. Complete with steel striker plates under the fill/gauging openings.

E. Provide with gauging opening that accommodates water draw off pipe to bottom of tank.

F. Exterior surfaces sandblasted, primed with one coat of red iron oxide primer, and shop painted with one coat of enamel based exterior paint.

G. Coordinate with manufacturer to provide integral channel strut support connection points on tank as required for tank mounted piping, conduit, and equipment.

H. Gasket material for flanges: Compatible with fuel oil indicated and minus 50 degrees F ambient temperatures.

2.3 TANK ACCESSORIES

A. Tank Vents: Downward venting “T” design. Screened openings. Cast iron or aluminum construction. Threaded. Similar to Morrison 155 or Clay & Bailey CB300.

B. Pipe Cap: watertight cap, brass body with cast iron lid, gasket, lockable. Similar to Morrison 178.

C. Spill Container: Seven gallon, steel, secondary containment basin with chain secured lid and drain to fill pipe. Morrison 518, Greer Tank "Fuel-Gard", Pomeco/OPW, or equal.

D. Emergency Vent Fuel Oil: Cast iron construction. Releases at approximately 8oz pressure. Equipped with fire screen. O-ring gasketed between cover and base. Similar to Morrison 2448 or Clay & Bailey No. 368.

E. Interstitial Leak Detection Gauge: Top mounted, HDPE float, aluminum rod and bushing, provide with gauge guard and aluminum locking nut. Similar to Krueger Sentry Gauge.

F. Level Gauge: Top mounted, side reading clock gauge with aluminum body, stainless steel float, nylon coated stainless steel cable, vapor tight construction, 360 degree swivel body, high level decal, adjustable alarm switch, alarm switch point decal. Similar to Morrison 918.

G. Remote Audible Alarm: Remote line voltage panel, four intrinsically safe input channels, four electromechanical output line voltage relays, integral audible alarm, selectable normally open or normally closed input and outputs. Provide with external horn and strobe on building exterior. Similar to Morrison 918AC.

H. External Emergency Valves: Cast iron body and top. Brass and stainless steel trim. Stainless steel spring. Buna N seals. U.L. listed. Similar to Emco Wheaton A60 series.

PART 3 EXECUTION

3.1 ABOVE GROUND TANKS, ASSOCIATED PIPING, AND ACCESSORIES

A. Paint pipe, fittings, and tank accessories to match tank.

B. Install and adjust level gauge.

C. Install spill container so that top of fill pipe is within two inches of top of containment basin.

3.2 TESTS

A. Test tank piping with air at 5 psig pressure for one hour without noticeable pressure drop or air leaks. Demonstrate bubble tightness of pipe joints using soap and water solution.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 21 13 - HYDRONIC PIPING

A. This Section covers selection, installation, and testing of hydronic heating piping systems and accessories.

1.2 SUBMITTALS

A. Manufacturer's data, catalog cuts of pipe and fittings are not required.

1. Catalog cuts and selections for equipment and accessory items.

B. Application Schedule: Submit a schedule of piping and fittings listing the application, product, material, and size proposed for each application.

PART 2 PRODUCTS

2.1 ABOVE GRADE PIPE AND FITTINGS

A. 2 inches and smaller:

1. Type L hard copper tubing in accordance with ASTM B 42 with wrought copper solder fittings with lead free solder.

2. 3/4-inch and 1-inch branch piping may be connected to copper run piping using mechanically formed tee connections when run piping is minimum 1-1/2 inches and 2 inches respectively.

2.2 HEATING SYSTEM FLUID

A. 60 percent deionized water/40 percent propylene glycol solution and corrosion inhibitors, as recommended by the glycol manufacturer. Corrosion inhibitors shall be of the phosphate based; pH buffered chemical, non-plating type. Dowfrost, ArcticTherm P-50, Hercules Cryo-Tek -100 or equal.

B. Glycol and corrosion inhibitors shall be packaged by a single manufacturer.

C. Free initial and annual testing of heating system fluid condition shall be a standard service of the glycol manufacturer.

2.3 HEATING SYSTEM CHEMICAL CLEANING COMPOUND

A. 1 percent-2 percent Tri-Sodium Phosphate and water solution or equal. Approximately 1pound per 50 gallons.

2.4 GLYCOL CONCENTRATION TESTING DEVICE

A. Optical, automatic temperature compensating, high impact vinyl housing. Leica or equal.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Install piping level or slightly sloped up in direction of flow.

B. Provide air vents with isolation at all high points and drain valves at all low points.

C. Drain existing system as required to accommodate new work. Check existing glycol concentration and type.

3.2 TESTING

A. Hydrostatically test new and existing system at 100 psig for 1 hour with no noticeable pressure drop or water leaks.

B. Firmly tap soldered fittings with a leather or rubber mallet during the pressure test to demonstrate soundness of soldered joints.

3.3 CLEANING

A. Drain system and refill and clean system with building domestic water treated with chemical cleaning compound using manufacturer's recommended concentrations.

B. Clean system by maintaining system temperature at 140 degrees Fahrenheit, operating all pumps with all control valves positioned to full heating, for a period of 8 hours. At Contractor's option room temperature water may be used but circulation time shall be increased to 24 hours.

C. Flush and drain the system with all strainers cleaned at least twice.

3.4 FILLING

A. Fill system, including glycol mixing tank to 75 percent full, with heating system fluid utilizing the glycol mixing tank and remove air from system. Check glycol concentration using glycol concentration testing device. Record amount of glycol utilized and final system concentration. At time of instruction of Owner personnel, turn device over to Owner.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 21 16 - HYDRONIC PIPING SPECIALTIES

A. This Section covers selection and installation of hydronic heat transfer system specialties.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for equipment and accessory items including:

a. Materials of construction.

b. Dimensional diagrams.

2. Performance and capacity data including:

a. Capacity under specified conditions.

PART 2 PRODUCTS

2.1 PRESSURE RELIEF VALVES

A. Relieving capacity equal to heat input rate and setpoint equal to maximum rated working pressure, unless otherwise noted. ASME labeled. Bell & Gossett, Armstrong, Taco, or equal.

2.2 AIR SEPARATORS

A. Pipe mounted, ASME labeled for 125 psig. Spirotherm Spriovent VDR, Taco, Bell and Gossett, or equal.

B. Air elimination verified by third party agency showing unit is effective for removal of micro bubbles and fluid reaches saturation within 100 cycles so that at any cooler downstream location the fluid condition is below saturation so that any free air would be absorbed.

C. Rated for removal of air to 18 microns and dirt to 35 microns.

D. Provide neodymium magnets inside air separator. Provide magnets that can be deactivated for cleaning or provide access to remove and clean magnets.

2.3 DIAPHRAGM EXPANSION TANKS

A. Pre-charged and complete with integral heavy-duty butyl rubber diaphragm. Amtrol, Bell & Gossett, Wessels, or equal.

B. ASME rated and stamped for 125 PSIG working pressure.

C. Vertical tanks: Equipped with floor mounting skirt.

D. Equipped with schrader valve charging connection.

2.4 GLYCOL MIXING TANKS

A. 6 gallon plastic tank with integral 115V feed pump, with integral check valve, pressure gauge, and pressure switch. Pump rated for 5 to 55 psi. Axiom Model MF200, no substitutions, no alternate brands.

B. Stencil, in minimum 1-inch high letters, the following label on the glycol mix tank:
REFILL WITH FACTORY MIXED PROPYLENE GLYCOL MIX ONLY

PART 3 EXECUTION

A. Install as indicated and in accordance with manufacturer's recommendations.

B. Provide pipe hangers on each side of air separators.

C. Size supports for compression and expansion tanks assuming that tank will be full of water. At expansion tanks, assume that diaphragm has failed.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 21 23 - HYDRONIC CIRCULATING PUMPS

A. This Section covers construction, selection, and installation of hydronic circulating pumps.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for equipment and accessory items.

a. Materials of construction.

b. Dimensional diagrams with equipment clearances.

c. Control interface diagrams.

2. Performance and capacity data including:

a. Capacity, head, and brake horsepower under specified conditions.

b. Pump curves.

c. Pump efficiency.

d. Electrical data.

PART 2 PRODUCTS

2.1 GENERAL

A. Selected to provide capacity and head based on operating conditions and fluid indicated.

B. Rated for minimum of 230 degrees F, 125 psig service.

C. Factory operationally tested prior to shipping.

D. Components compatible with fluid pumped. Provide Viton, Tungsten Carbide, or Silicon Carbide seal for glycol fluids. For water only fluids, provide either the above seals or carbon ceramic seals.

E. Provide with motors selected to operate within their nameplate amperage (not service factor amperage) at 110 percent design flow.

2.2 SMALL IN-LINE CIRCULATOR PUMPS

A. Single stage, wet rotor, integrally mounted direct drive, maintenance free, canned rotor motor. Grundfos UP Bell & Gossett, Taco, or equal.

B. Stainless steel fitted pump housing, stainless fitted cast iron or stainless fitted bronze for open systems.

C. Designed and constructed to allow replacement of all parts except volute casing without disturbing piping connections.

D. Pump impellers: Glass filled plastic composite.

E. Pump rotor: Stainless clad.

F. Pump/motor bearings: Ceramic sleeve type.

G. O-rings and gaskets: Propylene rubber.

2.3 LARGE IN-LINE CIRCULATOR PUMPS

A. Single stage, sensor-less variable speed wet rotor, with integrally mounted direct drive, maintenance free, canned rotor, Grundfos Magna3, Taco Bell & Gossett, or equal.

B. Stainless steel fitted pump housing.

C. Designed and constructed to allow replacement of all parts except volute casing without disturbing piping connections.

D. Pump impellers: Composite, PES.

E. Pump rotor: PPS.

F. Pump/motor bearings: Aluminum oxide/carbon.

G. O-rings and gaskets: EDPM or Propylene rubber.

H. Motor: 4 or 8 pole, electronically commutated synchronous permanent-magnet motor with integral speed controller.

I. Provide with Integrated electronic controller with algorithm to minimize energy consumption by reducing the factory-set setpoint to adjust to actual system characteristics, without use of external sensor input, by reducing speed to adjust to optimum location on the pump curve based on actual current and rpm. Alternate algorithms are acceptable provided that the pump speed is controlled by an output from DDC controls sensed by a differential pressure sensor piped to the hydraulically remote terminal unit piped back to the sensor located adjacent to the pump.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide supplementary pipe or pump supports as indicated and as required to prevent overstressing piping or pump casing.

B. Provide pump connectors at suction and discharge pipe connections to base mounted pumps.

C. Level, bolt to floor, and realign base mounted pumps and fill pump base with non-shrink grout in accordance with pump manufacturer's recommendations.

3.2 OPERATION

A. Pump motors shall draw less than nameplate amperage (not service factor amperage) when operating driven equipment within both mechanical and electrical design parameters for this Project.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 23 00 - REFRIGERANT SYSTEM PIPING AND SPECIALTIES

A. This Section covers design, selection, installation, and testing of refrigeration systems.

B. The refrigeration system includes all pipe, valves, fittings, accessories, coils, compressors, condensers, receivers, and refrigerant charges required for a fully functioning system with operating characteristics indicated.

C. Provide accessories indicated and required for a fully functional refrigeration system with operating characteristics indicated.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for equipment and accessory items, including:

a. Materials of Construction.

b. Dimensional drawings and details.

c. Submittal of pipe and fittings are not required.

2. Performance and capacity data, including:

a. Capacity under specified conditions.

B. Contractor Qualifications:

1. Name and address of installing contractor.

2. Submit material indicating that the Contractor is regularly engaged in the refrigeration system installation and has employees trained in the installation and repair, testing, and certification of refrigeration systems.

3. Submit who will be responsible for the refrigeration system design. Provide name, qualifications, and copy of required refrigeration installation certifications.

C. Applications Schedules:

1. Submit a schedule of piping and fittings listing the application, product, material, and size proposed for each application.

2. Submit a schedule of accessory items listing the application, product, material, and size proposed for each application.

D. Shop Drawings: Provide complete piping diagrams showing all pipe sizes, offsets, rises, slopes, equipment, and accessories. Coordinate diagram with equipment submittals by labeling each item with its submittal item number.

E. Design Calculation: provide pipe-sizing calculations, for refrigerant piping system.

1.3 QUALITY ASSURANCE

A. Employ a refrigeration system specialist to design, install, start-up, and test the refrigeration system.

1. Specialist shall be authorized by the refrigeration equipment manufacturer to perform start-up and warranty work on the refrigeration equipment supplied.

2. Specialist shall maintain a staffed service organization in Alaska available to the project within 36 hours during the compressor and equipment warranty period.

3. Specialist shall have a minimum of ten years' experience in refrigeration system design, installation, start-up, and operation.

4. Specialist shall be an EPA certified refrigeration system installer.

B. Design, construct, and install refrigeration system in accordance with IMC and ANSI/ASHRAE Standard 15-2010.

C. Provide UL listed/ASME rated components.

PART 2 PRODUCTS

2.1 PIPING

A. Drawn temper (hard drawn) ACR copper tube (ASTM B 280) and fittings with brazed or silver soldered joints.

B. Dehydrated and sealed at the factory.

C. Manufactured, Pre-Insulated Line-Sets

1. Annealed (soft drawn) ACR copper tube (ASTM B1003)

2. Pre-insulated tubing with nominal 3/4 inch thick closed cell elastomeric insulation with a maximum thermal conductivity rating of 0.24 (BTU-inch)/(square foot-hour-Fahrenheit).

3. Tubing sets dehydrated, nitrogen purged, and sealed t the factory.

2.2 REFRIGERANT

A. R-410A, blend of Difluoromethane (HFC-32) and Pentafluoroethane(HFC-125)

2.3 ACCESSORIES

A. Isolation clamps: Mild steel clamp, zinc dichromate plate, welded stud with nylon insert locknut. Provide with cushion, selected for application, between clamp and pipe. Hydra-Zorb or equal.

B. Manual shutoff valves: 1/4 turn ball valve with mechanical stops, polished brass ball, full flow port. Forged brass body with copper tube extensions, continuous weld body joint, dual Teflon ball seals at each end, 500 psig working pressure. Similar to Superior W Series, JB.

C. Flexible connectors: Brass bellows type with woven wire protective cover rated for 300 PSIG working pressure and 1200 psig burst pressure. Hyspan, Superior, Flexonics, or equal.

PART 3 EXECUTION

3.1 PIPING

A. Provide changes in direction of refrigerant piping with long radius elbows.

B. Introduce dry nitrogen into the piping during brazing and silver soldering to prevent formation of copper oxides. Do not embrittle piping by overheating during brazing or soldering.

C. Protect accessories and equipment from overheating and entry of foreign matter during installation.

D. Support refrigerant piping with channel strut and isolation clamps.

E. Insulate suction line hangers and supports.

F. Provide all refrigerant and nitrogen required for testing.

G. Provide refrigerant as required to completely charge the system to the operating charge and recharge the system as required to maintain the charge during the Project warranty period.

H. Arrange and size piping to ensure oil return to the compressor without trapping or slugging.

I. Install piping with minimum possible direction and elevation changes.

3.2 ACCESSORIES

A. Install accessories as indicated, as required, and in accordance with manufacturer's recommendations.

B. Install flexible connectors at pipe connections to vibration isolated equipment.

C. Pipe relief valve discharges to the exterior of the facility at a location not less than 15 feet above adjoining ground level and not less than 20 feet from any window, door, or ventilation system outside air intake opening.

3.3 TESTING AND EVACUATION

A. Test high side and low side piping 400-430 psig or at manufacturer’s instructions using dry nitrogen and hold for 24 hours without pressure change, ambient temperature

B. After testing, evacuate system to 500 microns absolute pressure and hold for 3 hours without pressure change, ambient temperature changes considered.

3.4 START-UP AND TRAINING

A. Start-up, test, calibrate, and "fine tune" the refrigeration system for proper operation and optimum efficiency. Submit report of start-up and test to Contracting Officer prior to Substantial Completion Inspection. Record system operating pressures and temperatures.

B. Demonstrate to the Contracting Officer that the refrigeration system performs in accordance with the Contract Documents.

C. After installation and start-up, instruct Owner designated personnel for a minimum of eight hours on refrigeration system equipment associated controls system maintenance, operation, field-testing, and calibration.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 31 13 - HVAC DUCTS AND CASINGS

A. This Section covers fabrication and installation of air ducts and plenums.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and selections for equipment and accessory items.

B. Shop Drawings: Provide drawing with construction details for proposed special fabrications or deviations from SMACNA or work indicated.

C. Shop Drawings: Substantial deviations:

1. Submit to the Contracting Officer Shop Drawings for any proposed substantial deviations in the duct systems for this facility from these documents for review and acceptance. The submittal shall include one reproducible sheet of each Drawing, or seven copies of each non-reproducible sheet submitted.

2. Any substantial deviations from these documents installed prior to Contracting Officer review and acceptance of Shop Drawings may be required by the Contracting Officer to be removed and the indicated system be installed at no additional cost to the Owner.

3. The Contracting Officer is the sole judge of what constitutes a substantial deviation and what is an acceptable alternate technique or method.

PART 2 PRODUCTS

2.1 MATERIALS

A. Galvanized steel, stainless steel, or aluminum sheets conforming to SMACNA HVAC Duct Construction Standards, 2005 Edition. Ducts shown are galvanized steel except where indicated (AL) which shall be aluminum or (SS) which shall be stainless steel. All indicated dimensions are inches.

B. Fabricate exposed galvanized ductwork from "Paint Grip" galvanized steel or similar mill surface etch treatment to create a paintable galvanized surface.

C. Duct sealant:

1. UL listed, Class 1. Water based, vinyl acrylic suitable for use with low, medium, or high-pressure duct system. Hardcast Iron Grip IG-601, Duro-Dyne DSW, Ductmate Proseal, United McGill Duct Sealer, or equal.

2. Service temperature limits: 0 degrees F to 200 degrees F.

3. Minimum solids content: 60 percent by weight.

2.2 FABRICATION

A. In accordance with SMACNA HVAC Duct Construction Standards, 2006 Edition.

B. Fabricate all ductwork in accordance with SMACNA requirements for 2-inch w.g. pressure class unless otherwise indicated with minimum 26-gauge sheet metal.

C. Fabricate ducts straight and smooth on the inside, with neatly finished joints.

D. At Contractor's option, transverse duct joints may be made with ductmate system companion angles.

E. Joints in exposed round duct: Slip coupling with 2-inch engagement and bead stop for tight and uniform joint make-up. United Steel Metal "Ramp Couplings" or equal.

F. Elbows in exposed round duct: Pleated elbows or five gore segmented standing seam elbows.

PART 3 EXECUTION

3.1 DUCT SIZES

A. Duct sizes shown on the Drawings are sheet metal sizes.

B. Requirement for duct lining is indicated elsewhere or on the Drawings by (-"x") where x is the thickness of the lining.

C. Requirement for insulation is indicated elsewhere or on the Drawings by (+"x") where x is the thickness of the insulation.

3.2 INSTALLATION

A. In accordance with SMACNA HVAC Duct Construction Standards, 2005 Edition.

B. Conceal ductwork above ceilings unless otherwise indicated.

C. Support ducts independently from the overhead structure by means of hangers in accordance with SMACNA.

D. Install ductwork and equipment as required to provide minimum 6 feet 8 inches headroom in mechanical rooms, ductwork as high as possible, unless otherwise indicated, in other spaces with exposed ductwork, and as required to not interfere with other items or access to equipment.

E. Provide flexible duct connectors, with 3 inches to 6 inches active length, at all externally vibration isolated fan inlet and outlet connections.

F. Install ductwork and accessories to provide a system free from buckling, warping, vibration or breathing.

G. Do not support other items, pipe, conduit, ceilings, etc., from duct supports.

H. Seal heat recovery ventilation system ductwork in accordance with SMACNA sealing class “B” requirements.

I. Mechanically fasten joints with sheet metal screws.

J. Seal airtight seams in positive pressurized exhaust ductwork.

K. Provide access to dampers, motors, other concealed operable items, coils, and items requiring periodic inspection, maintenance, or replacement through maximum practical size access doors.

L. At insulated ductwork, provide frames for access doors with depth equal to depth of insulation so that insulation can butt to frame.

M. Seal, airtight, control damper, airflow monitoring station, and louver frames to the ducts in which they are installed.

N. Coordinate building envelope penetrations with Architectural drawing and Division 07 Specifications.

O. Maintain duct cleanliness in accordance with SMACNA guidelines to the Basic Level. In addition, seal openings in supply air and any riser ductwork airtight with four mil polyethylene sheeting and duct tape from time of original installation until final connections are made.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 33 11 - AIR DUCT ACCESSORIES

A. This Section covers selection and installation of duct accessories.

1.2 SUBMITTALS

A. Manufacture Data:

1. Catalog selection for equipment and accessory items.

B. Shop Drawings: Provide drawings with construction details for sheet metal fabrication work indicated in contract documents.

PART 2 PRODUCTS

2.1 GENERAL

A. Construct accessories installed in galvanized ductwork as indicated in the following paragraphs.

B. Construct accessories installed in stainless steel ductwork from stainless steel with features indicated in the following paragraphs.

2.2 FLEXIBLE CONNECTIONS

A. Vibration isolated equipment duct connections to non-insulated ductwork.

1. UL listed with three-inch minimum flexible section and 24 gauge metal flanges. Durodyne Excelon, Metal-Fab, Easyflex, or equal.

2. Continuous temperature range: minus 40 degrees F to 180 degrees F.

3. Rated abrasion resistance: 15,000 cycles.

B. Vibration isolated equipment duct connections to insulated ductwork.

1. UL listed with 4 inches minimum flexible section, 24-gauge galvanized metal flanges, double layer fabric, and one-inch thick fiberglass insulation between fabrics. Durodyne Insulflex Metal Fab, Easyflex, or equal.

2. Continuous temperature range: minus 40 degrees F to 180 degrees F.

3. Rated abrasion resistance: 500 cycles.

2.3 TURNING VANES

A. Standard:

1. 24-gauge galvanized, four inches radius airfoil shaped vanes and 24-gauge galvanized rails.

2. 24-gauge galvanized, two inches radius, single vanes and 24-gauge rails may be used on ductwork whose height or width is 12 inches or less.

2.4 DUCT ACCESS DOORS

A. Fabricated per SMACNA and sized for use or as indicated. Minimum 12 inches by 12 inches size where duct size permits. Cesco HAD, Ruskin ADH, Duro-Dyne IAD, or equal.

B. Insulated or acoustically lined to match ductwork.

C. Gasketed, hinged, and cam latch operated. Double latch on doors 18 inches high and larger. Sheet metal screwed in place access panels are not permitted.

2.5 SPIN-IN FITTINGS

A. Constructed from galvanized sheet metal and spring-loaded retractable damper with position locking regulator. Similar to Royal No. 702.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

A. All duct accessories shall provide intended function without rattles, sags, vibration or whistles.

3.2 FLEXIBLE CONNECTIONS

A. Provide where indicated and in accordance with manufacturer's and SMACNA recommendations.

3.3 TURNING VANES

A. Provide with vane leading and trailing edges parallel to adjacent duct sides.

B. Provide turning vanes at all mitered elbows in supply, return, and exhaust air ductwork whether or not turning vanes are specifically indicated on the Drawing.

C. Do not install turning vanes in mitered elbows in transfer air boots unless specifically indicated otherwise.

D. Install in accordance with manufacturer's or SMACNA recommendations.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 33 13 - DAMPERS

A. This Section covers selection and installation of dampers.

1.2 SUBMITTALS

A. Manufacture Data:

1. Catalog selection for equipment and accessory items.

B. Shop Drawings: Provide drawings with construction details for sheet metal fabrication work indicated in contract documents.

PART 2 PRODUCTS

2.1 GENERAL

A. Construct accessories installed in galvanized ductwork as indicated in the following paragraphs.

B. Construct accessories installed in stainless steel ductwork from stainless steel with features indicated in the following paragraphs.

2.2 NON-MOTORIZED DAMPERS

A. Balancing Dampers:

1. 16 galvanized steel channel frame and blades, opposed blade, capable of providing 95 percent shutoff. Ruskin MD-35, Greenheck, Canarm, or equal.

2. Operator: Heavy-duty zinc plated steel with quadrant regulator. Similar to Duro-Dyne KS-12.

3. Provide elevated regulators on insulated ducts so that insulation is continuous.

B. Volume Control Dampers:

1. Single blade, constructed in accordance with SMACNA.

2. Zinc plated steel, quadrant regulator. Similar to Duro-Dyne KS-385/385L.

3. Provide elevated regulators on insulated ducts so that insulation is continuous.

C. Backdraft Dampers:

1. Fan discharge mounted and locations subject to less than 40 degrees F temperatures.

a. Counterbalanced with extruded aluminum blades and frame. Blades to have extruded vinyl edge seals. Ruskin Type CBD-6, Greenheck, Canarm, or equal.

2. Maximum 0.05-inch W.G. pressure drop.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

A. All duct accessories shall provide intended function without rattles, sags, vibration or whistles.

B. Install in accordance with manufacturer's or SMACNA recommendations.

3.2 BACKDRAFT DAMPERS

A. Dampers indicated in ductwork or plenums are in addition to any dampers specified or indicated as furnished with fans

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 33 46 - FLEXIBLE DUCTS

A. This Section covers selection and installation of flexible ductwork.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog selection for equipment and accessory items.

PART 2 PRODUCTS

2.1 GENERAL

A. Class I Connector, UL Standard 181.

B. Flex duct diameters indicated are internal diameter.

C. Factory fabricated with an inner sleeve, insulation, and outer vapor barrier jacket. Thermaflex M-KE, Flexmaster U.S.A., ATCO Rubber Products, Inc, or equal.

1. Inner sleeve: Acoustically rated CPE bonded to coated spring steel wire helix.

2. Insulation: Fiberglass blanket, R-Value = 4 minimum.

3. Outer vapor barrier jacket: Fiberglass reinforced film laminate with maximum vapor transmission rating of 0.1 US Perms.

4. Rated operating pressure: Minus 1 to plus 6 inches WG, 4 through 12-inch ID, and minus 1/2 to 6 inches WG, 14 through 16-inch ID.

5. Rated operating temperature: Minus 20 degrees F to 250 degrees F.

6. Rated velocity: 4000-fpm minimum.

7. Maximum Surface Burning Characteristics:

a. Flame spread: 25 maximum.

b. Smoke developed: 50 maximum.

PART 3 EXECUTION

3.1 INSTALLATION

A. Maximum length of each run of HVAC flexible duct shall not exceed 6 feet.

B. In accordance with SMACNA HVAC Duct Construction Standards, 2005 Edition.

C. Support flexible ductwork so that it is not supported by ceilings, ceiling support members, piping, equipment, or other ductwork.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 37 13 - DIFFUSERS, REGISTERS, AND GRILLES

A. This Section covers selection and installation of room air distribution devices and outlets.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and selections for equipment and accessory items.

B. Shop Drawings: Provide drawings with construction details for sheet metal fabrication work indicated in contract documents.

PART 2 PRODUCTS

2.1 GENERAL

A. Refer to Drawings for size, type, and capacity.

B. Where stainless steel construction is indicated, construct air outlets, frames, and opposed blade volume dampers entirely from stainless steel.

C. Construct other air outlets and frames from steel or aluminum with eggshell white baked enamel finish, and in T-bar ceilings finish to match T-bar, unless otherwise indicated. Clean, phosphatize, and dry all surfaces prior to finishing.

D. Provide air outlets with frames/borders required to make installation compatible with mounting surface.

E. Provide neck adapters as required to adapt supply duct to diffuser.

F. Coordinate light troffer air boots with troffer supplied.

2.2 LINEAR BAR GRILLE

A. Fixed, extruded aluminum bars, aluminum finish. Removeable core. Titus CT series, Anemostat, Kreuger, or equal.

B. Provide opposed blade volume damper when indicated. Screwdriver operator accessible through face.

2.3 LOW VOLUME, ROUND DIFFUSERS

A. Round, molded plastic, off white color. Aldes Algrille or equal.

B. Integral volume adjustment.

PART 3 EXECUTION

3.1 INSTALLATION

A. Coordinate installation with location indicated on architectural Drawings.

B. Provide edge gaskets and securely fasten all surface mounted flange type diffusers, registers, and grilles to ductwork or ceilings. Draw the air devices tight to the finished surface to prevent leakage and smudging.

C. Provide ceiling trim specially manufactured for the purpose at all locations where slot diffusers are installed in gypsum board or plaster ceilings.

D. Outlet installation shall result in no gaps between outlet face or frame and mounting surface.

E. At lay-in ceilings, support room air outlets from structure above. At Contractor's option, slot diffusers weighing less than 50 pounds may be secured to ceiling grid using side clips provided with diffuser and sheet metal screws.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 51 00 - BREECHINGS, CHIMNEYS, AND STACKS

A. This Section covers selection and installation of fuel fired equipment stacks, breechings, and connectors.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for component parts and accessory items including:

a. Materials of Construction.

b. Indicate third party performance testing.

B. Shop Drawings: Provide dimensional stack assembly drawings and details, including all stack accessories.

C. Shop Drawings: Provide dimensional drawings and details of contractor fabricated items.

PART 2 PRODUCTS

2.1 DIRECT VENT SYSTEM

A. Provide gas tight, double wall assembly, with insulated space between the walls, UL listed for positive pressure applications with building heating equipment and appliances which produce exhausted flue gases up to 1000 degrees Fahrenheit under continuous operating conditions and up to 1400 degrees Fahrenheit under intermittent operating conditions. US Boiler FDVS, no substitutions, no alternative brands.

B. Provide assembly UL listing with clearance to combustible construction no greater than three inches.

C. Provide concentric direct vent hood and through wall assembly UL listed with clearance to combustible construction no greater than zero inches.

D. Provide assembly complete with interlocking sections, hoods, backer plates, supports, flashings, connectors, and other accessories as indicated, as required by IMC, and as recommended by the manufacturer.

E. Provide combustion air duct with vacuum relief valve.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install as indicated, as recommended by the manufacturer, and in accordance with UL listing or IMC clearance requirements to combustibles.

3.2 ADJUSTMENT

A. Adjust combustion air vacuum relief valve per valve manufacturer's recommendations.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 52 23 - FORCED DRAFT CAST IRON BOILERS

A. This Section covers selection and installation of heating system forced draft cast iron boilers.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog data and selections for equipment and accessory items including:

a. Materials of construction.

b. Dimensional drawings and details.

1) Dimensions of all components.

2) Connection sizes and locations.

3) Equipment clearances.

4) Piping diagrams.

5) Accessory details.

c. Wiring diagrams.

d. Control interface diagram.

2. Performance and capacity data including:

a. Output under specified conditions.

b. Combustion efficiency.

c. Fuel consumption rate.

d. Electrical data.

PART 2 PRODUCTS

2.1 GENERAL

A. #1 diesel pressure fired, cast iron sectional, boiler-burner unit manufactured and marked in accordance with ASME Code Section IV requirements. Burnham MPO, Weil-McClain, Viessmann, or equal.

B. Indicated capacity is gross I-B-R output required.

C. I-B-R Efficiency: 87 percent minimum with 13 percent carbon dioxide.

2.2 BOILER

A. Heat Exchanger/Combustion Chamber:

1. Vertical section, vertical flow, cast iron water base with wet, cast iron back section.

2. Individual clean-out openings between sections covered with insulated cast iron covers. Provide replaceable gas tight seals.

3. Internal baffles to adequately mix return and supply water to prevent thermal shock with return water temperatures down to 140 degrees F.

B. Spring loaded explosion pressure relief door with built-in observation port in back section.

C. Refractory lined burner mounting plate with built-in observation port.

D. Heavy gauge, corrosion resistant steel flue canopy.

E. Manual, lock type, adjustable flue connector damper.

F. Removable, insulated, heavy gauge steel jacket with baked enamel finish. Installable and removable for boiler cleaning without disconnecting piping connections.

G. Water side rated for 50 psig minimum working pressure and factory hydrostatically tested prior to shipping. Provide boiler with 30 psig safety relief valve.

2.3 OIL BURNER

A. UL listed, flame retention design, interrupted ignition, cadmium sulfide flame detector.

B. Positive displacement, gear operated fuel oil pump. Sized and selected for the fuel type, burner operation, and piping configuration. Similar to Suntec, or Webster.

C. Flange secured to burner mounting plate.

D. Operation: Single stage firing.

E. Burner Controller: Beckett 7505 with 52040U lockout alarm module, no substitutions, no alternates.

2.4 BOILER TRIM

A. Operator controls: Provide high limit aquastat with adjustable temperature range from 100 degrees F to 240 degrees F with an adjustable differential temperature set point range from 5 degrees F to 30 degrees F.

B. Limits:

1. Provide automatic reset type probe type low water cut-out. Similar to McDonnell-Miller Guard Dog Series 751P/752P.

2. High limit aquastat control: Manual reset, set at 220 degrees F, Similar to Honeywell Series L4006.

C. Combination pressure gauge and thermometer.

D. Pressure relief valve: ASME, factory set to match pressure rating of boiler.

2.5 BOILER CONTROLS

A. Boiler operation is to be supervised by a separate boiler plant manager specified under section 23 09 33 “Standalone Control System for HVAC”.

PART 3 EXECUTION

3.1 INSTALLATION

A. In accordance with UL and ASME approvals.

B. Provide manufacturer recommended inlet and outlet piping sizes and configurations. Boiler manufacturer recommendations may require multiple supply and return connections to heating system piping indicated.

C. Install barometric damper in connector.

D. Provide brass nipples and fittings at boiler trim and at connections of copper piping systems to boilers.

E. Provide manufacturer's recommended clearances to sides of boilers for cleaning and section removal.

F. Provide full tapping size nipple and blind flange at bottom, front mud drum tapping. Provide boiler drain tapped into bottom of blind flange.

3.2 START UP AND TESTING

A. Have boiler started up and burner tested and adjusted for optimum efficiency by factory authorized representative.

B. Submit report of startup and test to Contracting Officer prior to Substantial Completion Inspection. Report to include start-up procedure and the following data:

1. Tag Number and location.

2. Appliance nameplate information.

3. Burner nameplate information.

4. Nozzle size, type, and angle.

5. Connector temperature, combustion efficiency, draft, percent CO2 and smoke (on a scale of 1-5). Include high and low fire readings when applicable.

6. Parts per million of CO for gas fired operation when applicable.

7. Inlet and outlet heated medium temperature.

C. Call for inspection as required by Alaska Statues AS 18.60. Submit inspection report to owner.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 72 33 - AIR-TO-AIR ENERGY RECOVERY EQUIPMENT - RESIDENTIAL

A. This Section covers selection and installation of residential grade energy recovery ventilators.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for equipment and accessory items including:

a. Materials of construction.

b. Dimensional drawings and details:

1) Dimensions of all components.

2) Connection sizes and locations.

3) Equipment clearances.

4) Accessory details.

c. Wiring Diagram.

d. Control Interface Diagram.

2. Performance and capacity data including:

a. Capacity under specified conditions.

b. Fan curves.

c. Core data.

d. Filter Data

e. Acoustical data.

f. Electrical data including motor efficiency.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide factory fabricated heat recovery ventilators complete with insulated casing, heat recovery module, filters, fans and motors, fan speed controller, and vibration isolation. Lifebreath, no substitutions, no alternative brands.

2.2 CASING

A. 20-Gauge Galvanized steel panels with factory applied polyester enamel finish.

B. Lined with rigid, foil faced fiberglass insulation.

C. Drain pans with integral drain connections.

2.3 HEAT RECOVERY MODULE

A. Removable aluminum core configured for counter-flow design.

B. Complete with washable filters on supply and exhaust.

2.4 FANS AND MOTORS

A. Fan assembly removable for cleaning.

B. Centrifugal, double width, double inlet, forward curved blade wheels.

C. Two permanently lubricated, high efficiency PSC motor. 115 VAC, 4 amps each.

2.5 CONTROLS

A. Manufacturer provided controls with fan on/off, fan speed (two-speed minimum) control, and recirculation mode controls.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install as indicated and in accordance with manufacturer's recommendations.

B. Seal duct joints and seams airtight with duct sealant.

C. Install units to allow access panels to completely open without obstruction from accessible location for maintenance purposes.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 81 11 - DUCTLESS AIR CONDITIONERS

A. This Section covers ductless air conditioner systems including the associated evaporator(s) and condenser.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for equipment and accessory items.

2. Selection with drawings and details indicating dimensions and compliance with capacity/condition requirements indicated.

3. Diagrams showing connection sizes and locations.

4. Fan data indicating capacity.

5. Dimensional diagrams with equipment clearances.

6. Materials of construction.

7. Electrical data.

8. Wiring Diagrams.

9. Control interface diagram.

B. Shop Drawing: Complete piping diagram showing all pipe sizes, offsets, rises, slopes, equipment, and accessory items.

PART 2 PRODUCTS

2.1 GENERAL

A. Self-contained factory assembled and wired unit designed to be wall mounted. Package to include fan, coils, filters, refrigeration system components, condensing unit, condensate pump, internal automatic temperature control system and panel, electrical panel with integral disconnect switch, piping, and valves.

B. Complete with cabinet and chassis constructed from heavy gauge galvanized steel and designed for easy service access.

C. Complete with wiring diagram and schematic diagram mounted on a panel of each unit.

D. Provide units easily serviceable through front or side access panels.

E. Refrigeration System:

1. Provide a refrigeration system split between evaporator and condenser sections with both portions factory piped and sealed with an operating charged. Provide evaporator and condenser sections fitted for field connection without requiring brazing, dehydration, or charging. Refrigeration line sets shall be provided by the manufacturer in proper lengths for application.

2. Provide evaporator section complete with copper tube, aluminum fin evaporator coil and thermal expansion valve pre-charged with refrigerant and sealed.

3. Provide complete refrigeration circuit line sets per manufacture sizing recommendations for length and tubing diameter, Streamline or equal.

4. Provide with shock, movement, and vibration resistant strut clamps, UL 2043 Classified for use in plenums (25/50 flame and smoke spread), Hydra-Zorb Strut Mounted Cushion Clamp, ZSI Inc., or equal.

F. Air Distribution System:

1. Fan: Quiet, direct drive with two double inlet blower, self-aligning sleeve bearings, and lifetime lubrication.

2. Motor: High efficiency, permanent-split capacitor, equipped with 2 speeds for airflow modulation.

3. Filter: 1-inch thick disposable.

2.2 SPLIT SYSTEM- CONSTANT FLOW

A. Split system with capability of serving up to three evaporator units with a single remote condenser unit. Wall mounted evaporators including fan, coil, filter, and internal automatic temperature controls system. Foot mounted condenser including refrigeration system components, condensing coil, and compressor.

B. Refrigerant line length allowing up to 65 feet of piping length and 25 feet of height differential.

C. Control System:

1. Provide LCD wireless remote controller with backlit display and luminescent control buttons. It must allow the user to turn unit on and off, set timers and to select and display time, temperature setpoints, and fan speed set point, high or low.

D. Multi-Split System:

1. Multi-split system capable of serving multiple zones.

2. Heat Pump: For heat pump systems, operation of the system shall permit either cooling or heating of all indoor units simultaneously. Mitsubishi MXZ Series, no substitutions, no alternative brands.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install as indicated and in accordance with manufacturer's recommendations.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 82 16 - AIR COILS

A. This Section covers construction and testing of heating or cooling coils.

1.2 SUBMITTALS

A. Manufacturer's data, include submittal data for coils integral with air handling equipment with the air handling unit data.

1. Provide a separate complete submittal for each coil even though some accessory items may be repeated in several packages.

2. Catalog data and selections for equipment and accessory items including:

a. Materials of construction.

b. Dimensional drawings and details:

1) Dimensions of all components.

2) Connection sizes and locations.

3) Piping diagrams.

4) Accessory details.

c. Indicate third party performance testing.

3. Performance and capacity data including:

a. Capacity under specified conditions.

b. Where coil parameters are within the scope of AHRI testing, provide manufacturer's AHRI certificate. If coil parameters falls outside the scope of AHRI testing, coil performance must be based on an AHRI certified test and adjusted for non-standard conditions using industry recognized performance adjustment factors.

c. Airflow and pressure drop.

d. Fluid flow and pressure drop.

B. Air Coil Schedule: Submit a schedule of air coils listing the location, coil capacity (BTU/hr), size, airflow (CFM), and fluid flow (GPM) for each air coil.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide coils with performance rated by AHRI when tested with 100% water as the heating fluid.

2.2 CONSTRUCTION

A. Aluminum plate, ten fins per inch maximum, mechanically bonded to 5/8-inch copper tubes set on staggered centers. Precision Coils, Trane, USA Coil or equal.

B. Copper headers with all header connections and return bend joints brazed. Arranged to allow coil to be completely drained through gravity flow.

C. Rated for a minimum of 150 psi working pressure.

D. Fabricate coil casing and tube sheets from 16-gauge (minimum) galvanized steel formed to provide good support for the tubes.

E. Coil flow arranged for counterflow between airstream and fluid. Fluid flow arranged such that coil is self-venting during normal operation.

PART 3 EXECUTION

3.1 PRIOR TO SHIPMENT

A. Test coils under water with air at 300 psig.

B. Clean coils after testing to the order of cleanliness normally required for the intended service.

C. Cap coil piping connections with shipping caps after cleaning and testing.

3.2 INSTALLATION

A. Comb coil fins of all dents and other irregularities after installation.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 82 36 - FINNED TUBING RADIATION - COMMERCIAL

A. This Section covers the selection and installation of commercial grade finned tube radiation.

1.2 SUBMITTALS

A. Manufacture's Data:

1. Catalog data and selections for equipment and accessory items including:

a. Provide a separate complete submittal for each finned tube type even though some accessory items may be repeated in several packages.

b. Materials of construction.

c. Element pipe size, fin size, fin spacing.

d. Metal gauges.

e. Jointing details.

f. Enclosure finish.

g. Enclosure color sample selection chart.

h. Dimensional drawings and details:

1) Enclosure, support, and brackets.

2) Accessory details.

i. Indicate third party performance testing.

2. Performance and capacity data including:

a. Output under specified conditions.

b. De-rates associated with selection.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide enclosure, heating element, supports, and accessories of a single manufacturer as a complete package. Rittling, no substitutions, no alternative brands.

B. Output I-B-R rated.

C. Enclosure heights, depths, and top style are defined by manufacturer and model indicated on the Drawings for each finned tube radiation type.

D. Finned lengths are indicated on the Drawings. Whenever manufacturer's nominal element length provides less finned length than indicated, provide the next longer nominal length.

E. Element lengths indicated may not be reduced by utilizing finned elements of a higher nominal capacity.

F. Indicated pipe or tube size may not be increased on heating systems utilizing a glycol solution.

G. Material gauges shall be equal to or heavier than that specified hereunder; where material or gauge is not specified, it shall be equal to or heavier than the standard of the manufacturer indicated on the Drawings.

2.2 ENCLOSURES AND TRIM

A. Fabricated from 16-gauge minimum bonderized steel for enclosures less than 20 inches high and 14-gauge minimum bonderized steel for enclosures 20 inches high and higher unless otherwise indicated.

B. Baked enamel finish of color selected by Contracting Officer from manufacturer's standard color selection chart.

C. Provide wall, end, corner, and other trim of the same gauge as enclosure as required to provide a finished product. Terminate covers and fins for radiation that extends from one room to another at the wall dividing the rooms with only piping passing through the wall. Install enclosure wall trim piece at all wall terminations.

D. Provide key operated hinged access doors at each valve and air vent location.

2.3 NONFERROUS HEATING ELEMENTS

A. Fabricated from copper tube with mechanically bonded aluminum fins.

B. Rated for a working pressure 180 psig minimum at 300 degrees Fahrenheit.

2.4 ENCLOSURE TOP SUPPORTS

A. Fabricated from 18-gauge minimum bonderized steel.

B. Factory finish to match enclosure on exposed portions.

C. Formed with a projection on the top to hold the enclosure away from the wall a sufficient distance for easy installation or removal without damaging wall or enclosures.

2.5 ENCLOSURE AND ELEMENT SADDLE SUPPORT BRACKETS

A. Fabricated from 14-gauge steel and coated with low-friction material to minimize movement noise during warm-up and cool-down.

B. Designed to constrain the element saddles to positively prevent fin impingement on brackets or enclosure while allowing at least 1-1/4 inches lateral saddle movement.

2.6 ELEMENTS SADDLES

A. Free moving double saddle type fabricated from heavy gauge bonderized steel. Wire or rod hangers will not be accepted.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:

1. Install enclosures, elements, and supports in accordance with manufacturer's instructions, and as indicated.

B. Enclosure Top Supports:

1. Continuous for the length of the enclosure.

2. Firmly anchored to the wall with screws at every wall stud crossed.

C. Enclosures and Trim:

1. Install enclosures wall-to-wall or, when not indicated wall-to-wall, of length required to totally encompass indicated element lengths and accessories. Install non wall-to-wall enclosures tight to end wall, centered under window, or centered on wall as indicated.

2. Install enclosures with tops level, with joints tightly butted, and at mounting heights indicated with manufacturer's recommended as minimum.

3. Install trim specifically recommended by manufacturer for application. Install trim square with enclosure.

4. Where control element of self-contained control valve is mounted on enclosure, set element square with enclosure and conceal sensing bulb within enclosure.

D. Enclosure and Element Saddle Support Brackets:

1. Space not over four feet on center. Provide bracket within 2 feet of each end of enclosure. Provide additional brackets when required to support enclosure accessories.

2. Firmly attach to enclosure with concealed screw or spring clip type fasteners. Friction type fasteners will not be allowed.

3. Securely fastened with screws to wall studs at the top and bottom.

E. Elements:

1. Install so that fins do not impinge on brackets or enclosures. Trimming fins will not be accepted.

2. Install flat or pitched up to one-half inch per ten feet in direction of flow.

3. Install eccentric reducers with top flat on joints between different size element and heating water return piping. Supply connections may utilize concentric reducers.

4. Elements shall be clean and free of paint.

3.2 FINISHES

A. Touch up all damaged spots and holidays with manufacturer supplied touch-up enamel.

B. Provide the Owner with at least two unopened one-half pint cans of touch-up enamel from the same batch as the original factory-finish batch when final finish is from manufacturer's standard color selection chart.

C. All enclosures and trim within same room shall be of the same shade and present an identical appearance irrespective of viewing angle.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 82 39 - UNIT HEATERS

A. This Section covers selection and installation of hydronic unit heaters.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Provide a separate complete submittal for each unit even though some accessory items may be repeated in several packages.

2. Catalog data and selections for equipment and accessory items.

3. Selection with drawings and details indicating dimensions and compliance with capacity/condition requirements indicated.

4. Coil Data.

5. Fan data indicating capacity.

6. Wiring diagram.

7. Electrical data.

B. Sample: Enclosure finish and color.

PART 2 PRODUCTS

2.1 FIXED DISCHARGE UNIT HEATERS

A. Manufacturer's standard catalog item which most closely exceeds the design requirements indicated with fluid indicated. Modine, Rittling, Beacon Morris, or equal.

B. Casing:

1. Horizontal projection units: Two-piece with "picture frame" front formed into wrap around sides, top, and bottom. 20 gauge back panel.

2. Phosphatized to prevent corrosion and finished with manufacturer's standard color baked enamel unless otherwise indicated.

C. Coil:

1. Aluminum fins mechanically bonded to seamless copper tubes.

2. Rated working pressure: Steam, 75 psig. Hot water, 225 psig.

3. Tested under water at 250 psig.

D. Fan and Motor:

1. Direct drive propeller type, factory balanced fan with aluminum blades.

2. Totally enclosed, permanently lubricated motor with integral overload protection.

3. Provide motors 1/6 horsepower and larger with ball bearings.

E. Discharge:

1. Louvered discharge on horizontal projection units.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide flex connections at supply and return piping connections to units with motors 1/4 horsepower and larger.

3.2 OPERATION

A. Units shall not have any detectable rattles, buzzes, or vibration. Sheet metal screws, adhesives, or other fastening devices or techniques shall not be used to correct shipping damage or for field modifications to eliminate rattles, buzzes, or vibrations.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 82 43 - CABINET UNIT HEATERS

A. This Section covers selection and installation of cabinet unit heaters.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Provide a separate complete submittal for each unit even though some accessory items may be repeated in several packages.

2. Catalog data and selections for equipment and accessory items.

3. Selection with drawings and details indicating dimensions and compliance with capacity/condition requirements indicated.

4. Fan data indicating capacity.

5. Coil Data.

6. Filter Data.

7. Acoustical Data.

8. Wiring diagram.

9. Electrical data.

B. Sample: Enclosure finish and color.

PART 2 PRODUCTS

2.1 GENERAL

A. Manufacturer's standard catalog item that most closely exceeds the design capacity requirements as scheduled on the Drawings with indicated fluids and temperatures. Modine, Beacon Morris, Rittling, or equal.

B. Provide factory fabricated unit complete with cabinet, chassis, coil, filter, fan wheel, fan housing, motor, and controls.

C. Filter: One inch pleated media. Average ASHRAE Standard 52-76 efficiency: 20 percent with 85 percent arrestance.

D. Coil: Aluminum fins mechanically bonded to copper tubes. Rated for 300 psig working pressure and 200 degrees Fahrenheit inlet fluid temperature. Factory leaked tested under water at 100 psig.

E. Fan and housing: Centrifugal forward-curved, double width, aluminum fan wheel. Formed sheet metal housing with corrosion resistant finish.

F. Motor: Three-speed, permanent split capacitor, integral overload protection, permanently lubricated, on common rigid support with fan.

G. Vibration isolation: Rubber-in-shear supporting fan and motor.

H. Controls: Unit mounted, concealed, three-speed switch with off position. Unit mounted, concealed, electrical power disconnect switch.

2.2 ACOUSTICAL PERFORMANCE

A. Units with a high-speed output of 600 cfm or less shall not exceed a NC-50 on high speed and a NC-40 on low speed. Ratings shall not include room effects.

B. Units larger than 600 cfm shall not exceed a NC-55 on high speed and a NC-45 on low speed. Ratings shall not include room effects.

2.3 HORIZONTAL UNITS

A. 18 gauge galvanized structural steel chassis.

B. 16 gauge galvanized steel bottom panel and 18 gauge galvanized steel end and top panels.

C. Bottom panel hinged with full piano hinge and provided to expose motor, coil, filter, and controls.

D. Inlet and outlets as indicated on drawings.

2.4 CABINET FINISH

A. Baked enamel finish of color selected by Contracting Officer from manufacturer's standard color selection chart.

B. All cabinet parts cleaned, bonderized, and phosphatized prior to finishing.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install units to allow access panel to completely open without obstruction.

3.2 OPERATION

A. Units shall not have any detectable rattles, buzzes, or vibration. Sheetmetal screws, adhesives, or other fastening devices or techniques shall not be used to correct shipping damage or for field modifications to eliminate rattles, buzzes, or vibrations.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 05 01 - GENERAL PROVISIONS

A. This Section covers general electrical requirements for Work covered under this Division.

B. All Work and Services specifically covered under this Division is supplementary to that covered under other Divisions of these Contract Documents. The requirements of this Division, which are more stringent than that covered under other parts of these Contract Documents, apply to Work covered under this Division.

C. All incidental Work required but not specified under this Division shall comply with the Division in which it is specified.

D. Review the Drawings and Specifications of all other Divisions for additional Work under Division 26.

1.2 DEFINITIONS

A. Furnish:Shall mean deliver to the project site.

B. Install: Shall mean build into the work, including connections and any parts commonly considered as incidental to a complete installation.

C. Provide: Shall mean furnish and install complete.

D. Work or Project: Shall mean all work required by the Contract Agreement.

1.3 ABBREVIATIONS AND INITIALS

A. Any or all of the following may appear in the Contract Documents, and shall be applied per the following explanations:

a.c. or AC	Alternating Current (60 Hz. unless otherwise noted)
AFF	Above Finished Floor
AFG	Above Finished Grade
AIC	Amperes Interrupting Capacity (RMS Symmetrical)
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge Size
d.c. or DC	Direct Current

EMT	Electrical Metallic Tubing
GND	Ground
GFCI	Ground Fault Circuit Interrupter
Hertz or Hz	Frequency in Cycles per Second
HP	Horsepower
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IMC	Intermediate Metal Conduit
LTG	Lighting
MSS	Motor Starting Switch
MCC	Motor Control Center
NEC	National Electrical Code
NESC	National Electrical Safety Code
NECA	National Electrical Contractors Association, Inc.
NEMA	National Electrical Manufacturers Association
NIC	Not in Contract
NIE	Not in Electrical
O.L.	Motor Overload Devices
OSHA	Occupational Safety and Health Administration
RSC	Rigid Steel Conduit
UL	Underwriter's Laboratories
VAC or VDC	Volts, AC or DC, respectively

B. Other abbreviations and initials, which may appear in the Contract Documents, are intended to have the meanings commonly accepted in the electrical construction industry, and the Owner shall be contacted for definition if any question arises concerning them.

1.4 DRAWINGS

A. Unless otherwise indicated, drawing symbols conform to the applicable standards of ANSI. The Drawings (or Contract Drawings) rely heavily upon symbolic representation of the features shown, and represent exact details only so far as indicated. The following should also be kept in mind:

1. The Drawings are, to some extent, diagrammatic and are not intended to show exact details.

2. Dimensions scaled from the Drawings may vary due to tracing tolerances, printing distortion, field conditions, field changes, and other factors. For these reasons, it shall be the Contractor's responsibility to field-verify dimensions that pertain to his work. The Contractor shall make minor relocations where necessary to resolve conflicts or present a uniform appearance. The Drawings show exact location of electrical features only where specifically dimensioned.

3. The Electrical Contractor shall review the Contract Documents of the other trades on the Project, and shall coordinate the installation of electrical features with the work of all other trades. In areas such as mechanical rooms where conflicts are likely with structural, mechanical, or other features, the electrical installation shall be performed after the other trades, and arranged to eliminate conflicts.

4. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by all. Discrepancies between any combination of Drawings, specification, and/or field conditions shall be promptly brought to the attention of the Owner for a decision. Failure to obtain such decision before proceeding shall automatically leave the Contractor liable for all expenses necessary to correct the situation to the satisfaction of the Owner.

5. Provide fixtures, devices, equipment, conduit, conductors and accessories indicated on the drawings unless it is specifically indicated that the fixture, device, equipment, conduit, conductor, or accessory is existing.

1.5 GENERAL REQUIREMENTS

A. Provide all work as shown on the Drawings and in these Specifications for a complete, safe, and functional installation.

B. The Contractor is responsible for providing a complete and operating facility. The intention of the Contract Documents is to include all labor and materials, equipment, and transportation necessary or reasonably inferable as being necessary for the execution of the work. Where minor adjustments of the work are necessary for purposes of fabrication or installation of items or resolution of conflicts between items within the intent of the Contract Documents, the Contractor shall make such adjustments at no added expense

to the Owner. Where such adjustments affect functional or aesthetic design of the work, they shall first be submitted to the Owner's Representative for review and approval.

C. Unless otherwise noted, all materials shall be of new manufacture and installed before expiration of their shelf life, if applicable.

D. Materials and equipment are to be those of major and reputable manufacturers with ability to render competent and thorough service through local and regional organizations capable of expeditiously providing service, parts, and assistance.

E. Materials of similar nature, style, function, purpose and/or appearance shall be like products from the standard product line of the same manufacturer.

F. All products shall be listed and labeled by an approved national testing laboratory for their intended use and location in all cases where such products are listed and labeled.

G. The omission of express reference to any parts, supplies, services, or facilities necessary for, or incidental to, a complete installation shall not be construed as a release from furnishing such items at no additional cost to the owner.

H. Any deviations from the installation shown in these Contract Documents, due to a particular manufacturer's requirements, shall be made without additional cost to the Owner.

I. Verification is required of all equipment sizes and locations prior to the ordering or installation of connection materials and disconnecting equipment to ensure that the power connections are of the proper size and type, and in the proper location. Verify all electrical loads (voltage, phase, full load amperes, number and point of connections, minimum circuit ampacity, etc.) for equipment furnished under all divisions of this specification, by reviewing respective shop drawings furnished under each division. Meet with each subcontractor furnishing equipment requiring electrical service and review electrical characteristics. Report any variances from electrical characteristics noted on the drawings with the Owner before proceeding with rough work. Obtain and review the equipment shop drawings to determine particular final connection requirements before rough-in begins for each equipment item.

J. All materials shall be installed in a neat, orderly, and secure fashion, as required by these specifications and commonly recognized standards of good workmanship. The norms for execution of the work shall be in conformity with NEC Chapter 3 and the National Electrical Contractors' Association "National Electrical Installation Standards", for which the Owner's judgment shall be final.

K. Electrical equipment shall be installed in spaces that are accessible and in a manner that allows for maintenance and replacement. Entries into spaces shall allow for the passage of equipment. Coordinate the final locations with piping, ducts and equipment of other trades to insure proper access for all trades. Coordinate location of concealed equipment, disconnects and boxes with access panels and doors.

1.6 WIRING OF MECHANICAL EQUIPMENT, MOTORS, AND OTHER UTILIZATION EQUIPMENT

A. Where equipment arrangement varies from that shown on the Drawings, making necessary additional disconnect switches in order to comply with the NEC, such disconnects shall be provided at no additional cost to the Owner.

B. The Electrical Contractor shall provide connection of each motor to its respective controller. The final 18 inches to 36 inches of each connection to a motor shall be made through flexible metal conduit, per Section 26 05 33.

C. Where disconnects or controllers are furnished as part of the mechanical or other utilization equipment, such as in package units, the Electrical Contractor shall provide all power wiring to the equipment and associated disconnects and controllers.

1.7 WORK INCIDENTAL TO SUBSTITUTIONS

A. When substitutions for specified Methods or materials alter the relationship between the Work actually required and that called for by the Contract Documents, the Contractor shall bear responsibility for all expenses incurred by any necessary revisions, including the Work of other trades.

1.8 VAPOR BARRIER PENETRATIONS

A. Penetrations of the building vapor barrier caused by the electrical installation shall be minimized, and where they do occur they shall be sealed as elsewhere described in these Specifications.

1.9 FIRESTOPPING

A. Where electrical raceways or other features penetrate fire-rated building surfaces, they shall be securely sealed to the surrounding surface with intumescent coatings as elsewhere described in these Specifications for the general construction.

B. Acceptable manufacturers include, but are not limited to, the following: 3M, Gardner Bender, NSi, DAP or equal.

1.10 ELECTRICAL WORK EXPOSED TO WEATHER

A. Provide corrosion protection for all ferrous metal portions of electrical work items exposed to weather including conduit, clamps, supports, disconnect switches and other items.

B. All ferrous metal shall be hot-dip galvanized after fabrication, painted or cadmium plated, or similarly protected against corrosion. Approval of painting material and methods is required.

C. All enclosures and equipment shall be weathertight and shall be NEMA rated for the environment.

D. Arrange all equipment in such a fashion as to prevent a buildup of water or other weather related issues that may result in premature failure of the device, damage of materials or other potential public safety hazards.

1.11 PROTECTION AND CLEANING

A. All electrical equipment shall, during the entire duration of construction work, be protected against water, dust, debris, overspray or any other contamination, whether environmental in origin or as a result of construction work.

B. All construction dust, debris, overspray, scrap and surplus materials, etc., resulting from this Work shall be cleared away, leaving the installation in completely clean condition.

C. Clean up all equipment to factory condition. Use touch-up paint where required. All cleaning shall be in accordance with the manufacturer's recommendations.

D. These cleaning requirements apply not only to exterior surfaces, but also interiors of accessible enclosures. In particular, the interiors of equipment having contacts or heat dissipating components shall be thoroughly vacuum cleaned prior to energizing.

1.12 UTILITY REQUIREMENTS

A. It shall be the Contractor's responsibility to contact all Utility providers (Power & Telephone) and verify the extent of the service work to be performed by the Contractor and by the provider in order to provide complete utility services. Fully coordinate with the utility providers to assure the work related to the services to the facility will be established at the date of substantial completion.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 05 19 - WIRE CONDUCTORS AND CABLE

A. Provide 600 volt building wire and cable as shown on the drawings and further specified herein. All wire and cable shall conform to the latest specifications of the NEC and/or the ICEA.

B. All wire and cable sizes noted on the drawings are for copper conductors, and copper conductors only shall be used for building wire throughout the entire installation.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers include, but are not limited to, the following: American Insulated Wire, BICC General, Carol Cable, Excel Wire & Cable, Okonite, Southwire, Superior Essex, AFC Cable Systems or equal.

2.2 CONDUCTORS

A. All conductors shall be copper, except as otherwise noted.

1. Conductors No. 10 AWG and smaller shall be stranded or solid.

2. Conductors No. 8 AWG or larger shall be stranded.

2.3 INSULATION TYPES

A. Branch circuit conductors shall be 600 volt insulated, and unless otherwise noted on the drawings, shall have the following insulation types:

1. Heated indoor spaces - THHN/THWN or XHHW.

2. Outdoors or other cold locations where exposed to temperatures less than 32 degrees F - XHHW.

B. Feeder conductors shall have type XHHW insulation.

C. Nylon-jacketed conductors such as types THHN or THWN shall not be used in any location subjected to ambient temperatures below 32 degrees Fahrenheit.

D. Special applications: Conductors in light fixture wiring channels shall have 90 degrees Celsius insulation rating, types THHN, XHHW, or equal. Conductors in high temperature locations shall have one of the high temperature insulation types suitable for the use and as permitted by the NEC.

2.4 METAL CLAD (MC) CABLE

A. Provide metal-clad cable (Type MC) that complies with UL Standard 1569, the NEC, and this Section.

B. Metal-clad cable shall consist of THHN insulated solid copper conductors, a Mylar wrapping around the conductor bundle, and a close fitting aluminum or galvanized steel outer sheath.

C. Provide minimum 12 AWG conductors in Type MC cables.

1. Provide larger conductor sizes as required to limit branch circuit voltage drop to 3 percent at the full connected load.

2. Use larger conductor sizes to adjust allowable ampacity if there are more than 3 current-carrying conductors in a cable.

3. For isolated ground power circuits provide Type MC cables with a separate neutral conductor for each phase conductor; uniquely identify each neutral with a colored stripe on the white insulation corresponding to the phase conductor insulation color.

D. Provide MC cables with the specified conductor color coding.

E. Provide NRTL listed, insulated throat, snap-in steel box connectors for Type MC cables.

PART 3 EXECUTION

3.1 COLOR CODING

A. Conductors No. 6 AWG and smaller shall be color-coded by factory pigmentation of the insulation. Larger conductors may be color-coded by wrapping the ends with colored tape in all enclosures, except that white (or gray) and green conductors may never be phase-taped for any use other than neutral and ground, respectively. Color-coding throughout the entire installation shall be as follows:

SYSTEM VOLTAGE	
Conductor	208Y/120
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green

3.2 INSTALLATION

A. Install cable in accordance with NECA Standards of Installation.

B. Branch circuit conductors shall be No. 12 AWG copper, except for the following:

1. On 120 volt, 20 amp circuits over 70 feet (actual measured one-way distance) from panel to the last receptacle or middle of the lighting string (as appropriate), use No. 10 conductors for the entire circuit.

2. Where branch circuit conductor sizes are indicated on the drawings, they shall take precedence over the foregoing. Where field conditions dictate circuit routings that increase conductor lengths beyond what would be expected from the layout shown on the drawings, they shall be submitted to the Owner for acceptance.

C. All conductor connections shall be made up securely with solderless pressure connectors such as setscrew lugs, wirenuts, "wingnuts", insulated tap connectors, insulation piercing tap connectors, or suitable crimp fittings. Split bolt connector shall not be used. Where the connector manufacturer does not require twisting together of conductors, conductors shall be left untwisted.

D. Use compression type connectors for copper wire splices and taps, #6 AWG and larger. Utilize heat shrink tubing of the proper voltage rating for uninsulated conductors and connectors.

E. Thoroughly clean wires before installing lugs and connectors.

F. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

G. Terminate spare conductors with wire nuts.

H. Where stranded conductors are used, their ends shall be terminated with crimp-on connectors, set screw lugs, box lugs, or self-lifting pressure terminals.

I. Flexible cords shall be connected to equipment, fixtures, boxes, or other enclosures only by means of cord-grip bodies or other strain-relief fittings specifically designed for the purpose.

J. Where conductors or their connectors are to be connected to metal surfaces, the surface shall first be scraped free of any paint, oxide, or other non-conductive substances. Where there is a possibility of corrosion due to moisture or other cause, a conductive corrosion inhibitor shall be used between the conductor and the metal surface.

K. Where compression fittings are used to terminate conductors operating under 600 volts, the fitting shall have a viewport, or other approved method, so that it can be verified that the conductor is properly seated in the connector.

L. Conductor terminations shall use the manufacturer’s recommended methods and hardware unless specifically noted otherwise.

M. Conductors shall be pulled into raceways only by constant-tension pulling methods. Where necessary, wire-pulling lubricants of a type that is not harmful to conductor insulation and will not harden shall be used.

N. Completely and thoroughly swab raceway system before installing conductors.

O. Neatly train and lace wiring inside boxes, equipment and panelboards.

P. All conductors shall be protected from damage. Where the conductor or insulation is damaged, the Owner may require, at no cost to the Owner, the replacement of the entire conductor, or the implementation of an approved repair method approved by the Owner.

Q. Provide dedicated neutral conductors to branch circuits where neutral conductors are required. Multi-wire branch circuits are not permitted. Use of handle tied breakers to provide simultaneous disconnection of ungrounded conductors for multi-wire branch circuits is not permitted unless specifically called out elsewhere in these contract documents.

3.3 TYPE MC CABLE INSTALLATION

A. Install MC cables according to NECA 1 Standard Practices for Good Workmanship in Electrical Construction, NECA 120 Standard for Installing Armor and Metal Clad Cable, the NEC section 330, and requirements in this Section.

B. Route MC cables to meet Project conditions.

C. Use Type MC cables for 15- and 20-ampere branch circuit wiring beyond the first outlet or junction box; however, use conduit for the “homerun” from the first outlet or junction box to the branch circuit panelboard.

D. Use Type MC cables in interior, dry locations where it will be concealed above ceilings, in dry-wall partitions, in equipment enclosures, or below raised floors.

E. Install and support Type MC cables as required in Article 330 of the NEC. Use NRTL listed spring steel MC cable supports or UV resistant plastic tie wraps to support Type MC cables; do not use wire to support Type MC cables.

3.4 SEPARATION OF SYSTEMS

A. Wiring of different voltage levels, frequency, current characteristics (AC & DC) or functions (normal vs. emergency) shall not share the same raceway or enclosures unless specifically shown on the drawings or permitted by the Owner, or inherently necessary for correct system function (i.e., at transfer switches, transformers, etc.).

B. For A.C. Variable Frequency Drives and Inverters of any kind, conductors for supply, load, and control functions shall not share the same raceway.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 05 26 - GROUNDING AND BONDING

A. All metal raceways, enclosures, and other electrical equipment, as well as non-electrical equipment that may pick up harmful potentials from the electrical system, shall be securely bonded and grounded as required by the NEC, the Drawings, and this Specification.

B. Provide communication system grounding conductor at point of service entrance and connect to building service ground.

C. Provide a separate, insulated equipment grounding conductor inside all feeder and branch circuit conduits.

PART 2 PRODUCTS

2.1 CONDUCTORS

A. All grounding conductors and bonding jumpers shall be copper (absolutely no aluminum substitution permitted), sized according to the NEC. Where separate equipment grounding conductors are called for, they shall be green insulated where run with branch circuits and feeders.

2.2 GROUND RODS

A. Ground rods shall be 3/4-inch by 10 feet-0 inches, except where longer rods are called for on the Drawings, in which case they shall be 3/4-inch diameter sectional type, length as indicated. All ground rods shall be copper-coated steel, "Copperweld" or equal.

2.3 TELECOMMUNICATIONS PRIMARY BONDING BUSBAR (PBB)

A. The telecommunications primary bonding busbar (PBB) shall be a predrilled copper busbar provided with standard NEMA bolt hole sizing and spacing. It shall have a minimum thickness of 1/4 inches, a minimum width of 2 inches and a minimum length of 4 inches. It must be listed by an NRTL.

B. The PBB shall be capable of accommodating bonding conductors that originate at various equipment and metallic surfaces and allow for future growth.

C. If building steel is available and used as a grounding (earthing) electrode, the telecommunications busbars shall be installed on or as close as practicable to a structural steel member within the telecommunications space.

2.4 HARDWARE

A. Clamps, lugs, connectors, bonding bushings, and all other such grounding and bonding hardware shall be approved for the purpose; shall be made of hot-dip galvanized steel, or bronze or other corrosion-resistant alloy. Acceptable manufacturers include, but are not limited to, the following: O.Z. Gedney, T & B, Erico, or any other manufacturer meeting the requirements of the contract documents. No split bolt connectors allowed.

PART 3 EXECUTION

3.1 CONCEALED CONNECTIONS

A. Permanent grounding connections, where permitted by the NEC to be concealed, shall not be so concealed until inspected and accepted by the Owner or their authorized representative. Failure to comply with this requirement will make the contractor liable for any expenses incurred in the process of re-exposing the connections for inspection, and subsequent repair and patching of the concealing construction, including the work of other trades. The Contractor shall schedule inspection of such connections at least one week in advance of concealment and will not be entitled to any additional compensation or time extension for delays caused by inability of the Owner or their representative to be available at the desired time.

3.2 GROUNDING CONDUCTOR RACEWAY BONDING

A. All grounding electrode conductors run in metal raceways shall be bonded to the raceway at both ends. At grounding electrodes, compliance with NEC requirements for conduit connection to the electrode will satisfy this requirement.

3.3 CONCENTRIC AND ECCENTRIC KNOCKOUTS

A. In addition to the NEC requirements for service equipment, metal raceways throughout the project shall be provided with bonding bushings and NEC-sized bonding jumpers where they enter enclosures through concentric or eccentric knockouts, reducing washers, or other arrangements that may be disturbed by relative movement between raceway and enclosure.

3.4 COMMUNICATIONS RACEWAY GROUNDING

A. Communications raceways shall be continuously grounded.

B. All metallic raceways for computer cabling located within the same room or space as the telecommunications grounding bus shall be bonded to the grounding bus using a No. 6 AWG grounding jumper.

C. All EMT from computer outlets shall be bonded to the cable tray system with a No. 10 AWG bonding jumper or other suitable cable tray fitting.

3.5 TELECOMMUNICATIONS BUSBAR BONDING

A. Using an earth grounding (earthing) resistance tester measure the resistance between the nearest available grounding (earthing) electrode (e.g., structural steel column) and each telecommunications busbar in the facility. The maximum value for the bonding resistance between these two points is 0.1 ohms.

3.6 EXTERNAL BONDING JUMPERS

A. Where the NEC permits grounding conductors external to, but routed with, a raceway, such routing shall be accomplished by spiraling the conductor around the raceway no more than two revolutions.

3.7 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Grounding and bonding conductors shall be terminated using a separate terminal for each conductor.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 05 33 - RACEWAYS

A. All conductors shall be run in metal raceways as follows unless of a Metal Clad (MC) type cable assembly or otherwise noted on the Drawings.

1.2 APPLICATIONS

A. Feeder Raceways - Rigid Steel Conduit (RSC). Electrical Metallic Tubing (EMT) may be used for indoor feeder raceways where not subject to physical damage.

B. Branch Raceways - Unless otherwise shown, raceways concealed in non-concrete walls or above suspended ceilings shall be Electrical Metallic Tubing (EMT); exposed raceways shall be EMT in mechanical and electrical spaces, shops and other similar unfinished type areas with exposed devices and features and shall be surface metal raceway in finished areas.

C. The substitution of Intermediate Metal Conduit for Rigid Steel Conduit where permitted by the NEC is permitted by this Specification, except for the following applications:

1. RSC and IMC shall not be intermixed in any conduit run unless a pullbox or conduit body is provided between them.

D. The final connection to any motor or other rotating or vibrating equipment, or equipment which may require position adjustment after installation shall be made through a slack section of flexible metal conduit 18 inches to 36 inches long. For such connections to pump motors, and to equipment in damp, wet, or exterior locations or in Mechanical Rooms, the flex shall be of the oil-resistant liquid-tight type.

E. Other raceways shall be as noted on the Drawings or further specified herein.

F. Nonferrous metal conduit is not permitted unless specifically noted.

PART 2 PRODUCTS

2.1 TYPE

A. Minimum size for all raceways shall be 1/2-inch diameter. Minimum size of conduit for home-runs shall be 3/4-inch diameter.

B. Raceways shall be of types and characteristics recognized by the NEC.

2.2 QUALITY ASSURANCE

A. Conduit and fittings shall be standard types and sizes as manufactured by a nationally recognized manufacturer of this type of materials and be in conformity with applicable standards and UL listings.

2.3 CONDUIT AND TUBING

A. Rigid Metal Conduit (RMC)

1. RMC shall be hot dip galvanized, Schedule 40 Dimensions with smooth interior.

2. RMC shall be made up with threaded fittings only.

3. Acceptable manufacturers include, but are not limited to, the following: Allied Tube & Conduit, J & L, Triangle, Western Tube & Conduit, Youngstown, or equal.

B. Electrical Metallic Tubing (EMT)

1. EMT shall be galvanized, with smooth interior.

2. EMT shall be made up with concrete-tight compression fittings. Provide rain-tight compression EMT fittings for exterior locations. Connectors shall have insulated throats.

3. Acceptable manufacturers include, but are not limited to, the following: Allied Tube & Conduit, J & L, Triangle, Western Tube & Conduit, Youngstown, or equal.

C. Intermediate Metal Conduit (IMC)

1. IMC shall be hot-dip galvanized steel, with smooth interior.

2. IMC shall be made up with threaded fittings only.

3. Acceptable manufacturers include but are not limited to the following: Allied Tube & Conduit, Cyprus, Western Tube & Conduit, or equal.

D. Flexible Metal Conduit (FMC)

1. FMC shall be unjacketed (“Greenfield” or “Reduced Wall Flex”), made of interlocking galvanized steel armor.

2. Acceptable manufacturers include, but are not limited to, the following: Alflex, American Metal, Carol Cable Co., Electri-flex, National Electric, Thomas & Betts, Triangle, or equal.

E. Liquid-tight Flexible Metal Conduit (LFMC)

1. LFMC shall have a flexible galvanized steel spiral core with a flexible outer jacket of PVC, resistant to water, oil, grease, corrosive agents, and abrasion. Acceptable manufacturers include, but are not limited to the following: Carol, Anaconda, or equal.

2. Fittings for liquid-tight flexible conduit shall be steel or malleable iron of a type incorporating a threaded grounding cone, nylon or plastic compression ring, and a tightening gland, providing a low resistance ground connection. All throats shall be insulated.

3. Exterior or other extreme temperature applications of LFMC shall have temperature rating of minus 67 degrees Fahrenheit to plus 220 degrees Fahrenheit.

4. If used without a separate equipment grounding conductor, liquid-tight flex shall have a continuous copper ground wire integral with its construction and shall be made up with fittings approved for grounding.

5. Acceptable manufacturers include, but are not limited to, the following: AFC Cable Systems, Eaton, Thomas & Betts, Carol, Anaconda, or equal.

2.4 CONDUIT TRANSITION FITTINGS AND COUPLINGS

A. Use of manufactured transition fittings and couplings between differing types of raceway systems (i.e. transition from RSC to HDPE) shall be listed for this purpose. Couplings within the raceway system in below grade applications shall be configured and connected so these joints are water tight.

2.5 WIREWAYS AND GUTTERS

A. Unless otherwise noted, wireways and gutters shall be similar to pull and junction boxes in construction, with screw covers.

B. Wireways and gutters shall be used only where shown on the drawings or specifically accepted by the Owner. Auxiliary gutters which are used at distribution panelboards and other service equipment is not subject to this owner acceptance requirement.

2.6 CONDUIT BODIES

A. Use of conduit bodies having the "LL" or "LR" configurations is not permitted unless specifically called for or accepted by the Owner.

PART 3 EXECUTION

3.1 LAYOUT

A. Raceways shall be concealed, except in mechanical and electrical rooms and as otherwise noted on the drawings. Exposed raceways shall be run square with the building lines. Concealed raceways shall be run perpendicular or parallel to walls, and shall be grouped together to minimize congestion where practical.

B. Unless otherwise noted on the Drawings, branch circuit raceways shall be sized per the NEC tables.

C. Structural members shall not be cut, drilled, or notched for raceways or other electrical features unless specifically accepted by the Owner.

D. Metal raceways crossing expansion joints, and in other required places, shall make provision for 3-way movement at such points. Such fittings shall be installed so that they are initially in the center of all 3 axes of movement (i.e.: not deflected to make part of a conduit bend or compressed or extended to compensate for incorrect conduit length).

E. At all raceway penetrations of the vapor barrier provide a double splice patch (one on each side of vapor barrier) by cutting a square piece of vapor barrier 12 inches larger on all sides than the pipe. Cut a round hole in the center of the square splice patch, smaller than the pipe, to form a stretched fit. Force the pipe through the splice patch and tape all sides to the vapor barrier and seal the vapor barrier to the pipe at the penetration with an adhesive compatible with the vapor barrier material.

F. Provide solid blocking installed flat at all vapor barrier penetrations. On the interior face of the exterior stud wall, flat blocking installed at each penetration shall be a minimum of four inches larger than the penetration. Locate the penetration at the centerline of the flat blocking.

G. All raceways running from a warm area to a cold area, and all raceways passing through penetrations in vapor barriers, shall be securely sealed inside the warm end with ductseal, a silicone compound not harmful to the wire insulation, or equal.

H. Maintain a minimum 6-inch clearance between conduit and piping. Maintain 12-inch clearance between conduit and heat sources such as flues, steam pipes, heating pipes, and heating appliances.

I. Nylon pull wires shall be provided in all spare and unused conduits.

J. Where electrical raceways must penetrate roofing membranes, such penetrations shall be flashed and sealed as required for mechanical piping penetrations of roof.

K. Raceways shall be installed in switchboards, panelboards, gutters, pull boxes and the like from the back of the enclosure closest to the mounting surface, to the front in a manner that will not obstruct the future installation of raceways.

L. The ceiling grid and ceiling support wire shall not be used for raceway support. Support all wiring from the structural ceiling. Fixture wire support may be used for flexible wiring but shall not be used for supporting other raceway types.

M. Panelboard, switchgear and motor control center enclosures, and enclosures for other similar equipment shall not be used for through wiring. Only manufacturer installed wiring shall be allowed to run between such enclosures which have multiple sections.

N. Do not route raceways on floor unless specifically shown on drawings.

3.2 ASSEMBLY

A. Raceways shall be physically and electrically continuous from enclosure to enclosure. Electrical continuity for nonmetallic conduits shall be assured by inclusion of an NEC-sized grounding conductor. For metallic conduits, it shall be assured by making up all joints wrench-tight and free of foreign materials. Threaded conduits shall enter enclosures by means of threaded hubs or double-locknut-and bushing connections. For conduits of one inch trade size and larger, bushings shall be of the insulated type.

B. Conduit joints shall be cut square, reamed smooth, and cleaned of burrs, cutting oil, cuttings, and other foreign materials prior to assembly. Ends shall be capped to prevent entrance of foreign materials during construction.

C. Bends, offsets, and saddles shall be made with factory elbows and fittings, or field-made with approved benders, to not less than NEC-required radii.

D. Raceways shall be securely fastened in place at NEC-required intervals and at each elbow by means of malleable one-hole straps, clamp-backs where necessary, two-hole sheet metal straps, or other approved devices; all with fastening hardware per Section 26 05 90. Wire shall not be used for fastening raceways. The use of adjustable "trapeze" hangers made of U-channel strut suspended by threaded rods is encouraged for the support of groups of parallel conduits. Conduits shall be secured to each such trapeze by means of the strut manufacturer's standard conduit clamps or by J-bolts, with U-bolts at elbows and ends of runs.

E. Use a junction box at transitions between different types of raceway. Exception: Use one piece manufactured transition fittings between rigid and flexible conduit. Use manufactured transition fitting between conduit and multi-outlet assembly.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 05 34 - OUTLET BOXES

A. Provide outlet boxes for connection of branch circuits to fixtures and devices as shown on the plans and further specified herein.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Boxes shall be the products of Raco, Steel City, Appleton, Crouse-Hinds, or equal.

2.2 TYPES AND SIZES

A. Boxes shall be deep type (2-1/8 inches nominal) unless space limitations or drawing notes require shallower boxes. Boxes shall be as follows:

1. Fixture outlet boxes for use with concealed raceway systems shall be 4 inches octagonal or square, galvanized sheet steel.

2. Boxes for wall-mounted devices with concealed raceways shall be galvanized sheet steel, 4 inches square for up to two devices, and solid ganged boxes for more than two devices.

3. Ceiling-mounted boxes for use with exposed raceways shall be galvanized sheet steel.

4. Cast boxes with threaded hubs, external mounting brackets or holes, and gasketed covers shall be used in the following locations:

a. Exterior locations.

b. Wet or Damp locations.

c. Mechanical rooms and pump stations, etc., where subject to physical damage.

d. Adjacent to water or steam connections.

5. Exposed interior locations below 8 feet above finished floor, for use with exposed raceway systems, shall be of the threaded hub cast metal type, with matching cover suitable for the device being installed.

6. Communications & data outlet boxes shall be galvanized sheet Steel, 5”x5”x2-7/8” square with suitable plaster rings.

PART 3 EXECUTION

3.1 COORDINATION OF LOCATIONS

A. Provide electrical boxes as shown on the drawings, and as required for splices, taps, wire pulling, equipment connections and code compliance.

B. Electrical box locations shown on the drawings are approximate unless dimensioned. Verify location of floor boxes prior to rough-in.

C. Locate and install boxes to allow access. Where installation is inaccessible, coordinate locations and sizes of required access doors.

D. Locate and install to maintain headroom and to present a neat appearance.

3.2 INSTALLATION

A. Outlet boxes shall be installed plumb with, and securely fastened to the structural framing of, the surrounding construction.

B. Recessed boxes shall have the correct plaster rings and recess distances so that the device cover plates are tight to the wall or ceiling finish.

C. No through-wall boxes will be permitted. Where outlets are shown mounted back-to-back on a common wall, they shall be offset horizontally a minimum of 12 inches, to minimize sound transmission.

1. Telecommunications outlet boxes shall be offset horizontally by a minimum of 24 inches unless a butyl rubber-based firestop is installed.

D. Install boxes in walls without damaging wall insulation.

E. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

F. Where sheet metal boxes penetrate the building vapor barrier, their exterior surfaces shall be completely covered with overlapped application of vapor-barrier tape to effectively seal all unused knockouts and other holes against vapor migration. The edges of the hole in the vapor barrier shall be securely sealed to the lip of the box with vapor barrier tape and/or an adhesive compatible with the vapor barrier material.

G. Provide the best suitable box for each outlet requirement. Extension rings should not be used on new construction except where needed to bring an outlet box to 1/8-inch of the finished wall or ceiling, or where required by specific device requirements. No more than one extension ring should be used for each outlet box.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 05 35 - PULL AND JUNCTION BOXES

A. This Section covers general electrical requirements for work covered under this Division.

1.2 PULL BOXES

A. Where necessary in raceway systems to facilitate conductor installation, provide pull boxes as further specified herein. At the minimum, raceway runs shall have a pullbox every 100 feet or after every 360 degrees of bends.

1.3 JUNCTION BOXES

A. Where shown on the plans or where otherwise necessary to tap, terminate, or redirect raceway runs, provide junction boxes as specified herein.

PART 2 PRODUCTS

2.1 SIZES

A. Unless otherwise noted on the Drawings, pull and junction boxes shall be sized according to NEC requirements for the number, size, and entry configuration of the conduits and conductors entering them.

2.2 BRANCH CIRCUITS

A. Unless otherwise noted on the Drawings, pull and junction boxes for branch circuit raceways shall be outlet boxes as specified in Section 26 05 34, with matching blank covers.

2.3 FEEDER AND OTHER PULL AND JUNCTION BOXES

A. For larger than branch circuit raceways and conductors, and where noted on the drawings, pull and junction boxes shall be made of Code-gauge sheet steel with baked enamel or galvanized finish. Surface-mounted boxes shall have removable screw covers. Flush-mounted boxes shall have flush trim and hinged door with lockable latch, keyed same as panelboards.

PART 3 EXECUTION

3.1 INSTALLATION

A. Pull and junction boxes shall not be installed in visible locations in finished areas unless specifically called for on the Drawings or accepted by the Owner.

B. Pull and junction boxes shall be securely fastened to the building structure by means independent of the raceways entering them.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 05 53 - IDENTIFICATION

A. Provide nameplates, panelboard directories, junction box, wire and cable markers, and outlet box color coding as specified herein.

PART 2 PRODUCTS

2.1 MATERIALS

A. Nameplates: Engraved three-layer plastic, 0.125 inch thick, black with white center core unless noted otherwise, with matte finish and square corners. Minimum size shall be 3/4 by 2 inches; minimum lettering shall be 1/4 inch and lettering shall be aligned. Unless otherwise noted, all labels shall be nameplates as specified herein.

B. Wire and Cable Markers: Cloth markers, split sleeve, adhesive wrap-on type or shrink tubing type. Lettering shall be machine generated or manually typed.

C. Receptacle Plate Labels and Utilization Connection Point Labels: Clear adhesive Mylar or plastic type, minimum 3/16 inches size with black letters by a Kroy or other electronic label maker.

PART 3 EXECUTION

3.1 INSTALLATION

A. Panelboards, disconnect switches, contactors, motor starters, push-buttons, selector switches, distribution gear and switches, circuit breakers, security cabinets, telephone cabinets and backboards, data patch panels, alarm cabinets, therein, and the like shall be labeled with laminated plastic labels.

1. Degrease and clean surfaces to receive nameplates.

2. Install nameplates parallel to equipment lines.

3. Labels shall be secured with pop rivets or fasteners. Adhesive attachment is not acceptable, except for labels on receptacle plates or nameplates mounted on unheated indoor surfaces with foam tape.

4. Secure nameplate to inside face of recessed panelboard doors in finished areas.

B. Terminals on strips shall be numbered with indelible markings on special strips designed for the purpose, and a diagram or typed directory shall be provided in the terminal enclosure to identify the origin, function, and destination of each conductor in the enclosure.

C. Indelibly mark the outside cover of each junction box with the breaker number and panel identity of the source of power to each circuit within the box.

D. All power conductors (including neutral) in pull or junction boxes or other enclosures shall be permanently and legibly tagged or labeled with panel and circuit numbers or other data which clearly identifies their origin, function, and destination. Cloth markers or tubing type, handwritten marking is not acceptable.

1. Exception: Conductors in a pull or junction box which contains only an individual branch circuit or a single multi-wire branch circuit whose conductors are terminated on a multi-pole breaker or contiguous breakers need not be tagged or labeled.

E. Provide control and instrumentation cables with permanent type identification markers with permanent type identification markers with type cable number and from/to information at each point of termination.

1. Position cable markers to be readily visible for inspection.

2. Cable numbers shall match those when shown on the Drawings.

3. Provide wire tags at each termination point for each conductor.

F. All receptacle plates and utilization connection points shall be labeled with the panel and circuit number for the branch circuit that supplies the receptacle.

G. The Main Disconnect Switch shall be permanently marked to identify it as a source disconnecting means.

H. No temporary markings are permitted to remain on equipment. Remove all temporary markings where possible. Where markings cannot be removed, repaint trims, housing, etc. to cover markings. Refinish defaced finishes.

3.2 CIRCUIT DIRECTORIES

A. Branch panelboard doors shall have accurate typed circuit directory cards of the two-column type, with odd numbers down the left, and even numbers down the right, with numbers increasing from top to bottom. Multi-pole breakers shall be labeled with each of the single pole spaces occupied. Where room numbers are used, they shall be the final assigned room numbers. Note: Final assigned room numbers may differ from those shown on the drawings.

B. Provide new updated typed circuit directories for all panelboards affected by the Work of this project. Each entry shall accurately and uniquely identify the specific purpose of the connected load (i.e., Lighting, Receptacles, Mechanical Equipment, etc.) in accordance with NEC 408.4.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 05 90 - FASTENING HARDWARE

A. Furnish and install all fasteners and other hardware necessary for the proper, secure installation of all electrical features.

PART 2 PRODUCTS

2.1 FASTENERS

A. Raceway supports, boxes, and other electrical devices shall be fastened by wood screws or sheet metal screws on wooden surfaces, toggle bolts on hollow masonry units, expansion bolts on concrete or brick, and machine screws or welded threaded studs on steel work. Threaded studs driven by a powder charge and provided with a lock washer, flat washer, and nut(s) are acceptable in lieu of expansion bolts or machine or wood screws.

2.2 ASSOCIATED HARDWARE

A. All fasteners shall be provided with flat washers. All fasteners having untapered threads (such as machine screws) shall also be provided with a lock washer under the bolt head or nut, whichever is turned in the process of tightening. Fasteners through resilient materials shall have stop sleeves.

2.3 HARDWARE FINISHES

A. All threaded fasteners and associated hardware shall be steel, with a corrosion resistant finish. Threaded fasteners subjected to wet or damp conditions shall be galvanized.

2.4 TOOLING

A. Bolts shall have Hex or Allen heads. Screws shall have straight-slotted, Phillips, or Allen heads. Screws with square-socket heads ("locked-recess" or "Canadian"-style) are permitted only for fastening raceways or other features which the Owner would normally not be expected to have to change during the life of the facility; their use on enclosures or other assemblies which might eventually require Owner access is specifically prohibited.

PART 3 EXECUTION

3.1 GENERAL

A. All fasteners shall be tightened to within secure limits for the size of fastener and material(s) fastened. For critical applications, such as busbar connections, panelboard lugs, field installed bolt in breakers, transformer connections and breaker and ground bus connections having over a No 10 AWG conductor, a torque wrench shall be used to tighten the fasteners to the manufacturer's recommended value.

B. Fasten hangar rods, conduit clamps, and outlet and junction boxes to building structure using threaded bolts and screws.

C. Do not fasten supports to piping, ductwork, mechanical equipment, conduit, or ceiling suspension system. For cable whips for luminaries these may be supported above a suspended ceiling independent support wiring specifically marked as such may be added to provide the required support. No other equipment will be allowed to be supported by wires and shall be securely supported by the surrounding structure.

D. Fabricate supports from structural steel or steel channel, rigidly welded, or bolted to present neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

E. In wet and damp locations use steel channel supports to stand cabinets one inch off wall.

F. Earthquake Anchorages:

1. Equipment weighing more than 50 pounds shall be adequately anchored to the building structure to resist lateral earthquake forces.

2. Total lateral (earthquake) forces shall be 2.75 times the equipment weight acting laterally in any direction through the equipment center of gravity. Provide adequate backing at structural attachment points to accept the forces involved.

G. Where necessary to install fasteners into the underside of metal roof decking, they shall be placed in the low points of the corrugations where the roofing membrane is thickest, and they shall not be long enough to penetrate the membrane.

H. Fasteners used on doors or covers shall have no sharp edges or points which may cut personnel opening or removing door or cover. Fasteners used on doors and covers shall not damage conductors.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 24 18 - BRANCH CIRCUIT PANELBOARDS

A. Provide branch circuit panelboards as shown on the contract drawings and further specified herein.

1.2 SUBMITTALS

A. Submit manufacturer's product data and specifications for equipment and component devices.

B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker arrangement and sizes.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers for branch circuit panelboards shall be Square D, Cutler-Hammer, Siemens, or equal.

2.2 PANELBOARD FEATURES

A. Branch panelboards shall be of the bolt-on circuit breaker type, with the following features:

1. Flush or surface mounted, as shown on the Drawings. Flush-mounted panelboards may be furnished with prime coat finish only, for jobsite finish painting. Surface-mounted panelboards shall be furnished with the factory standard paint finish.

2. Panelboard fronts shall not contain any visible screws or other fasteners. Fasteners which are designed to be wedged in place by sliding sideways with a screwdriver are specifically prohibited. Fronts shall have a lip or bracket which rests on the bottom return flange of the panel enclosure, to permit the front to be held in place with one hand while fastening. Each front shall have a hinged door with a locking latch, furnished with two keys. All locks shall be keyed alike.

3. Panelboards shall have main lugs only, unless a main circuit breaker, through-feed lugs, or subfeed lugs are noted. Lugs shall be sized to accommodate the feeder conductors shown on the Drawings.

4. Current rating of the main buses shall be as noted on the Drawings. Where a main circuit breaker size does not correspond to a factory standard bus size, the next larger standard size main buses shall be used. All bus components shall be braced to withstand fault currents of the peak magnitude corresponding to the branch circuit breaker interrupting ratings shown on the Drawings. Panelboards shall be bussed full height (including bus fingers and related hardware), to allow all available branch circuit spaces to be used.

5. Cabinets shall be nominally 20 inches wide, 5-3/4 inches deep.

6. An adequate ground bus shall be provided for all branch circuit equipment grounding conductors shown on the drawings, plus 20 percent spare.

7. Unless otherwise noted, multi-section panelboards shall have equal quantity of circuit positions in each section, and equal size enclosures for each section.

2.3 BRANCH CIRCUIT BREAKERS

A. Panelboards shall be furnished with bolt-on branch circuit breakers conforming to Section 26 28 16, in the quantity, size, number of poles, and interrupting ratings shown on the panel schedule(s). Branch circuit breakers shall be installed in the exact circuit positions shown on the panel schedule(s), unless otherwise accepted by the Owner.

B. Where GFI breakers are called for, they shall have a ground fault current trip level of 5mA (or 30 mA for dedicated heating cables), a "test" button on the front, and trip circuitry essentially immune to nuisance tripping due to spurious influences such as RF noise.

PART 3 EXECUTION

3.1 INSTALLATION

A. Branch panelboards shall be securely fastened to the structural framing of the surrounding construction and shall be installed plumb with the surrounding construction. Flush-mounting panelboards shall be installed with their enclosures flush with the finished wall surface.

B. Height: 6 feet to top of panelboard.

C. Provide filler plates for unused spaces in panelboards.

D. In multi-section panelboards, conductors shall directly enter the section to which they make connection, without being routed through other sections. Where this is not possible, the Owner shall be contacted for acceptance of alternate arrangements.

E. From each flush-mounted panelboard, provide a spare 1 inch and three spare 3/4 inch raceways stubbed into the accessible ceiling space (attic, drop ceiling, etc., as appropriate to the job) and capped. Similarly, IF the structure has an accessible crawl space or ceiling of the floor below, also provide spare 1 inch and three spare 3/4 inch raceways from each panel stubbed down into it and capped.

F. Conductors shall not be spliced in panelboards.

G. All conductors shall be routed so as to pass to the outside of the deadfront support brackets and bussing equipment, and shall be provided with a minimum of 3 inches of slack after termination in their designated location.

3.2 CIRCUIT DIRECTORIES

A. Branch panelboard doors shall have accurate typed circuit directory cards of the two-column type, with odd numbers down the left, and even numbers down the right, with numbers increasing from top to bottom. Multi-pole breakers shall be labeled with each of the single pole spaces occupied. Where room numbers are used, they shall be the final assigned room numbers. Note: Final assigned room numbers may differ from those shown on the drawings.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 27 13 - SERVICE ENTRANCE

A. Provide secondary metering and service disconnecting means in service equipment as shown on the Drawings and further specified herein.

B. Coordinate with serving utility to determine point of demarcation of utility provided and contractor provided equipment. Owner shall be responsible for costs paid to the serving utility to provide electrical service for the facility.

1.2 SERVICE CHARACTERISTICS

A. The building service shall be 208Y/120 volts, 4 wire, 3 phase, 60 Hertz alternating current; derived from a utility furnished pole mounted transformer bank. Contractor shall provide service and distribution systems as required by the Contract Drawings and further specified herein.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. Installation subject to approval, inspection, and conformance with construction standards of the serving utility, the Project Manager and applicable authorities having jurisdiction.

B. Conform with all requirements of NEC and utility practices of safe construction.

1.4 SUBMITTALS

A. Submit manufacturer's product data and specifications for:

1. Meter socket.

2. Service disconnect.

PART 2 PRODUCTS

2.1 METER SOCKET

A. Meter socket shall be 3-phase, 4-wire, 320-amp, ringless, 7-jaw, NEMA 3R construction.

2.2 SERVICE DISCONNECT

A. Main circuit breaker service disconnect shall be provided as sized on the Drawings.

2.3 GROUNDING

A. Ground Rods: Provide copper-clad steel sectional type grounds at least 3/4-inch in diameter and 10 feet long unless otherwise indicated. Die-stamp each rod near the top with the name or trademark of the manufacturer and the length of the rod in feet. The rods shall have a hard, clean, smooth, continuous surface throughout the length of rod.

PART 3 EXECUTION

3.1 INSTALLATION OF SECONDARY SERVICE

A. Make arrangements with Utility Company to obtain permanent electric service to the Project.

B. Provide, install service equipment as required by the Utility Company.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 27 26 - WIRING DEVICES AND PLATES

A. Provide wiring devices and cover plates as shown on the drawings and further specified herein.

1.2 SUBMITTALS

A. Submit manufacturer's product data and specifications.

B. Submit product data showing configurations, finishes, dimensions, and manufacturer's instructions.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Among the acceptable wiring devices and plates are the products of Arrow-Hart, Bryant, Hubbell, Leviton, Pass & Seymour, or equal.

2.2 LIGHT SWITCHES

A. Light switches shall be:

1. Premium specification grade, AC quiet type, with screw terminals.

2. Rated 20 amperes at 120 volts for 120 volt circuits.

3. Two-pole, three-way, four-way, key-operated and other types of switches shall be provided where indicated on the drawings. Where not otherwise designated, switches shall be single-pole, single-throw.

4. Switch handles shall be white, except where pilot-light switches are called for, in which case they shall have a LED lamp mounted in a translucent red handle.

5. Pilot light switches shall be LED lamp type mounted in the handle (lighted handle), “on” when switch is “on”, rated for the voltage of the wiring system. Lighted switches shall be the same except “on” when the switch is “off”.

6. Dimming light switches shall provide 0-10V dimming control.

2.3 RECEPTACLES

A. Single and duplex receptacles shall be Commercial Specification grade, nylon faced, white, self-grounding, t120-volt, 20-amp, 3-wire, NEMA 5-20R configuration, with screw terminals.

1. Interior receptacles shall additionally be tamper-resistant listed.

2. Exterior receptacles shall additionally be weather-resistant listed.

B. Special purpose receptacles shall be Specification grade, with the NEMA configuration noted on the drawings. A matching plug shall be furnished for every special receptacle.

C. Weatherproof, while-in-use covers shall have a full width hinged cover suitable for receptacles installed in wet locations to maintain the integrity of the receptacle when the attachment plug is inserted.

D. GFI receptacles shall be of NEMA 5-20R configuration, for single-strap mounting, with "test" and "reset" buttons accessible from front. Ground fault trip level shall be 5mA, and the trip circuitry shall be essentially immune to nuisance tripping due to spurious influences such as RF noise. Feedthrough terminals shall be provided for protection of downstream outlets.

2.4 PLATES

A. Cover plates for devices in recessed boxes shall be made of satin-finished 430 stainless steel. Cover plates for devices in surface-mounted boxes shall be of pressed or machined metal construction, specifically designed to suit the boxes.

2.5 CORD CAPS AND PLUGS

A. Cord caps and plugs shall be of the NEMA configurations indicated on the drawings; constructed of high-impact nylon, hard rubber, or Bakelite with metal armor shell. Cord caps and plugs shall have cord strain relief feature and shall incorporate NEC "deadfront" construction.

2.6 SEALING PAD

A. On exterior wall, on walls of mechanical rooms having recessed boxes, on toilet room walls and on all sound isolation walls provide a closed cell foam sealing pad under the outlet or switch plate.

B. Sealing pads/putty shall be as manufactured by Sound Isolation Co., STI, or equal.

2.7 TERMINALS

A. Wiring devices shall have binding-screw type terminals only. Terminals using spring pressure to secure the wire and make electrical contact are not permitted.

PART 3 EXECUTION

3.1 WIRING

A. Devices shall be connected with no more than one conductor under each screw terminal.

B. Connect wiring device grounding terminal to outlet box with bonding jumper and to branch circuit equipment grounding conductor. Grounding through the yoke or screw contact is not an acceptable alternate to the ground wire.

C. Connect wiring devices by wrapping conductor around screw terminal for termination of solid conductors #10 AWG and smaller. Use compression or clamp type terminals for stranded wire.

3.2 INSTALLATION

A. Provide cover plates of the appropriate configuration for all devices provided for the project, suitable for the box and installation.

B. Devices and plates shall be installed using the fasteners supplied or recommended by the manufacturer for the components to be installed. The use of sheet metal screws instead of machine screws where threaded holes are provided is not acceptable.

C. Install devices and wall plates flush and level.

D. Operate each wall switch with circuit energized and verify proper operation.

E. Verify that each receptacle device is energized.

F. Test each receptacle device for proper polarity and voltage drop.

G. Test each GFI receptacle for proper operation, including ground fault test.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 27 30 - HEATING CABLE

A. Provide heat tape installation complete with all accessories and branch wiring as shown on the Drawings and as further specified herein.

1.2 SUBMITTALS

A. Submit manufacturer's product data and Specifications for equipment and component devices.

B. Provide manufacturer's installation instructions.

PART 2 PRODUCTS

2.1 HEAT TAPES

A. Heat tapes for exterior tracing of piping shall be field-cut-to-length, parallel-circuit type, self-limiting, for 120 volt 2-wire operation; 5 Watts per foot nominal, with metallic outer grounding braid and overall jacket of fluoropolymer; Raychem 5BTV1-CT, or equal.

2.2 BRANCH CIRCUIT WIRING

A. Provide branch circuit wiring as shown on the Contract Drawings, using the materials and methods described elsewhere in these Specifications.

2.3 CIRCUIT BREAKER

A. Heat tape circuits shall be protected by a ground fault circuit breaker with a 30 milliamp trip.

2.4 HEAT TAPE FITTINGS

A. Transitions from raceway system to heat tape shall be by means of the heat tape manufacturer's recommended fittings. Similarly, the other end of the heat tape shall be terminated in the heat tape manufacturer's recommended end fitting, and tee-splices shall be made with the manufacturer's recommended kit.

2.5 HEAT TAPE SWITCHES

A. Heat tape manual control and disconnect switches shall be flush mounted in finished areas or surface mounted in utility areas, Square D, Class 2510, Type K, manual switch without overload protection, complete with red pilot light and positive lockout handle guard kit, or equal. Provide device and enclosure suitable for the location of switch.

2.6 WARNING LABELS

A. Provide heat trace warning labels on 10 foot centers on outside of pipe insulation. Labels shall be Chromalox CL-1 or equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. All rain leader piping and drains shall be provided with heat tape freeze protection as indicated on the Drawings and as required by these Specifications.

B. All roof and deck drain bodies shall be spirally wrapped around the drain body to provide a minimum 60 watts of freeze protection.

C. All power connections to heat tapes shall be made in accessible locations. Connections shall be arranged in such a manner that all heat tape is concealed by the pipe or sleeved in raceways.

D. All fittings shall be made up with the proper sealants, where called for by the heat tape manufacturer.

E. All heat tapes shall be applied in strict accordance with the manufacturer's instructions.

3.2 TESTING

A. All heat tape installations shall be tested for circuit continuity and insulation resistance in accordance with the manufacturer’s instructions.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 28 15 - DISCONNECTS

A. Provide disconnect switches for motors and other circuits as shown on the drawings and further specified herein.

1.2 SUBMITTALS

A. Submit manufacturer's product data and specifications.

B. Submit product data showing configurations, switching, overcurrent protective devices, and manufacturer's instructions.

C. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit current interrupting rating.

PART 2 PRODUCTS

2.1 DISCONNECT SWITCHES

A. Unless otherwise noted, disconnect switches shall have the following features:

1. The proper NEMA enclosure to suit the location, or as noted on the Drawings.

2. The proper voltage rating to suit the circuit voltage.

3. Quick-make/quick-break mechanisms with visible blades (when the cover is open), to disconnect all ungrounded conductors.

4. Switch handle positions shall be marked to indicate the ON and OFF conditions, and the handles shall be padlockable in the OFF position. Covers shall be interlocked with the handles to prevent cover opening while switch is ON, and a means shall be provided to permit qualified personnel to defeat this feature.

5. Disconnects shall be fusible, heavy-duty switches, unless otherwise noted. Where disconnects are not readily accessible, they shall be of the non-fusible type, and fusible protection for the circuit shall be provided in an accessible location. Disconnects provided as a "local" disconnect, where short circuit protection is provided by upstream devices, shall be of the non-fusible type.

6. Motor disconnects shall be sized according to their standard, not maximum, ratings.

7. Where separate control voltages are supplied to motor controllers, the disconnect switch shall simultaneously disconnect the control circuit(s) with the power circuit(s).

2.2 MANUFACTURERS

A. Among the acceptable disconnects are the products of Square D, Cutler-Hammer, Siemens or equal.

2.3 SINGLE-PHASE MOTORS NOTED ON THE DRAWINGS

A. For single-phase motors controlled by a manually operated switch, said switch may suffice as the disconnecting means if all applicable code requirements are met.

B. Where "light switches" are called for on the drawings to be used as disconnects for single-phase fractional horsepower motors, they shall be toggle-type unless noted key-type, 20A. /1P with horsepower rating at least 50 percent larger than motor served.

PART 3 EXECUTION

3.1 INSTALLATION

A. All disconnects are to be installed within sight of the equipment being served and where they are readily accessible with required working clearances. Locations indicated on the drawings are for general location and may not show interferences with mechanical piping or other materials. Make all location adjustments as necessary to assure working clearances are achieved at no additional cost to the Owner.

B. Install fuses in fusible disconnect switches.

C. Provide a label on inside door of each switch indicating UL fuse class and size for replacement.

D. Where a disconnect switch is indicated on the drawings as being required for a specific piece of equipment and the equipment is supplied with an integral disconnect switch, the Contractor shall omit the disconnect switch and offer the Owner full credit for the disconnect switch.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 28 16 - OVERCURRENT PROTECTIVE DEVICES

A. Provide fuses and circuit breakers of the correct sizes and types as called for on the Contract Drawings and further specified herein.

1.2 SPARE FUSES

A. Provide three spare fuses of each size and type used for new transformers, motor starters, etc. in the project.

1.3 SUBMITTALS

A. Submit manufacturer's product data and specifications.

B. Submit product data showing sizes, configurations, and manufacturer's instructions.

PART 2 PRODUCTS

2.1 FUSES

A. Acceptable Manufacturers are limited to the following: Bussman, Reliance, Shawmut, or equal. Fuses shall be of the correct voltage rating for the circuit where used, and the following types unless otherwise noted:

1. In motor disconnect switches: UL Class RK-1, dual-element time-delay type, current limiting, sized to suit the motor nameplate full load current in accordance with the manufacturer's recommendations for overload and single-phasing protection.

2.2 CIRCUIT BREAKERS

A. Unless otherwise noted, circuit breakers shall be of the molded-case thermal-magnetic type, with the following features:

1. Size, number of poles, and interrupting capacity as shown on the drawings. Ampere ratings shall be clearly visible, even when the breaker is installed in its appropriate enclosure.

2. Voltage rating to suit the voltage of the system on which they are used.

3. Each circuit breaker pole shall provide both instantaneous and inverse-time tripping, with tripping clearly indicated, and a common-tripping tie to any other poles in the same breaker. Handle-ties are not acceptable for this purpose.

4. Breakers shall be operated by a toggle handle and shall have a quick-make, quick-break, over center switching mechanism that includes a trip-free feature so that the contacts cannot be held closed against tripping currents.

5. Circuit breakers shall be labeled or listed by an independent testing laboratory and shall conform to the latest NEMA Standards and the short-circuit test parameters of NEMA Publication AB 1.

6. Circuit breakers shall not use solid-state components for any function except ground-fault tripping.

2.3 GFI BREAKERS

A. GFI breakers shall be essentially immune to nuisance tripping due to spurious influences such as RF noise and shall be equipped with a test button on the front.

B. GFI circuit breakers shall be thermal-magnetic circuit breakers as previously specified herein but shall also have a ground-fault current trip mechanism operating at a current level of 5mA.

C. GFI circuit breakers for use in dedicated heating cable circuits shall have a ground-fault current trip mechanism for equipment protection operating at a current level of 30 mA.

PART 3 EXECUTION

3.1 GENERAL

A. Provide overcurrent protective devices as shown on the drawings and as specified herein.

B. Single pole breakers with handle ties are not acceptable for multi-pole breakers.

3.2 INSTALLATION

A. Inside the cover of each fusible switch enclosure, the correct size and type of fuse for that switch shall be plainly and legibly typed on a card placed in a plastic pocket. A laminated schedule of fuses needed for each disconnect provided shall be mounted in the main mechanical room.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 29 01 - MOTOR STARTERS

A. Provide motor starters in Motor Control Centers, Motor Starter Panels, or where specifically indicated on the drawings. Where motor starters are furnished by others as part of mechanical equipment units or packages, refer to Specification Section 26 05 01 for additional connection requirements.

1.2 DEFINITION

A. Motor starters are also referred to in these Documents by the NEC-defined term "Controller."

1.3 SUBMITTALS

A. Submit manufacturer's product data and specifications.

B. Submit product data showing configurations, pilot devices, relays, switching, overcurrent protective devices, and manufacturer's instructions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Among the acceptable motor starters are the products of Square D, Cutler-Hammer, Siemens, or equal.

2.2 MANUAL MOTOR START SWITCHES

A. Fractional Horsepower motor start switches with thermal overloads (TT switches) shall be Square D Class 2510, Type F, rated 16-amps or equal, with red LED type pilot light, resettable overload protection, and toggle handle with guard/lockoff hasp.

2.3 MAGNETIC STARTERS

A. Unless otherwise noted, magnetic starters shall be:

1. Full-voltage non-reversing starting, with resettable integral solid state, ambient insensitive motor overload protection with Trip Class 20 protection.

2. Of the correct voltage rating for the system on which they are installed, with NEMA size and number of poles as shown on the drawings.

3. Housed in the NEMA enclosure appropriate for the location in which they are installed.

4. With hand-off-automatic switch for motors with automatic control, on-off switch for motors with manual control, red and green LED type pilot lights, and overload reset button in front cover.

5. With 120-volt coil and fused control circuit, control power to be derived from a separate control transformer in each starter enclosure, except for 120-volt motor starters or 208-volt motor starters where a separate neutral is provided to give a 120-volt control circuit.

6. With provisions for field-installation of at least two auxiliary control contacts, both normally open and normally-closed types.

2.4 COMBINATION MAGNETIC STARTER/DISCONNECTS

A. Combination magnetic starter/disconnects, also referred to in these Documents as "Combination Starters", shall each consist of a fusible disconnect switch per Section 26 28 15 and a magnetic starter as specified above, in a common enclosure with front-mounted operator handle for the disconnect.

2.5 OTHER TYPES

A. Where starter types other than full-voltage non-reversing (FVNR) are called for on the Drawings, they shall be provided complete with all features specified for FVNR starters.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide overload elements and devices correlated with full load current, NEMA code letter and service factor reflected on actual nameplate of each furnished motor.

B. After final connections are made, check, and correct the rotation of all motors.

C. Provide engraved nameplates for all units clearly identifying the equipment served.

D. Do not mount starters on vibrating equipment. Fasten securely to supporting structure at walls and mounting stands.

E. Motor Data: Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperage, code letter, service factor, voltage/phase rating, and the final settings of overload devices.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 36 23 - AUTOMATIC TRANSFER SWITCHES

A. Furnish and install where shown on Drawings enclosed automatic transfer switch(es) of the indicated ratings. Automatic Transfer Switch shall be Eaton ATC-900, no substitutions.

1.2 CODES AND STANDARDS

A. Transfer switches shall be UL 1008 listed.

1.3 SUBMITTALS

A. Submit complete manufacturer's data.

B. Submit shop drawings and product data.

C. Submit manufacturer's installation instructions.

D. Submit descriptive literature, Operating instructions, maintenance, and repair data.

PART 2 PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. Transfer switches shall be 3-pole, with simultaneous neutral switching operation, size as noted on the drawings, for use on a 208Y/120 volt, 3 phase, 4 wire system; mechanically held; electrically operated type with manual operator. Switches shall be mechanically linked to provide interlock between two circuits obtaining control and transfer power from the source to which it is being transferred. Provide full three phase relay protection monitoring normal power source. Generator shall be started and load transferred from normal to standby when normal operating power voltage drops to 90 percent on any phase longer than five seconds.

B. Main contacts shall be rated for 600 Volts AC minimum.

C. Transfer switches shall be rated to carry 100 percent of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60 degrees C, relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet (3000M).

D. Transfer switch equipment shall have withstand and closing ratings (WCR) in RMS symmetrical amperes greater than the available fault currents shown on the drawings and at the specified voltage. The transfer switch and its upstream protection shall be coordinated. The transfer switch shall be third party listed and labeled for use with the specific protective device(s) installed in the application.

E. Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in the source 1 and source 2 positions. The transfer switch shall be specifically designed to transfer to the best available source if it inadvertently stops in a neutral position.

F. Transfer switches shall be equipped with permanently attached manual operating handles and quick-break, quick-make over-center contact mechanisms.

G. Main switch contacts shall be high-pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.

H. Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism.

I. Power transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with components that could be operating at line voltage levels.

J. Provide the following additional features:

1. Time delay to delay retransfer from emergency to normal power, adjustable from 5 to 180 seconds. Initially set at 30 seconds.

2. Minimum run time for generator unit, once started for any reason, shall not be less than 15 minutes.

3. Time delay relay to prevent generator startup on momentary failure of normal-power, adjustable from one second to 5 minutes. Initially set at 5 seconds.

4. Contacts for remote engine starting.

5. Time delay relay(s) to delay generator shutdown after retransfer to normal, to permit engine cooling off period, adjustable from 20 seconds to 10 minutes. Initially set at 5 minutes.

6. Two indicating lights to indicate emergency transfer switch position, red for emergency power, green for normal power.

7. Auxiliary contacts to control motorized dampers, fans or other mechanical equipment.

8. One additional normally open contact on both normal and emergency relays.

9. One set of normally open auxiliary contacts for remote indication of normal power failure.

10. Enclosure: Mounted in separate NEMA 1 enclosure.

2.2 TRANSFER SWITCH CONTROL

A. Operator Panel. Each transfer switch shall be provided with a control panel to allow the operator to view the status and control operation of the transfer switch. The operator panel shall be a sealed membrane panel rated NEMA 3R/IP53 or better (regardless of enclosure rating) that is permanently labeled for switch and control functions. The operator panel shall be provided with the following features and capabilities.

1. High intensity LED lamps to indicate the source that the load is connected to (source 1 or source 2); and which source(s) are available. Source available LED indicators shall operate from the control microprocessor to indicate the true condition of the sources as sensed by the control.

2. High intensity LED lamps to indicate that the transfer switch is “not in auto” (due to control being disabled or due to bypass switch (when used) enabled or in operation) and “Test/Exercise Active” to indicate that the control system is testing or exercising the generator set.

3. “OVERRIDE” pushbutton to cause the transfer switch to bypass any active time delays for start, transfer, and retransfer and immediately proceed with its next logical operation.

4. “TEST” pushbutton to initiate a preprogrammed test sequence for the generator set and transfer switch. The transfer switch shall be programmable for test with load or test without load.

5. “RESET/LAMP TEST” pushbutton that will clear any faults present in the control, or simultaneously test all lamps on the panel by lighting them.

6. The control system shall continuously log information on the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. This information shall be available via a PC-based service tool and an operator display panel.

7. Vacuum fluorescent alphanumeric display panel with push-button navigation switches. The display shall be clearly visible in both bright (sunlight) and no light conditions. It shall be visible over an angle of at least 120 degrees. The Alphanumeric display panel shall be capable of providing the following functions and capabilities:

a. Display source condition information, including AC voltage for each phase of normal and emergency source, frequency of each source. Voltage for all three phases shall be displayed on a single screen for easy viewing of voltage balance. Line to neutral voltages shall be displayed for 4-wire systems.

b. Display source status, to indicate source is connected or not connected.

c. Display load data, including 3-phase AC voltage, 3-phase AC current, frequency, KW, KVA, and power factor. Voltage and current data for all phases shall be displayed on a single screen.

d. The display panel shall allow the operator to view and make the following adjustments in the control system, after entering an access code:

1) Set nominal voltage and frequency for the transfer switch.

2) Adjust voltage and frequency sensor operation set points.

3) Set up time clock functions.

4) Set up load sequence functions.

5) Enable or disable control functions in the transfer switch, including program transition.

6) Set up exercise and load test operation conditions, as well as normal system time delays for transfer time, time delay start, stop, transfer, and retransfer.

e. Display Real time Clock data, including date, and time in hours, minutes, and seconds. The real time clock shall incorporate provisions for automatic daylight savings time and leap year adjustments. The control shall also log total operating hours for the control system.

f. Display service history for the transfer switch. Display source connected hours, to indicate the total number of hours connected to each source. Display number of times transferred, and total number of times each source has failed.

g. Display information for other transfer switches in the system, including transfer switch name, real time load in KW on the transfer switch, current source condition, and current operating mode.

h. Display fault history on the transfer switch, including condition, and date and time of fault. Faults to include controller checksum error, low controller DC voltage, ATS fail to close on transfer, ATS fail to close on retransfer, battery charger malfunction, network battery voltage low, network communications error.

B. Internal Controls

1. The transfer switch control system shall be configurable in the field for any operating voltage level up to 600VAC. Provide RMS voltage sensing and metering that is accurate to within plus or minus 1% of nominal voltage level. Frequency sensing shall be accurate to within plus or minus 0.2%. Voltage sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions that are not field configurable are not acceptable.

2. Transfer switch voltage sensors shall be close differential type, providing source availability information to the control system based on the following functions:

   a. Monitoring all phases of the normal service (source 1) for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of normal voltage level).

   b. Monitoring all phases of the emergency service (source 2) for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of pickup voltage level).

   c. Monitoring all phases of the normal service (source 1) and emergency service (source 2) for voltage imbalance.

   d. Monitoring all phases of the normal service (source 1) and emergency service (source 2) for loss of a single phase.

   e. Monitoring all phases of the normal service (source 1) and emergency service (source 2) for phase rotation.

   f. Monitoring all phases of the normal service (source 1) and emergency service (source 2) for over voltage conditions (adjustable for dropout over a range of 105 to 135% of normal voltage, and pickup at 95-99% of dropout voltage level).

   g. Monitoring all phases of the normal service (source 1) and emergency service (source 2) for over or under frequency conditions.

   h. Monitoring the neutral current flow in the load side of the transfer switch. The control shall initiate an alarm when the neutral current exceeds a preset adjustable value in the range of 100-150% of rated phase current for more than an adjustable time period of 10 to 60 seconds.

3. All transfer switch sensing shall be configurable to allow setting of levels, and enabling or disabling of features and functions. Selected functions including voltage sensing levels and time delays shall be configurable using the operator panel. Designs utilizing DIP switches or other electromechanical devices are not acceptable. The transfer control shall incorporate a series of diagnostic LED lamps.

4. The transfer switch shall be configurable to control the operation time from source to source (program transition operation). The control system shall be capable of enabling or disabling this feature, and adjusting the time period to a specific value. A phase band monitor or similar device is not an acceptable alternate for this feature.

5. The transfer switch shall incorporate adjustable time delays for generator set start (adjustable in a range from 0-15 seconds); transfer (adjustable in a range from 0-120 seconds); retransfer (adjustable in a range from 0-30 minutes); and generator stop (cooldown) (adjustable in a range of 0-30 minutes).

6. The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device for load shedding purposes. On receipt of this signal, the transfer switch shall switch to a neutral position when connected to source 2. If source 1 is available when the load-shed signal is received, the transfer switch shall connect to source 1.

7. The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device to prevent transfer to the generator service.

8. The transfer switch shall provide a relay contact signal prior to transfer or retransfer. The time period before and after transfer shall be adjustable in a range of 0 to 50 seconds.

9. The control system shall be designed and prototype tested for operation in ambient temperatures from -40C to +70C. It shall be designed and tested to comply with the requirements of the noted voltage and RFI/EMI standards.

10. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs, and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.

11. The transfer switch network monitoring equipment shall be provided with a battery based auxiliary power supply to allow monitoring of the transfer switch when both AC power sources are non-operational. The battery power supply shall be monitored for proper condition, and the transfer switch shall include an alarm condition to indicate low battery condition.

C. Control Interface

1. The transfer switch will provide an isolated relay contact for starting of a generator set. The relay shall be normally held open, and close to start the generator set. Output contacts shall be form C, for compatibility with any generator set.

2. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.

3. The transfer switch shall provide relay contacts to indicate the following conditions: source 1 available, load connected to source 1, source 2 available, source 2 connected to load.

4. The transfer switch shall be provided with a network communication card, and configured to allow communication with the transfer switch and other network system components. The network shall provide a redundant start signal to the generator set(s) in the system.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide unit and all connections complete, and make operational.

B. Following final adjustment and setting of all adjustable control and timing components mark each adjusting screw, knob, lever, etc. and the component face with an indelible ink or paint indicating initial set point.

3.2 TESTING

A. Test and adjust unit(s) on site in conjunction with engine-generator(s).

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 50 00 - LIGHTING

A. Provide a complete and functional lighting system as shown on the Drawings and further specified herein.

1.2 SUBMITTALS

A. PRODUCT DATA

1. Submit manufacturer’s product data for each type of luminaire as defined within this specification and as noted in the Lighting Fixture Schedule on the drawings.

PART 2 PRODUCTS

2.1 LIGHT FIXTURES

A. Provide luminaires as indicated on the drawings. Provide luminaires complete with illumination levels, color temperature and input wattage as indicated on the contract documents. Details, shapes and dimensions are indicative of the general type desired, but are not intended to restrict selection to luminaires of a particular manufacturer. Luminaires of similar designs, light distribution and brightness characteristics, and of equal finish and quality may be submitted.

1. Where alternate light types are submitted other than shown on the contract documents, the contractor or their designee shall provide representative room lighting calculations for each alternate type used which can be compared by the engineer to determine equivalency of light produced by alternate type.

2.2 LAMPS

A. LED solid state elements shall be inclusive of the fixture and not require periodic replacement. When replacements are required, the fixture shall allow the replacement of the solid-state lighting elements (LED's), the associated frequency generators, power couplers and other related components required to refresh the fixture.

2.3 LENSES AND DIFFUSERS

A. Where plastic lenses or diffusers are specified, they shall be made only of discoloration-resistant virgin acrylic or polycarbonate as listed in fixture schedules, with a minimum overall thickness of .125 inch, or specifically noted otherwise in the Contract Documents. Polystyrene lenses and diffusers are not permitted.

2.4 LED ELEMENTS AND DRIVERS

A. LED solid state elements shall be inclusive of the fixture and not require periodic replacement.

B. LED Drivers shall be solid state units with minimum 85% efficiency and capable of dimming via 0-10V inputs or as otherwise indicated on the contract documents. Driver shall have integral short circuit, open circuit and overload protection and shall comply with FCC 47 CFR Part 15.

C. Where specified within the lighting fixture schedule, the luminaire shall be provided with an integral battery back-up system which will illuminate the light elements for the required 90-minute period. Backup system shall have self-diagnostic functions and have provisions for connection of remote test switches if indicated on contract documents.

PART 3 EXECUTION

3.1 ACCESSORIES

A. Lighting fixtures shall be provided complete with all suspension, trim, mounting, and operating accessories normally considered necessary for a complete, functional, and safe installation, whether specifically called for in the Contract Documents or not.

B. For pendant-hung fixtures, run the power cord from the ceiling to the fixture neatly alongside the cable from which the fixture is hung.

3.2 COORDINATION WITH CEILING CONSTRUCTION

A. Prior to ordering, the Contractor shall verify complete compatibility of all lighting fixture construction, trim, and mounting accessories with the reflected ceiling plans and finish schedules of the Architectural Drawings.

3.3 LIGHTING FIXTURE SUPPORTS

A. Lighting fixtures installed in lay-in type suspended ceilings shall be supported from the building structure above (not by the ceiling system grid) per the following:

1. Lighting fixtures no larger than 2 feet by 4 feet shall each have two supports at diagonally opposite corners of each fixture. Longer fixtures shall have at least one support for each 4 feet of length as well as the ends, and 4 feet by 4 feet fixtures shall have four supports, one at each corner.

2. Supports may consist of No. 12 galvanized iron wire, securely twisted and fastened, except where chains with S-hooks and turnbuckle adjusters are elsewhere called for in the Contract Documents. Support wires shall be installed vertically and as close to plumb as possible.

3. Where lay-in fixtures are installed in continuous rows, they shall not be solidly interconnected by any non-flexible raceways, hardware, or shared supports, unless specifically called for on the Drawings. All fixtures in lay-in ceilings shall be flex-connected.

B. Fixtures (other than those designed for simple box mounting) that are mounted directly on the building structure shall be supported with fasteners per Section 26 05 90 appropriate for the type of construction, in the following configurations:

1. Lighting fixtures up to 2 feet by 4 feet shall have four fasteners, one near each corner.

2. Longer fixtures shall have two fasteners at each end as well as at every 4 feet of length.

3. Lighting fixtures 4 feet by 4 feet shall have one fastener near each corner, plus two additional fasteners at convenient positions near the midpoints of two opposite sides.

4. Any other type of fixtures shall be supported by at least two fasteners or by support as provided by the manufacturer.

C. Fasteners into wooden members shall be appropriately sized sheet metal or lag screws, penetrating at least 1-1/4 inches into members at least 2 inches thick.

D. Pendant or chain-hung fixtures no more than 8 feet long shall have two such supports, each approximately 1/4 of the fixture length in from each end.

E. Fixtures weighing more than 50 pounds shall have special supports, subject to acceptance by the Owner.

3.4 ADJUSTING AND CLEANING

A. Align luminaires and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt and debris from installed luminaires.

3.5 LAY-IN FIXTURE WIRING

A. Lay-in light fixtures shall be connected by one of the following methods: manufacture provided cords, flexible metal conduit, or MC cables to junction boxes. Routing of flexible cables/conduits from one fixture to the next fixture via a through-wiring method “Daisy-Chaining” shall not be permitted.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 51 02 - AUTOMATIC LIGHTING CONTROL DEVICES

A. Provide occupancy sensors and occupancy sensor systems, complete with all components required for complete and properly functional systems.

1.2 SUBMITTALS

A. Submit manufacturer's product data and specifications.

B. Submit product data showing configurations, relays, switching, wiring diagrams and manufacturer's instructions.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers include, but are not limited to, the following: Hubbell, Wattstopper, Leviton, Mytech or equal.

2.2 OCCUPANCY SENSORS

A. All occupancy sensors shall be equipped with low voltage leads and an internal Form C relay. Provide with auxiliary relays for multiple circuit switching where shown on the drawings.

1. Type OSA occupancy sensors shall be dual technology ultrasonic and passive infrared devices with all digital technology to continuously analyze the environment and self-adapt to meet specific changes, ceiling mounted, immediate activation, automatic or adjustable 5 minute to 30-minute electronic timer upon evacuation, 500 square foot coverage in a square room, use with auxiliary power switch packs, 120 volt, 20 amp contacts, off white.

2. Type OSW occupancy sensors shall be dual technology ultrasonic and passive infrared devices with all digital technology to continuously analyze the environment and self-adapt to meet specific changes, wall mounted, immediate activation, automatic or adjustable 5 minute to 30-minute adjustable electronic timer upon evacuation, 1,000 square feet, 180 degree coverage, use with auxiliary power switch packs, 120 or 277 volt, 20 amp contacts, white, optional Manual ON override switch.

PART 3 EXECUTION

3.1 GENERAL

A. Ultrasonic occupancy sensor switches shall have bi-directional transmitters which will emit an ultrasonic wave pattern, and receivers, which will trigger an adjustable timing circuit, and in turn will switch on the lights.

B. Ultrasonic sensors shall be crystal-controlled, and sensors shall not interfere with each other when two or more sensors are placed in the same room.

C. Units shall have a bypass pin, which will leave lights on in the event of electronic failure of the switch. The bypass provision pin or device shall remain in the sensor and shall be visible from the floor.

D. The unit shall be equipped with an adjustable sensitivity control.

3.2 INSTALLATION

A. Sensors shall be capable of detecting presence in 95 percent of the floor area to be controlled.

B. Detection shall be maintained when a person of average size and weight moves only once every six minutes, within a maximum distance of six inches in a horizontal or vertical manner at the approximate speed of 12 inches per second.

C. Detector sensitivity shall be self -adjusting to avoid false triggering by random noises, lights, or motions other than human movement such as air currents from open windows, air conditioners, heaters, lightning, traffic noise, program clocks, bells, telephones, sunlight, car lights and RF interference.

D. Timers on occupancy sensors shall be set at 15 minutes for office spaces, 30 minutes for general use areas.

E. Provide all occupancy sensor system wiring in raceway in concealed locations. Low voltage conductors are not required to be installed in raceways in accessible locations, i.e. above suspended ceilings. Where low voltage conductors are not installed in raceways, provide strain relief of cable within 12 inches of termination.

F. Provide occupancy sensor equipment neatly mounted and properly terminated.

G. Provide all connections, grounding, bonding, and other accessories in accordance with the manufacturer's instructions.

H. Where occupancy sensors control lighting and light switches are also shown on the drawings, install the occupancy sensors ahead of lighting switches. The intent is to allow occupants the ability to manually turn off the room lighting.

I. Provide complete identification of components, including power supplies and relays.

J. The placement and type of occupancy sensors and all associated power supplies and relays shall be accurately shown on the as-built drawings.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 27 20 00 - TELECOMMUNICATIONS SYSTEM

A. Provide a complete telecommunications network system, consisting of copper and/or fiber optic (FO) entrance cable, termination equipment, copper and/or fiber backbone cable, horizontal distribution cable, workstation outlets, racks, cable management, patch panel(s), cable tray(s), cable ladder(s), conduit, grounding, and labeling as shown on the drawings and further specified herein.

B. Provide and conduct all tests as specified herein, requested by the Contracting Officer, or otherwise required to certify, validate, and demonstrate the safety, completeness, and proper installation of all system components.

C. Install all work in strict accordance with:

1. Telecommunications Industry Association (TIA) and Electronic Industries Alliance (EIA) Building Telecommunications Wiring Standards.

2. Manufacturer's recommendations.

1.2 QUALIFICATIONS

A. Firms shall have at least 3 years of telecommunications installation experience in the application, installation and testing of the specified systems and equipment. Fiber optic splicing/termination personnel shall have at least 5 years’ experience.

1.3 SUBMITTALS

A. Submit manufacturer's product data and specifications for equipment and component devices.

B. Submittals shall include a riser diagram showing each telecommunications outlet with the address, raceway sizes and cable count in the raceways to the rack mounted equipment.

C. Provide schematic wiring diagrams showing interconnections and wire terminations at each individual system component. Include conductor labels to be used by the installer during construction.

PART 2 PRODUCTS

2.1 RACEWAYS

A. Raceways shall be as specified for power wiring, for the locations where they are to be installed.

B. Minimum conduit size shall be 3/4 inches, or as otherwise noted on the Drawings or specified herein.

2.2 DISTRIBUTION (HORIZONTAL) CABLING

A. Distribution cables shall be 4 pair, 24 AWG solid, unshielded, plenum rated outer jacket, UL/NEC rated Type CMP, TIA/EIA-568-B.2-1 Category 6A, 100-ohm impedance. Cable shall be provided with an overall jacket with sequential footage markings and a ripcord for easy cable entry.

2.3 OUTLETS

A. The standard communications outlet shall include two communication ports unless otherwise noted in the drawings. The telecommunications ports shall be constructed of high impact rated thermoplastic housing, RJ-45 non-keyed type, 8 position, 8 conductor (8P8C), modular in construction, with reusable insulation displacement terminations, conforming to TIA/EIA-568-B.2-1 Category 6A requirements, configured and color coded for TIA/EIA-568-B.2-1 designation T568B wiring.

B. Outlets shall mount in a single gang plaster ring in outlet boxes as specified in 26 05 34. Surface mounted outlets shall mount on a single gang box, unless otherwise required by the indicated configuration.

C. The outlets and associated components shall be Commscope Catalog #6644-1-154-XX faceplate with Catalog #6830-1-830-XX, or similar products manufactured by Ortronics, Siemens, Leviton, or equal.

2.4 OUTLET BOXES

A. Junction boxes shall be provided as necessary and shall conform to the requirements for junction boxes in Section 26 05 35 of these Specifications.

B. Double gang electrical boxes 5-in square by 2 1/4-in boxes suitable for 1-in conduit installations shall be utilized for standard outlet locations.

2.5 OUTLET FACEPLATES

A. Faceplates for standard outlets shall be single gang, capacity for a minimum of four ports or modules. Blank modules shall be provided to fill unused ports in the faceplate. Provide color coded snap-in icon tabs denoting the current media service (e.g., phone, data, video, etc.) with color as chosen by the Owner. Fill all unused openings with blank modules and insert one data tab per utilized port.

2.6 TELEPHONE BACKBOARDS:

A. Telephone backboards shall be 3/4-inch fire retardant treated grade AC plywood (FR) of the size noted on the drawings. Prime paint telephone backboard and finish with two coats white alkyd enamel, except the contractor shall mask off where at least one fire rating stamp is imprinted on plywood backboard to provide owner verification the plywood used is FR rated. Stations, central office lines and features shall appear on color coded backboards.

2.7 PATCH PANELS

A. Patch panels shall be unloaded keystone, 48-port for RJ-45 non-keyed 8 position modular jacks, terminated with insulation displacement type terminations, conforming to EIA/TIA-568-B.2-1 standards for Category 6A requirements, with wire management on rear of panels, front identification strips, rear designation cover, wired to EIA/TIA-568-B.2-1 designation T568B wiring, for 19-inch rack mounting.

B. Patch panels shall be Commscope Catalog #CPP-6A-SDDM-SL-1U-48, or similar products by Ortronics, Leviton, or equal.

2.8 SELF-SUPPORT RACKS

A. Self-support racks shall be 7 feet tall suitable for 19 inch wide rack mounted equipment, steel, four-post frame. Rack shall have square mounting holes for use with cage nuts for mounting equipment. Rack shall be U.L. Listed, Legrand Ortronics No. MM2071638-B, or equal. Provide vertical and horizontal cable management hardware.

2.9 POWER DISTRIBUTION UNITS

A. Provide rack mounted Power Distribution Unit (PDU). PDU shall be 1 rack unit in height, rated for 15A, 120V, with 10 NEMA 5-15 outlets. PDU shall be APC NetShelter Basic Rack PDU, model no. AP9562, no substitutions.

2.10 UNINTERRUPTIBLE POWER SUPPLY

A. Provide rack mounted Uninterruptible Power Supply (UPS). UPS shall be 1 rack unit in height, rated 2200VA, with Lithium-ion batteries, 120V distribution with 5 NEMA 5-20R and 1 NEMA L5-20R outlets, smart connect, extended runtime, and rail kit. UPS shall be APC model no. SRTL2K2RM1UC.

PART 3 EXECUTION

3.1 WIRING AND RACEWAYS

A. Equipment or devices shall have complete cable systems from the equipment or device outlet box to a terminal block or patch panel. All cables shall be terminated in a modular jack at the outlet port, and on the terminals in the patch panels or terminal block. One separate run per outlet port shall be provided.

B. All wiring shall be continuous from the communications outlet to the terminal block. No splices shall be allowed.

C. Wiring in ceilings shall be supported by cable supports specifically designed to support and secure cables above suspended ceiling tiles or shall be installed in cable tray. Neatly bundle and tag wiring.

D. Where cables are run exposed in finished areas, where subject to physical damage, or where raceways are indicated on the Drawings, wiring shall be run in metal raceways as specified for power wiring. Conduit fill shall not exceed 40 percent.

E. Maximum distribution cable length for computer outlets shall not exceed 90 meters (295 feet).

F. Wiring in cable trays shall be neatly bundled and tagged with Cable Management Straps.

G. Wiring shall not share raceways or be bundled with other building systems.

H. All cables shall be labeled at each end with the location of the other end.

I. A nylon pull cord shall be pulled into all empty raceways, with a minimum 12-inch tail at each end.

J. Computer distribution cable shall be punched down by approved methods for TIA/EIA 568-B.2-1 standards for Category 6A wiring on the back sides of the modular to 110 patch panels and properly terminated at each outlet configured for TIA/EIA 568-B.2-1 designation T568B wiring. Note that raceways and conductors are not necessarily shown on the Drawings but are to be provided complete.

K. Addressing:

1. Each telecommunications outlet and associated jacks on the front of the patch panels shall display the outlet port address.

2. Addressing at the patch panels and the outlets shall be performed on heavy paper strips by a Kroy lettering device and mounted behind the clear plastic covers provided with the equipment. Provide outlet and jack addressing and labeling as directed by the Owner.

3. The Contractor shall provide a floor plan map which shows the outlet numbers adjacent to each outlet location. These maps shall be included in the Operation & Maintenance Manuals.

4. Network backbone cables shall be terminated on the bottom rightmost outlets on the patch panel and shall be labeled.

3.2 QUALITY ASSURANCE

A. A qualified field technician shall inspect and test the complete wiring system. Testing shall be performed on each conductor and fiber. Testing shall be performed before and after the cable is installed. Testing after installation shall include the testing of terminations. Cable which does not conform shall be replaced at the expense of the Contractor. Acceptability and testing of the system shall extend through the Warranty period. The testing of the system shall not be deemed completed until after the equipment is in place and the wiring system proves to be 100 percent functional.

B. Category 6A Cable Testing:

1. All Category 6A cable testing shall be performed after completion of building electrical systems are online and in service.

2. Perform Category 6A link tests in accordance with TIA/EIA-568-B.1 and TIA/EIA-568-B.2. Test shall include wire map, length, insertion loss, NEXT, PSNEXT, ELFEXT, and PSELFEXT, return loss, propagation delay and delay skew.

C. Provide results of final acceptance tests to the Owner after completion of tests. Test reports shall include:

1. The equipment calibration date and calibration expiration date.

2. The test equipment nomenclature, model, serial number and manufacturer.

3. Name(s) of the testing team member(s), organization/company name, company address and the company telephone number(s).

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 31 10 00 - SITE CLEARING

A. This Section covers 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. Removing existing vegetation.
2. Clearing and grubbing.
3. Stripping and stockpiling topsoil.
4. Temporary erosion and sedimentation control.

1.3 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video recordings.

1.6 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property shall be obtained by Contractor, in coordination with Owner before beginning site clearing activities.

1. Do not proceed with work on adjoining property until directed by Owner.

C. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

D. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 EXISTING UTILITIES

A. Locate, identify, flag or protect as needed, any utilities to remain before beginning site clearing operations.

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Owner’s written permission.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Grind down stumps and remove roots larger than 2 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.

2. Chip removed tree branches and dispose of offsite.

3. Anticipated depth of topsoil layer is 12 inches.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material as indicated in section 31 20 00 EARTH MOVING unless further excavation or earthwork is indicated.

3.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 12 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Do not stockpile topsoil within protection zones.

2. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements and artifacts as indicated and necessary to facilitate new construction.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Burning tree, shrub, and other vegetation or waste material on owner’s property is not permitted.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 31 20 00 - EARTH MOVING

A. Provide all site preparation, excavating, filling, compacting, and related items of work required to complete the earthwork as indicated on the Drawings and as specified herein.

B. Provide all excavation and backfill as required for the installation of all buried utility work.

C. Remove from site and legally dispose of all excavated materials that are not suitable for reuse as fill. Disposal site as selected by Owner.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

B. Excavation: Removal of material of whatever character encountered above subgrade elevations and to lines and dimensions indicated.

C. Fill: Soil materials used to raise existing grades.

D. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

E. Utilities: On-site pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 INFORMATION SUBMITTALS

A. Submit the Quality Assurance and Quality Control Plans.

B. Submit ASTM C-117/C-136 Gradation Analyses for structural fill, sand bedding, or other backfill material specified to be used for this work. Submit test results prior to beginning any backfill work. At the discretion of the Project Manager retest and resubmittal may be required when source of material changes or when the appearance of the product delivered to the jobsite varies significantly.

C. Submit ASTM D-1557 Modified Proctor test results for structural fill, sand bedding, common fill, and in-situ soils below structures requiring compaction of subgrade. Submit test results prior to beginning any backfill work. Retest and resubmittal required when source of fill changes or varies significantly. Determination to be made by the Project Manager.

D. Submit copies of all ASTM D-2922 compaction test results within 48 hours of the performance of the test.

E. Product data for geotextile separator fabric.

F. Copies of permits required for activities associated with excavation, dewatering, or backfill.

G. Photographs of bottom of excavation before placement of geotextile or fill material.

1.4 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing. Agency shall be under the direct supervision of an engineer registered to practice in Alaska.

1.5 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by the Contractor in coordination with the Owner prior to beginning work.

1. Do not proceed with work on adjoining property until directed by the Owner.

C. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures are in place.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter and is compactable under the provisions of SSHC 203-3.04 and 203-3.05.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Structural Fill: Material meeting the following gradation:

Size	% Passing
4"	100
No. 4 Mesh	30-60
No. 200 Mesh	0-5

E. Non-Frost Susceptible (NFS) Soils or Fill: Sand and gravel containing less than five (5) percent passing the No. 200 sieve, based on the material passing the 3/4-inch sieve.

F. Common Fill under Improvements: Any sandy gravel, sand, sandy-silt, silt, or other satisfactory soils, containing no debris or organic contamination and is compactable under the provisions of Part 3 of this Section.

G. Common Fill for Area Grading or Landscape Areas: Any sandy gravel, sand, sandy-silt, or other satisfactory soils containing no debris. Organic materials up to 10 percent by weight may be mixed in the soil mass provided the material is reasonably mixed and the organic content does not consist of large roots, stumps or tree limbs.

H. Sand: ASTM C 33/C 33M; fine aggregate.

2.2 BORROW SOURCE

A. Use materials from excavation where qualified. Additional materials to come from source of Contractor's choosing. All borrow materials shall be approved by the Project Manager.

2.3 GEOTEXTILES

A. Meet AASHTO M288 for a class 2 geotextile, except provide a minimum permittivity of 0.05 sec with a maximum apparent opening size (AOS) of No. 30 U.S. Standard Sieve as determined by ASTM D4751.

1. Joined by sewing or overlapping a minimum of 24 inches.

PART 3 EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

3.2 DEWATERING

A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding Project site and surrounding area.

B. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation support, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

C. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

D. Legally dispose of all water resulting from dewatering or other site operations.

E. Acquire all permits necessary for dewatering and disposal of dewatering effluent including a State of Alaska Department of Natural Resources Temporary Water Use Permit and a State of Alaska Department of Environmental Conservation Excavation Dewatering Permit.

3.3 EXCAVATION, GENERAL

A. General:

1. Depth and extent of excavation shall be in conformance with Contract Drawings and Specifications and shall be sufficient for placement of structural fill, bedding or other specified backfill beneath utilities, foundations, and other structures at elevations shown on Drawings.

2. No excavation is authorized below indicated depths unless so required in writing by Owner to obtain suitable bearing materials or to remove objectionable debris.

3. Unauthorized over-excavation beyond limits set by Drawings and/or Specifications shall be replaced with structural fill materials as specified elsewhere in this Section. Backfill and compaction of unauthorized over-excavation shall be at Contractor's expense.

4. Maintain guardrails and barricades to protect all open cuts. Storage of excavated materials along one side of trench or excavation shall constitute a barricade for that side.

5. Provide adequate lights, flares, and guards as required to protect the public.

6. Protect adjacent building foundations, utilities, road surfacing, and survey controls by careful excavation and shoring as required.

7. Provide bridging of excavations as required to permit access to all areas of the job site by other crafts.

8. Contractor is responsible for excavating all types of material encountered in excavations including frozen soils down to the specified excavation limits without extra cost to the Owner, except for solid rock (where rock is not indicated on Drawings). Solid rock shall consist of igneous, metamorphic and sedimentary rock, which cannot be excavated without the use of blasting or rippers.

B. Sheeting and Bracing:

1. Contractor is responsible for establishing excavation backslopes and protecting banks for safe working conditions and prevention of erosion.

3.4 SUBGRADE INSPECTION

A. Notify Project Manager when excavations have reached required subgrade.

B. If Project Manager determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Subgrade preparation under building foundation.

1. Once all unsuitable soils and existing foundation material have been removed, and prior to placement of the structural fill, the base of the excavation should be compacted.

D. Soft or yielding spots shall be replaced and recompacted. Adjust moisture content as necessary to achieve proper compaction.

E. Compact subgrade by rolling a rubber-tired Front end loader with full bucket over the excavated area. All areas shall be compacted with at least two passes of a tire in at least two perpendicular directions for a total of 4 passes.

F. Subgrade shall have no irregularities varying more than 0.1 feet above or below grade after compaction.

G. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

H. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Project Manager, without additional compensation.

I. Photograph bottom of excavation from at least three cardinal directions before placement of geotextile or fill material.

3.5 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavations as directed by Project Manager.

3.6 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.7 BACKFILL

A. General:

1. Place and compact backfill in excavations promptly, but not before completing the following:

a. Construction below finish grade including, where applicable, insulation.

b. Surveying locations of underground utilities for Record Documents.

c. Photographic documentation.

d. Removing trash and debris.

2. Obtain Project Manager’s approval of excavations prior to placement of fills.

3. No extra payment for fill in excess of limits shown on Drawings or as specified herein without written approval of Project Manager.

4. Remove all forms, trash and debris from excavation before starting to backfill.

5. Lifts shall be placed on level planes. Step sides and bottom of excavations if necessary to accomplish level fills.

6. Each lift of backfill material to be carried level to all sides of excavated area. No partial fills permitted.

7. Edges of fills shall be compacted and brought up at a maximum slope of 2:1.

8. Clean up and grade all areas disturbed by placement of backfill.

B. Structural Fill:

1. Material required (MINIMUM) beneath referenced structure or area when not specifically detailed on plans:

a. Under building footings: 18” or depth as required to bring grade up to underside of footings or slabs, whichever is greater.

2. Maximum loose depth of each lift shall be 12 inches in areas to be compacted by machine.

3. Fill in horizontal layers shall not exceed 6 inches loose depth where hand tampers or hand operated vibratory compactors are used.

C. Sand Bedding:

1. Sand fills shall be placed in lifts as required to fill the designated areas.

2. Adjust lift thickness, moisture content and placement methods as necessary to achieve specified density.

3. Water jetting or slurrying shall be permitted only with prior approval from the Project Manager.

D. Common Fill:

1. Use common fill for backfill as shown on the plans and for areas outside of building and parking areas, except where other materials are indicated on Drawings.

2. Maximum loose lift thickness 8 inches under footings or areas to be paved.

3. Maximum loose thickness 12 inches under area grading or landscape areas.

E. Backfill against insulation with care to prevent damage.

3.8 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.9 COMPACTION OF SOIL BACKFILLS AND FILLS

A. General:

1. Adjust moisture content as required to accomplish proper compaction and to provide dust control when required by the Project Manager.

2. Compaction shall be thorough and to minimum density specified herein at all points throughout depth of fill.

3. Compact to specified percentage of maximum dry unit weight at optimum moisture content obtainable by ASTM D-1557, Procedure A or B as appropriate.

4. Compact to specified percentage of maximum dry unit weight at optimum moisture content obtainable by AASHTO T-180 and corrected by AASHTO T-224, as required.

5. When multiple lifts are required to achieve the specified grade, each lift shall be compacted to the specified density prior to placing the next lift.

B. Compaction Requirements:

Soil Material	% of Maximum Dry Unit Weight
Top 6 inches of subgrade under structural fill or bedding	95%
Structural Fill	95%
Sand	98%
Top 6 inches of subgrade under common fill	90%
Common Fill against foundations and footings within 5 feet of foundation wall	95%
Top 18 inches of Common Fill in areas to receive topsoil	90%

3.10 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.

2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within plus or minus 1 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2-inch when tested with a 10-foot straightedge.

3.11 FIELD QUALITY CONTROL

A. Special Inspections: Contractor will coordinate with Project Manager to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.

2. Determine that fill material classification and maximum lift thickness comply with requirements.

3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.

B. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

C. Soil Testing:

1. Soil testing shall be performed by the Contractor’s approved independent geotechnical engineering testing agency (see Section 1, TESTING AND INSPECTION SERVICE) according to the approved Quality Control (QC) plan.

D. Compaction Testing:

1. Test methods:

a. Field density testing shall conform with ASTM D-6938 (nuclear gauge method), ASTM D-1556, (Sand-Cone Method) or by ASTM D-2167 (Rainhart Volumeter). The ASTM D-1556 and D-2167 is applicable only to cohesive soils and silty sands and shall only be used to test densities in sand bedding, or common fill which do not contain appreciable amounts of coarse materials in excess of 1.5 inches.

b. The number of tests shall be (minimum) as follows. Additional testing shall be required if, in the opinion of the Project Manager, the soil compaction test results indicate that the specified compaction is not being obtained:

1) For building foundations: One per 500 square feet of each lift, but in no case fewer than three tests.

2) For embankment and fill under roads and parking areas: One lift per 2000 square feet, but in no case fewer than three tests.

3.12 SURVEY MONUMENTS

A. Disturbed Survey Monuments: Employ a qualified Land Surveyor licensed in the state of Alaska to replace any survey monuments disturbed by this project.

3.13 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Project Manager; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.14 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Project Manager.

B. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 31 66 19 - REFRIGERATED FOUNDATIONS

A. Provide all site preparation, excavation, filling to indicated lines and grades, compaction and related earthwork as required to install the ground cooling system as indicated on shop drawings and in accordance with specifications and installer instructions submitted by Arctic Foundations Inc.

1.2 SUMMARY

A. Section Includes:

1. Passive Ground Cooling Systems for cooling or freezing unstable soils caused by degrading permafrost beneath foundations and other site improvements.

B. Related Requirements:

1. Section 31 20 00 "Earth Moving" for excavation, fill, compaction and grading of soil materials.

1.3 DEFINITIONS

A. Thermoprobes: ground cooling system utilizing flat loop evaporators and thermosyphon risers to passively cool soils.

B. Permafrost: Soils beneath the active layer which remain continuously frozen throughout the year.

C. Active Layer: Soils extending from the ground surface through the soil column which experience seasonal freezing and thawing throughout the year.

D. Frozen soils: soils with ambient temperature at or below 32°F.

E. Thawed soils: soils with ambient temperature above 32°F.

F. Evaporators: underground, horizontal loop portion of the ground cooling system.

G. Condensers: above ground “fin” section of the ground cooling system.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at the project site prior to installation of ground cooling system. Preinstallation conference should take place after full depth of excavation has been completed and prior to placement of geotextile fabrics or other fill materials.

1. Required participants:

a. Contractor.

b. Owner representative.

c. Engineer representative.

d. Refrigerated Foundation installer representative.

2. Required elements.

a. All products and materials required for installation of soil refrigeration system shall be stockpiled on site prior to Preinstallation conference.

1.5 INFORMATIONAL SUBMITTALS

A. Product data for Ground Cooling System.

1. Include data for evaporator tubing.

2. Include data for any couplings and reducers.

3. Include data for all pressure containing pipe.

4. Include data for geotextile separator fabric.

5. Include data for fuel proof membrane.

B. Installer qualifications

1. Welders' qualifications.

1.6 DELEGATED DESIGN SUBMITTALS

A. Submit shop drawings, specifications, product data, manufacturer's installation instructions and any other literature associated with installation of the ground cooling soil stabilization system. Design drawings shall be stamped and sealed by a registered Professional Engineer licensed in the state of Alaska.

1. Shop drawings:

a. Show overall layout plans of evaporator loops and risers.

b. Show excavation section including depth of excavations, thickness of sand bed, vertical locations of evaporator loops, insulation thickness, depth of cover over insulation, and any geotextile or fuel proof membranes.

c. Show details for flat loop evaporator piping assembly.

d. Show details for flat loop evaporator bends, couplings, welds, and other fabrications as required.

e. Show details for thermosyphon riser assembly.

f. Show details and locations for anchoring thermosyphon risers to building.

1.7 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify utility locator service for area where Project is located before excavation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Handle and store Ground Cooling components to comply with manufacturer's recommendations.

1. Store components flat, off-of ground, and adequately supported to prevent lateral bending.

2. Protect components from weather by covering with waterproof sheeting, securely anchored.

3. Provide for air circulation around stacks and under coverings.

B. Inspect components showing discoloration, corrosion, or other evidence of deterioration. Discard and replace components that are damaged or defective.

PART 2 PRODUCTS

2.1 GROUND COOLING SYSTEM

A. System shall be Arctic Foundations, Inc. (AFI) Sloping Evaporator Thermoprobes.

B. Thermosyphon ground cooling system shall be designed by a licensed Professional Engineer registered in the state of Alaska.

C. Consisting of sloping evaporators installed below grade and thermosyphon risers installed vertically and braced to the building exterior.

D. Evaporators shall extend minimum of 5 feet laterally beyond the extent of the outer-most foundation elements including building foundation pads, ramp, deck and stair foundation pads, fuel tank, and generator foundation systems.

E. Install rigid insulation as indicated on shop drawings.

F. Rigid insulation shall extend laterally over the thermosyphons beyond the flat loops a minimum of 12 feet.

G. The thermosyphon condensers shall be installed in a manner and location to maximize exposure to winter air flow and reduce opportunity for blockage by snow or other obstructions.

PART 3 EXECUTION

3.1 PREPARATION

A. Excavate insitu soil to the lines, grades, and extents shown on approved shop drawings.

3.2 INSTALLATION

A. Install Ground Cooling System in accordance with manufacturer recommendations.

1. Welds shall be performed in accordance with, and by persons qualified per ASME Section IX.

3.3 REPAIRS AND PROTECTION

A. Protect evaporators from damage by equipment.

B. Do not drive self-propelled equipment over evaporators until at least 24 inches of cover have been placed above evaporator tubing.

C. Protect thermosyphon risers from damage throughout construction sequence by barricades or other appropriate means.

D. Repairs to ground cooling system components shall be performed by manufacturers authorized representatives.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 33 11 00 - WATER UTILITY PIPING

A. This Section covers selection, installation, testing, and sterilization of water piping.

1.2 ABBREVIATIONS

A. NSF – National Sanitation Foundation

1.3 SUBMITTALS

A. Manufacturer's Data, catalog cuts and selections of pipe and fittings.

B. Submit data showing that pipe, fittings, and accessories in contact with domestic water are NSF 61 rated to current lead free requirements.

C. Submit DEC certificate of performance from disinfecting and flushing operations.

1. Documentation that the modified portions of the public water system were disinfected and flushed per AWWA C651. Include pipe section locations, dates, and times of flushing and disinfection.

2. Documentation that bacterial testing was performed. Provide sample locations and results of total coliform bacterial testing after flushing and disinfection as required by AWWA C651.

D. Fusion Joints

1. All persons performing the fusion process shall have been trained and qualified by a company that has been trained in the correct method of butt fusion and electro fusion in accordance to ASTM F 2620-06 PPI TN-42 / TR-33. All persons shall be trained and qualified annually. The fusion operator shall be thoroughly familiar with and trained on the equipment being used. Submit fusion technician qualifications for all pipe diameters and SDR’s fused on project.

2. All fusion equipment (butt fusion and electro fusion) used on this project shall have been certified to show that it is in good working order. All butt fusion equipment shall have an annual certification sticker and all electro fusion equipment shall have been recalibrated and tested every two years. The sticker will show the certification date and location and company that performed the certification. The selected butt fusion equipment shall be capable of meeting all parameters of the job. The equipment shall have jaws or reducing inserts

designed to properly hold the size of the pipe being fused, it shall be able to generate enough force to reach the required fusion pressure during all fusion conditions. Submit fusion equipment certifications.

3. A minimum of one fusion sample shall be performed and tested upon each shift start-up, and or upon each new fusion operator's shift. Each sample will be tested and logged in to the fusion sample log. If the test sample does not pass another sample will be taken 180 degrees from the first sample and re-tested, if this test sample also fails all butt fusion activities shall be stopped until a passing test has been performed. Acceptable methods of testing will be bend back test, in field tensile tester, guided side bend tester, and/or a qualified testing facility that performs these tests as part of their normal operation. A hand operated fusion unit and electro fusion test log shall be kept and turned in upon the completion of the project.

PART 2 PRODUCTS

2.1 PIPE

A. All main and service pipe and materials in direct contact with potable water shall meet the requirements of NSF 61 and lead-free requirements of the Reduction of Lead in Drinking Water Act.

B. Utilidor piping is considered interior pipe.

C. Water piping

1. HDPE (High Density Polyethylene) pipe manufactured in accordance with AWWA C906 from PE4710 polyethylene compounds that meet or exceed ASTM D3350. SDR 11, material cell classification of 445574, color and ultraviolet stabilizer of code C per ASTM D3350.

2.2 PIPE JOINT RESTRAINT

A. Provide pipe-to-pipe joint restraint through stainless steel locking segments integral with joint gasket, UL approved for 250 psig operating pressure when used in conjunction with piping provided. U.S. Pipe Field Lok or equal.

B. Provide pipe-to-fitting joint restraint through restraining mechanism integral with follower gland. Ductile iron construction. Twist-off nuts. Joint flexibility maintained after burial. UL approved for 250 psig operating pressure when used in conjunction with piping provided. EBAA Iron, Inc., MEGALUG or equal.

2.3 PIPE FITTINGS

A. For HDPE pipe electrofusion fittings must comply with ASTM F1055 or butt fusion welded in accordance with ASTM F2620.

2.4 VALVES

A. Resilient wedge gate valves shall conform to AWWA C515. Rubberseated butterfly valves shall conform to AWWA C504. Valve shall include a non-corrosive stem.

B. Stainless steel hardware shall be used to provide corrosion protection.

PART 3 EXECUTION

3.1 INSTALLATION

A. Prior to performing Work on the existing domestic water system isolate that portion of system requiring renovation from the rest of the domestic water system. Do not reconnect the isolated portion of the domestic water system to the existing system until sterilization and testing are complete.

B. Install piping and equipment in accordance with manufacturer's recommendations, with accessories recommended by the manufacturer for service intended, and with accessories indicated.

C. Cut pipe square and clean, ream, and clear pipe of all burrs and debris.

D. Install couplings in accordance with manufacturer's recommendations.

E. For cold weather assemblies keep the temperature of the restrained joint gaskets above 40 degrees Fahrenheit prior to installation.

F. Fusion Joints

1. Butt Fusion Procedure Parameters: Generic Fusion Interface Pressure Range 60-90 psi. Generic Heater Surface Temperature Range 400-450 degrees F.

2. Securely fasten the components to be joined.

3. Clean the inside and outside of the pipe to be joined by wiping with a clean lint-free cloth. Remove all foreign matter.

4. Face the pipe ends: The pipe ends must be faced to establish clean, parallel mating surfaces. Remove any pipe chips from the facing operation and any foreign matter with a clean, lint-free cotton cloth. A visual inspection of this operation should verify that faces are square, perpendicular to the pipe centerline on each pipe end and with no detectable gap. Align the pipe profile.

5. After joining the pipes and holding, avoid pulling, installation or rough handling for an additional 30 minutes. Additional time may be required for pipes with a wall thickness greater than 2 inches.

6. Visual inspection:

   a. Visually inspect and compare the joint against the manufacturer's recommended appearance guidelines. Visually, the width of butt fusion beads should be approximately 2-2½ times the bead height above the pipe and the beads should be rounded and uniformly sized all around the pipe circumference. The v-groove between the beads should not be deeper than half the bead height above the pipe surface.

   b. Visually unacceptable joints should be cut out and re-fused using the correct procedure.

3.2 PRESSURE TESTING

A. Hydrostatically test new and existing system at 1.5 x the working pressure or 150 psi, whichever is more restrictive, for 2 hours with no noticeable pressure drop or water leaks.

B. Report any leaks in the existing system to the Contract Officer. At the option of the Contract Officer, he will issue a Contract Amendment to repair leaks or he will have other maintenance personnel repair the leaks.

C. Pressure test should be performed in accordance with AWWA C906 NFPA 13 and NFPA 24. If the installed pipeline provides water to any fire protection equipment, NFPA 13 and NFPA 24 take precedence over AWWA C600.

D. All mechanical joints shall be left exposed until completion of the pressure test. All portions of the pipeline shall be adequately restrained or backfilled to counterbalance thrust forces introduced by the pressure test. All service tees shall be installed prior to the pressure test. All air shall be properly vented from the pipe during charging.

E. Water for pressure testing and flushing may be provided by the Utility. Once the line has been filled and all air removed, the utility main connection shall be isolated from the new section of piping under test. The Contractor shall provide chlorinated make-up water and test pump to pressurize the line to 200 psig or 50 psig in excess of the system working pressure, whichever is greater. The system shall maintain that pressure at +/- 5 psig for 2 hours. The make-up water and pump shall be disconnected during the test period.

3.3 DISINFECTION AND FLUSHING

A. All water mains and services (laterals) shall be disinfected, flushed and tested in accordance with the latest revisions of AWWA C651. The Contractor shall furnish all material, labor, equipment, and services required for disinfection of the pipeline.

B. Submit a work plan for disinfection, flushing, and testing of the water mains and/or services. Include in the plan the method of disinfection to be used per the latest revisions of AWWA C651. No work shall commence until the work plan is approved by the Utility.

C. Flush piping clear of debris or discoloration prior to sterilization.

D. Prior to connection of the isolated portion of the domestic water system to the existing system thoroughly sterilize new and isolated existing portions of the domestic water system with calcium hypochlorite granules or tablets.

E. Fill pipe slowly with water while purging the air. When the pipe is full, isolate the system. The chlorinated water will have a minimum contact time of 24 hours.

F. Operate all valves at least twice during the contact period.

G. After sterilization, a minimum chlorine residual of 25 mg/Lis required at the end of the 24 hour period, to be verified by the Utility. Re-chlorinate any section that does not meet this minimum.

H. Flush the solution from the system with clean water until the residual chlorine content is less than 0.2 PPM throughout the system. During the flushing period, open and close all valves several times.

I. Do not discharge chlorinated water to the environment. Dechlorinate wastewater from disinfection operations and dispose of into sanitary sewer system. Upon successful verification of detectable free chlorine residuals the main shall be flushed of high saturated chlorine. The Contractor shall make all necessary arrangements for disposal of the flushing water to the sanitary sewer or other location, and to ensure the flush does not cause property damage, flood the ditch or inhibit traffic in the area.

J. The Contractor shall re-chlorinate any section failing to meet the AWWA standards.

K. After sterilizing and flushing the system, sample the water and submit samples to an independent testing laboratory for bacteriological testing. Submit certificate of conformance with State of Alaska, Department of Environmental Conservation, Water Quality Regulations to the Contracting Officer.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 33 31 00 - SANITARY UTILITY PIPING

A. This Section covers selection, installation, and testing of sanitary sewer piping.

1.2 SUBMITTALS

A. Manufacturer's Data, catalog cuts and selections of pipe and fittings.

B. Fusion Joints

1. All persons performing the fusion process shall have been trained and qualified by a company that has been trained in the correct method of electro fusion in accordance to ASTM F 2620-06 PPI TN-42 / TR-33. All persons shall be trained and qualified annually. The fusion operator shall be thoroughly familiar with and trained on the equipment being used. Submit fusion technician qualifications for all pipe diameters and SDR's fused on project.

2. All fusion equipment used on this project shall have been certified to show that it is in good working order. All electro fusion equipment shall have been recalibrated and tested every two years. The sticker will show the certification date and location and company that performed the certification. The equipment shall have jaws or reducing inserts designed to properly hold the size of the pipe being fused, it shall be able to generate enough force to reach the required fusion pressure during all fusion conditions. Submit fusion equipment certifications.

3. A minimum of one fusion sample shall be performed and tested upon each shift start-up, and/or upon each new fusion operator's shift. Each sample will be tested and logged in to the fusion sample log. If the test sample does not pass, another sample will be taken 180 degrees from the first sample and re-tested, if this test sample also fails all fusion activities shell be stopped until a passing test has been performed. Acceptable methods of testing will be bend back test, in field tensile tester, guided side bend tester, and or a qualified testing facility that performs these tests as part of their normal operation. A hand operated fusion unit and electro fusion test log shall be kept and turned in upon the completion of the project.

PART 2 PRODUCTS

2.1 PIPE, FITTINGS, AND JOINTS

A. Gravity service piping, 4-inch and larger

1. HDPE (High Density Polyethylene) pipe manufactured in accordance with AWWA C906 from PE4710 polyethylene compounds that meet or exceed ASTM D3350. Material cell classification of 445574, color and ultraviolet stabilizer of code C per ASTM D3350. Shall conform to standard iron pipe size outside dimensions (IPS) having a wall thickness with a standard dimensional ration (SDR) of 17.

2.2 PIPE FITTINGS

A. HDPE pipe shall be joined with electrofusion fittings. Electrofusion fittings must comply with ASTM F1055.

2.3 CLEANOUT

A. Provide cleanout at 5 feet from building maximum, where changes in alignment or grade exceed 45 degrees, at every 200 feet along exterior runs, and where indicated.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install piping and equipment in accordance with manufacturer's recommendations, with accessories recommended by the manufacturer for service intended, and with accessories indicated.

B. Cut pipe square and clean, ream, and clear pipe of all burrs and debris.

C. Pitch drainage piping down 1/4-inch per foot in direction of flow unless otherwise indicated.

D. Final accuracy of gravity sanitary sewer main installations shall be within one-hundredths (1/100) of a foot vertically and one-half of a foot horizontally of the exact location taken from the project plans. In addition, no single section of pipe shall vary by more than 10 percent from the grade shown on the project plans. In no case will a reverse or flat grade be allowed. Pipe which exceeds the above limits of variation shall be adjusted immediately and no further pipe shall be laid until so authorized by the Owner.

3.2 TESTING

A. During testing, isolate piping system equipment and accessories that are not rated to withstand test pressures or perform test prior to connection of such equipment and accessories to the piping system.

B. Plastic gravity sewer lines to be tested in accordance with ASTM F 1417. Test sections shall be isolated and initially pressurized to 4 psi. After stabilization, reduce the pressure to 3.5 psi before starting the test. If a 1 psi drop does not occur within the test time, the line has passed. If the pressure drop is more than 1 psi during the test time, the line is presumed to have failed the test. For minimum test time see table below.

Nominal Pipe Size (inch)	Time (minutes/100ft)
4	3.8
6	5.7
8	7.6
10	9.4
12	11.3
15	14.2
18	17

3.3 CLEANING

A. When all installation work is complete, remove all debris from pipe, cleanouts, and surrounding area. The mains shall be flushed with water to the satisfaction of the Owner.

END OF SECTION