Abbey Ridge Apartments
Renovations
3035 South 204th Street
SeaTac, WA 98198

Contract No. TC2002931

Project Manual
Volume 2: Divisions 03-12; 26-28; 31-33

October 11, 2019

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- Geotechnical Summary & Recommendations, May 31, 2019 21
- Foundation Support Recommendations, October 9, 2018 20

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MAINTENANCE OF CONCRETE

PART 1 GENERAL

1.1 SUMMARY
A. Section includes concrete surfaces, cracks, and reinforcement repair, or replacement, for existing walls, sidewalks and curbs at the perimeter of this Work damaged during the work of this Contract.
B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.
C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.
D. Related Sections:
   1. Section 03 30 00 – Cast-In-Place Concrete.
   2. Section 05 05 23 – Welding.

1.2 REFERENCES
A. ASTM International:
   1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
   2. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   3. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.
   8. ASTM C293 - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading).
  10. ASTM C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.
  11. ASTM C1042 - Standard Test Method for Bond Strength of Latex Systems Used With Concrete By Slant Shear.
B. American Welding Society: AWS D1.4 - Structural Welding Code - Reinforcing
Steels.

1.3 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures.
B. Product Data: Submit product standards, physical and chemical characteristics,
technical specifications, limitations, maintenance instructions, and general
recommendations regarding each material.
C. Samples: Submit color samples for patches required to match existing.
D. Submit mix designs for each separate application.
E. Submit certification from manufacturer stating the percentage of recycled content
material, identifying post-consumer and post-industrial contents.

1.4 CLOSEOUT SUBMITTALS
A. Section 01 70 00 - Execution and Closeout Requirements.
B. Project Record Documents: Accurately record actual locations of concrete
repairs or replacements.

1.5 QUALITY ASSURANCE
A. Perform Work in accordance with City of SeaTac Standards.
B. Maintain one copy of documents on site.
C. Perform welding work in accordance with AWS D1.4. Any welding must be
performed by WABO certified welders conforming to Section 05 05 23.

1.6 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this
section with minimum three years documented experience.
B. Applicator: Company specializing in concrete repair with minimum three years
documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Section 01 60 00 - Product Requirements: Product storage and handling
requirements.
B. Comply with instructions for storage, shelf life limitations, and handling.

PART 2 PRODUCTS
2.1 EPOXY ADHESIVE INJECTION MATERIALS
A. Furnish materials in accordance with City of SeaTac standards.
B. Epoxy Adhesive: Two-part epoxy adhesive containing 100 percent solids,
meeting the following minimum characteristics or those of City of SeaTac
Standards, whichever is greater:
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<td>ASTM C882</td>
<td>2,700 psi</td>
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<tr>
<td>Tensile Strength</td>
<td>ASTM D638</td>
<td>6,600 psi</td>
</tr>
<tr>
<td>Elongation</td>
<td>ASTM D638</td>
<td>2 percent at 7 days, 70 degrees F</td>
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<td>Flexural Strength</td>
<td>ASTM D790</td>
<td>8,000 psi</td>
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<td>Compressive Strength</td>
<td>ASTM D695</td>
<td>6,500 psi</td>
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2.2  CONCRETE MATERIALS
A. Refer to Section 03 30 00 Cast-In-Place Concrete.

2.3  REINFORCEMENT MATERIALS
A. Refer to Section 03 20 00 Concrete Reinforcement. Match existing reinforcement size, strength, spacing.

PART 3 EXECUTION

3.1  EXAMINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Verify surfaces are ready to receive work.
C. Beginning of installation means acceptance of existing surfaces.

3.2  PREPARATION
A. Clean concrete surfaces of dirt, laitance, corrosion, or other contamination; wire brush using water; rinse surface and allow to dry.
B. Remove concrete slab or curb entirely back to the nearest expansion joint. Removal of damaged concrete to the nearest crack control joint will not be approved.
C. Clean exposed reinforcement steel surfaces. Mechanically cut away damaged portions of bar.
D. Compact substrate soils to match density of existing soils prior to damage.

3.3  REPAIR AND REPLACEMENT WORK
A. Any repair of reinforcing shall be coordinated with, and approved by, the jurisdiction or permitting authority in addition to the Engineer of Record.
B. Repair reinforcement by welding new bar reinforcement to existing reinforcement with sleeve splices. Strength of welded splices and reinforcement to exceed original stress values.
C. Replace damaged work to match existing in material, thickness, shape, color and finish.
D. Replace expansion joint material as needed, matching material and color of existing joint materials.
E. Sack and patch concrete walls to repair air pockets, honeycombing, blow holes and other surface imperfections to achieve a smooth finish.

3.4 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
F. Collect cut-offs and scraps and place in designated area for recycling.

3.5 FIELD QUALITY CONTROL
A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.
B. Inspect reinforcement steel placement prior to casting concrete.
C. Test concrete for compressive strength during pours.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Formwork for cast-in place concrete, forming accessories, step nosings, form stripping.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Related Sections:
   1. Section 03 20 00 – Concrete Reinforcing.
   2. Section 03 30 00 – Cast-In-Place Concrete.
   3. Section 05 50 00 – Metal Fabrications.
   4. Section 32 16 00 – Curbs and Sidewalk.

1.2 REFERENCES

A. American Concrete Institute:
   2. ACI 301 - Specifications for Structural Concrete.
   3. ACI 318 - Building Code Requirements for Structural Concrete.
   4. ACI 347 - Guide to Formwork for Concrete.


E. ASTM International:

F. West Coast Lumber Inspection Bureau: WCLIB - Standard Grading Rules for West Coast Lumber.

1.3 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing in accordance with ACI 318 to conform to applicable code requirements to achieve concrete shape, line and dimension as indicated on Drawings.
B. Provide Class ‘A’ for all exterior and interior exposed (painted and non-painted) concrete surfaces.

1.4 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
B. Product Data: Submit data on form materials and form release products.
C. VOC limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components.
D. Submit certification from manufacturer stating the percentage of recycled content material, identifying post-consumer and post-industrial contents.

1.5 QUALITY ASSURANCE
A. Perform Work in accordance with ACI 347, ACI 301, and ACI 318.
B. For wood products furnished for work of this Section, comply with AF&PA.
C. Maintain one copy of each document on site.

1.6 QUALIFICATIONS
A. Design formwork under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Washington.

1.7 COORDINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Coordinate this Section with other sections of work, requiring attachment of components to formwork.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS
A. Form Materials: At discretion of Contractor.

2.2 FORMWORK ACCESSORIES
A. Form Ties: Snap-off type, metal, fixed length, cone type, with waterproofing washer, free of defects capable of leaving holes larger than 1-1/4 inch in concrete surface. Note that form tie holes will be exposed to view in the finished work. Refer to Section 03 30 00.
B. Spreaders: Standard, non-corrosive metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete face. Wire ties, wood spreaders or through bolts are not permitted.
C. Form Anchors and Hangers:
   1. Do not use anchors and hangers in exposed concrete leaving exposed metal at concrete surface.
   2. Symmetrically arrange hangers supporting forms from structural steel members to minimize twisting or rotation of member.
   3. Penetration of structural steel members is not permitted.
D. Form Release Agent:
1. Shall be delivered in manufacturer’s sealed and trademarked containers and shall be guaranteed to provide clean, stain-free concrete release and not to interfere with future-applied coatings and finishes.
2. Vegetable-based: paraffin and waxes shall not be used when a concrete finish is specified.
3. Waterborne: Low VOC.
4. Manufacturers:
   b. Cresset Chemical Co., Crete-Lease 20-VOC.
   d. Leahy-Wolf Company, Bio-Form.
   e. M.J. Doud, Inc., Greenplus Form Release Agent ES.
   f. Natural Soy, LLC, Soy Form Away.
   g. Tamms Industries, Aquaform.
   h. W.R. Meadows, Inc., SealTight Dougard II.
   i. Substitutions: Section 01 25 13 – Product Substitution Procedures.

E. Corners: Chamfer, rigid plastic or wood strip type; size per drawing details; maximum possible lengths.

F. Flashing Reglets: The products of the Fry Reglet Corporation, or approved equal, as detailed on the drawings, longest possible lengths, with alignment splines for joints.

G. Vapor Barrier: under slabs on grade, refer to Section 07 26 00 Vapor Barriers and Vapor Retarders.


I. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.

J. Accent Joints: rigid plastic or wood strip type; horizontal or vertical orientation, refer to drawings for locations and detail.

PART 3 EXECUTION

3.1 EXAMINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.
C. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

3.2 INSTALLATION
A. Earth Forms: Earth forms are not permitted.
B. Formwork - General:
1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.

2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.

3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.

4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.

5. Complete wedging and bracing before placing concrete.

C. Forms for Smooth Finish Concrete:
   1. Use steel, plywood or lined board forms.
   2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
   3. Install form lining with close-fitting square joints between separate sheets without springing into place.
   4. Use full size sheets of form lines and plywood wherever possible.
   5. Tape joints to prevent protrusions in concrete.
   6. Use care in forming and stripping wood forms to protect corners and edges.
   7. Level and continue horizontal joints.
   8. Keep wood forms wet until stripped.

D. Forms for Surfaces to Receive Membrane Waterproofing: Use plywood or steel forms. After erection of forms, tape form joints to prevent protrusions in concrete.

E. Framing, Studding and Bracing:
   1. Space studs at 16 inches on center maximum for boards and 12 inches on center maximum for plywood.
   2. Size framing, bracing, centering, and supporting members with sufficient strength to maintain shape and position under imposed loads from construction operations.
   3. Construct beam soffits of material minimum of 2 inches thick.
   4. Distribute bracing loads over base area on which bracing is erected.
   5. When placed on ground, protect against undermining, settlement or accidental impact.

F. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with reference standards.

G. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

H. Obtain Architect/Engineer’s approval before framing openings in structural members not indicated on Drawings.

I. Install chamfer strips on external corners.

J. Install void forms in accordance with manufacturer’s recommendations.

K. Do not reuse wood formwork more than two times for concrete surfaces to be exposed to view. Do not patch formwork.
3.3 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
C. Do not apply form release agent where concrete surfaces are indicated to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.
D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer's specifications. Do not coat forms for concrete indicated to receive "scored finish". Apply form coatings before placing reinforcing steel.

3.4 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Install formed openings for items to be embedded in or passing through concrete work.
B. Locate and set in place items required to be cast directly into concrete.
C. Coordinate with Work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
D. Position recessed reglets for brick veneer masonry anchors in accordance with spacing and intervals specified in Section 04 20 19 Veneer Unit Masonry or as indicated on Drawings.
E. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.
F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
G. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.
H. Form Ties:
   1. Use sufficient strength and sufficient quantity to prevent spreading of forms.
   2. Place ties at least 1 inch away from finished surface of concrete.
   3. Leave inner rods in concrete when forms are stripped.
   4. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings. Note that form holes will be left exposed to view. Refer to Section 03 30 00.
I. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.
J. Construction Joints:
   1. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.
2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
3. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.
4. Arrange joints in continuous line straight, true and sharp.

K. Embedded Items:
1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, water stops, and other features.
2. Do not embed wood or uncoated aluminum in concrete.
3. Obtain installation and setting information for embedded items furnished under other Specification sections.
4. Securely anchor embedded items in correct location and alignment prior to placing concrete.
5. Verify conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318 for size and location limitations.

L. Openings for Items Passing Through Concrete:
1. Frame openings in concrete where indicated on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
2. Coordinate work to avoid cutting and patching of concrete after placement.
3. Perform cutting and repairing of concrete required as result of failure to provide required openings.

M. Screeds:
1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
2. Slope slabs to drain where required or as shown on Drawings.
3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.

N. Screed Supports:
1. For concrete over waterproof membranes and vapor retarder membranes, use cradle, pad or base type screed supports which will not puncture membrane.
2. Staking through membrane will not be permitted.

O. Cleanouts and Access Panels:
1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris and waste material.
2. Clean forms and surfaces against which concrete is to be placed. Remove chips, saw dust and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.

3.5 FORM CLEANING
A. Clean forms as erection proceeds, to remove foreign matter within forms.
B. Clean form cavities of debris prior to placing concrete.
C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.6 FORM REMOVAL
A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.
D. Leave forms in place for minimum number of days as specified in ACI 347.

3.7 ERECTION TOLERANCES
A. Construct formwork to maintain tolerances required by ACI reference standards.

3.8 FIELD QUALITY CONTROL
A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
C. Notify Inspection Company after placement of reinforcing steel in forms, but prior to placing concrete.
D. Schedule concrete placement to permit formwork inspection before placing concrete.

3.9 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations where feasible.
B. Give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.1 SUMMARY
A. Section includes reinforcing bars, welded wire fabric, fibrous reinforcement, and reinforcement accessories.
B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.
C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.
D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the metals.
E. Related Sections:
   1. Section 03 10 00 – Concrete Forming and Accessories.
   2. Section 03 30 00 – Cast-In-Place Concrete.
   3. Section 05 05 23 – Welding
   4. Drawing sheets that include General Structural Notes.

1.2 REFERENCES
A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 318 - Building Code Requirements for Structural Concrete.
B. ASTM International:
   1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
   4. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
   6. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   8. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
10. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
14. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.

C. American Welding Society: AWS D1.4 - Structural Welding Code - Reinforcing Steel.

D. Concrete Reinforcing Steel Institute:
2. CRSI - Placing Reinforcing Bars.

1.3 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules, and supporting and spacing devices. Submit wall elevations indicating locations of embedded elements including embed plates, etc.
C. Product literature: Fibrous concrete reinforcement products.
D. Certificates: Submit AWS qualification certificate for welders employed on the Work.
E. Manufacturer's Certificate: Certify products meet or exceed specified requirements. Submit certified copies of mill test report of reinforcement materials analysis.
F. Submit certification from manufacturer stating the percentage of recycled content material, identifying post-consumer and post-industrial contents.
G. Submit certification from manufacturer verifying the location of the manufacturer, including full address and phone number, and list of materials harvested, extracted or recovered within 500 miles of the project site.
H. Provide certification from manufacturer verifying the location of the fabricator for products of this Section. Include mailing address and phone number. Provide list of recovered or recycled steel within 500 miles of project site.

1.4 QUALITY ASSURANCE
B. Prepare shop drawings in accordance with ACI SP-66.
C. Maintain one copy of each document on site.
1.5 QUALIFICATIONS
   A. Welders: AWS qualified within previous 12 months. Welding to be performed by WABO Certified welders conforming to Section 05 05 23.
   B. No reinforcing may be welded except where noted.

1.6 COORDINATION
   A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
   B. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT
   A. All products: Refer to the General Structural Notes on the drawings.

2.2 ACCESSORY MATERIALS
   A. Tie Wire: Minimum 16 gage annealed type.
   B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions, including load bearing pad on bottom to prevent vapor barrier puncture.
   C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic-coated steel type; size and shape to meet Project conditions.
   D. Epoxy Coating Patching Material: Type as recommended by coating manufacturer.

2.3 FABRICATION
   A. Fabricate concrete reinforcement in accordance with ACI 318-14.
   B. Form standard hooks for 180-degree bends, 90-degree bends, stirrup and tie hooks, and seismic hooks as indicated on Drawings.
   C. Form reinforcement bends with minimum diameters in accordance with ACI 318.
   D. Fabricate column reinforcement with offset bends at reinforcement splices.
   E. Form ties and stirrups from the following:
      1. For bars #6 and Smaller: #3 deformed bars.
      2. For bars #7 and Larger: #4 deformed bars.
   F. Weld reinforcement in accordance with AWS D1.4. No reinforcement may be welded except where noted.
   G. Locate reinforcement splices not indicated on Drawings, at point of minimum stress. Review location of splices with Architect/Engineer.
PART 3 EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position beyond specified tolerance.

B. Do not weld crossing reinforcement bars for assembly except as permitted by Architect/Engineer.

C. Do not displace or damage vapor barrier.

D. Accommodate placement of formed openings.

E. Space reinforcement bars with minimum clear spacing in accordance with ACI 318 of one bar diameter, but not less than 1 inch. Where bars are indicated in multiple layers, place upper bars directly above lower bars.

F. Splice reinforcing in accordance with splicing device manufacturer’s instructions. Splicing device specifications must be submitted to Engineer of Record for approval prior to installation.

3.2 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Install reinforcement within the following tolerances for flexural members, walls, and compression members:

<table>
<thead>
<tr>
<th>Reinforcement Depth</th>
<th>Depth Tolerance</th>
<th>Concrete Cover Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 8 inches</td>
<td>plus or minus 3/8 inch</td>
<td>minus 3/8 inch</td>
</tr>
<tr>
<td>Less than 8 inches</td>
<td>plus or minus 1/2 inch</td>
<td>minus 1/2 inch</td>
</tr>
</tbody>
</table>

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Field inspection and testing will be performed by Owner’s testing laboratory in accordance with ACI 318 and the Building Code.

C. Provide free access to Work and cooperate with appointed firm.

D. Reinforcement Inspection:
   1. Placement Acceptance: Specified and ACI 318 material requirements and specified placement tolerances.
   3. Periodic Placement Inspection: Inspect for correct materials, fabrication, sizes, locations, spacing, concrete cover, and splicing.
   4. Weldability Inspection: Inspect for reinforcement weldability when formed from steel other than ASTM A706/A706M.
   5. Continuous Weld Inspection: Inspect reinforcement as required by ACI 318.
   6. Periodic Weld Inspection: Other welded connections.
3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.

B. Where possible, give preference to suppliers who take back waste for re-use or recycling.

C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.

D. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete and concrete finishing for the following:
   1. Footings.
   2. Foundation walls.
   3. Retaining walls.
   4. Slabs on grade.
   5. Control, expansion and contraction joint devices.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

E. Related Sections:
   1. Section 03 01 00 – Maintenance of Concrete (existing sidewalks and curbs).
   2. Section 03 10 00 – Concrete Forming.
   3. Section 03 20 00 – Concrete Reinforcing.
   4. Section 07 90 00 – Joint Protection.
   5. Section 09 90 00 – Painting and Coating.
   6. Division 26: Electrical items for casting into concrete.
   8. Section 32 16 00 – Curbs and Sidewalks.
   9. Drawings sheets that include General Structural Notes.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 302.1 – Guide for Concrete Floor and Slab Construction.
   4. ACI 305 - Hot Weather Concreting.
   7. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:
   1. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
4. ASTM C42/C42M - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
8. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
10. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
15. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
33. ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.
34. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.3 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Product Data: Submit data on joint devices, attachment accessories, admixtures.
C. Design Data:
   1. Submit concrete mix design for each concrete mix to be used identifying where it will be used. Submit separate mix designs when admixtures are required for the following:
      a. Hot and cold weather concrete work.
      b. Air entrained concrete work.
   2. Identify mix ingredients and proportions, including admixtures.
   3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.
D. Submit certification from manufacturer stating the percentage of recycled content material, identifying post-consumer and post-industrial contents.
E. Submit certification from manufacturer verifying the location of the manufacturer, including full address and phone number, and list of materials harvested, extracted or recovered within 500 miles of the project site.

1.4 CLOSEOUT SUBMITTALS
A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
B. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

1.5 QUALITY ASSURANCE
A. Perform Work in accordance with ACI 301, ACI 303R, and ACI 318.
B. Conform to ACI 305 when concreting during hot weather.
C. Conform to ACI 306.1 when concreting during cold weather.
D. Acquire cement and aggregate from one source for Work.

1.6 ENVIRONMENTAL REQUIREMENTS
A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
B. Maintain concrete temperature after installation at minimum 50 degrees F for minimum 7 days.
1.7 COORDINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS
A. Cement: ASTM C150, Type I or Type II. Type III cement may be used for cold weather construction.
B. Normal Weight Aggregates: ASTM C33. Aggregates shall be free from any substance that may be deleteriously reactive with the alkalis in the cement in an amount sufficient to cause excessive expansion of the concrete. Maximum ½” aggregate for all concrete walls.
C. Water: ACI 318; potable, without deleterious amounts of chloride ions.

2.2 ADMIXTURES
A. Refer to the General Structural Notes: The use of admixtures is the responsibility of the Contractor, and only as approved by the Structural Engineer.
C. Fly Ash: ASTM C618 Class F, maximum 30% by weight of all cementitious materials. Use fly ash from one single source for the entire project. Slag is not an acceptable alternate to fly ash.

2.3 ACCESSORIES
A. Bonding Grout and repair materials: Use products in accordance with manufacturer's printed instructions.
   1. Manufacturers:
      a. Portland Cement mortar modified with a latex acrylic, non-re-emulsified bonding agent conforming to ASTM C1059 Type II. Acceptable products include Euclid Chemical Co. "Flex-Con", Dayton "Day-Chem Ad Bond (J-40)".
      b. Epoxy mortars and epoxy compounds that are moisture insensitive during application and after curing and that embody an epoxy binder conforming to ASTM C881.
e. Substitutions: Section 01 25 13 – Product Substitution Procedures.

B. Dissipating Resin Curing Materials: liquid type membrane forming curing compound complying with ASTM C309, Type I. Curing compound must be of a type that does not inhibit subsequent moist curing operations. The film shall chemically break down in a two-to-four-week period and shall not affect adhesion of coverings or membranes. Acceptable products are Burke "RES-X Curing Compound", Euclid Chemical Co "Kurez DR", Dayton "Day-Chem Rez Cure (J-11-W)", or approved equal.

C. Moisture retaining cover: waterproof sheet materials conforming to ASTM C171.

D. Concrete Reinforcing Fibers: ASTM C1116, refer to the General Structural Notes on the drawings.

E. Pre-formed Waterstops: Rubber, neoprene, or PVC products of Greenstreak, JP Specialties, Inc., Paul Murphy Plastics Co. (Wirestop), or approved equal. Supply and install together with the manufacturer’s pre-molded unions and fittings for splices, directional changes, and intersections.

F. Bentonite Waterstops: The products of Cetco, Volclay Waterstop-RX, expanding concrete joint waterstop, together with manufacturer’s primer and adhesive.

2.4 CONCRETE MIX

A. For concrete slabs where flooring finishes using adhesives are scheduled on the drawings, the maximum water/cement ratio shall not exceed 0.42 – 0.40.

B. Select proportions for normal weight concrete in accordance with ACI 301. Prepare mix designs for each type and strength of concrete. Concrete strength is to be verified by submitting test data in accordance with ACI 318 Section 5.3 by Field Experience Method or, if available, by Laboratory Trial Batch Methods. Mix proportions shall produce consistent and workable concrete that can be worked readily into forms and around reinforcement without segregation or excessive bleeding.

1. Field Experience Method: if Field test data is available, in accordance with ACI 301, submit for acceptance the mixture proportions along with the field test data.

2. Trial Batch Method: Use an independent, qualified testing facility for preparing and reporting proposed mix designs. All expenses connected with such testing and submittals shall be borne by the Contractor.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify requirements for concrete cover over reinforcement.

C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.
3.2 PREPARATION
A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Remove laitance, coatings, and unsound materials.
B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
C. Remove debris and ice from formwork, reinforcement, and concrete substrates.
D. Remove water from areas receiving concrete before concrete is placed.

3.3 PLACING CONCRETE
A. Place concrete in accordance with ACI 301 and ACI 318.
B. Notify testing laboratory minimum 24 hours prior to commencement of pouring operations.
C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints, and vapor barrier sheet are not disturbed during concrete placement.
D. Install vapor barrier under interior slabs on grade in accordance with ASTM E1643. Lap joints minimum 6 inches and seal watertight using products and procedures recommended by the sheet manufacturer.
E. Repair vapor barrier damaged during placement of concrete reinforcing, following manufacturer's recommended procedures.
F. Separate slabs on grade from vertical surfaces with ½" inch thick joint filler.
G. Install construction joints and crack control joints after review with Architect. Set top to required elevations. Secure to resist movement by wet concrete.
H. Deposit concrete at final position. Prevent segregation of mix.
I. Place concrete in continuous operation for each panel or section determined by predetermined joints.
J. Consolidate concrete.
K. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
L. Place concrete continuously between predetermined expansion, control, and construction joints.
M. Saw cut control joints within 12 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.
N. Screed slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 ft. Slope to drains as indicated, and slope to drain away from the building.
O. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1/4 inch per foot nominal, or as otherwise indicated on drawings.

3.4 CONCRETE FINISHING
A. Provide formed concrete walls with smooth formed finish. Form tie holes shall be expressed in the finished work; remove ties and fill holes neatly flush with surface.
B. Light broom finish on all exterior concrete slabs on grade.
C. Provide Class ‘A’ per ACI 347 for all concrete surfaces (painted and non-painted) exposed to view at building interior and exterior.

D. Provide Class ‘B’ per ACI 347 for all non-exposed concrete surfaces.

E. Finish concrete floor surfaces in accordance with ACI 301 and ACI 318.
   1. Screed to true levels and slopes.
   2. Tool all salient edges of concrete.
   3. Machine troweling permitted provided that maximum specified tolerance is not exceeded.
   4. Do not absorb water with neat cement.
   5. Make sharp arise at wall-to-floor conditions.
   6. Perform scoring indicated and/or specified. Maintain all control, construction, and expansion joints.

F. Edge forms and screeds: Set edge forms and intermediate screed strips accurately to produce designed elevations and contours in finished surfaces. Build sufficiently strong to support vibrating bridge screeds or roller type screeds if required for specified finish. Align concrete surface to contours of screed strips by use of strike-off templates or reviewed compacting type screeds. All concrete requiring finishing to be protected from rain or snow during finishing operations.

G. Slab tolerance:
   1. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E1155 and ACI 302.1R (paragraph 8.15) for a randomly trafficked floor surface:
      a. All floors other than those to receive thin-set flooring or resilient floor covering: Specified overall values of flatness, F(F)25, and levelness F(L)20; with minimum local values of flatness F(F)17, and levelness F(L)15.
      b. Thin-set flooring, resilient floor covering: Specified overall values of flatness, F(F)35, and levelness F(L)25; with minimum local values of flatness F(F)24, and levelness F(L)17.
      c. If floors exceed these values, Contractor shall be responsible for any corrections. For elevated slabs on metal deck, conform only to flatness criteria above; levelness criteria above do not apply.
   2. In mechanical spaces with equipment floor drains, maintain floor level and pitch to drains in a 12-inch radius.
   3. In rooms shown with floor areas sloping to drain, provide slope true to line and evenly graded.

H. Finishes:
   1. Float finish: Apply float finish to monolithic slab surfaces that are to receive trowel finish and other finishes specified, and slab surfaces shown or scheduled for waterproofing and roofing.
   2. Scratch finish: Apply scratch finish to monolithic slab surfaces that are to receive mortar setting beds for pavers.
   3. Steel trowel finish those surfaces scheduled for carpeting, resilient flooring, and seamless flooring. Steel trowel those surfaces scheduled to be exposed, with no finish, and/or polished or bead-blasted finish.
      a. Screed accurately to proper elevations without irregularities. Allow concrete time to bleed naturally before working. Float to compact plastic mass using motor driven metal disc type float. Do not
overwork. Finish with a steel trowel, performing final troweling after surface is hard enough to ring under the trowel.

b. Retain moisture in slab surface during finishing. Provide a fog spray over finish area in dry or windy weather. Have on hand a hose and spray nozzle.

c. Conform to surface flatness slab tolerance as noted above. Take special care to finish slab level and true with the main area of the slab around conduit, plumbing stacks, and the like. Use of dry cement to remove free water is prohibited.

d. Use trowel finish for all concrete surfaces not receiving a broomed or other specified finish, unless noted otherwise.

4. Broom finish: provide on all exterior concrete walking surfaces. Float finish and then score with a broom to produce a uniform texture perpendicular to the direction of traffic.

I. Floors to receive grind & polish where indicated on drawings (Section 03 40 00):
1. Smooth finish from edge to edge with no rough areas.
2. Concrete curing: minimum twenty-eight days
3. Floor Flatness: (FF) of 35.
4. Floor Levelness: (FL) of 25.
5. Sheen Level: Semi-gloss finish.

J. Defective work: Correct defects in defined traffic floor by grinding or removal and replacement of defective Work. Areas requiring corrective Work will be identified. Re-measure corrected areas by same process.

K. Promptly remove and replace, when directed to do so, slabs that show excessive shrinkage cracks, and any slabs that do not drain properly.

3.5 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure concrete in accordance with ACI 308.1. Cure floor surfaces in accordance with ACI 301.

3.6 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Field inspection and testing will be performed by Owner’s testing laboratory in accordance with ACI 318, the 2015 IBC, and the permitting authority.

C. Provide free access to Work and cooperate with appointed firm.

D. Submit proposed mix design of each class of concrete to Structural Engineer for review prior to commencement of Work.

E. Concrete Inspections:
1. Reinforcing steel placement prior to concrete pours.
2. Continuous Placement Inspection: Inspect for proper installation procedures.
3. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.

F. Strength Test Samples:
3. Sample concrete and make one set of five cylinders for every 150 cu yds or less of each class of concrete placed each day and for every 5,000 sf of surface area for slabs and walls.
4. When volume of concrete for any class of concrete would provide less than 5 sets of cylinders, take samples from five randomly selected batches, or from every batch when less than 5 batches are used.
5. Make one additional cylinder during cold weather concreting, and field cure.

G. Field Testing:
1. Slump Test Method: ASTM C143/C143M.
3. Temperature Test Method: ASTM C1064/C1064M.
4. Measure slump and temperature for each compressive strength concrete sample.
5. Measure air content in air entrained concrete for each compressive strength concrete sample.

H. Cylinder Compressive Strength Testing:
2. Test Acceptance: In accordance with ACI 318.
3. Test one cylinder at 7 days.
4. Test two cylinders at 28 days.
5. Retain two cylinders for 56 days, or as otherwise requested by Architect/Engineer.
6. Dispose remaining cylinders when testing is not required.

I. Core Compressive Strength Testing:
1. Sampling and Testing Procedures: ASTM C42/C42M.
2. Test Acceptance: In accordance with ACI 318.
3. As directed by Architect/Engineer, drill cores for each failed strength test from concrete represented by failed strength test.

J. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.7 PATCHING
A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.
B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.
C. Patch imperfections as directed by Architect/Engineer, and in accordance with ACI 301.
3.8 DEFECTIVE CONCRETE
A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
B. Repair or replacement of defective concrete will be determined by Architect/Engineer.
C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

3.9 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
SECTION 05 05 23
WELDING

PART 1 GENERAL

1.1 SUMMARY
A. Section includes welding of structural and miscellaneous metals specified in other Sections.
B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.
C. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.
D. Related Sections:
   1. Section 05 12 00 – Structural Steel Framing.
   2. Section 05 50 00 – Metal Fabrications.

1.2 REFERENCES
B. ASTM International:
   ASTM A706-06a – Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
C. American Welding Society (AWS):
   1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
   2. AWS D1.1 - Structural Welding Code - Steel.

1.3 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
B. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

1.4 QUALITY ASSURANCE
A. Perform Work in accordance with the following requirements:

1.5 QUALIFICATIONS
A. Welding Certification: All welding performed by Certified Welders, certified within previous 12 months by Washington Association of Building Officials (WABO). Submit evidence of certification for the type of welding performed.
B. Contractor must have valid local Fire Department Cutting and Welding permit.

1.6 COORDINATION
Section 01 30 00 - Administrative Requirements: Requirements for coordination.

PART 2 PRODUCTS

2.1 MATERIALS
See individual referenced Sections for metals to be welded.

2.2 WELDING MATERIALS
Electrodes: Type 70XX (refer to the General Structural Notes on the drawings), or as otherwise required to develop strength of particular grade and section to be welded in accordance with AWS recommendations.

PART 3 EXECUTION

3.1 EXAMINATION
A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
B. Verify bearing surfaces are at correct elevation.
C. Verify anchors are set in correct locations and arrangements with correct exposure for steel attachment.

3.2 PREPARATION
A. Shape edges to be joined as necessary to accomplish a sound weld and as indicated on the drawings. Prepare and clean edges of all oil, grease, scale and rust in accordance with AWS D1.1. Remove paint and galvanizing from surfaces prior to welding.
B. Protection: Take all precautions required by regulations and referenced standards to protect persons and property. Carefully mask or shield all adjacent surfaces to prevent damage from heat or welding materials. Take particular care to prevent fires, and provide fire extinguisher nearby. When welding finished assemblies adjacent to, or above, finished materials protect surfaces from damage related to welding activities.

3.3 WELDING PROCEDURES
A. Clean and weld in accordance with referenced AISC Specifications Section 1.17, and AWS D1.1, D1.3, and D1.4.
B. Miscellaneous and Reinforcing Steel: See structural drawings for welding of reinforcing bars or plates, angles, and similar shapes. Conform to referenced regulatory requirements AWS D1.1 and D1.4.
C. Use automatic end welding according to AWS D1.1 and manufacturer’s written instructions to develop full capacities of shear stud connectors, threaded studs or deformed bar anchors.
D. Use electrodes type in accordance with the structural drawings and with referenced AWS standards. Electrodes to be thoroughly dry prior to use.

E. Grind smooth all welds exposed to view, except fillet welds. Provide reasonably smooth and uniform as-weld surfaces for fillet welds exposed to view. Remove all service metal and piece marks on steel items exposed to view. Paint all welds to be exposed in the finished work with primer specified in Section 05 12 00.

3.4 CLEANING AND REPAIR

A. Remove all slag or flux remaining on any bead.

B. Remove any cracks or blowholes appearing on any bead. Use Methods such as chipping, grinding, or gas gouging.

C. Repair any damaged finishes as directed, or replace damaged items at no additional cost to the Owner.

D. Clean welding area daily.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements; Field inspecting and testing.

B. Welding:
   1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
   2. Visually inspect all welds.
   3. Ultrasonic Inspection: ASTM E164; perform on all full penetration welds.

C. Correct defective bolted connections and welds.

3.6 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan.

B. Where possible, give preference to suppliers who take back waste for re-use or recycling.

C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.

D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.

E. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section includes structural shapes, channels and angles, tubes and pipe, plates and bars, fasteners, connectors, and anchors, and grout.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

E. Related Sections:
   1. Section 03 30 00 – Cast-In-Place Concrete.
   2. Section 05 05 23 – Welding.
   3. Section 05 52 00 – Metal Railings.

1.2 REFERENCES

A. American Institute of Steel Construction:
   1. AISC Code of Standard Practice for Steel Buildings and Bridges.
   7. AISC Specification for Structural Steel Buildings.

B. ASTM International:
12. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
18. ASTM A588/A588M - Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4-in. (100-mm) Thick.
22. ASTM A852/A852M - Standard Specification for Quenched and Tempered Low-Alloy Structural Steel Plate with 70 ksi (485 MPa) Minimum Yield Strength to 4 in. (100 mm) Thick.
27. ASTM E164 - Standard Practice for Ultrasonic Contact Examination of Weldments.

C. American Welding Society:
   1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
   2. AWS D1.1 - Structural Welding Code - Steel.


E. SSPC: The Society for Protective Coatings:
   1. SSPC - Steel Structures Painting Manual.
   2. SSPC Paint 15 - Steel Joist Shop Paint.
   3. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).
   4. SSPC SP 3 - Power Tool Cleaning.
   5. SSPC SP 6 - Commercial Blast Cleaning.
   6. SSPC SP 10 - Near-White Blast Cleaning.

1.3 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments, connections and fasteners.
   2. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
C. Mill Test Reports: Submit indicating structural strength, destructive and non-destructive test analysis.
D. Manufacturer's Mill Certificate: Certify products meet or exceed specified requirements.
E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.
F. Submit certification from manufacturer stating the percentage of recycled content material, identifying post-consumer and post-industrial contents.
G. Submit certification from manufacturer verifying the location of the manufacturer, including full address and phone number, and list of materials harvested, extracted or recovered within 500 miles of the project site.
H. Provide manufacturer's literature certifying that steel products contain a minimum of 18% recycled scrap content. Identify post-consumer and post-industrial percentages.
I. Provide certification from manufacturer verifying the location of the fabricator for products of this Section. Include mailing address and phone number. Provide list of recovered or recycled steel within 500 miles of project site.

1.4 QUALITY ASSURANCE
A. Perform Work in accordance with the following:
   1. AISC Code of Standard Practice for Steel Buildings and Bridges.

1.5 QUALIFICATIONS
A. Fabricator: Company specializing in performing Work of this section with minimum 5 years experience.
B. Erector: Company specializing in performing Work of this section with minimum 5 years experience.
C. Shop Painter: Company specializing in performing Work of this section with minimum 5 years experience.
D. Welders and Welding Procedures: AWS D.1 qualified within previous 12 months.

1.6 COORDINATION
A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL
Structural Shapes, bars, plates: according to the General Structural Notes on the drawings.

2.2 FASTENERS, CONNECTORS, AND ANCHORS
Bolts, nuts, washers, and connectors: according to the General Structural Notes on the Drawings.

2.3 WELDING MATERIALS
A. Welding Materials: AWS D1.1; type required for materials being welded.
B. Refer to Section 05 05 23.

2.4 ACCESSORIES
A. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing minimum compressive strength as indicated in the General Structural Notes on the drawings.
B. Shop and Touch-Up Primer: SSPC Paint 15, Type 1, red oxide.

2.5 FABRICATION
A. Space shear stud connectors at spacing indicated on the Drawings.
B. Continuously seal joined members as indicated on the drawings. Grind exposed welds smooth.
C. Fabricate connections for bolt, nut, and washer connectors.
D. Develop required camber for members.

2.6 FINISH
A. Prepare structural component surfaces in accordance with referenced standards.
B. Shop prime structural steel members. Do not prime surfaces that will be field welded, in contact with concrete, or high strength bolted.

2.7 SOURCE QUALITY CONTROL AND TESTS
A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.
B. Shop test bolted and welded connections as specified for field quality control tests.

PART 3 EXECUTION
3.1 EXAMINATION
A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
B. Verify bearing surfaces are at correct elevation.
C. Verify anchors are set in correct locations and arrangements with correct exposure for steel attachment.

3.2 PREPARATION
A. Furnish templates for installation of anchors and embedments in concrete work.

3.3 ERECTION
A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.
B. Field weld components and shear connectors indicated on Drawings.
C. Field connect members with threaded fasteners; torque to required resistance.
D. Do not field cut or alter structural members without approval of Architect/Engineer.
E. After erection, touch up welds and abrasions to match shop finishes.

3.4 GROUT INSTALLATION
A. Grout under base plates and as otherwise shown in accordance with Structural Notes.
B. Fill void under bearing surface with grout. Install and pack grout to remove air pockets.
C. Moist cure grout.
D. Remove forms after grout is set. Trim grout edges to form smooth surface, splayed 45 degrees.
E. Tighten anchor bolts after grout has cured for a minimum of 3 days.

3.5 ERECTION TOLERANCES
A. Section 01 40 00 - Quality Requirements: Tolerances.
B. Refer to AISC Code of Standard Practice for Steel Buildings and Bridges.

3.6 FIELD QUALITY CONTROL
A. Section 01 40 00 - Quality Requirements:; Field inspecting and testing.
B. Bolted Connections: Inspect in accordance with AISC specifications.
   1. Visually inspect all bolted connections.
   2. For Direct Tension Indicators, comply with requirements of ASTM F959. Verify that gaps are less than gaps specified in Table 2.
C. Welding:
   1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
   2. Visually inspect all welds.
   3. Ultrasonic Inspection: ASTM E164; perform on all full penetration welds.
D. Correct defective bolted connections and welds.

3.7 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes shop fabricated metal items as indicated on the drawings: structural supports for miscellaneous attachments, handrails, guardrails, fences, gates, gratings and the like.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials. Refer to Section 01 81 15 & 01 81 19 for specific requirements.

D. Related Sections:
   1. Section 03 30 00 - Cast-In-Place Concrete.
   2. Section 05 12 00 – Structural Steel
   3. Section 05 05 23 – Welding.
   4. Section 09 90 00 - Painting and Coating: Field applied paint finish.
   5. General Structural Notes on the drawings.

1.2 REFERENCES

A. ASTM International:
   10. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

B. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.
3. AWS D1.6 - Structural Welding Code - Stainless Steel.

C. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.
2. SSPC SP 1 - Solvent Cleaning.
3. SSPC SP 10 - Near-White Blast Cleaning.
4. SSPC Paint 15 - Steel Joist Shop Paint.
5. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

1.3 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal requirements.
B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.
C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months. Welding to be performed by WABO Certified welders conforming to Section 05 05 23.
D. Submit certification from manufacturer stating the percentage of recycled content material, identifying post-consumer and post-industrial contents.

1.4 QUALITY ASSURANCE
A. Finish joints in accordance with NOMMA Guideline 1.
B. Welding: Comply with Section 05 05 23.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
B. Accept metal fabrications on site in labeled shipments. Inspect for damage.
C. Protect metal fabrications from damage by exposure to weather.

1.6 FIELD MEASUREMENTS
Verify field measurements are as indicated on shop drawings.
PART 2 PRODUCTS

2.1 MATERIALS - STEEL
A. Steel sections, plates, bars and other rolled shapes: Refer to the General Structural Notes on the drawings.
B. Steel Pipe: ASTM A53, Type E or S, Grade B, Schedule 40.
C. Bolts, nuts, washers: Refer to the General Structural Notes.
D. Welding Materials: AWS D1.1; type required for materials being welded.
E. Shop and Touch-Up Primer: SSPC Paint 15, Type 1, red oxide.

2.2 FABRICATION
A. Fit and shop assemble items in largest practical sections, for delivery to site.
B. Fabricate items with joints tightly fitted and secured.
C. Continuously seal joined members by continuous welds.
D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FACTORY APPLIED FINISHES - STEEL
A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
B. Do not prime surfaces in direct contact with concrete or where field welding is required.
C. Prime paint items with one coat except where galvanizing is specified.
D. For steel fabrications with shop painting indicated on the drawings, refer to Section 09 90 00 - Painting and Coating.

2.4 FABRICATION TOLERANCES
A. Squareness: 1/8" maximum difference in diagonal measurements.
B. Maximum Offset Between Faces: 1/16".
C. Maximum Misalignment of Adjacent Members: 1/16".
D. Maximum Bow: 1/8" in 48 inches.
E. Maximum Deviation From Plane: 1/16" in 48 inches.

PART 3 EXECUTION

3.1 EXAMINATION
Section 01 30 00 - Administrative Requirements: Coordination and project conditions. Verify field conditions are acceptable and are ready to receive Work.

3.2 PREPARATION
A. Clean and strip primed steel items to bare metal where site welding is required.
B. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION
A. Install items plumb and level, accurately fitted, free from distortion or defects.
B. Make provisions for erection stresses. Install temporary bracing to maintain alignment, until permanent bracing and attachments are installed.
C. Field weld components indicated on design drawings or shop drawings.
D. Perform field welding in accordance with AWS D1.1 and Section 05 05 23.
E. Obtain approval of Architect/Engineer prior to site cutting or making adjustments not scheduled.
F. After erection, touch up welds, abrasions, and damaged finishes with prime paint or galvanizing repair paint to match shop finishes.

3.4 ERECTION TOLERANCES
A. Section 01 40 00 - Quality Requirements: Tolerances.
B. Maximum Variation From Plumb: 1/4" per story or for every 12 ft in height whichever is greater, non-cumulative.
C. Maximum Offset From Alignment: 1/4".
D. Maximum Out-of-Position: 1/4".

3.5 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
SECTION 05 52 00
METAL RAILINGS

PART 1 GENERAL

1.1 SUMMARY
A. Section includes welded steel guard rails and handrails as shown on the drawings. Railing to be hot-dipped galvanized per NOMMA Guideline 1 - Joint Finishes: Finish #2.
B. Related Sections:
   1. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for placement of anchors specified in this section in concrete.
   2. Section 09 90 00 - Painting and Coating: Paint finish.

1.2 REFERENCES
A. American Architectural Manufacturers Association:
   1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
B. ASTM International:
   3. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   6. ASTM B177 - Standard Guide for Chromium Electroplating on Steel for Engineering Use.

C. Green Seal:
   1. GC-3 - Environmental Criteria for Anti-Corrosive Paints.

D. National Ornamental & Miscellaneous Metals Association:
   1. NOMMA Guideline 1 - Joint Finishes: Finish #2.

E. SSPC: The Society for Protective Coatings:
   1. SSPC - Steel Structures Painting Manual.
   2. SSPC Paint 15 - Steel Joist Shop Paint.
   3. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

1.3 SUBMITTALS
   A. Section 01 33 00 - Submittal Procedures: Submittal requirements.
   B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1.4 QUALITY ASSURANCE
   A. Finish joints in accordance with NOMMA Guideline 1.

1.5 FIELD MEASUREMENTS
   A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 STEEL RAILING SYSTEM COMPONENTS
   A. Pipe for rails and posts: ASTM A53, Grade B, Schedule 40; 1-¼" inch diameter steel pipe; welded joints.
   B. Fittings: Elbows, returns, and wall bracket components: stamp saddles and end caps.
      1. Manufacturers: Wagner Companies, Sharpe Products or approved equal.
   C. Mounting: brackets and flanges, with steel inserts for casting in concrete. Prepare backing plate for mounting in wall construction.
   D. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
   E. Splice Connectors: Steel concealed spigots.
   F. Shop and Touch-Up Primer: SSPC Paint 15, Type 1, red oxide.
   G. Interior locations, Shop Painting: refer to Section 09 00 00 - Painting and Coating.
   H. Exterior locations, Galvanized: ASTM A123; minimum 2.0 oz/sq ft coating thickness; galvanize after fabrication.
   I. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic zinc rich.
2.2 FABRICATION
A. Fit and shop assemble components in largest practical sizes for delivery to site.
B. Fabricate components with joints tightly fitted and secured. Furnish spigots and sleeves to accommodate site assembly and installation.
C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
E. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations not encouraging water intrusion.
F. Interior Components: Continuously seal joined pieces by continuous welds.
G. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
H. Accurately form components to suit stairs and landings, to each other and to building structure.
I. Accommodate for expansion and contraction of members and building movement without damage to connections or members.

PART 3 EXECUTION

3.1 EXAMINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Verify field conditions are acceptable and are ready to receive work.
C. Verify concealed blocking and reinforcement is installed and correctly located to receive wall-mounted handrails.

3.2 PREPARATION
A. Supply items required to be cast into concrete, embedded in masonry, or placed in partitions with setting templates, to appropriate sections.

3.3 INSTALLATION
A. Install components plumb and level, accurately fitted, free from distortion or defects.
B. Anchor railings to structure with anchors. See Structural.
C. No field welds on shop-finished products.
D. Use flush countersunk fastenings for bolts and screws.

3.4 ERECTION TOLERANCES
A. Section 01 40 00 - Quality Requirements: Tolerances.
B. Variation From Plumb: none.
C. Maximum Offset From Alignment: 1/16".

3.5 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY
A. Section includes structural floor, wall, and roof framing; floor, wall, and roof sheathing; preservative treatment of wood; fire retardant treatment of wood; miscellaneous framing and sheathing; backing boards; and concealed wood blocking for support of toilet and bath accessories, wall cabinets, and wood trim.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

E. Related Sections:
   1. Section 01 45 23 – Testing and Inspection Services.
   2. Section 06 20 00 - Finish Carpentry.

1.2 REFERENCES
A. American National Standards Institute:
   1. ANSI A135.4 - Basic Hardboard.
   2. ANSI A208.1 - Mat-Formed Wood Particleboard.

B. American Wood-Preservers’ Association:
   1. AWPA C1 - All Timber Products - Preservative Treatment by Pressure Process.
   2. AWPA C20 - Structural Lumber - Fire-Retardant Treatment by Pressure Processes.

C. ASTM International:


F. National Lumber Grades Authority: NLGA - Standard Grading Rules for Canadian Lumber.


K. West Coast Lumber Inspection Bureau: WCLIB - Standard Grading Rules for West Coast Lumber.

L. Western Wood Products Association: WWPA G-5 - Western Lumber Grading Rules.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit technical data on wood preservative materials, and application instructions.

C. Moisture Readings: submit three copies of moisture content readings for framing materials enclosed in walls and roof framing.

D. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components. All adhesives must conform to the South Coast Air Quality Management District Rule 1168 and all sealants must conform to Bay Area Air Quality Management District – Regulation 8, Rule 51.

E. Urea Formaldehyde: Include manufacturer’s literature stating that no plywood or sheathing components contain added urea formaldehyde.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the following:

B. Surface Burning Characteristics: Fire Retardant Treated Materials: Maximum 25/450 flame spread/Smoke developed index when tested in accordance with ASTM E84.

C. Apply label from agency approved by authority having jurisdiction to identify each fire retardant treated material.

E. Moisture Content: take moisture readings of lumber and plywood prior to enclosure in wall and ceiling assemblies.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Protect framing and sheathing materials from excessive exposure to moisture.
PART 2 PRODUCTS

2.1 LUMBER MATERIALS
A. Lumber Grading Rules: WCLIB. Refer to the General Structural Notes on the drawings.
B. Beam, joist, purlin and stiffener roof framing: Refer to the General Structural Notes, 19% maximum moisture content, kiln dried.
C. Studding, plates, and misc. light framing: Refer to the General Structural Notes, 19% maximum moisture content.
D. Tropical woods will not be accepted unless FSC-certified.

2.2 SHEATHING AND UNDERLAYMENT MATERIALS
A. Refer to the General Structural Notes on the drawings.
B. Telephone and electrical panel boards: ¾” plywood, CDX, fire treated.

2.3 FIREBLOCKING AND DRAFTSTOPPING
A. Fireblocking: Solid lumber nominal 2 inches thick, structural wood panel, or particleboard.
B. Draftstopping: Gypsum board or plywood.
   1. Gypsum board, 1/2-inch thick.

2.4 ACCESSORIES
A. Fasteners and Anchors:
   1. As listed in the General Structural Notes on the drawings.
   2. Fasteners: Hot dipped or Electro galvanized steel for high humidity, Z-Max or other special coating for treated wood locations, unfinished steel elsewhere.
   3. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.
B. Structural Framing Connectors: refer to the General Structural Notes on the drawings.
C. Sill Gasket on Top of Foundation Wall or Concrete PT Deck: ¼ inch thick, plate width wide, closed cell polyethylene foam from continuous rolls; Dow, Owens Corning, ProtectoWrap, Reflectix, Inc., or equal.
D. Sheathing Glue: EWA AFG-01, waterproof of water base, air cure type, cartridge dispensed.
E. Building Paper: refer to Section 07 27 00 - Air Barriers and Water-Resistive Barriers.

2.5 FACTORY WOOD TREATMENT
A. Wood or Plywood: Water borne preservative treatment for lumber and plywood in conditions not subject to soil, weather, and/or continuous water contact to be sodium borate treatment, AWPA C31 for lumber and C9 for plywood.
B. Wood exposed to soil, weather and/or water: ACQ (Alkaline Copper Quat) or CA (Copper Azole) water borne preservative by Chemical Specialties, Inc. or alternate manufacturer approved by the Architect of arsenic and/or chromium free wood preservative. Recommended retention of 0.25 lb./cu. ft. for above ground applications, and 0.042 lb./cu. ft. for ground or concrete contact.

C. Moisture Content After Treatment: Kiln dried (KD AT).
   1. Lumber: Maximum 19 percent.
   2. Structural Panels: Maximum 15 percent.

PART 3 EXECUTION

3.1 FRAMING
   A. Set structural members level and plumb, in correct position.
   B. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.
   C. Place horizontal members, crown side up.
   D. Construct load bearing framing and curb members full length without splices.
   E. Double members at openings as noted in the General Structural Notes on the drawings. Space short studs over and under opening to stud spacing.
   F. Construct double joist headers at floor and ceiling openings and under wall stud partitions parallel to floor joists. Frame rigidly into joists.
   G. Place sill gasket directly on concrete foundation. Puncture gasket clean and fit tight to protruding foundation anchor bolts.
   H. Coordinate installation of plywood decking, glue laminated structural units, and wood joists/stiffeners.
   I. Curb roof openings except where prefabricated curbs are provided. Construct curb members of solid wood sections. Form corners by alternating and lapping side members.
   J. Coordinate curb installation with installation of decking and support of deck openings.

3.2 SHEATHING
   A. Install sheathing perpendicular to framing members, with ends staggered over firm bearing. On sloped surfaces, lay sheathing with tongue upwards.
   B. Engage plywood tongue and groove edges. Allow expansion space at edges and ends.
   C. Attach sheathing with adhesive and fasteners per the General Structural Notes on the drawings.
   D. Provide solid wood blocking at edges of sheets between supporting framing members.
   E. Cut roof sheathing to accommodate roof drains and flanges.
3.3 FIREBLOCKING AND DRAFTSTOPPING
A. Install fireblocking to cut off concealed draft openings.
   1. Concealed Framed Wall and Furred Spaces: Install fireblocking vertically at floor and ceiling levels and horizontally at maximum 10 feet on center.
   2. Connections Between Horizontal and Vertical Spaces: Install fireblocking between vertical walls and partitions and the following:
      a. Horizontal floor and roof framing.
      b. Soffits, dropped ceilings, cove ceilings and other horizontal concealed spaces.
   3. Stairs: Install fireblocking between stair stringers at top and bottom of each run.

3.4 QUALITY ASSURANCE
A. Special Inspection: Refer to the General Structural Notes on the drawings for inspection of structural wood shear walls and attachments comprising the seismic force resisting system.

3.5 JOBSITE WASTE REDUCTION
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
F. Collect cut-offs and scraps and place in designated area for recycling.
G. Implement cut lists, prepare accurate materials lists, and implement jobsite efficiencies to reduce jobsite waste.

3.6 SITE APPLIED WOOD TREATMENT
A. Brush-apply two coats of preservative treatment on pressure-treated wood subject to site-sawn cuts.
B. Allow preservative to dry prior to erecting members.

3.7 TOLERANCES
A. Section 01 40 00 - Quality Requirements: Tolerances.
B. Framing Members: ¼” from indicated position, maximum.
C. Surface Flatness of Floor: ¼” in 10 feet maximum, and ½” in 30 feet maximum.
3.6 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.

B. Where possible, give preference to suppliers who take back waste for re-use or recycling.

C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.

D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.

E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.

F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
Abbey Ridge Apartments Renovations

Contract No. TC2002931

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Interior finish carpentry items: standing and running wood trim, moldings, and finish hardware installation.
   2. Exterior finish carpentry items: wood window and door trim, exterior decking.
   3. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

B. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

C. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

D. All materials/products to have no added urea formaldehyde (NAUF).

E. Related Sections:
   1. Section 06 10 00 – Rough Carpentry.
   2. Section 06 61 16 – Solid Surface Countertop
   3. Section 08 16 00 – Composite Doors.
   4. Section 08 71 00 – Door Hardware.
   5. Section 09 90 00 – Painting and Coating.
   6. Section 12 35 30 – Casework.

1.2 REFERENCES

A. American National Standards Institute:
   1. ANSI A135.4 – Basic Hardboard.
   2. ANSI A156.9 – Cabinet Hardware.
   3. ANSI A208.1 – Mat-Formed Wood Particleboard.
   4. ANSI A208.2 – Medium Density Fiberboard for Interior Use


C. ASTM International:

E. American Wood-Preservers’ Association: AWPA C1 - All Timber Products - Preservative Treatment by Pressure Process.


J. National Fire Protection Association:


L. Window and Door Manufacturers Association: WDMA I.S.4 - Water-Repellent Treatment for Millwork.


1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories, to minimum scale of 1-1/2 inch to 1 ft.

C. Product Data:
   1. Submit data on fire retardant treatment materials and application instructions.
   2. Submit data on attachment hardware and finish hardware.

D. Urea Formaldehyde: Include manufacturer’s literature stating that no particleboard, plywood, OSB, MDF or other applicable wood products contain added urea formaldehyde.

E. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components. All adhesives must conform to the South Coast Air Quality Management District Rule 1168 and all sealants must conform to Bay Area Air Quality Management District – Regulation 8, Rule 51.

F. Samples:
   1. Submit two samples of MDF trim 10 inch long.
   2. Submit two samples each of prefinished paneling, hardware items, and shop finishes.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with AWI (Architectural Woodwork Institute), Custom Grade for opaque/painted finishes, and Premium Grade for transparent finishes.

B. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
1.5 QUALIFICATIONS
Fabricator: Company or individual specializing in fabricating Products specified in this section with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
B. Protect work from moisture damage.

1.7 FIELD MEASUREMENTS
Verify field measurements prior to fabrication.

1.8 SEQUENCING
Sequence work to ensure utility connections are achieved in orderly and expeditious manner.

1.9 COORDINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Coordinate work with installation of associated and adjacent components.

PART 2 PRODUCTS

2.1 GENERAL
A. Moisture content of finish woods not more than 9% when delivered to the building.
B. Surface quality of the wood: Contractor shall take care in selecting the best face and edge of each piece, and consider its use and location. Materials shall have no visible milling or planing marks.

2.2 MATERIALS
A. All materials and assemblies are to be in accordance with reference AWI Manual “Premium Grade” for transparent finished items and “Custom Grade” for opaque (painted) finished items except as otherwise modified. Tropical woods will not be accepted unless FSC-Certified.
B. Interior MDF Mouldings:
   1. Paint Grade: Formaldehyde-free Medium Density Fiberboard (MDF). Profiles as indicated.
   2. Finish: Per Section 09 90 00.
   3. Window sill at all locations, sill and apron: Pre-primed 5/4 x stock for sill, 1/2” x 4” apron.
   4. Door & window casework: Pre-primed 1/2” x 4”.
C. Plywood:
   1. In accordance with referenced AWI, PS 1-74, and the like, Douglas Fir.
D. Adhesive for woods:
1. Interior woodwork: Low-VOC FS MMM-A-125C, Type II, water and mold resistant. Use ASTM D 3110 dry-use type for laminated and finger-jointed members, certified in accordance with ASTM C557 and complying with required VOC regulations, water-based contact cement and water-based construction adhesive.


2.3 ACCESSORIES
A. FABRICATION Fasteners: Of size and type to suit application as required by the Building Code or as approved by the Architect. All rough hardware subject to moisture to be hot-dipped galvanized.
B. Wood Filler: Oil base, low VOC, tinted to match surface finish color.

2.4 FABRICATION
A. Fabricate to AWI Custom or Premium standards per Quality Assurance provisions above.
B. Shop assemble work for delivery to site, permitting passage through building openings.
C. When necessary to cut and fit on site, fabricate materials with ample allowance for cutting. Furnish trim for scribing and site cutting.
D. Workmanship to be “First-Class Workmanship”
   1. Finish exposed surfaces smooth, free from tool and machine marks.
   2. Use concealed fastening wherever possible.
   3. Kerf backs of members more than 5" wide, or more that 1" net thickness.
   4. Joints: Make tight and form to conceal shrinkage, as far as possible.
E. Fitting and Adjustment: Regardless of tolerances specified for individual components, forming proportions of working assemblies, make final fitting and adjustments as required.

2.5 SHOP FINISHING
A. Sand work smooth and set exposed fasteners.
B. Apply wood filler in exposed fastener indentations.
C. On items to receive transparent finishes, use wood filler matching surrounding surfaces and of types recommended for applied finishes.
D. Finish work in accordance with Section 09 90 00 for transparent and opaque finishes as noted on the drawings.
E. Seal, and finish exposed to view surfaces.
F. Seal internal surfaces and semi-concealed surfaces.
G. Prime paint or seal surfaces in contact with cementitious materials.
PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Verify adequacy of backing and support framing.
C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 INSTALLATION

A. Install work in accordance with AWI Custom and Premium quality standard as noted in Quality Assurance provisions above.
B. Set and secure materials and components in place, plumb and level.
C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
D. Install interior wood trim with nails at 16 inches on center. Set nail heads and follow with putty to flush with surface. Carefully select the color of the putty to match the background color of the wood. Where wood color varies, select a putty color, or add stain to the putty, to match the wood color. It is not acceptable to use one putty color for all areas if the wood color varies.
E. Install prefinished paneling with full bed contact adhesive applied to substrate.
F. Preparation For Site Finishing (opaque):
   2. Site Finishing: Refer to Section 09 90 00.
   3. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.3 INSTALLATION OF WORK FROM OTHER SECTIONS

A. Installation of solid core doors: For all pre-hung or field-hung solid core doors, the following special procedure shall apply. It is required that all screws on the top hinge penetrate the wall framing behind the door frame. Replace the screws pre-packaged with the hinge with flat head screws, same finish as the pre-packaged screws, with sufficient length to penetrate into the wall framing. This is required to prevent the settling of the door away from the frame at this hinge. Architect will inspect this procedure on a spot basis during installation.
B. Installation of work from other Sections: Install all items provided in other Sections and not specifically installed by other trades. Conform to finish carpentry installation requirements specified in this Section. Items to be installed include but are not limited to those items listed in "Related Work".

1. Install finish hardware specified in Section 08 71 00. Installation by skilled mechanics. Conform to hardware manufacturer's instructions, and to Code requirements.

2. Adjust moveable parts to operate smoothly at time of acceptance. Make further adjustments as necessary during warranty period.

3. Replace hardware that has been damaged during installation.

4. Make mortises accurately to exactly receive hardware. Depth of mortises to be such that hardware is flush with finished surface.

5. Place doorstops and holders to allow maximum swing. Doors not to contact anything by stop.

6. Placement: locate hardware on doors as noted in Section 08 71 00.

7. After hardware installation, clean all surfaces of mortar, paint and other contaminants. Lubricate moving parts, or replace parts with cannot be lubricated and do not function properly.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.

B. Where possible, give preference to suppliers who take back waste for re-use or recycling.

C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.

D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.

E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.

F. Collect cut-offs and scraps and place in designated area for recycling.

3.5 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation from Indicated Position: 1/16 inch.

C. Maximum Offset from Alignment with Abutting Materials: 1/32 inch.
PART 1 GENERAL

1.1 GENERAL REQUIREMENTS
The work under this section shall conform to the requirements of Division 00 (Procurement and Contracting Requirements), Division 01 (General Requirements)—including all General Requirements, all Supplemental/Special Requirements, and all governmental requirements, as identified in Division 00 and 01 of this Project Manual.

1.2 WORK INCLUDED
A. Wood preservative -treatment of indicated material.
B. Work includes, but is not limited to:
   1. Wood plates and members resting on or embedded in concrete or masonry not in direct contact with soil or water.
   2. Wood exposed to weather and embedded-in or fastened to concrete.
   3. Other wood materials exposed to moisture, weather or dampness where indicated in drawings.

1.3 RELATED WORK
Coordinate related work specified in other parts of the Project Manual, including but not limited to the following:
1. Section 03 30 00 – Cast In Place Concrete
2. Section 06 10 00 – Rough Carpentry
3. Section 07 45 00 – Rainscreen System

1.4 REFERENCE STANDARDS
A. American Wood Preserver's Association (AWPA): Standard Specifications and AWPA C2 (lumber) and C9 (plywood).
B. UBC Standard 25-12.
C. ASTM D 1760 – Specification for Pressure Treatment of Timber Products.

1.5 STAMP
All pressure treated products shall bear the stamp of an independent quality control agency. The stamp shall identify treatment facility, date of treatment, treatment method, dryness, and quality control agency. Approved agencies include: A.W.P.I., Southwestern laboratories, A.W. Williams, and California Lumber Inspection Service.

1.6 TREATED PRODUCT DELIVERY, STORAGE, AND HANDLING
In accordance with Section 06 10 00 and following: Keep covered and dry until used - Store treated lumber with spacers between.
PART 2 PRODUCTS

2.1 MATERIALS AND METHODS

A. Wood or plywood: Material to be pressure treated specified/Section 06 10 00 and as shown on drawings.
   1. Pressure treatment: Where indicated as “treated” on drawings or as required by code, include bottoms of wood plates in contact with concrete or masonry walls, earth supported or exposed at exterior; rooftop curbs, cants, and embedded wood nailers in concrete walls.
   2. Treatment to consist of using Alkaline Copper Quaternary (ACQ). Ammoniacal Copper Arsenate (ACA) may be used as an alternative (by written substitution request, and approved by Architect), while Ammoniacal Copper Zinc Arsenate (ACZA) may not. Borate treatment is allowed for wood used for rainscreen furring and for wall plates. Pressure treatment of required lumber in accordance with AWPA Standard C-2 to retention of 0.25 lb. per cu. ft. (above ground condition of use). Water-borne preservatives to be in accordance with AWPA standards and specifications, Article 9.09., particularly 9.09.3(4). Faces of exposed decking material shall be free of incising marks.
   3. Wood preservative surface application: Manufactured by Chemical Specialties or approved. Use clear where application will be exposed to view.

B. Factory pressure treat all wood, plywood, or lumber indicated to be treated in accordance with the following APWA Standards:
   1. When using Alkaline Copper Quaternary (ACQ), refer to manufacturer’s recommendations for wood to be used in an above ground or in ground application.
   2. When using Ammoniacal Copper Arsenate (ACA)
      a. Above ground/out of weather use: LP-2, with ACA to a retention of 0.25lb./cu. ft.
      b. In contact with ground/in weather or embedded in concrete in the ground: LP-22, with ACA to 0.40 lb./cu. ft.

2.2 MOISTURE CONTENT

Season after treatment to moisture content required for non-treated materials - refer to Section 06 10 00.

PART 3 EXECUTION

3.1 INSTALLATION

Materials specified this Section installed under Section 06 10 00.

3.2 FIELD CUTS

Treat field cut ends and rippings with heavy brush coat of CCA in order to comply with AWPA M4.

3.3 FIELD QUALITY CONTROL

A. Verify that treated materials are installed in designated areas and that type designations listed in Part 2 match with field conditions and use.
B. Verify presence of appropriate stamp and grademark on installed materials.

3.4 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
SECTION 06 61 16
QUARTZ COUNTERTOPS

PART 1 GENERAL

1.1 SUMMARY
A. Work includes but is not limited to the furnishing and installation of quartz countertops for all the kitchens and bathrooms in all residential apartments and countertops in the Office building.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

E. Related Sections:
   1. Section 06 10 00 – Rough Carpentry.
   2. Section 06 20 00 – Finish Carpentry.
   3. Section 09 90 00 – Painting and Coating
   4. Section 12 35 30 – Casework.

1.2 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop drawings: Provide Submit fully dimensioned shop drawings showing countertop layouts, joinery, terminating conditions, substrate construction, cutouts and holes.

C. Product data: Submit copies of manufacturer’s product data, performance data, installation, and maintenance instructions. Provide color chart or samples as required for Owner/Architect's selection/confirmation of colors.

D. Samples: Submit selection and verification samples for each color, pattern, and finish required.

E. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components. All adhesives must conform to the South Coast Air Quality Management District Rule 1168 and all sealants must conform to Bay Area Air Quality Management District – Regulation 8, Rule 51.

F. Submit certification from manufacturer stating the percentage of recycled content material, identifying post-consumer and post-industrial contents.
1.2 Reference Standards
P. NEMA LD-3: High Pressure Decorative Laminates.
R. SCAQMD Rule 1168: Adhesive and Sealant Applications.
S. UL 2818: GREENGUARD Certification Program for Chemical Emissions for Building Materials, Finishes and Furnishings.

1.3 QUALITY ASSURANCE
A. Section 00 73 13 - Supplementary Conditions.
   1. Fabricator Qualifications: Minimum of three years documented experience in fabricating quartz countertops similar in scope and complexity to this Project. Currently certified by the manufacturer as an acceptable fabricator.
   2. Installer Qualifications: Minimum of three years documented installation experience for projects similar in scope and complexity to this Project, and currently certified by the manufacturer as an acceptable installer.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Section 01 60 00 - Product Requirements.
B. Deliver fabricated work in protective packing to minimize any potential damage to work prior to installation.
C. Do not deliver any materials to site until areas are ready to receive them for installation.
D. Store all materials indoors in a dry area away from extreme temperatures and sunlight.
E. Handle all quartz fabricated materials in such a way as to prevent damage to other finished surfaces.

1.4 PROJECT CONDITIONS
A. Field Measurements: Verify actual measurements and openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.
B. Adhesive: Acclimatize adhesives to occupancy room temperatures with maximum temperature not to exceed 75 degrees F.

1.5 WARRANTY
A. The manufacturer shall provide a limited warranty that the materials provided under this section shall not develop visible defects or otherwise fail due to manufacturing defects within a period of ten (10) years from the date of acceptance by the Owner.

PART 2 PRODUCTS

2.1 QUARTZ COUNTERTOP
A. Listed Manufacturer: DDN Interior Supply.
B. Other Manufacturers:
   1. Basix International, Basix Quartz Series
C. Material: Cast, mineral-filled, homogeneous, non-porous, decorative surface alloy comprised of polyester and acrylic components conforming to ISSFA-2-01.
D. Finish: Surface finish shall be manufacturer’s standard finish, or an appropriate finish selected by the owner/architect. Fabricator will supply a sample of the finish to be approved by the architect prior to fabrication of the product.
E. Color: selected by Architect/Owner from manufacturer's Stock color palette.
F. Horizontal Surfaces;
   1. Kitchen Countertop: Horizontal surfaces of 2cm thick material with 4cm built-up edge. Provide kitchen countertops using manufacturer’s approved adhesive.
   2. Vanity Top: Horizontal surfaces of 2cm thick material with 4cm built-up built-up edge. Provide vanity tops using manufacturer’s approved adhesive.
   3. Backsplashes: 4” vertical backsplash and side splash surfaces of 1/2” thick material using manufacturer’s approved adhesive.
2.2 ACCESSORY PRODUCTS
A. Sealants: 100% silicone to be matched to quartz sheet color.
B. Adhesives:
   1. Flexible adhesives shall be 100% silicone and shall be matched to quartz sheet color.
   2. Rigid structural adhesive shall be manufacturer’s seam adhesive.
C. Provide all product types from the same manufacturer for consistency and uniformity.

PART 3 EXECUTION

3.1 EXAMINATION
A. Prior to all work of this section, carefully inspect work of all other trades and verify conditions as complete and satisfactory for appliance installation.
B. Field verify dimensions prior to fabrication.
C. Coordinate requirements for blocking and structural supports to ensure adequate means for installation.
D. Discrepancies: In the event of discrepancy, immediately notify Architect. Do not proceed until all discrepancies have been fully resolved.

3.2 FABRICATION
A. Fabrication shall be performed by an ISFA accredited fabricator or who has demonstrated proficiency in the types of work required by this project.
B. Shop fabricated components to greatest extent practicable to sizes and shapes indicated, in accordance with approved shop drawings.
C. Special techniques: Comply with the manufacturer’s recommendations for the use of specific types of stationary equipment and stationary tools. Site fabrication and finishing processes shall be in accordance with the manufacturer’s recommendations for working with the quartz fabrication materials.
D. Form seams between components, unless otherwise indicated, using quartz manufacturer’s standard seam adhesive. Adhesive shall be color coordinated to match quartz material color and shall form inconspicuous seams.
E. Provide cutouts for plumbing fittings and bath accessories as indicated on the drawings and as recommended by the equipment and quartz manufacturer.
F. Cut and finish component edges with clean, sharp returns. Route radii and contours to exact template sizes. Repair or reject defective or inaccurate work

3.3 INSTALLATION
A. Install in accordance with manufacturer’s written instructions and approved shop drawings.
B. Prepare substrate, plane, plumb and level, secure in place with all fasteners set flush. Shim supporting structure as required to provide an acceptable surface for attaching finish materials.

C. Install components, plane, plumb and level, in accordance with approved shop drawings and product data.

D. Pre-fit finish material in place. Scribe material as required to provide proper fit with adjacent materials.

E. Provide additional support for material seams in both horizontal and vertical locations. Separation/release paper shall be provided between all supports and seams to prevent direct adhering of finish material to substrate.

F. Form field joints using manufacturer’s recommended adhesive, with inconspicuous joints in finished work.

G. Prior to installing quartz fabrication, make sure that substrate is clean and dry. Place silicone “dabs” on substrate in accordance with manufacturer’s recommendations.

H. Provide backsplashes and sidesplashes as indicated on the drawings. Adhere backsplashes and sidesplashes to countertops using manufacturer’s recommended color matched flexible adhesive.

I. Keep components and hands clean during installation. Remove adhesives, sealants and other stains from the work as they occur.

J. During installation, protect surfaces of quartz fabrications from damage until all components have been installed.

K. Make plumbing connections to sinks in accordance with Division 15, Mechanical. Do not over tighten connections that are in direct contact with or attached to quartz fabrications.

3.4 PROTECTION OF INSTALLED WORK

A. After fabrication and installation, protect surfaces of quartz fabrications from damage until accepted by the Owner. Replace any damaged material prior to acceptance.

3.5 CLEANING FOR QUARTZ FABRICATION

A. After installation, all surfaces shall be cleaned to remove contaminants. After cleaning, all work shall be protected against damage until it is accepted by the Owner. Thereafter, it shall be the responsibility of the Owner to maintain protection and provide final cleaning.

3.6 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.

B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.

D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.

E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.

F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY
A. Section includes: Composite decking at residential buildings & office building.
B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.
C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.
D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.
E. All materials/products to have no added urea formaldehyde (NAUF).
F. Related Sections:
   1. Section 06 10 00 – Rough Carpentry.

1.2 REFERENCES
D. ASTM D 570: Water Absorption of Plastics
E. ASTM D 1761: Mechanical Fasteners in Wood
F. ASTM D -1413-99: Test method for Wood Preservatives by Laboratory Soilblock Cultures

1.3 DESIGN/PERFORMANCE REQUIREMENTS
A. Structural Performance:
   1. Deck: Uniform Load – 100lbf/sq.ft.
   2. Tread of Stairs: Concentrated Load: 750 lbf/sq.ft., and 1/8” max. deflection with a concentrated load of 300 lbf on area of 4 sq. in.
B. Fire-Surface Burning Characteristics per ASTM E-84.
1.4 SUBMITTALS
   A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
   B. Product Data: Indicate sizes, profiles, surface style, and performance characteristics.
   C. Urea Formaldehyde: Include manufacturer’s literature stating that no particleboard, plywood, OSB, MDF or other applicable wood products contain added urea formaldehyde.
   D. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components. All adhesives must conform to the South Coast Air Quality Management District Rule 1168 and all sealants must conform to Bay Area Air Quality Management District – Regulation 8, Rule 51.
   E. Samples: For each product specified, one sample representing actual product color, size, and finish.

1.5 QUALIFICATIONS
   Fabricator: Company or individual specializing in fabricating Products specified in this section with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING
   A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
   B. Store products on a flat and level surface. Adjust support blocks accordingly.
   C. When stacking bundles, supports should start approximately 8” from each end and be spaced approximately 2ft on center. Supports should line up vertically/perpendicular to the decking product.
   D. Do not stack decking more than 14 bundles.
   E. Keep material covered using the provided bundle cover until time of installation.

1.7 FIELD MEASUREMENTS
   Verify field measurements prior to fabrication.

1.8 SEQUENCING
   Sequence work to ensure utility connections are achieved in orderly and expeditious manner.

1.9 WARRANTY
   A. Provide manufactures warranty against rot, decay, splitting, checking, splintering, fungal damage, and termite damage for a period of 25 years.
   B. Provide the fade and stain warranty against food staining and fading for a period of 25 years.

1.10 COORDINATION
   A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Coordinate work with installation of associated and adjacent components.

PART 2 PRODUCTS

2.1 MATERIALS
A. Listed Manufacturer: Trex Company, Winchester, VA.
B. Other Manufacturers:
C. Trex Select Composite Decking consisting of recycled Linear Low Density Polyethylene (LLDPE) and recycled wood extruded into shapes and sizes as follows:
D. Decking Boards; 0.82” x 5.5”.
E. Lengths – 12, 16, and 20 feet.
F. Color – To be specified by Owner/Architect from standard list of colors.
G. Physical Properties:
   1. Flame spread: 85.
   2. Thermal Expansion: 1.9 x 10-5 inch/inch/degree.
   3. Moisture Absorption: < 1.2%
   4. Screw Withdrawal: 388 lbs/in
   5. Fungus Resistance: no decay
   7. Compression Parallel: 1588 psi
   8. Compression Perpendicular: 1437 psi
   9. Bending Strength: 3280 psi
  10. Shear Strength: 1761 psi
  11. Modulus of Elasticity: 400,000psi
  12. Modulus of Rupture: 3750 psi

2.2 ACCESSORIES
A. Fasteners: manufacturer’s hidden fasteners.
B. Wood Filler: Oil base, low VOC, tinted to match surface finish color.

2.3 FABRICATION
A. When necessary to cut and fit on site, fabricate materials with ample allowance for cutting. Furnish trim for scribing and site cutting.
B. Workmanship to be “First-Class Workmanship”
   1. Finish exposed surfaces smooth, free from tool and machine marks.
   2. Use concealed fastening wherever possible.
   3. Kerf backs of members more than 5” wide, or more that 1” net thickness.
   4. Joints: Make tight and form to conceal shrinkage, as far as possible.
C. Fitting and Adjustment: Regardless of tolerances specified for individual components, forming proportions of working assemblies, make final fitting and adjustments as required.
PART 3 EXECUTION

3.1 EXAMINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Verify adequacy of backing and support framing.
C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 INSTALLATION
A. Set and secure materials and components in place, plumb and level.
B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
C. Preparation For Site Finishing (opaque):
   2. Site Finishing: Refer to Section 09 90 00.
   3. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.3 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
F. Collect cut-offs and scraps and place in designated area for recycling.

3.4 ERECTION TOLERANCES
A. Section 01 40 00 - Quality Requirements: Tolerances.
B. Maximum Variation from Indicated Position: 1/16 inch.
C. Maximum Offset from Alignment with Abutting Materials: 1/32 inch.

END OF SECTION
1.1 SUMMARY
   A. Section includes supplying and installing pultruded guardrail and handrail in compliance with IBC 2015.
   B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.
   C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.
   D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.
   E. Related Sections:
      1. Section 06 10 00 – Rough Carpentry.
      2. Section 03 30 00 - Cast-in-Place Concrete
      3. Section 09 90 00 – Painting and Coatings.

1.2 REFERENCES
   A. ASTM International:
      1. ASTM D-638-Tensile Properties of Plastics.
      3. ASTM D-2344-Apparent Interlaminar Shear Strength of parallel Fiber Composites by Short Beam Method.
      5. ASTM D-84-Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS
   A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
   B. Product Data: Submit data on products describing size, finish, structural design data, structural properties data, and attachment methods.
   C. Shop Drawings: Submit manufacturer’s shop drawings clearly showing material sizes, types, styles, part or catalog numbers, complete details for the fabrication of and erection of components including, but not limited to, location, lengths, type and sizes of fasteners, clip angles, member sizes and connection details.
D. Samples: Submit four samples of each specialty product where Architect is required to make a finish selection, illustrating color and finish choices.

E. Manufacturer's Installation Instructions including certificates of compliance, test reports as applicable, and design calculations for systems not sized or designed in the contract documents, sealed by a Professional Engineer.

1.4 COORDINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate the Work with deck and balcony construction.

1.5 QUALITY ASSURANCE
A. Installer Qualifications: Company and employees specializing in work of this Section, with minimum 5 years documented experience.

B. Manufacturer shall offer a minimum 3 year limited warranty on all FRP products against defects in materials and workmanship.

C. Manufacturer shall provide proof of certification from at least two other quality assurance programs for its facilities or products (UL, DNV, ABS, USCG, AARR).

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING
A. All materials are to be new and delivered to the site in an undamaged condition. In the event of damage, immediately make repairs and/or replace as necessary to the approval of the Owner’s Representative and at no additional cost to the Owner.

B. Handle all components carefully to prevent damage during shipment. Brace and insulate to prevent abrasion, cracking, chipping, bending, twisting, scratching, other deformations and other types of damage. Adhesives, resins and their catalysts are to be stored in dry indoor storage facilities between 70 and 85 degrees Fahrenheit (21 to 29 degrees Celsius) until they are required.

PART 2 PRODUCTS
2.1 FIBERGLASS RAILINGS
A. Listed manufacturer: GLASRAIL® Structural Pultruded Fiberglass Railing System

B. Section 01 25 13 – Product Substitution Procedures.

C. All posts and rails are to be FRP structural shapes manufactured by the pultrusion process. The structural shapes shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions specified in the Contract Documents.

D. Fiberglass reinforcement shall be a combination of continuous roving, continuous strand mat, and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.

E. Resins shall be isophthalic polyester with chemical formulation necessary to provide corrosion resistance, strength & other physical properties as required.
F. All finished surfaces of FRP items and fabrications shall be smooth, resin-rich, free of voids and without dry spot, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.

G. All pultruded structural shapes shall be further protected from ultraviolet (UV) attack with 1) integral UV inhibitors in the resin, 2) a synthetic surfacing veil to help produce a resin rich surface, and 3) an appropriate UV resistant coating for outdoor exposures.

H. All FRP products shall have a tested flame spreading rating of 25 or less per ASTM E- 84 Tunnel Test.

I. Top and bottom rails are to be 1.75” x 0.125” (44.4mm x 3.2 mm) wall square tube, the posts are to be 2.1125” x 0.1875” (53.9 mm X 4.8 mm) wall square tube and kickplate is to be ½” deep and 4” wide with two reinforcing ribs.

J. The completed handrail installation shall meet the following load requirements with a minimum factor of safety of 2.0:
   1. Concentrated Load: 200lb (891 N) applied in any direction at the top rail.
   2. Uniform Load: 50lb/lf (730.5 N/m) of the top rail in any direction.
   3. Loads are assumed not to act concurrently.

K. All fasteners used in the railing system are to be 316 SS. Rivets to be 18-8 SS.

L. Pultruded structural shapes used in the handrail and guardrail are to have the minimum longitudinal mechanical properties listed below:

<table>
<thead>
<tr>
<th>Property</th>
<th>ASTM Method</th>
<th>Value/Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductivity</td>
<td>C177</td>
<td>4</td>
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<tr>
<td>Coefficient of Linear Exp.</td>
<td>D696</td>
<td>.000006</td>
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</tbody>
</table>

**LONGITUDINAL DIRECTION**

<table>
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<th>Property</th>
<th>ASTM Method</th>
<th>Value/Units</th>
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</thead>
<tbody>
<tr>
<td>Tensile Strength</td>
<td>D638</td>
<td>35,000 psi</td>
</tr>
<tr>
<td>Tensile Modulus</td>
<td>D638</td>
<td>2.5 x 10^6 psi</td>
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<tr>
<td>Flexural Strength</td>
<td>D790</td>
<td>30,000 psi</td>
</tr>
<tr>
<td>Flexural Modulus</td>
<td>D790</td>
<td>2 x 10^6 psi</td>
</tr>
<tr>
<td>Izod Impact</td>
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**TRANSVERSE DIRECTION**

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<th>Value/Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength</td>
<td>D638</td>
<td>10,000 psi</td>
</tr>
</tbody>
</table>
PART 3 EXECUTION

3.1 FABRICATION
A. The handrail post/rail connection is to be fabricated such that the rails are unbroken and continuous through the post without the use of packs or places. The bottom rail is to be installed through the post at the prepared hole made to fit the outside dimensions of the rail. The top rail is to fit into the machined, u-shaped pocket formed into top of the post such that the rail is located at the center of the post. All exposed post corners are to be radiuses to eliminate sharp edges. The rails are to be joined to the post through a combination of bonding and riveting. No sharp protruding edges are to remain after assembly of the handrail. Spacing of the posts shall not exceed 6'-0" (1.83 m).

B. The bases of the posts are to be attached according to the contract drawings. The bases of the posts are to be reinforced to a height of 8.5" (254 mm).

C. To avoid embrittlement at cold temperature and loss of strength at high temperature, PVC or CPVC connectors should not be used as a load-carrying component of the handrail system.

D. All shop fabricated cuts are to be coated with a vinyl ester resin to provide maximum corrosion resistance. Field cuts are to be similarly coated by the contractor in accordance with the manufacturer’s instructions.

3.2 PREPARATION
A. Contractor is responsible for all temporary barricades, enclosures and protection of adjacent property and existing work. These are to be in place before operations are started. Coordinate this work with other work and trades.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION
A. Install plumb and level, securely and rigidly anchored to substrate.

B. Follow manufacturer’s printed instructions, using manufacturer’s standard attachment devices and procedures.

C. Leave product and adjacent area clean and free of defects.

3.4 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials not required for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.

B. Where possible, give preference to suppliers who take back waste for re-use or recycling.

C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.

D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.

E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.

F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section is for stone fiber board insulation for continuous thermal insulation over existing and new exterior wall and roof assemblies.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

E. Related Sections:
1. Section 07 27 00 – Air Barriers and Water-Resistive Barriers.
2. Section 07 45 00 – Rainscreen System
3. Section 07 90 00 – Joint Protection.

1.2 REFERENCES

A. ASTM International:

B. Factory Mutual Global Inc.(FM).

C. Green Guard for Children and Schools Certification

1.3 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Product Data: Submit data on product characteristics, performance criteria, and limitations.
C. Installation: Include manufacturer’s specifications and installation instructions.
D. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components.

1.4 QUALITY ASSURANCE
A. Board Insulation Installer Quality Assurance: Work experience of 5 years minimum with work similar to work of this Section.
B. Wall and Window Installation Mock-Up: The General Contractor will direct the building of a mock-up wall independent of the building envelope for the Architect and Owner to review with all products and trades included in the exterior wall assemblies. At the mock-up wall, all products of the each of the exterior wall assemblies (framing and sheathing, windows, rigid insulation, rainscreen furring, metal flashing, self-adhering membranes, air/water barriers, cladding materials) will be inspected at various stages of installation. This mock-up wall will be evaluated for constructability and weather-tight qualities and may be tested for weather-tight qualities. Modifications, if any, to the exterior wall assemblies resulting from the mock-up will be discussed, documented by the contractor and incorporated into the work. Contractor to coordinate with mock-up required in Section 08 53 00 Plastic Windows and Sliding Glass Doors and in Section 07 21 16 Blanket Insulation.

1.5 DELIVERY, STORAGE AND HANDLING
A. Delivery and Acceptance Requirements:
1. Deliver material in accordance with Section 01 60 00 - Product Requirements.
2. Deliver materials and accessories in insulation manufacture’s original packaging with identification labels intact and in sizes to suit project.
3. Ensure insulation materials are not exposed to moisture during delivery.
4. Replace wet or damaged insulation materials.
B. Storage and Handling Requirements: Store materials off ground in dry location and protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
   1. Store in original packaging until installed.

1.6 COORDINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

1.7 WARRANTY
A. Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not intended to limit other rights Owner may have under Contract Conditions.

PART 2 PRODUCTS

2.1 BOARD INSULATION
A. Listed Manufacturer – Mineral Wool: ROXUL, Inc.
B. Listed Manufacturer - Extruded Polystyrene: Owens Corning.
C. Other Manufacturers:

2.2 COMPONENTS
A. Mineral Wool: Rockboard 80, rigid, mineral wool insulation board to ASTM C612:
   1. Facing: Unfaced.
   2. Thickness: as indicated on the drawings.
   4. Flame Spread: 5 per ASTM E84.
   5. Smoke developed: 10 per ASTM E84.
   6. Thermal Resistance: R value per 1 inch at 75°F: 4.1 h ft² °F/Btu to ASTM C518.
   7. Water Vapor Permeance: 30 perm maximum.
   8. Moisture sorption: 1% maximum to ASTM C1104/C1104M.
   9. Recycled Content: minimum 40% recycled content post-consumer.
   10. Urea-formaldehyde free.
   11. Non-setting, non-staining, acoustically tested.

B. Extruded Polystyrene Insulation: Foamular 150 extruded polystyrene insulation, cellular type, conforming to the following:
   1. Board Size: 24" x 96".
   2. Board Thickness: as required or noted on drawings.
   4. Water Absorption: In accordance with ASTM C272, .10 percent by volume maximum.
8. Locations:
   a. New exterior walls and roof assemblies at maintenance shed and pool equipment house.
   b. Existing roof and ceiling at office.

C. Accessories:
   1. Mechanical fasteners in accordance with insulation manufacturer's written recommendations.
   2. Foundation Sealing Compound: Bitumen sealing compound in accordance with Section [07 90 00 - Joint Sealants].
   3. Adhesive: All-purpose construction adhesive in accordance with insulation manufacturer’s written recommendations.

D. Product shall meet the requirements of California’s practice for testing VOCs from building materials using small chambers, Green Guard for Children and Schools certification can be used as a proxy.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
   B. Verify substrate, adjacent materials, and insulation are dry and ready to receive insulation.

3.2 INSTALLATION
   A. General:
      1. Install insulation in accordance with manufacturer’s written installation instructions.
      2. Install insulation to maintain continuity of thermal protection to building elements and spaces.
      3. Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or penetrating insulation. All voids or gaps should be filled.
   B. Installation of Insulation Board:
      1. Install insulation board using mechanical fasteners in accordance with insulation manufacturer’s written recommendations.
      2. Attach insulation board with 1.5 inches concrete nails and seal with bitumen sealing compound.

3.3 WASTE MANAGEMENT
   A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other
similar programs) where feasible.

B. Where possible, give preference to suppliers who take back waste for re-use or recycling.

C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.

D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.

E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.

F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
SECTION 07 21 16

BLANKET INSULATION

PART 1 GENERAL

1.1 SUMMARY
A. Section includes batt insulation in exterior wall and roof assemblies.
B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for additional requirements.
C. Related Sections:
   1. Section 07 21 13 - Board Insulation.
   2. Section 07 27 00 - Water-Resistive Barriers.
   3. Section 07 84 00 - Firestopping.

1.2 REFERENCES
A. ASTM International:
D. Green Guard for Children and Schools Certification

1.3 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Product Data: Submit data on product characteristics, performance criteria, and limitations.
C. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components.
D. Submit certification from manufacturer stating the percentage of recycled content material, identifying post-consumer and post-industrial contents.
E. Submit certification from manufacturer verifying the location of the manufacturer, including full address and phone number, and list of materials harvested, extracted or recovered within 500 miles of the project site.
1.4 QUALITY ASSURANCE

A. **Wall and Window Installation Mock-Up:** The General Contractor will direct the building of a mock-up wall independent of the building envelope for the Architect and Owner to review with all products and trades included in the exterior wall assemblies. At the mock-up wall, all products of the each of the exterior wall assemblies (framing and sheathing, windows, rigid insulation, rainscreen furring, metal flashing, self-adhering membranes, air/water barriers, cladding materials) will be inspected at various stages of installation. This mock-up wall will be evaluated for constructability and weather-tight qualities and may be tested for weather-tight qualities. Modifications, if any, to the exterior wall assemblies resulting from the mock-up will be discussed, documented by the contractor and incorporated into the work. Contractor to coordinate with mock-up required in Section 08 53 00 Plastic Windows and Sliding Glass Doors and 07 21 13 Board Insulation.

B. Insulation Installed in Concealed Locations Surface Burning Characteristics:

1. Batt Insulation: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.5 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate the Work with Section 07 26 00 for installation of vapor retarder.

PART 2 PRODUCTS

2.1 BATT INSULATION

A. Listed Manufacturer: CertainTeed Corporation, Certapro AcoustaTherm Batt Insulation, unfaced fiberglass batts.

B. Other Manufacturers:

1. Knauf Insulation (EcoBatt).
2. Johns Manville.
3. Owens Corning.
4. Guardian Fiberglass, Inc.
5. Celotex Corporation.

2.2 COMPONENTS

A. Acoustic Batt Wall and Ceiling Insulation:

1. Facing: Unfaced.
2. Thickness: as indicated on the drawings.
3. Flame Spread: maximum 25 per ASTM E 84.
4. Smoke developed: maximum 50 per ASTM E 84.
5. Recycled Content: minimum 25% recycled content post-consumer.
6. Urea-formaldehyde free.

B. Thermal Batt Insulation: ASTM C665; preformed glass or mineral fiber blanket; friction fit, conforming to the following:
1. Thermal Resistance for exterior wall assemblies: R-21 blankets or as otherwise indicated on the drawings.
2. Facing: Unfaced.
3. Flame Spread: maximum 25 per ASTM E 84.
4. Smoke developed: maximum 50 per ASTM E 84.
5. Recycled Content: minimum 25% recycled content post-consumer.
6. Urea-formaldehyde free.

C. Acoustic Sealant:
1. USG, Presstite, Tremco or AC Horn.
2. Non-setting, non-staining, acoustically tested.

D. Securing Pins:
1. Impaling clip of galvanized steel with washer retainer, to be adhered to surface to receive insulation, length to suit insulation thickness, capable of securely and rigidly fastening insulation in place.

E. Product shall meet the requirements of California’s practice for testing VOCs from building materials using small chambers, Green Guard for Children and Schools certification can be used as a proxy.

PART 3 EXECUTION

3.1 EXAMINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Verify substrate, adjacent materials, and insulation are dry and ready to receive insulation.

3.2 INSTALLATION
A. Install in exterior wall spaces without gaps or voids. Do not compress insulation.
B. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
C. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation.
D. For insulation installed in parking garage ceilings, install chicken wire panels around fire sprinkler heads in compliance with NFPA and local standards.
E. Coordinate Work of this section with installation of vapor retarder specified in Section 07 26 00.

3.3 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Refer to Section 01 74 19 for specific requirements.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section includes vapor permeable air and water-resistive barriers (WRB) installed as a drainage plane in exterior wall assemblies and associated accessories.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

E. Related Sections:
   1. Section 07 21 13 – Board Insulation.
   2. Section 07 45 00 – Rainscreen System.
   3. Section 07 62 00 – Sheet Metal Flashing and Trim.
   4. Section 07 90 00 – Joint Protection.
   5. Section 08 53 00 – Plastic (PVC) Windows.

1.2 REFERENCES

A. ASTM International:
   1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   6. ASTM E84; Test Method for Surface Burning Characteristics of Building Materials
   8. ASTM E 1677 - Specification for an Air Barrier (AB) Material or System for Low-Rise Framed Building Walls.

B. AATCC – American Association of Textile Chemists and Colorists:

C. TAPPI:
1. Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area).
2. Test Method T-460; Air Resistance (Gurley Hill Method).

1.3 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Product Data: Submit data on material characteristics, performance criteria, and limitations of each component.
C. Manufacturer's Installation Instructions: Submit preparation, installation requirements and techniques, product storage and handling criteria.
D. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components.

1.4 QUALITY ASSURANCE
A. Qualifications:
   1. Installer shall have experience with installation of similar weather barrier assemblies under similar conditions.
   2. Installation shall be in accordance with manufacturer's installation guidelines and recommendations.

1.5 ENVIRONMENTAL REQUIREMENTS
A. Section 01 60 00 - Product Requirements.
B. Maintain temperature and humidity recommended by materials manufacturers before, during and after installation.

1.6 DELIVERY, STORAGE AND HANDLING
A. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
B. Store weather barrier materials as recommended by system manufacturer.

1.7 SEQUENCING
Sequence Work to permit installation of materials in conjunction with related materials and seals.

1.8 COORDINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Coordinate the Work of this section with sections referencing this section.

PART 2 PRODUCTS

2.1 MANUFACTURER AND PRODUCT
A. Manufacturer, Product:
1. Dupont Tyvek HomeWrap and related assembly components.

B. Performance Criteria:
1. Air Penetration: <.004 cfm/ft² at 1.57 psf, when tested in accordance with ASTM E2178. Type I per ASTM E1677.
3. Water Penetration Resistance: 250 cm when tested in accordance with AATCC Test Method 127.
4. Basis Weight: 1.8 oz/yd², when tested in accordance with TAPPI Test Method T-410.
5. Air Resistance: 1200 seconds, when tested in accordance with TAPPI Test Method T-460.
6. Tensile Strength: 30/30 lbs/in., when tested in accordance with ASTM D882.
7. Tear Resistance: 8/6 lbs, when tested in accordance with ASTM D1117.
8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 15, Smoke Developed: 15.

B. Accessories:
1. Seam Tape: 3 inch wide, DuPont™ Tyvek® Tape as distributed by DuPont Building Innovations.
2. Fasteners: DuPont™ Tyvek® Wrap Caps, as distributed by DuPont: #4 nails with large 1-inch plastic cap fasteners, or 1-inch plastic cap staples with leg length sufficient to achieve a minimum penetration of 5/8-inch into the wood stud.
3. Adhesive: provide adhesive recommended by weather barrier manufacturer.
4. Primer: Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.

C. Sealant: Dow 758 Silicon Weather Barrier Sealant or as recommended by weather barrier manufacturer.

PART 3 EXECUTION

3.1 PREPARATION
A. Verify installation conditions as satisfactory to receive work of this Section. Do not begin installation until all unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. In general, strictly comply with manufacturer's printed installation instructions. Refer to the drawings for application sequence for products of this Section.
B. Carefully and accurately lay out, cut, fit and install to detail.
C. Install products weather-fashion, facilitating the passage of water or moisture toward drainage paths or weep holes as detailed.
D. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.
E. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface. Maintain weather barrier plumb and level.

F. Extend bottom roll edge over sill plate interface 2” to 3” minimum. Seal weather barrier with sealant or tape. Shingle weather barrier over back edge of thru-wall flashings and seal weather barrier with sealant or tape. Ensure weeps are not blocked.

G. Subsequent layers shall overlap lower layers a minimum of 6 inches horizontally in a shingling manner.

H. Window and Door Openings: Extend weather barrier completely over openings.

I. Weather Barrier Attachment:
   1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, spaced 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.

3.3 SEAMING

A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.

B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.4 OPENING PREPARATION (For Use With Flanged Windows)

A. Cut weather barrier in an “I-cut” pattern. A modified I-cut is also acceptable.
   1. Cut weather barrier horizontally along the bottom and top of the window opening.
   2. From the top center of the window opening, cut weather barrier vertically down to the sill.
   3. Fold side and bottom weather barrier flaps into window opening and fasten.

B. Cut a head flap at 45-degree angle in the weather barrier membrane at window head to expose 8 inches of sheathing. Temporarily secure weather barrier membrane flap away from sheathing with tape.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Do not permit adjacent work to damage work of this section.

3.5 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.

B. Where possible, give preference to suppliers who take back waste for re-use or recycling.

C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.

E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.

F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
SECTION 07 31 13
GLASS-FIBER-REINFORCED ASPHALT SHINGLES

PART 1 GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Asphalt shingles.
   2. Moisture shedding underlayment, ridge, valley and eave protection.
   3. Ridge and Intake venting.
   4. Metal flashings and accessories.
B. The Owner has established sustainability goals for this project. It is a specific requirement of this Section that shingles meet the specified requirements for local production and recycled content.
C. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria.
D. The Contractor shall inform the Owner and Architect of any conflicts between sustainable criteria and health, safety and durability
E. Related Sections:
   1. Section 06 10 00 - Rough Carpentry.
   2. Section 07 26 00 - Vapor Retarders.
   3. Section 07 27 00 - Air Barriers and Weather Resistant Barriers.
   4. Section 07 62 00 - Sheet Metal Flashing and Trim.

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

B. National Roofing Contractors Association:
1. NRCA - The NRCA Steep Roofing Manual.

C. Sheet Metal and Air Conditioning Contractors:

D. Underwriters Laboratories Inc.:
1. UL 580 - Tests for Uplift Resistance of Roof Assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Wind Resistance: Conform to applicable code for UL 580 wind uplift, UL 997 Wind Resistance for shingle types specified.

B. Wind Resistance: ASTM D3161; Class D, passes 90 mph minimum test velocity. Special fastening as required.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures.

B. Shop Drawings: Indicate Roofing layout and top and bottom course detailing transitions, including substrate requirements, weather-resistive barriers and all flashings, jointing methods and locations, fastening methods and locations, and installation details.

C. Product Data: Submit data indicating material characteristics, performance criteria, and limitations.

D. Samples: Submit two standard size samples of each shingle color indicating color range and finish texture/pattern; for color and texture selection.

E. Manufacturer's Installation Instructions: Submit installation criteria and procedures.
F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

G. Inspection Report: Submit report of roof inspection verifying shingles are sealed. Indicate extent of areas that did not properly self-seal and what corrective measures were required.

H. Provide manufacturer's literature certifying that shingle products contain a minimum of 20% recycled content. Identify post-consumer and post-industrial percentages.

I. Submit certification from manufacturer verifying the location of the manufacturer, including full address and phone number, and list of materials harvested, extracted or recovered within 500 miles of the project site.

1.5 QUALITY ASSURANCE
A. Perform Work in accordance with NRCA Steep Roofing Manual.
B. Roof Covering Fire Classification: Minimum Class A when tested in accordance with ASTM E108 or UL 790.
C. Apply label from agency approved by authority having jurisdiction to identify each roof assembly component.
D. Perform Work in accordance with City of SeaTac standards.

1.6 ENVIRONMENTAL REQUIREMENTS
A. Section 01 60 00 - Product Requirements.
B. Anticipate and observe environmental conditions (temperature, humidity and moisture) within limits recommended by manufacturer for optimum results. Do not install products under environment conditions outside manufacturer's absolute limits.

1.7 WARRANTY
A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
B. Furnish manufacturer’s lifetime warranty for asphalt shingles.

PART 2 PRODUCTS

2.1 GLASS-FIBER-REINFORCED ASPHALT SHINGLES
A. Listed Manufacturer: CertainTeed Corporation Landmark Solaris.
B. Other Manufacturers accepted:
   1. Owens Corning TruDefinition® Duration® Shingles
C. Fiber glass-based asphalt shingles complying with ASTM specifications E 108 Class A or UL 790 Class A, D 3462, D 3161 Class “F”, D3161 Class “A” D 7158 (UL2390/D6381) Class H, D 3018 Type 1, D 3018, CSA A123.5, UL 2218, Cool...
Roof Rating Council (CRRC), Energy Star, Florida Building Code (FBC), Miami-Dade County Approved and International Code Council (ICC) Evaluation Report

D. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.
E. Base Sheet: ASTM 15; asphalt-impregnated fiberglass-reinforced felt.
F. Flashings: Per Section 07 62 00 for installation under this section.

2.2 COMPONENTS
A. Ice Dam Membrane: ASTM D1970; self adhering polymer modified bituminous sheet material, slip resistant surface, 40 mils thick, 36 inches wide, with strippable release paper to expose adhesive surface.

2.3 FALL ARREST/FALL RESTRAINT SYSTEM
A. “RIDGE-IT” as manufactured by Guardian Metal Products, Inc., 4050 Auburn Way North, Suite #4, Auburn, WA 98002 or other approved equal complying with all regulations, including but not limited to WISHA, OSHA, ANSI fall arrest and fall restraint, anchor point standards.
B. Description: 2" x 24" x 20 GA. ASTM B-504 Stainless Steel Strap doubled and one drop forged Zinc Chromate “D” ring installed at each end. Doubled straps are secured to each other by spot welding and a minimum of 8 - 1/4” holes are punched for use in attaching the anchor to the roof rafter or substrate Finished size is 2” x 12”.
   1. Steel Eyelet (“D” Ring): ASTM F-887-84; Drop Forged, 5000 lbs. proof load, 3/8” x 2” Steel, Zinc Plated

2.4 RIDGE, HIP, AND EAVE VENTS
A. Ridge Vent: Cor-a-vent; V-300E, net free vent area: 13.5 s.i./l.f..
B. Intake Vent: In-Vent: Cor-a-vent; IN-vent On-the-roof Attic intake vent: 1” profile, net free vent area: 6.75 s.i./l.f.

2.5 ACCESSORIES
A. Fasteners: In strict accordance to manufacturer’s requirements and recommendations for installation. Staples used for fastening shingles only with the approval of the manufacturer.
B. Roofing cement and miscellaneous conforming to manufacturer’s requirements for completed installation

2.6 FABRICATION
A. Form flashings [to profiles indicated on Drawings, and] to protect roofing materials from physical damage and shed water.
B. Form eave edge [and gable edge] flashing to extend minimum 2 inches onto roof and minimum 0.25 inches below sheathing.
C. Form flashing sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
D. Hem exposed edges of flashings minimum 1/4 inch on underside.
E. Apply bituminous paint on concealed surfaces of flashings.

PART 3 EXECUTION

3.1 EXAMINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Verify roof penetrations and plumbing stacks are in place and flashed to deck surface.
C. Verify roof openings are correctly framed.
D. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.2 PREPARATION
A. Fill knot holes and surface cracks with latex filler at areas of bonded membrane.
B. Broom clean deck surfaces and underlayment.

3.3 INSTALLATION
A. Ice Dam Membrane Installation:
   1. Place edge metal flashings tight with fascia boards. Weather lap joints minimum 2 inches and seal with plastic cement. Secure flange with nails at maximum 12 inches on center.
   2. Install ice dam membrane parallel with eave edge, flush with face of eave edge flashing with edges lapped shingle style and ends lapped and staggered between rows.
   3. Extend ice dam membrane minimum 2 ft up-slope beyond interior face of exterior wall.
B. Underlayment Installation:
   1. Place one ply of underlayment over substrate [not covered by ice dam membrane, with ends and edges weather lapped 2 inches Stagger end laps of each consecutive layer. Weather lap ice dam membrane minimum 2 inches . Nail underlayment in place.
   2. Install underlayment in accordance with manufacturer’s instructions. Nail underlayment overlap at 36 inches on center.
   3. Weather lap and seal items projecting through or mounted on roof watertight with plastic cement.
C. Valley Protection Installation:
   1. Ice Dam Membrane - Closed Valleys:
      a. Place ice dam membrane sheet, 36 inches wide, centered over valley as valley protection.
D. Base Sheet: Install in strict compliance with manufacturer’s instructions. In general:
1. Place one ply of base sheet over area to be roofed with ends and edges weather lapped minimum 6" on edges and 12" on ends. Stagger end laps of each consecutive layer. Nail in place.

2. Install base sheet nailed sufficiently to hold in place.

3. Turn sheet up intersecting walls and rakes in preparation for step or roof-to-wall metal flashings.

4. Valleys to receive extra 36" width of base sheet over initial base sheet layer.

5. Weather lap items projecting through or mounted on roof and seal watertight with plastic cement.

E. Woven Valley Installation: Reinforce valleys with 36" width base sheet, applied over underlayment. Lay first course of shingles along eaves of one roof area and over valley, extending it into adjoining section at least 12". Follow the same procedure for succeeding courses. Press shingles into valley and nail, with no nail closer than 6" to centerline and with (2) nails at the end of each terminal strip. Next, apply the first course of shingles along eaves of the intersecting roof area, extending it over previously applied shingles. Embed the upper corner of each shingle in a 3" wide strip of asphalt plastic cement.

F. Metal Flashing:

1. Apply bituminous paint on concealed surfaces of flashings.

2. Weather lap joints minimum 4" and seal weather tight with plastic cement.

3. Secure in place with nails at 8" o.c. Conceal fastening.

4. Flash and seal work projecting through or mounted on roofing with plastic cement, weather tight.

5. Place edge metal under base sheet at eves (gutters) and over base sheet at rake.

G. Asphalt Shingles:

1. Install shingles in strict compliance with manufacturer’s instructions. In general:

2. Place shingles in straight coursing pattern with recommended (5") weather exposure to produce double thickness over full roof area. Provide triple course of shingles at eaves.

3. Project first course of shingles 1/8" beyond edge metal.

4. Extend shingles 1/8" beyond face of gable edge metal.

5. Cap hips and ridges with individual shingles, maintaining recommended weather exposure.

6. Valleys to be full woven type. Follow manufacturer’s instructions.

7. Where projections extend through roof surface, install flashing with 4" minimum continuous flange; nail to manufacturer’s directions. Seal with collar of flashing compound around base prior to and after application of shingles.

8. Coordinate installation of roof mounted components or work projecting through roof with weather tight placement of counter flashings.

9. Complete installation to provide weather tight service.

10. Nailing shall follow manufacturer’s printed instructions, 4 per 3-tab shingle. No over-driven or under-driven fasteners allowed.
11. Stapling or power stapling is discouraged, and allowed only if permitted by manufacturer.

H. Ridge and Intake vents: Install in accordance with manufacturer's printed instructions.

I. Fall arrest/fall restraint system: Install fall arrest/restraint system according to manufacturer's written instructions. Secure roof top tie down strap through structural plywood deck and into dimensional lumber rafter with 8 each (4 each side) 16d Ardos/Spiral nails driven in at an angle to ensure proper penetration.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Before Substantial Completion, inspect roof to verify shingles self-sealed from exposure to prevent wind uplift. Apply plastic cement to secure shingles that failed to seal. Report results of inspection and required corrective measures.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Do not permit traffic over finished roof surface.

3.6 WASTE MANAGEMENT

A. Per the Evergreen Sustainable Development Standard, this project is required to divert 75% of all waste from the landfill.

B. Separate waste in accordance with Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.

C. Where possible, give preference to suppliers who take back waste for re-use or recycling.

D. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.

E. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.

F. Place used sealant tubes and near empty containers in areas designated for hazardous materials.

G. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
SECTION 07 42 13
METAL ROOFING

PART 1  GENERAL

1.1  SUMMARY

A. Section includes preformed and prefinished metal system for roof at existing office, and new maintenance shed and pool house, with related flashings and accessory components.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

E. Related Sections:
   1. Section 07 27 00 – Air Barriers and Water-Resistive Barriers.
   2. Section 07 21 13 - Board Insulation.
   3. Section 07 21 16 – Blanket Insulation
   4. Section 07 62 00 – Sheet Metal Flashing and Trim.
   5. Section 07 84 00 – Firestopping.

1.2  REFERENCES


B. ASTM International:
   2. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

1.3 PERFORMANCE REQUIREMENTS
A. Components: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with applicable code and as measured in accordance with ASTM E330.
   1. Design Pressure: Minimum 20 lb/sq ft.
B. Maximum Allowable Deflection of Panel: 1/180 of span.
C. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; deflection of structural support framing.
D. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.

1.4 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Shop Drawings: Indicate dimensions, layout, joints, expansion joints, construction details, methods of anchorage, and interface with adjacent materials.
C. Product Data: Submit data on panels.
D. Samples: Submit four samples of siding finish, 8"x10" in size illustrating finish color, sheen, and texture.
E. Manufacturer’s Installation Instructions: Submit special procedures.
F. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components.

1.5 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years experience.
B. Installer: Company specializing in performing Work of this section with minimum three years experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
B. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
C. Store prefinished material off ground protected from weather, to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
D. Prevent contact with materials capable of causing discoloration or staining.
1.7 COORDINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Coordinate Work for installation of water-resistive barrier and air barrier seals.
C. Coordinate Work with installation of windows, louvers, doors and adjacent components or materials.

1.8 WARRANTY
A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
B. Furnish manufacturer's lifetime full system weathertightness warranty for metal roofing.

PART 2 PRODUCTS

2.1 MANUFACTURED METAL SIDING AND ROOFING
A. Listed Manufacturer: AEP Span, Tacoma, WA.
B. Other Manufacturers/Fabricators:
   1. Exterior Metals Inc., Lakewood, WA.
   2. Metal Sales Manufacturing Corp., Kent WA and Spokane, WA.

2.2 METAL ROOF
A. AEP Span, SpanSeam: DuraTech 5000, 12" wide coverage, 180° seam, 22 gauge, 2" high seam. Color as selected by Architect from the manufacturer's standard color range.
B. Closure Pieces: manufacturer's standard neoprene or rubber product, shaped to match the siding profile, installed with sealant per manufacturer's standard procedure.
C. Fasteners: Manufacturer's standard type to suit application and substrate material; with soft neoprene washers; fastener cap same color as exterior panel.

2.3 ACCESSORIES
A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; color to match siding
B. Sealants: Manufacturer's standard type suitable for use with installation of system; non-staining, non-skinning, non-shrinking, and non-sagging; color to match siding.
C. Field Touch-up Paint: As recommended by panel manufacturer.

2.4 FABRICATION
A. Form sections to shape indicated on Drawings, accurate in size, square, and free from distortion or defects.
B. Form pieces in longest practicable lengths.
C. Panel Profile: Manufacturer’s standard profile for specified system.
D. Fabricate corners in one continuous piece with minimum 18-inch returns.

PART 3 EXECUTION

3.1 EXAMINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Verify building members are ready to receive panel system.

3.2 INSTALLATION
A. Follow manufacturer's recommendations for installation of each type of roofing.
B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
C. Use concealed fasteners wherever possible.
D. Seal and place gaskets/closure pieces in wall siding to prevent weather and insect penetration. Maintain neat appearance. Align closure pieces top-to-top with ventilation strips as shown on the drawings.

3.3 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
F. Collect cut-offs and scraps and place in designated area for recycling.

3.4 CLEANING
A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
B. Remove site cuttings from finish surfaces.
C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION
SECTION 07 45 00
RAINSCREEN SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section includes rainscreen materials and installation, for placement behind exterior siding materials. Includes fasteners and accessory products.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

E. Related Sections:
   1. Section 06 10 00 – Rough Carpentry.
   2. Section 06 20 00 – Finish Carpentry.
   3. Section 06 30 00 – Wood Treatment
   4. Section 07 21 13 – Board Insulation.
   5. Section 07 27 00 – Weather Resistive Barriers.
   6. Section 07 46 00 – Fiber Cement Siding.
   7. Section 07 62 00 – Sheet Metal Flashing and Trim.
   8. Section 07 65 00 – Flexible Flashings.
   9. Section 07 90 00 – Joint Protection.
  10. Section 08 53 00 – Plastic (PVC) Windows.

1.2 REFERENCES

A. American Wood-Preservers' Association:
   1. AWPA C1 - All Timber Products - Preservative Treatment by Pressure Process.
   2. AWPA C20 - Structural Lumber - Fire-Retardant Treatment by Pressure Processes.

B. ASTM International:
   1. ASTM A153 - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   2. ASTM A653 - Specification for Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.


J. West Coast Lumber Inspection Bureau: WCLIB - Standard Grading Rules for West Coast Lumber.

K. Western Wood Products Association: WWPA G-5 - Western Lumber Grading Rules.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit technical data for furring (strapping) materials, fasteners, cavity ventilation products, etc. if different than those specified.

C. Product Data: Submit technical data for field-applied wood preservative materials, and application instructions.

D. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components.

E. Submit certification from manufacturer verifying the location of the manufacturer, including full address and phone number, and list of materials harvested, extracted or recovered within 500 miles of the project site.

F. Provide certification from manufacturer verifying the location of the fabricator for products of this Section. Include mailing address and phone number. Provide list of recovered or recycled steel within 500 miles of project site.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the following:

B. Surface Burning Characteristics: Fire Retardant Treated Materials: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
1.5 DELIVERY, STORAGE, AND HANDLING
A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
B. Protect materials from exposure to moisture prior to installation.

PART 2 PRODUCTS

2.1 FURRING/STRAPPING MATERIALS
A. Refer to the drawings for furring materials, location, and orientation (horizontal or vertical).
B. Wood, vertical orientation:
   1. Lap and panel siding: 3/4" pressure treated CDX softwood plywood, ripped into 4" wide strips or 1x4 pressure treated softwood lumber without knotholes, checks or cracks (No.1 grade or better). Spacing of furring at maximum 16" centers, aligned with solid wood framing. Larger sizes might be required at specific locations identified on drawings.
C. Wood, vertical orientation directly to concrete substrate:
   1. Lap and panel siding: 3/4" pressure treated CDX softwood plywood, ripped into 4" wide strips or 1x4 pressure treated softwood lumber without knotholes, checks or cracks (No.1 grade or better). Spacing of furring maximum 16" centers, aligned with solid wood framing. Larger sizes might be required at specific locations identified on drawings.
D. Substitutions: according to Section 01 25 13 – Product Substitution Procedures.

2.2 ATTACHMENT TO SUBSTRATE FRAMING
A. Fasteners for wood furring:
   1. For sodium borate treated furring: Hot-dipped galvanized nails or screws (ZMAX with a G185 coating per ASTM A653, or G90 coating per same standard). Also acceptable epoxy coated screws or nails.
   2. For ACQ treated furring: Stainless steel (Types 304 or 316).
   3. Size to achieve embedment listed below. Spacing of fasteners 12" centers.
B. Fasteners into substrates other than wood framing (CMU, concrete): ¼" drilled-in rawl pins, stainless steel (Types 304 or 316) for ACQ treated furring. Spacing of fasteners 16" centers.
C. Fastener embedment: 3/4" minimum into solid wood substrate framing, unless otherwise specifically allowed in writing by the manufacturer of the siding material.

2.3 ACCESSORIES
A. Cavity ventilation:
   1. Insect screening, 7/16" thick x continuous length.
   3. Place product at top and bottom of furring cavity as shown on the drawings and further specified below.
B. WRB, drainage plane, air barrier: refer to Section 07 27 00 - Air Barriers and Water-Resistive Barriers.

2.4 FACTORY WOOD TREATMENT
A. Wood or Plywood, preferred treatment: Water borne preservative treatment for lumber and plywood in conditions not subject to soil, weather, and/or continuous water contact to be sodium borate treatment, AWPA C31 for lumber and C9 for plywood.
B. Alternate treatment: ACQ preservative treatment. Note that stainless steel fasteners (Types 304 or 316) would be required if this method is selected.
C. Moisture Content After Treatment: Kiln dried (KD AT).
   1. Lumber: Maximum 19 percent.
   2. Structural Panels: Maximum 15 percent.

PART 3 EXECUTION

3.1 PREPARATION
A. Verify adequacy of backing/blocking and support framing.
B. Locate and mark solid wood framing (studs) behind sheathing materials so that furring members can be fastened directly to solid framing.

3.2 FURRING/STRAPING INSTALLATION
A. Set furring members level if horizontal orientation, and plumb if vertical orientation, in correct position for subsequent attachment of siding materials.
B. Locate and install vertical furring directly over framing members, or as otherwise noted on the drawings. Note that at certain locations the drawings may indicate that additional furring is placed between the standard spacings.
C. Fasteners shall penetrate into solid wood framing, unless otherwise indicated on the drawings or as otherwise allowed by the siding manufacturer and approved by the Architect. Owner may employ a Special Inspector to confirm that fasteners are driven only into solid wood framing.
D. Gap furring members at floor lines and at thru-wall flashings. Refer to details on the drawings.
E. For metal hat channel furring applications, where the furring is oriented horizontally, shim each fastener with a 1/8" minimum thick horseshoe plastic shim. Place the shim directly behind the fastener to enable water drainage behind the hat channel. Under each shim place a 3x3 inch square of self-adhering membrane (SAM) to preserve the air barrier at the fastener penetration. Drive fastener tight so that shim is held in place.

3.3 VENTILATION AND SCREENING
A. Install vent product at the top and bottom of each cavity. Install in long lengths and in continuous fashion without gaps.
B. Fasten with galvanized roofing nails with penetration into solid framing or plywood sheathing. Drive fasteners such that product is not dented or deformed.
C. Install with insect screening facing toward the ventilation cavity (facing down at the top of the cavity and facing up at the bottom of the cavity) according to the manufacturer’s instructions.

3.4 SITE APPLIED WOOD TREATMENT
A. Site-apply preservative treatment to cut ends of boards, or cut edges of plywood, only if the factory preservative treatment does not penetrate fully into the stock.
B. Brush-apply two coats of preservative treatment on wood or plywood edges after site cutting.
C. Allow preservative to dry prior to installing members.

3.5 QUALITY ASSURANCE
A. Moisture Content: take moisture readings of lumber and/or plywood furring prior to installation.

3.6 TOLERANCES
A. Section 01 40 00 - Quality Requirements: Tolerances.
B. Furring members: 1/4” from indicated position, maximum.

3.7 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY
A. Section includes:
   1. Exterior lap siding & flat panel siding for walls, related trim, flashings, accessories and fastenings.
B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.
C. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.
D. Performance Requirements:
   1. Durable, paintable, water shedding siding.
   2. The Owner has established environmental goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.
E. Project Specific Requirements: None.
F. Related Sections:
   1. Section 06 10 00 – Rough Carpentry.
   2. Section 07 45-00 – Rainscreen System.
   3. Section 07 62 00 – Sheet Metal Flashing and Trim.
   4. Section 07 90 00 – Joint Protection.
   5. Section 09 90 00 – Painting and Coating.

1.2 REFERENCES
A. American Hardboard Association: AHA A135.6 - Hardboard Siding.

1.3 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Product Data: Submit data indicating materials, component profiles, fastening methods, jointing details, sizes, surface texture, and accessories.
C. Fasteners: Submit manufacturer’s printed criteria specifically addressing the penetration of fasteners into substrate materials (plywood sheathing vs. solid framing) beneath the siding, including depth of penetration.
D. Samples: Submit two samples 12 x 12 inch in size illustrating surface texture and finish.
E. **MSDS Materials:** Include material safety and data sheets for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components.

F. **Submit certification from manufacturer verifying the location of the manufacturer, including full address and phone number, and list of materials harvested, extracted or recovered within 500 miles of the project site.**

### 1.4 QUALITY ASSURANCE

A. **Installer Qualifications:** Provide installer with not less than three years of experience with products similar to those specified.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. **Section 01 60 00 - Product Requirements:** Product storage and handling requirements.

B. Store products off the ground, on a flat surface, under a roof or separate waterproof covering, and in ventilated areas with constant minimum temperature according to manufacturer’s printed requirements.

### 1.6 WARRANTY

A. **Section 01 70 00 - Execution and Closeout Requirements:** Product warranties and product bonds.

B. Furnish manufacturer’s standard warranty for new siding products.

### PART 2 PRODUCTS

#### 2.1 FIBER-CEMENT SIDING

A. Refer to drawings for location of each siding type.

B. **Listed Manufacturer and Product:** James Hardie Building Products, Inc.

C. **Other Manufacturers accepted:**
   1. **Substitutions:** Section 01 25 13 - Product Requirements.

D. **Siding Type 1:** HardiePlank Lap Siding, smooth surface, factory primed for field finishing. Lap exposure of 5 inches, 5/16” thick planks in 12-foot lengths. See drawings for locations. Nails as recommended by manufacturer.

E. **Siding Type 2:** HardiePanel Siding, smooth surface, factory primed for field finishing. Reveals formed with Fry Reglet “T-piece” and ½” gap to adjacent panel. Corners using Fry Reglet “Outside Corner” shapes. Straight edge panels 48” long by 96” high and 5/16” thick. See drawings for locations. Exposed screws, as approved by manufacturer. Provide mock-up of panel installation. Align screws horizontally and vertically as approved Owner/Architect after mock-up review.

#### 2.2 RAINSCREEN SYSTEM

A. Refer to Section 07 45 00.

#### 2.3 ACCESSORIES

A. **Fasteners:** Stainless steel; length as required to penetrate minimum 1-1/4 inch.
Fasteners as recommended by Manufacturer for wind speed and exposure category based on ICC Evaluation Service, Inc. (ICC-ES) Report

B. Screws: Exposed fasteners, SFS Torx, 1.5", #10 or 12 self-tapping, stainless steel with a 0.472" dia. head.

C. Nails: James Hardie proprietary unobtrusive finishing nail, of size (depth of penetration) and strength to securely and rigidly retain the work and as required by the siding manufacturer in printed instructions.

D. Weather Resistive Barrier: refer to Section 07 27 00.

E. Flashing: refer to Section 07 62 00.

F. Prime/Paint: See Section 09 90 00.

G. Metal trim materials: Reveal Panel Trim extruded aluminum products by Fry Reglet, or approved Substitution, per Section 01 25 13.
   1. Finish: Field painted. Chemical conversion coat finish for field painting per ASTM ND1730-67, Type B.
   2. Typical shapes include "Inside Corner", "Outside Corner", "Vertical Molding" (for reveal joints), J-Channel (for window trim), and "T-Piece" (for reveal joints). Shop broken sheet metal trim, 24 gauge, acceptable in lieu of Fry products.

H. Trim: Primed SPF S1S2E – sizes and locations as indicated on drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify framing, substrate surfaces, rainscreen furring, and wall openings, and weather-resistive barrier are installed and ready to receive work.

3.2 INSTALLATION

A. Strictly comply with manufacturer's printed installation instructions, including nail size and spacing, nail penetration into solid wood or sheathing backing, nail head penetration into siding material, and the like.

B. If fasteners penetrate through rainscreen furring and into plywood sheathing, and not solid framing, confirm with siding manufacturer that this is acceptable practice.

C. Install metal flashings at wall edges, penetrations and openings as detailed. Install specified inside and outside corners as detailed.

D. Face nail panels according to manufacturer's instructions.

E. Position vertical reveals over rainscreen furring strips. Nail the flange of the T-Piece directly to a furring strip.

3.3 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.
B. Maximum Variation From plumb and level: 1/4 inch per 10 feet.
C. Maximum Offset From Joint Alignment: 1/16 inch.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 74 19.

END OF SECTION
SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SUMMARY

A. Section includes flashings and counterflashings, reglets, and fabricated sheet metal items as indicated on the drawings.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

E. Related Sections:
   1. Section 06 10 00 – Rough Carpentry.
   2. Section 07 53 03 – Membrane Roofing.
   3. Section 07 71 00 – Roof Specialties.
   4. Section 07 90 00 – Joint Protection.
   5. Section 07 71 23 – Manufactured Gutters and Downspouts.
   6. Section 07 90 00 – Joint Protection.
   7. Section 09 90 00 – Painting and Coating.

1.2 REFERENCES

A. American Architectural Manufacturers Association:
   1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

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

D. Federal Specification Unit: FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.

1.3 QUALITY ASSURANCE
A. Sheet Metal and Air Conditioning Contractors: SMACNA - Architectural Sheet Metal Manual. Conform to dimensions and profiles shown unless more stringent requirements are indicated.

1.4 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
C. Product Data: Submit data on manufactured components metal types, finishes, and characteristics.
D. Samples: Submit four samples 4"x4" in size illustrating metal finish color.
E. VOC limits: Include manufacturer's literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components.

1.5 QUALIFICATIONS
Fabricator and Installer: Company specializing in sheet metal work with minimum three years experience.
1.6 DELIVERY, STORAGE, AND HANDLING
A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
C. Prevent contact with materials causing discoloration or staining.

1.7 WARRANTY
A. Work of this Section is subject to two-year warranty. Provide manufacturer’s standard warranty on factory finished metal products for resistance to color change, chalk, fade and corrosion.
B. Provide fabricator/installer’s two-year warranty against defective materials and workmanship. Warranty to cover repair or replacement of work of this Section plus associated building materials, without additional cost to Owner, for water damage resulting from failures of products or installations of work of this Section.

1.8 COORDINATION
Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

PART 2 PRODUCTS

2.1 SHEET METAL FLASHING AND TRIM
A. Pre-Finished Galvanized Steel Sheet: ASTM A653 prime commercial quality steel sheet, G90 zinc coating (1.25 oz. per sf); 24 gauge core steel unless otherwise noted, shop pre-coated with three coat fluoropolymer finish; color as selected by Architect from manufacturer’s standard color chart.
B. Stainless Steel: ASTM A240/240M; Type 302/304, dead soft fully annealed, 0.018 inch thick; smooth surface, Number 2D (matte, non-reflective) finish.
C. Pre-Primed sheet metal: Galvanized and bonderized sheet steel, 24 gauge unless otherwise noted, ready for field painting.
D. Gutters and downspouts: refer to Section 07 71 23.

2.2 ACCESSORIES
A. Fasteners: Galvanized steel, with soft neoprene washers.
B. Sealant: sealant specified in Section 07 90 00.
C. Plastic Cement: ASTM D4586, Type I.
D. Reglets: Surface mounted type, 24 ga. galvanized steel manufactured by Fry Reglet Corp., Springlock flashing system, Type SM for surface mounted applications, field painted.
E. Solder: ASTM B32; type suitable for application and material being soldered.
2.3 FABRICATION
A. Form sections shape indicated on Drawings, accurate in size, square, and free from distortion or defects.
B. Fabricate cleats of same material as sheet metal, interlocking with sheet.
C. Form pieces in longest possible lengths, allowing for temperature-related expansion and contraction.
D. Hem exposed edges on underside 1/2 inch; miter and seam corners.
E. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
F. Fabricate corners from one piece with minimum 18-inch long legs; solder for rigidity, seal with sealant.
G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip, or as otherwise detailed on the drawings.

PART 3 EXECUTION

3.1 EXAMINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
C. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION
A. Install starter and edge strips, and cleats before starting installation.
B. Install surface mounted reglets to lines and levels indicated on Drawings. Seal top of reglets with sealant.
C. Paint concealed metal surfaces with protective backing paint to minimum dry film thickness of 15 mil.

3.3 INSTALLATION
A. Insert flashings into reglets to form tight fit.
B. Secure flashings in place using concealed fasteners wherever possible. Use exposed fasteners only where permitted or shown on drawings.
C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
D. Treat any contact surfaces of dissimilar metals to prevent electrolytic corrosion.
E. Fabricate and install with shapes true to line, corners square and sharp, and edges hemmed and neat. Torch cutting not allowed. Surfaces to be free of waves and buckles.
F. Allow for thermal expansion and contraction in accordance with Manual. Runs typically 30 feet maximum.
G. Make exterior work watertight.

3.4 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
F. Collect cut-offs and scraps and place in designated area for recycling.

3.5 FIELD QUALITY CONTROL
A. Inspection will involve surveillance of Work during installation to ascertain compliance with specified requirements.

END OF SECTION
SECTION 07 65 00
FLEXIBLE FLASHINGS

PART 1 GENERAL

1.1 SUMMARY
A. Work includes but is not limited to flexible membrane flashings installed at metal flashings, door and window openings, and at other exterior locations where detailed to eliminate water infiltration. Also included is membrane waterproofing installed at coping and flashing areas subject to sustained high temperatures under normal conditions of use.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

F. Related Sections:
1. Section 06 10 00 – Rough Carpentry.
2. Section 07 27 00 – Weather Resistive Barriers.
3. Section 07 45 00 – Rainscreen System.
4. Section 07 46 00 – Fiber Cement Siding.
5. Section 07 62 00 – Sheet Metal Flashing and Trim.

1.2 REFERENCES
A. American Society for Testing and Materials (ASTM):


1.3 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures.
B. Manufacturer’s product literature for each product type, including specification data showing compliance with performance criteria listed.
C. Manufacturer's written installation instructions. Required to be on file in Contractor’s field office during period of installation.
D. Samples: submit 12”x12” samples of each product type, or other size necessary to show manufacturer’s standard product stamp on the sample.
E. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components.

1.4 QUALITY ASSURANCE
A. Product Manufacturer: Company specializing in waterproof sheet membranes with minimum 3 years experience.
B. Applicator: Company or individual specializing in performing work of this Section with minimum 3 years experience.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Section 01 60 00 - Product Requirements.
B. Deliver in original labeled packages.
C. Store in clean dry place. Maintain ambient temperatures within limits recommended by the manufacturer before and during application and until liquid or mastic accessories have cured.
D. Handle carefully to avoid damage to product.

1.6 WARRANTY
A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
B. Furnish five-year manufacturer warranty for waterproofing failing to resist penetration of water.
C. For warranty repair work, remove and replace materials concealing waterproofing.
PART 2 PRODUCTS

2.1 FLEXIBLE FLASHING
A. Listed manufacturer and product: 3M, All Weather Flashing Tape 8067.
B. Other manufacturers:
D. Properties:
   1. 9.9-mil thick self-sealing and self-healing, fully adhered flexible flashing.
      Cold applied.
   2. Proprietary film with acrylic adhesive and heavy paper liner.
   4. Provide in 9” minimum width strips for application around window and
door openings, and other flashing areas.
E. Surface conditioner, by manufacturer of membrane product, for conditioning of wall
surface prior to the application of flashing sheets. Refer to manufacturer’s printed
instructions for specific substrate materials or environmental conditions requiring
application of surface conditioner.

PART 3 EXECUTION

3.1 INSPECTION
A. Verify installation conditions as satisfactory to receive work of this section. Do not
install until any unsatisfactory conditions are corrected. Beginning work
constitutes acceptance of conditions as satisfactory.

3.2 INSTALLATION
A. In general, strictly comply with manufacturer’s written installation instructions for
all proprietary products.
B. Carefully and accurately lay out, cut, fit, and install to detail.
C. Install products weather-fashion, facilitating the passage of water or moisture
toward drainage paths or weep holes as detailed.
D. Refer to detailed application sequence shown on the drawings.
E. Surface to receive flashing must be smooth, clean, dry, and free of voids, spalls,
loose substrates, and protrusions. Clean the substrate by wiping with a clean dry
cloth or brush.

3.3 INSTALLATION OF FLEXIBLE FLASHING STRIPS
A. Comply with the installation sequence shown on the drawings.
B. Observe environmental limitations of the manufacturer. Apply strip flashings in
fair weather when the air, surface and membrane temperatures are 40 degrees F
or higher. Apply covering materials at 40 degrees F or higher.
C. Apply surface conditioner in strict compliance with the manufacturer’s written
instructions.
D. Cut flashing into easily handled lengths. Peel release paper from roll to expose
adhesive surface and carefully position flashing against substrate. Press firmly
into place with a steel hand roller, fully adhering the flashing to the substrate to prevent water migrating under the flashing. Overlap adjacent pieces 3" minimum and roll overlap with the roller.

E. Install a flexible flashing strip behind all attachments to the building where a fastener will penetrate the weather-resistant barrier. This includes attachments for masonry veneer ties, fasteners for rigid insulation, clips or channels for metal panels or siding products, and the like. Strip shall be large enough to project outside the base dimension of the fastened object, or if the object is linear the strip shall be continuous for the entire length and width of the object.

F. Apply at all inside and outside corners over the water-resistive barrier, under trim products.

G. If wrinkles or fishmouths develop, follow manufacturer’s recommendations for cutting and remedying. Alternately, remove and reapply a new strip.

H. Do not leave flashing strips permanently exposed to sunlight. Do not exceed the maximum recommended exposure time stated by the manufacturer.

I. Protect the flashing from damage after installation. Cover to protect from exposure to sunlight, according to the manufacturer’s stated time limit.

3.4 INSTALLATION OF HIGH-TEMP MEMBRANES

A. In all cases, follow manufacturer's printed instructions.

B. Roll out membrane. Minimize wrinkles and bubbles.

C. Remove release paper layer. Roll out on substrate with mechanical roller to encourage full contact bond.

D. Lap sides and ends.

E. Overlap edges and ends minimum 3 inches. Weather lap joints on sloped substrate in direction of drainage. Seal joints and seams.

3.5 FIELD QUALITY CONTROL

A. Notify manufacturer’s representative prior to the start of work, and make arrangements for representative to be present during the pre-installation conference. Representative to verify that work is being conducted in accordance with manufacturer’s instructions.

B. Manufacturer’s representative is required to inspect the finished work prior to covering, and confirm that manufacturer’s instructions have been observed.

C. Verify that proper dimensions for vertical and horizontal laps have been observed.

D. Cover any product that remains exposed to sunlight within the time limitations required by the manufacturer.

E. Remedy any flashings that have become dislodged during the work, or have become loose from the substrate material or dog-eared at corners.

3.6 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should
be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.

B. Where possible, give preference to suppliers who take back waste for re-use or recycling.

C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.

D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.

E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.

F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
SECTION 07 71 23
MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1  GENERAL

1.1  SUMMARY
A. Section includes pre-finished aluminum gutters and downspouts.
B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.
C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.
D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.
E. Related Sections:
   1. Section 07 46 00 – Fiber Cement Siding.
   2. Section 07 62 00 – Sheet Metal Flashing and Trim.
   3. Section 07 90 00 – Joint Protection.

1.2  REFERENCES
A. American Architectural Manufacturers Association:
   1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
B. ASTM International:
   1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.


D. Federal Specification Unit: FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.


1.3 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Product Data: Submit data on manufactured components, materials, and finishes.
C. Samples: Submit four samples, 8"x10" illustrating component color and finish.

1.4 QUALITY ASSURANCE
Perform Work in accordance with SMACNA Manual.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope to drain.
C. Prevent contact with materials during storage capable of causing discoloration, staining, or damage.

1.6 WARRANTY
Furnish five-year manufacturer warranty for gutter and downspout finishes.

PART 2 PRODUCTS

2.1 GUTTERS AND DOWNSPOUTS
A. Gutters: 5-inch K-style prefinished aluminum, continuous gutter complete with end pieces, outlet tubes, and other accessories as required. Fabricate on site with no seams. Fabricate gutter accessories from same metal as gutters

B. Downspouts: Prefinished aluminum sheet, extruded to rectangular 2"x4" nominal size complete with front and side elbows.

2.2 COMPONENTS
A. Pre-Finished Aluminum Sheet: ASTM B209, manufacturer’s standard alloy and temper for specified finish; 0.040 inch thick; smooth finish, shop pre-coated with PVDF (polyvinylidene fluoride) coating; color as selected by Owner from manufacturer's standard color line.
2.3 ACCESSORIES
   A. Connectors: Manufacturer’s standard, same material as gutter and downspout.
   B. Anchors and Supports: Profiled to suit gutters and downspouts.
      1. Anchoring Devices: In accordance with SMACNA requirements. For aluminum, type recommended by fabricator.
      2. Gutter Supports: Aluminum quick screw hangers.
   C. Fasteners: Prefinished steel or aluminum 3-inch hex head screws with soft neoprene washers.

2.4 FABRICATION
   A. Form gutters and downspouts of profiles and sizes indicated.
   B. Fabricate with required connection pieces.
   C. Form sections to shape indicated, square, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
   D. Hem exposed edges of metal.
   E. Fabricate downspouts with a turn-out at the bottom. Seal watertight to downspout body.
   F. Fabricate gutter and downspout accessories; seal watertight.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
   B. Verify surfaces are ready to receive gutters and downspouts.

3.2 INSTALLATION
   A. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.
   B. Attach gutters at eave to firmly anchored gutter not more that 24-inches apart.
   C. Slope gutters sufficiently to assure positive drainage toward outlet at downspout – minimum 1/4” per foot.
   D. Join downspout sections with 1-1/2” telescoping joints. Provide hex head screws to securely strap to building and downspouts; locate fasteners at top and bottom and at 60-inches on center in between.
   E. Attach downspouts to wall so that bottom turn-out is 6” above splash block.
   F. Connect to existing storm lines. Tight lines to downspouts are to be excavated and moved as necessary to accommodate additional siding assembly thickness at cornerboard locations.
3.3 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.

B. Where possible, give preference to suppliers who take back waste for re-use or recycling.

C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.

D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.

E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.

F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY
A. Section includes firestopping materials and accessories; firestopping tops of fire rated walls.
B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 13 for additional requirements.
C. Related Sections:
   1. Section 07 26 00 - Vapor Barriers and Vapor Retarders.
   2. Section 09 21 16 - Gypsum Board Assemblies.

1.2 REFERENCES
A. ASTM International:
D. Underwriters Laboratories Inc.:
   3. UL 1479 - Fire Tests of Through-Penetration Firestops.
   5. UL - Fire Resistance Directory.

1.3 DEFINITIONS
A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 PERFORMANCE REQUIREMENTS
A. Conform to IBC, FM, or UL standards for fire resistance ratings and surface burning characteristics as referenced in the drawings or these Specifications.
1.5 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Product Data: Submit data on product characteristics, performance and limitation criteria.
C. Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
D. Manufacturer's Installation Instructions: Submit preparation and installation instructions.
E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
F. Engineering Judgments: For conditions not covered by UL or WH listed designs, submit judgments by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.
G. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant installed inside the weather resistive barrier (WRB) used in this Section identifying VOC limits and chemical components.

1.6 QUALITY ASSURANCE
A. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
B. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.7 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
B. Applicator: Company specializing in performing Work of this section with minimum three years experience, and approved by manufacturer.

1.8 ENVIRONMENTAL REQUIREMENTS
A. Section 01 60 00 - Product Requirements.
B. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F, or as otherwise indicated in manufacturer's instructions. Maintain this minimum temperature before, during, and for minimum 3 days after installation of materials.
C. Provide ventilation in areas to receive solvent cured materials.
PART 2 PRODUCTS

2.1 FIRESTOPPING

A. Manufacturers:
   1. Dow Corning Corp.
   2. Hilti Corp.
   3. 3M fire Protection Products.
   4. Pecora Corporation.
   5. United States Gypsum Co.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
   1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
   2. Foam Firestopping Compounds: Single component foam compound.
   3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
   4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
   5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
   6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
   7. Firestop Pillows: Formed mineral fiber pillows.
   8. Mortar as specified in Section 04 05 03 where permitted by applicable code.

C. VOC Limits: Refer to Section 01 81 13.

2.2 ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Dam Material: Permanent: As recommended by firestopping manufacturer.

C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 LOCATIONS

A. Joints around fenestration and door frames.
B. Junctions between walls and foundations, between walls at building corners, between walls and structural floors or roofs, and between walls and roof or wall panels.
C. Openings at penetrations of utility services through roof, walls, and floors.
D. Site-built fenestration and doors.
E. Building assemblies used as ducts or plenums.
F. Joints, seams and penetrations of vapor retarders.
G. All other openings in the building envelope.

3.2 EXAMINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Verify openings are ready to receive firestopping.
C. Verify acceptability of all firestopping products and application methods with the building and fire department inspectors prior to installation of any work.

3.3 PREPARATION
A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
B. Remove incompatible materials affecting bond.
C. Install backing or damming materials if required to arrest liquid material leakage.

3.4 APPLICATION
A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.
B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.
D. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.

3.5 FIELD QUALITY CONTROL
A. Section 01 40 00 - Quality Requirements, and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
B. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.6 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Refer to Section 01 74 19 for specific requirements.

3.7 CLEANING
A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
B. Clean adjacent surfaces of firestopping materials.

3.8 PROTECTION OF INSTALLED CONSTRUCTION
A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
B. Protect adjacent surfaces from damage by material installation.

END OF SECTION
SECTION 07 90 00

JOINT PROTECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes sealants and joint backing, and accessories.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

E. Related Sections:
   1. Section 06 41 00 – Architectural Wood Casework.
   2. Section 06 61 16 – Solid Surface Countertops.
   3. Section 07 27 00 – Weather Resistive Barriers.
   4. Section 07 46 00 – Fiber Cement Siding.
   5. Section 08 16 13 – Fiberglass Doors.
   7. Section 09 21 16 – Gypsum Board Assemblies: Acoustic sealant.
   8. Section 10 60 00 – Interior and Exterior Specialties: Tub surrounds.
   9. Section 12 35 30 – Casework

1.2 REFERENCE

A. ASTM International:
   2. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Products Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

C. Samples: Submit four samples, manufacturer's standard sample card illustrating sealant colors for selection.

D. Manufacturer's Installation Instructions: Submit special procedures, surface preparation, and perimeter conditions requiring special attention.

E. Warranty: Include coverage for installed sealants and accessories failing to achieve watertight seal, exhibit loss of adhesion or cohesion, and sealants that do not cure.

F. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components. All adhesives must conform to the South Coast Air Quality Management District Rule 1168 and all sealants must conform to Bay Area Air Quality Management District – Regulation 8, Rule 51.

1.4 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years experience.

B. Applicator: Company or individual specializing in performing Work of this section with minimum three years experience.

1.5 ENVIRONMENTAL REQUIREMENTS
A. Section 01 60 00 - Product Requirements.

B. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

1.6 COORDINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Work with sections referencing this section.

PART 2 PRODUCTS

2.1 JOINT SEALERS
A. Listed Manufacturers:
   1. Tremco Commercial Sealants and Waterproofing.
   2. Dow Corning Corp.

B. Other Manufacturers:
   1. BASF Sonolastic.
   2. GE Silicones.
   3. OSI
   4. Pecora Corp.
   5. Sika Corp.
   6. Bostik, Inc.
   7. Substitutions: Section 01 25 13 – Product Substitution Procedures.
C. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

D. Stain Characteristics: Provide elastomeric joint sealant products that are non-staining to porous substrates and have undergone testing according to ASTM C1248 and have not stained porous substrate materials indicated for this project.

E. Colors: As selected by the Architect from the manufacturer’s full line of standard colors.

F. VOC Limits: All interior and exterior Products must comply with VOC limits outlined in Bay Area Air Quality Management District Regulation 8, Rule 51.

G. Products Description:

1. High Performance General Purpose Exterior Non-traffic Sealant:
   a. Polyurethane; ASTM C920, Grade NS, Class 25, Uses M, G, and A; single component.
   b. Applications: Use for:
      1) Control, expansion, and soft joints in masonry.
      2) Joints between concrete and other materials.
      3) Joints between metal frames and other materials.
      4) Other exterior non-traffic joints for which no other sealant is indicated.

2. General Purpose Traffic Bearing Sealant:
   a. Polyurethane; ASTM C920, Grade P, Class 25, Use T; single component.
   b. Applications: Use for exterior and interior pedestrian and vehicular traffic bearing joints.

3. Exterior General Purpose Non-traffic Sealant:
   a. Silicone ultra-low modulus; ASTM C 920, Type S, Grade NS, Use NT; joint movement range 100% in extension and 50% in compression.
   b. Applications: Joints in concrete, masonry, metals, metal door and metal window frames.

4. Exterior between laps of Water-Resistant Barrier: Refer to Section 07 27 00.

5. Exterior General Purpose Non-traffic Sealant: BASF MasterSeal NP 150 or OSI Quad Max.
   a. Hybrid polymer; ASTM C920, Type S, Grade NS, Class 50, Use NT.
   b. Applications: Vinyl nail flange windows, fiber cement siding to trim, trim to vinyl window frames.

6. Exterior Compressible Gasket Expansion Joint Sealer:
   a. ASTM D2628, hollow neoprene (polychloroprene) compression gasket.
   b. Size and Shape: As indicated on Drawings.
   c. Applications: Use for exterior wall expansion joints.

7. Exterior Metal Lap Joint Sealant:
   a. Butyl or polyisobutylene, non-drying, non-skinning, non-curing.
Abbey Ridge Apartments Renovations

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D1056, sponge or expanded rubber or D1667, closed cell PVC, type acceptable to sealant manufacturer; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate surfaces and joint openings are ready to receive work.

C. Verify joint backing and release tapes are compatible with sealant.
3.2 PREPARATION
A. Remove loose materials and foreign matter impairing adhesion of sealant.
B. Clean and prime joints per manufacturer's requirements.
C. Perform preparation in accordance with ASTM C1193.
D. Protect elements surrounding Work of this section from damage or disfiguration.

3.3 INSTALLATION
A. Perform installation in accordance with ASTM C1193.
B. Perform acoustical sealant application work in accordance with ASTM C919.
C. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated, or otherwise recommended by the sealant manufacturer:
   2. Neck dimension no greater than 1/2 of joint width.
   3. Surface bond area on each side not less than 75 percent of joint width.
D. Install bond breaker where joint backing is not used.
E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
G. Tool joints concave.
H. Sanded joints in masonry work: After sealant has been placed in joint, and prior to skinning of sealant surface, broadcast fine sand onto the sealant surface to mimic adjacent mortar joints. Use only if joint is exposed to view in the finished work.
I. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.
J. Compression Gaskets: Avoid joints except at ends, corners, and intersections; seal joints with adhesive; install with face 1/8 to 1/4 inch below adjoining surface.

3.4 CLEANING
A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
B. Clean adjacent soiled surfaces.

3.5 PROTECTION OF INSTALLED CONSTRUCTION
A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
B. Protect sealants until cured.

3.6 AIR SEAL LOCATIONS
A. Joints around fenestration and door jambs;
B. Junctions between wall and foundations, between walls at building corners, between walls and structural floors or roofs, and between walls and roof or wall panels;
C. Openings at penetrations of utility services through roofs, walls and floors;
D. Site-built fenestration and doors;
E. Building assemblies used as ducts or plenums;
F. Joint, seams and penetrations of vapor retarders;
G. All other openings in the building envelope;
H. Seal at recessed light fixtures;
I. Seal at electrical panels, electrical boxes, data boxes;
J. Install caulk at top and bottom plates of exterior walls;
K. Seal between the bottom plate and subflooring;
L. Seal drywall at the intersection of the drywall and top/bottom plate;
M. Seal penetrations through the top and bottom plates from plumbing, wiring, and ducts;
N. Caulk interior window jambs;
O. Fill rough opening of windows and doors with backer rod and caulk;
P. Caulk at window and door trim to drywall;
Q. Seal at the junction between the ceiling and walls.

3.7 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
SECTION 08 16 00
MOLDED COMPOSITE DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Section 08 16 13 Fiberglass and Wood Doors.
B. Section 08 71 00 Door Hardware.

1.2 REFERENCES

1.3 SUBMITTALS
A. Refer to Section 01 33 00 Submittal Procedures.
B. Product Data: Submit door manufacturer current product literature, including installation instruction.
C. Samples: Provide finish samples for all products.
D. Quality Assurance Submittals
   1. Manufacturer Instructions: Provide manufacturer’s written installation instructions.
E. Closeout Submittals
   1. Refer to Section 01 70 00 Closeout Requirements.

1.4 DELIVERY, STORAGE AND HANDLING
A. Refer to Section 01 60 00 Product Requirements.
B. Deliver doors, materials and components in manufacturer’s original, unopened, undamaged containers with identification labels intact.
C. Store doors as recommended by manufacturer.

1.5 WARRANTY
A. Manufacturer standard 5-year warranty indicating that the door will be free from material and workmanship defects from the date of substantial completion each building.

PART 2 PRODUCTS

2.1 MANUFACTURER
A. JELD-WEN® Interior Doors; 3305 Lakeport Blvd; Klamath Falls, OR 97601, USA; Phone 877.535.3462, fax 541.882.3455; website www.jeld-wen.com.
B. Substitutions: Section 01 25 13 _ Product Substitution Procedures.
C. Product: Basis of Design:
   1. Type A (Office): JELD-WEN®’s Molded Wood Composite All-Panel Prehung Interior Door; Primed; Sizes per Door Schedule
2. Type B: JELD-WEN®’s Molded Interior Doors; Woodgrain 6-Panel Primed Molded Single Pre-hung Interior Door. Sizes and ratings per Door Schedule.

3. Type F & G: JELD-WEN®’s Molded Interior Doors; Woodgrain 6-Panel Primed Molded Single Interior Door. Sizes per Door Schedule.

2.2 FLUSH DOORS (Type A)
A. Door Design
   1. Surface Finish: Woodgrain
   2. Panels and Sticking Profile: flush: Madison All Panel
   3. Solid core interior doors with wood frame
      a. Thickness: 1-3/8 inch
   4. Finish: Pre-primed White
   5. Jambs (passage doors only)
      a. Jamb Width: 4-9/16 inch – field verify

2.3 UNIT DOORS (Type B)
A. Door Design:
   1. Surface Finish: Woodgrain
   2. Panels and Sticking Profile: Six panels, with cove and bead
   3. Construction: Solid core with MDF frame for interior doors
   4. Finish: Pre-primed White
   5. Thickness:
      b. Thickness: 1-3/8 inch for passage type doors
   6. Jambs (passage doors only)
      a. Jamb Width: 4-9/16 inch – field verify

2.4 CLOSET DOORS (Type F & G)
A. Door Design:
   1. Surface Finish: Woodgrain
   2. Panels and Sticking Profile: Six panels, with cove and bead
   3. Construction: Solid core with MDF frame for interior doors.
   4. Finish: Pre-primed White
   5. Thickness:
      b. Thickness: 1-3/8 inch for passage type doors

PART 3 EXECUTION

3.1 GENERAL
A. Install doors in accordance with manufacturer’s installation guidelines and recommendations.
3.2 EXAMINATION
A. Inspect door prior to installation.
B. Inspect rough opening for compliance with door manufacturer recommendations. Verify rough opening conditions are within recommended tolerances.

3.3 PREPARATION
A. Prepare door for installation in accordance with manufacturer’s recommendations.
B. Trim bottom of jamb sides to achieve desired distance between door bottom and finished floor height.

3.4 PASSAGE DOOR INSTALLATION
A. Place door unit into opening and level hinge side of jamb. Use shims fastened through jamb and stop to level and temporarily secure in place.
B. Level latch side of jamb. Use shims fastened through jamb and stop to level and temporarily secure in place.
C. Verify spacing between jamb and door is uniform on all sides. Adjust as necessary.
D. Shim top of jamb in center of opening and fasten with nail.
E. Re-check for square, level and even spacing around door. Nail securely in place through stop, jamb, shims and into studs every 12 inches.
F. Set nails.
G. Install trim on both sides using nails every 12 to 16 inches.

3.5 BI-PASS DOOR INSTALLATION
A. Attach door hardware to door.
B. Fasten overhead track in center of finished opening by inserting screws through pre-drilled holes.
C. Install door assemblies.
D. Check positioning and operation. Adjust hardware if necessary.

END OF SECTION
SECTION 08 16 13
FIBERGLASS and WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Section 08 16 00 Molded Composite Doors
B. Section 08 71 00 Door Hardware

1.2 REFERENCES
A. American Architectural Manufacturer Association (AAMA)
B. ASTM International
   1. ASTM E283; Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
   2. ASTM E330; Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Pressure Difference
   3. ASTM E331; Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
   4. ASTM E547; Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference
C. National Fenestration Rating Council (NFRC)
   1. NFRC 100; Procedure for Determining Fenestration Thermal Properties
   2. NFRC 200; Solar Heat Gain Coefficient and Visible Transmittance

1.3 SUBMITTALS
A. Refer to Section 01 33 00 Submittal Procedures.
B. Product Data: Submit door manufacturer current product literature, including installation instruction.
C. Samples: Provide finish samples for all products.
D. Quality Assurance Submittals
   1. Design Data: Provide manufacturer test report numbers indicating product compliance with indicated requirements.
   2. Manufacturer Instructions: Provide manufacturer’s written installation instructions.

1.4 DELIVERY, STORAGE AND HANDLING
A. Refer to Section 01 60 00 Product Requirements.
B. Deliver doors, materials and components in manufacturer’s original, unopened, undamaged containers with identification labels intact.

C. Store doors as recommended by manufacturer.

1.5 WARRANTY

A. Manufacturer standard warranty indicating that doors will be free from material and workmanship defects from the date of substantial completion for the time periods indicated below:
   1. Door System: 25 Years.
   2. Auralast Frame: Lifetime.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. JELD-WEN® Fiberglass Doors; 3305 Lakeport Blvd; Klamath Falls, OR 97601, USA; Phone 877.535.3462, fax 541.882.3455; website www.jeld-wen.com.

B. Product: Basis of Design:
   1. Type C (Residential Building Entry Doors): JELD-WEN®’s Premium Fiberglass, Smooth-Pro 36” x 80”, primed white fiberglass pre-hung exterior front door.
   2. Type D & E (Office Entry): JELD-WEN® Premium Fiberglass, Smooth-Pro 72” x 80” primed white fiberglass pre-hung exterior doors.
   3. Type H (Office Interior): JELD-WEN® Custom Wood Sliding Patio Door: pre-primed, pre-hung.

2.2 MATERIALS


B. Stiles and Rails: Engineered wood (laminated veneer lumber).

C. Core: Polyurethane core.

2.3 FIBERGLASS ENTRANCE DOORS (Type C)

A. Door Design:
   1. Surface Finish: Smooth
   2. Door Style: Panel with ½ view with square top.
   3. Construction: Smooth-Pro solid core with fiberglass facing
   6. Glazing: insulated, Low-E
   7. Frame:
      a. Jamb Width: 6-9/16 inch – field verify
      b. Jamb Species: Finger-Jointed Pine
   8. Hardware: per hardware schedule.
2.4 FIBERGLASS PATIO DOOR (Type D & E)
A. Door Design:
   1. Surface Finish: Smooth
   2. Door Style: Full view with square top. No muntins.
   3. Construction: Smooth-Pro solid core with fiberglass facing
   6. Glazing: insulated, Low-E
   7. Frame:
      a. Jamb Width: 6-9/16 inch – field verify
      b. Jamb Species: Finger-Jointed Pine
   8. Hardware: per hardware schedule.

2.5 PREHUNG PATIO SLIDING WOOD DOORS (Type H)
A. Door Design:
   1. Surface Finish: Smooth
   2. Door Style: Full view with square top. No muntins.
   3. Construction: Pine
   7. Frame:
      a. Jamb Width: 6-9/16 inch – field verify
      b. Jamb Species: Finger-Jointed Pine
   8. Hardware:
      a. Interior track - per manufacture.
      b. Aluminum threshold - per manufacture – limited to ½” height.
      c. Whitby Sliding Door handle.

2.6 CONSTRUCTION ACCESSORIES
A. Flashing: Refer to Section 07 60 00 Flashing and Sheet Metal.
B. Sealants: Refer to Section 07 92 00 Joint Sealants.

2.7 FABRICATION
A. Skins are adhered to engineered wood frames with core materials and bonding agents that permanently lock skin to frame.

PART 3 EXECUTION

3.1 GENERAL
A. Install doors in accordance with manufacturer’s installation guidelines and recommendations.

3.2 EXAMINATION
A. Inspect door prior to installation.
B. Inspect rough opening for compliance with door manufacturer recommendations. Verify rough opening conditions are within recommended tolerances.

3.3 INSTALLATION
A. Install jamb assembly.
   1. Caulk sill along outside edge and ½ inch in from edge of subfloor.
   2. Set door unit into center of opening and tack in place.
   3. Shim hinge then latch side jambs straight. Inspect jamb for square, level and plumb.

3.4 PROTECTION
A. Protect installed doors from damage.

3.5 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. See section 01 74 19.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Work includes:
   1. Overhead, sectional, transmitter controlled, motor operated door at new maintenance shed, including all hardware and hanger material.

B. Performance Requirements:
   1. The Owner has established environmental goals for this. Refer to Section 01 18 15 for general requirements.

C. Project Specific Requirements:
   1. None

D. Related Sections:
   1. Section 03 30 00 - Cast-In-Place Concrete.
   2. Section 05 50 00 - Metal Fabrications.
   3. Section 07 90 00 - Joint Protection.
   4. Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

A. Door and Access Systems Manufacturers Association International:
   1. DASMA 102 - Specifications for Sectional Overhead Type Doors.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

C. Product Data: Submit component construction, anchorage method, and hardware.

D. Manufacturer's Installation Instructions: Submit special procedures, and perimeter conditions requiring special attention.

E. Color chart, showing manufacturer’s standard finish colors.

F. MSDS materials: Include material safety and data sheets for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components.

G. Closeout Submittal:
   1. Operation and Maintenance Data:
      a. Include electrical control adjustment recommendations.
b. Include data for motor and transmission, shaft and gearing, lubrication frequency, periodic adjustments required, and spare part sources.

1.4 QUALITY ASSURANCE
A. Perform Work in accordance with DASMA 102, Application Type Commercial.
B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified.
C. Door springs, cables, bearings and shafts will be designed for a minimum of 100,000 cycles of operation.
D. Qualifications:
   1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
   2. Installer: Company specializing in performing Work of this section with minimum three years documented experience and approved by manufacturer.

1.5 WARRANTY
A. Section 01 70 00 - Execution and Closeout: Product warranties and product bonds.
B. Furnish two year manufacturer warranty for electric operating equipment with service available 24 hours a day / 7 days a week.

PART 2 PRODUCTS
2.1 SECTIONAL OVERHEAD DOORS
A. Manufacturers:
   1. Overhead Door Company, Lewisville, TX

B. Garage Door: 430 Series Steel Door.
   1. Panel: 2” thick. 24 gauge steel front, 26 gauge steel back cover.
   2. Springs: 100,000 cycles.
   3. Frame infill (where indicated on door schedule): Flattened expanded metal sheet. Mechanically fasten to frame w/mechanical adhesive tape that secures and eliminates noise from vibration.

C. Controls:
   1. Lock: Keyed lock with interlock switch for automatic operator.
   2. Electrical Motor Operation:
      a. Provide wall mounted light-duty commercial jackshaft operator.
      b. UL 325 listed.
3. Controls Door #243c, d, e, f, g: Push button operated control station at interior and card reader operated control station at exterior. Door may also be operated by hand held transmitter.

4. Controls Door #240b (trash room): Push button operated control station at interior and key operated control station exterior location. Flush mounted at interior and exterior location.

2.2 ACCESSORIES

A. Hand Held Transmitters: Digital control, resettable with smart logic receiver, capable of code changes by Owner; provide twelve (12) transmitters.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

C. Verify electric power is available and of correct characteristics.

3.2 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor retarder seal.

3.3 INSTALLATION

A. In general, strictly comply with manufacturer’s printed installation instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

F. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07 90 00.

G. Install perimeter weatherstripping.

3.4 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation from Plumb: 1/16 inch.
3.5  MANUFACTURER'S FIELD SERVICES
A.  Section 01 40 00 - Quality Requirements: Manufacturers’ field services.
B.  Ensure operation and adjustments to door assembly for specified operation.

3.6  ADJUSTING
A.  Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
B.  Adjust door assembly to smooth operation and in full contact with weatherstripping.

3.7  CLEANING
A.  Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
B.  Clean doors and frames.
C.  Remove labels and visible markings.

3.8  PROTECTION OF INSTALLED CONSTRUCTION
A.  Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
B.  Do not permit construction traffic through overhead door openings after adjustment and cleaning.

3.9  WASTE MANAGEMENT
A.  Separate waste in accordance with the Waste Management Plan. See section 01 74 19.

END OF SECTION
SECTION 08 53 00

PLASTIC (PVC) WINDOWS AND SLIDING GLASS DOORS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:

1. Factory fabricated tubular extruded plastic (PVC) windows in sliding and single hung configurations and glass patio doors. Units to be factory glazed, with integral nailing fin, operating hardware and insect screens.

2. Schedule of windows and sliding glass doors: refer to the drawings.

3. Section includes detailed instructions for installation and air leakage testing of flanged windows.

B. Performance Requirements:

1. System Design: Design and size components to withstand dead and live loads caused by pressure and suction of wind acting normal to plane of window.


3. Uniform Structural Load: Uniform Structural Load Test at 150% of Design Pressure. Test shall be conducted in accordance with ASTM E 330.

4. Assembly: To accommodate without damage to components or deterioration of seals, movement between window and perimeter framing, deflection of lintel.

5. Thermal Resistance of Assembly: U-Value of 0.30 or better when measured in accordance with NFRC 100. Solar Heat Gain Coefficient (SHGC) of 0.35 or better.

6. Vapor Seal: No vapor seal failure at lineal static pressure of 1 inch, 72 degrees F, and 40% of relative humidity.

7. Condensation Resistance Factor: CRF of 60* when measured in accordance with AAMA 1503.

8. Water Leakage: None, when measured in accordance with ASTM E 331 at a pressure differential of 15psf in the lab. None, when measured in accordance with field test AAMA 502-08 using a uniform static air pressure difference of (Product rating dp x .15 x .667) psf with a minimum field test pressure differential of 6psf.

9. System internal Drainage: Drain water entering assembly, condensation occurring in glazing channels, or migrating moisture within the system, to the exterior via a weep drainage network.

10. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound. Position thermal insulation on exterior surface of air barrier and vapor retarder.
11. Thermal Movement: Design sections to permit normal movement caused by thermal expansion and contraction of vinyl members to suit glass, infill, and perimeter opening construction.

12. Design Temperature Range: 120º F.

13. Noise Reduction (NR) rating for acoustic windows: See window schedule for requirements

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

E. Related Sections:
1. Section 06 10 00 – Rough Carpentry: Wood framed openings.
2. Section 07 27 00 – Weather Resistive Barriers.
3. Section 07 65 00 – Flexible Flashings.
4. Section 07 90 00 – Joint Protection.

1.2 REFERENCES

A. American Architectural Manufacturers Association:
2. AAMA 303 - Voluntary Specification for Poly (Vinyl Chloride) (PVC) Exterior Profile Extrusions.
3. AAMA 501.2-03 – Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
4. AAMA 502-08 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products.


C. ASTM International:
1. ASTM C1036 - Specification for Flat Glass.
2. ASTM C1048 - Specification for Heat-Treated Flat Glass - Kind HS, Kind FT - Coated and Uncoated Glass.
5. ASTM E1105-00 – Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtainwalls, by Uniform or Cyclic Static Air Pressure Difference.


1.3 SYSTEM DESCRIPTION

A. Windows: Extruded tubular plastic (PVC) sections, factory fabricated, vision glass, integral nailing flange, related flashings, anchorage and attachment devices.

B. Configuration: Conform to AAMA 101 Designations for fixed and operating sash designs shown on the drawings.
1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Schedule to indicate:
   1. Manufacturer
   2. Model number
   3. Type
   4. Design Pressure Rating
   5. U-factor
   6. SHGF value
   7. CRF Value
   8. Size
   9. Frame Color
   10. Glazing type
   11. Vent / no vent
   12. CPD Number

C. Shop Drawings: Submit window schedule indicating each unit size, rough-opening dimensions, framed opening tolerances, affected related work, location of fresh air port(s) and installation requirements.

D. Product Data: Submit component dimensions, anchorage and fasteners, glass, internal drainage, and typical details.

E. Samples: Submit two window and frame sections, 12 x 12 inch in size, illustrating window frame section, mullion section, screen and frame, and finished surfaces.

F. Manufacturer's Certificates: Certify Product performance ratings by NFRC as meeting or exceeding specified requirements.

G. Energy compliance labels: refer to paragraph 3.5 below.

H. VOC Limits: Include manufacturer’s data sheets for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components. All adhesives must conform to the South Coast Air Quality Management District Rule 1168 and all sealants must conform to Bay Area Air Quality Management District – Regulation 8, Rule 51.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
   1. Fabricate window assemblies in accordance with AAMA 101 for types of windows required.
   2. Insulated Glass: Fabricate insulated glass units in accordance with GANA (formerly FGMA) Glazing Manual.

B. Wall and Window Installation Mock-Up: The General Contractor will direct a mock-up of a window installation for the Architect and Owner to review with all products and trades included in the window assembly. At the selected mock-up location, all products of the each of the exterior wall assemblies (existing wood frame, windows, metal flashing, self-adhering membranes, air/water barriers, etc.) will be installed and inspected at various stages of installation. Perform the mock-up installations of the entire window assembly. These mock-up locations will be evaluated for constructability and may be tested for weather-tight qualities. Modifications, if any, to the exterior wall assemblies resulting from the mock-up...
will be discussed, documented by the contractor and incorporated into the work per ESDS-7.13. Contractor to coordinate with mock-up required in Section 07 21 16 Blanket Insulation & 07 21 13 Board Insulation.

1. Subcontractor(s) responsible for the work of this section required to attend.
2. Subcontractor(s) responsible for the work of this section required to supply two typical residential windows, one operable and one fixed, for the mock up.
3. Location to be coordinated with Owner.
4. Provide Owner with one week’s notice prior to installation

C. Window testing: refer to the Part 3 Execution portion of this Section.

D. Qualifications:
   1. Manufacturer: Company specializing in manufacturing commercial windows with minimum five years experience, and with service facilities within 100 miles of Project.
   2. Installer: Company specializing in installation of commercial windows with minimum five years experience, and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
B. Deliver to site in manufacturer's original unopened containers and packaging, with labels clearly identifying manufacturer and product name.
C. Protect flanges and finished surfaces with wrapping and/or boxing. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.
D. Jig, brace, and box window frame assemblies for transport to minimize flexing of members and to minimize flexing of joints. Store off ground in a vertical position.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.
B. Do not install glazing materials when ambient temperature is above or below manufacturer's stated limits. Maintain this temperature range during and after installation of sealants.

1.8 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
B. Correct defective Work within a five-year period after Date of Substantial Completion.
C. Furnish ten-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 VINYL WINDOWS
A. Manufacturer: Ply Gem Windows, Cary, NC (with offices in Auburn, WA)
B. Other Manufacturers accepted:
   1. VPI Quality Windows, Spokane, WA;
C. Substitutions: Section 01 60 00 – Product Requirements
D. Product Description: Ply Gem 200 Pro Sliding, hollow tubular ultra-violet resistant polyvinyl chloride (PVC) window frames with welded corner construction. Configurations of sash as scheduled on the drawings.
E. All units to be NFRC rated.

2.2 VINYL SLIDING PATIO DOOR
A. Manufacturer:
   1. Ply Gem Windows, Cary, NC (with offices in Auburn, WA)
   2. Substitutions: Section 01 60 00 – Product Requirements
B. Other Manufacturers accepted:
   1. VPI Quality Windows, Spokane, WA;
   2. Substitutions: Section 01 25 13 – Product Substitution Procedures
C. Product Description: Ply Gem Pro Series 960 Sliding Patio Door, hollow tubular ultra-violet resistant polyvinyl chloride (PVC) window frames with welded corner construction. Configurations of fixed and operable sash as scheduled on the drawings.
D. All units to be NFRC rated.

2.3 COMPONENTS
A. Minimum energy conservation requirements: U-value 0.27 or better for entire unit.
B. Insulating Glass: HP2+ sealed double pane units, 3/4" inch thick, Low-E argon filled, conforming to the following.
   2. Inner Pane: Clear float glass, Interior Surface Low-E, ASTM C1036, Quality 1.
   4. Pane Thickness: ¼”.
   5. U-value center of glass: 0.26 (summer daytime) and 0.28 (winter night time).
   6. Solar Heat Gain Coefficient (SHGC): 0.27.
   7. Visible Light Transmittance: 64%.
   8. Locations: All units except those specifically identified on the window schedule(s).
C. Window Frame: Extruded multi-chambered PVC frame with integral ultra-violet degradation resistance, continuous integral nailing fin; depth 3-7/16 inches; nominal wall thickness 0.050 to 0.080 inches; corners mitered and heat welded.

E. Window Sills: Tubular; sloped for positive wash; one-piece full width of opening.

F. Operable Sash Weather Stripping: Manufacturer's standard; permanently resilient, profiled to effect weather seal.

G. Patio Door Frame: Extruded multi-chambered PVC frame with integral ultra-violet degradation resistance, continuous integral nailing fin; depth 4-3/8 inches; nominal wall thickness 0.050 to 0.080 inches; corners mitered and fusion welded.

H. Patio Door Hardware: Smooth gliding rollers; two-point lock with adjustable strike. Anodized aluminum threshold cover.

I. Color: White PVC frame and hardware.

J. Insect Screen Frame: manufacturer's standard frame of rectangular sections; nominal size similar to operable glazed unit.

K. Insect Screens: gray color.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard.

2.5 FABRICATION

A. Integral nail flange.

B. Units to be factory assembled and glazed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify wall openings and adjoining air and vapor seal materials are ready to receive Work of this Section. Refer to step-by-step procedure for wrapping rough openings shown on the drawings.

C. Verify that window units are sized as required to provide an open perimeter shim space of not less than ¼" nor more than ½" in any location, or as otherwise required by the manufacturer.

D. Prior to installation, examine each window unit to assure that it is not damaged in any way. Do not install units that are damaged.

3.2 INSTALLATION

A. In general, strictly comply with manufacturer's printed installation instructions. Refer to the drawings for application sequence for products of this Section.

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.

D. Prior to installing window, install adjustable sill pan flashing.

E. Insert and center window in opening, adjust as needed to assure unit is completely plumb, level and straight. Operate ventilation sash to assure it operates properly. Fasten unit as shown on the drawings. Do not fasten the head flange except as noted below.

F. For units exceeding 24" width, fasten head flange with fasteners placed through washers approximately 3/8" above tops of nail flanges so that washers hold the flange tight to the sheathing while allowing differential header deflection without imposing building loads to the window.

G. Insert Gutter Guard under the sill flange to promote water drainage under the sill frame. Follow manufacturer’s instructions for placement of flange fasteners at the jamb flange and at the sill flange.

H. Proceed with perimeter flashing installation as shown on the drawings.

I. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation, or low-expanding foam insulation, in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

J. Coordinate attachment and seal of perimeter air and vapor retarder materials.

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

3.3 WINDOW AIR LEAKAGE TESTING


1. The storage room shall be pressurized to 50 Pascal with respect to the exterior.

2. The installation shall be inspected by the Owner with chemical smoke for air leakage of the window installation. This is not a test of the window but of the window installation. The judgment of success of the test will be the approval of the installation by the Owner.

3. The test shall demonstrate that the assembly is substantially airtight with no significant air leakage pathways identified.

4. The installation and test shall be repeated until a satisfactory standard is attained.

5. The successfully tested assembly shall be the method of installation for all the windows in the project.

6. The Owner may test additional windows during the project to ensure compliance. Coordinate with Owner as necessary.

3.4 ERECTION TOLERANCES

A. ADJUSTING Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.
3.5 REMOVING ENERGY-PERFORMANCE LABELS
   A. Remove energy-performance labels from window glass only after the Building Inspector has reviewed and approved the installation.
   B. Carefully remove labels, and provide the General Contractor with three undamaged labels from each separate window type (fixed, single-hung, casement, etc.) for the Project Manual to be provided to the Owner.

3.6 CLEANING
   A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
   B. Remove protective material from pre-finished surfaces.
   C. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.
   D. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

3.7 WASTE MANAGEMENT
   A. Separate waste in accordance with the Waste Management Plan. See section 01 74 19.

END OF SECTION
SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Work under this section includes the complete finish hardware requirements for the project. Quantities listed are for the contractor's convenience only and are not guaranteed. Items not specifically mentioned, but necessary to complete the work shall be furnished, matching the items specified in quality and finish.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

E. Related Sections:
   1. Section 08 16 00 Molded Composite Doors.
   2. Section 08 16 13 Fiberglass and Wood Doors

1.2 QUALITY ASSURANCE

A. Product Qualification:
   1. To assure a uniform high quality of materials for the project, it is intended that only specified items be furnished. Comparable products may be accepted upon prior approval of architect.
   2. Hardware to be new, free of defects, blemishes and excessive play. Obtain each kind of hardware (Mechanical latch and locksets, exit devices, hinges and closers) from one manufacturer except where specified.
   3. Fire-Rated opening in compliance with NFPA80. Hardware UL10C/UBC-7-2 (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved bearing hinges and smoke seal. Furnish openings complete.

B. Supplier Qualifications:
   1. Hardware supplier will be a direct factory contract supplier who employs a certified Architectural Hardware Consultant (AHC) available at all reasonable times during the course of the work for project hardware consultation to owner, architect and contractor.
   2. Supplier will be responsible for detailing, scheduling and ordering of finish hardware.
3. Conduct pre-installation conference at jobsite. Initiate and conduct with supplier, installer and related trades. Coordinate materials and techniques and sequence complex hardware items and systems installation.

4. Key Conference shall be initiated and conducted with owner to determine system, keyway(s) and structure.

C. Installer Qualifications:
   1. Installer to have not less than 3 years’ experience specializing in installation of work in this section. Company must maintain qualified personnel trained and experienced in installing hardware.

1.3 REFERENCES
   A. NFPA80 – Fire Doors and Windows
   C. NFPA105 – Smoke and Draft Control Door Assemblies
   D. ANSI A117.1 Accessible and Usable Buildings and Facilities

1.4 SUBMITTALS
   A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
   B. Hardware schedule: Submit digital copies of schedule. Organize vertically formatted schedule into Hardware Sets with index of doors and headings, indication complete designations of every item required for each door or opening. Include the following:
      1. Type, style, function, size, quantity and finish of hardware items.
      2. Name, part number and manufacture of each item.
      3. Fastenings and other pertinent information.
      4. Explanation of abbreviations, symbols and codes contained in schedule.
      5. Door and frame sizes, materials and degrees of swing.
   C. Product Data: Submit digital copies for each product indicated.
   D. Templates: Obtain and distribute templates for doors, frames, and other works specified to be prepared for installing door hardware.
   E. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.
   F. Keying Schedule: Prepared by or under the supervision of supplier, after receipt of the approved finish hardware schedule, detailing Owner’s final keying instructions for locks.
   G. Samples: Upon request submit material samples.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Deliver, store, handle and protect products to project site under provisions of Division 1 and as specified herein.
   B. Tag each item or package separately, with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
   C. Deliver keys to Owner by registered mail.
1.6 WARRANTY
A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Years from date of Substantial Completion, for durations indicated.
      a. Closers: Thirty years mechanical, two years electrical
      b. Exit Devices: Three years mechanical, one year electrical
      c. Locksets: Ten years(ND), three years (everything else), one year electrical

PART 2 - PRODUCTS

2.1 MATERIAL AND FABRICATION
A. Provide all door hardware for complete work, in accordance with the drawings and as specified herein.
B. Provide items and quantities not specifically mentioned to ensure a proper and complete operational installation.

2.2 MANUFACTURERS
A. Approval of products from manufacturers indicated as “Acceptable Manufacturer” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCHEDULED MANUFACTURER</th>
<th>ACCEPTABLE MANUFACTURER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinges</td>
<td>Ives (IVE)</td>
<td>Hager, Bommer</td>
</tr>
<tr>
<td>Flush Bolts &amp; Coordinators</td>
<td>Ives (IVE)</td>
<td>Burns, Rockwood</td>
</tr>
<tr>
<td>Locksets &amp; Deadlocks</td>
<td>Schlage (SCH)</td>
<td>No sub.</td>
</tr>
<tr>
<td>Aluminum Door Locks - Narrow Style</td>
<td>Adams Rite (ADA)</td>
<td>None</td>
</tr>
<tr>
<td>Exit Devices &amp; Mullions</td>
<td>Von Duprin (VON)</td>
<td>No Sub.</td>
</tr>
<tr>
<td>Electric Strikes</td>
<td>Von Duprin (VON)</td>
<td>Trine, SDC</td>
</tr>
<tr>
<td>Power Supplies</td>
<td>Von Duprin (VON)</td>
<td>Precision, Sargent, Falcon</td>
</tr>
<tr>
<td>Cylinders &amp; Keying</td>
<td>Schlage (SCH)</td>
<td>Everest 29 S keyway</td>
</tr>
<tr>
<td>Door Closers</td>
<td>LCN (LCN)</td>
<td>No sub</td>
</tr>
<tr>
<td>Automatic Operators</td>
<td>LCN (LCN)</td>
<td>Norton, Besam</td>
</tr>
<tr>
<td>Door Trim</td>
<td>Ives (IVE)</td>
<td>Trimco, Burns</td>
</tr>
<tr>
<td>Protection Plates</td>
<td>Ives (IVE)</td>
<td>Trimco, Burns</td>
</tr>
<tr>
<td>Overhead Stops</td>
<td>Glynn-Johnson (GLY)</td>
<td>Rixson, Sargent</td>
</tr>
<tr>
<td>Thresholds &amp; Weatherstrip</td>
<td>Zero (ZER)</td>
<td>NGP, Reese, Pemko</td>
</tr>
</tbody>
</table>
2.3 HANGING

A. Conventional Hinges: Hinge open width minimum, but of sufficient throw to permit maximum door swing. Steel or stainless steel pins:
   1. Three hinges per leaf to 7 feet, 6-inch height. Add one for each additional 30 inches in height or any fraction thereof.
   2. Provide 4 ½ x 4 ½ for 1 ¾” thick doors up to 3’5”. Provide 5 x 4 ½ on doors 36” and over.
   2. Exterior outswing doors to have non removable (NRP) pins.
   3. Pin tips, flat button, finish to match leaves
   4. Interior doors over 36” – Heavy weight
   5. Interior doors up to 36” – Standard weight

2.4 LOCKSETS, LATCHSETS, DEADBOLTS

A. Heavy Duty Mortise Locks and Latches: Schlage L9000 Series
   1. Provide mortise locks certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security.
   2. Provide lock case that is multi-function and field reversible for handing without opening case, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
   3. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
   4. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
   5. Provide electrified options as scheduled in the hardware sets.
   6. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
      a. Lever Design: Schlage 06A

B. Extra Heavy Duty Cylindrical Locks and Latches: Schlage ND Series
   1. Provide cylindrical locks conforming to ANSI A156.2 Series 4000, Grade 1.
   2. UL listed for A label and lesser class single doors up to 4ft x 8ft.
   3. Meets A117.1 Accessibility Codes.
   4. Provide solid steel rotational stops to control excessive rotation of lever.
   5. Provide completely ref func tional stops that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
   6. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
   7. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
   8. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
   9. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
   10. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.
a. Lever Design: Schlage Sparta

C. Standalone Electronic Locksets: Schlage Electronics NDE series

D. ADD FOR TRAINING

E. USE ENGAGE SOFTWARE
   1. Provide bored cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, non-handed, field-reversible.
   2. Latchbolt Throw: 1/2-inch (13 mm) unless noted otherwise. Provide 3/4-inch (19 mm) throw for UL listing at pairs.
   3. Chassis: Standard 161 cylindrical lock prep for 1-3/4-inch (44 mm) doors
   4. Provide offline electronic access control products that comply with the following requirements:
      a. Listed, UL 294 - The Standard of Safety for Access Control System Units.
      b. Compliant with ANSI/BHMA A156.25 Grade 1 Operation and Security.
      c. Compliant with ASTM E330 for door assemblies.
   5. Provide functions as scheduled that are field configurable without taking the offline electronic product off the door.
   6. Provide mechanical key override.
   7. Power Supply: 4 AA batteries
      a. Provide electronic access control locks and/or exit device trim with the ability to communicate battery status.
   8. Credential Reader:
      a. Proximity
   9. Operation:
      a. Provide electronic access control locks and/or exit device trim with the ability to be configured at door by handheld programming device the length of time device is unlocked upon access grant.
      b. Provide electronic access control locks and/or exit device trim with the ability to communicate identifying information such as firmware versions, hardware versions, serial numbers, and manufacturing dates by handheld programming device.
   10. Components:
      a. Schlage HHD series with Utility Software.
         1) Provide Handheld Programming Device for adaptable electronic access control products capable of the following minimum requirements.
            a) Capable of initializing lock and accessories using preloaded software.
            b) Utilized to field configure electronic access control devices, to download firmware updates and door files to device, and to download audit files from device.
   F. Tubular Locksets: Schlage F Series
   1. Provide tubular locks conforming to ANSI A156.2 Series 4000, Grade 2.
   2. Provide locks with standard 2-3/8 inches (60 mm) adjustable to 2-3/4 inches (70 mm) backset with 1/2 inch (13 mm) latch throw. Provide 2 ¾ inches (70 mm) backset, unless 2-3/8 inches (60 mm) is required by door or frame detail, or noted otherwise.
3. Provide locksets that fit standard 2-1/8 inches (54 mm) diameter bore without use of thru-bolts.
4. Standard Rose Size: 2-1/2 inches (64 mm) in diameter.
5. Door Thickness: Locksets adjustable to fit in 1-3/8 inches (35 mm) or 1-3/4 inches (44 mm) door thickness.
6. Provide standard T-strikes unless extended lip strips are necessary to protect trim.
7. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.
   a. Lever Design: Schlage ELA

2.5 EXIT DEVICES

A. Panic and Fire Rated Exit Devices: Von Duprin 98/99 Series
   1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, AND UL listed for Panic Exit or Fire Exit Hardware.
   2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
   3. Quiet Operation: Incorporate fluid damper or other device that eliminates noise of exit device operation.
   4. Touchpad: Extend minimum of one half of door width, but not the full length of exit device rail. Provide end-cap with two-point attachment to door. Provide compression springs in devices, latches, and outside trims or controls; tension springs prohibited.
   5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrical requirements.
   7. OPTION XP 98/99 only: Latchbolt, Rim Exit Devices: Non-tapered smart latchbolt with 90° latchbolt to strike engagement under stress.
   8. OPTION 98/9949 and/or 33/3549A only: Concealed Vertical Cable Exit Devices: Cable-actuated concealed vertical latch system in two-point and less bottom latch (LBL) configurations. Vertical rods not permitted.
      a. Cable: Stainless steel core wire in stainless steel with polytetrafluoroethylene (Teflon®) liner color-coded to latches and center slides. Conduit and core wire ends snap into latch and center slides without use of tools.
      b. Latchbolts and Blocking Cams: Manufactured from sintered metal low carbon copper- infiltrated steel, with molybdenum disulfide low friction coating.
      c. Top Latchbolt: Minimum 0.382 inch (10 mm) and greater than 90 degree engagement with strike to prevent door and frame separation under high static load.
      d. Bottom Latchbolt: Minimum of 0.44 inch (11 mm) engagement with strike.
      e. Product Cycle Life: 1,000,000 cycles.
      f. Latch Operation: Top and bottom latch operate independently of each other. Top latch fully engages top strike even when bottom latch is compromised. Separate trigger mechanisms not permitted.
      g. Latch release does not require separate trigger mechanism.
      h. Cable and latching system characteristics:
1) Assembled prior to being installed in door.
2) Installed in door as complete assembly.
3) Installed independently of exit device installation, and capable of functioning on door prior to device and trim installation.
4) Connected to exit device at single attachment point.
5) Bottom latch height adjusted from single point, after system is installed and connected to exit device, while door is hanging.
6) Latch position altered up and down 2 inches (51 mm) without additional adjustment.
7) System may be removed while door is hanging.
8) Configure latchbolt mounting: double or single tab mount for steel doors, and wood doors, face mount for aluminum doors, eliminating requirement of tabs.
9) Provide adjustable exit device to latch center line adjustment. Ensures double tab mounting option for top latch, regardless of exit device centerline.

9. Provide exit devices with manufacturer’s approved strikes.
10. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
11. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion that is removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.

a. Lever Style: Match lever style of locksets.

2.6 ELECTRIC STRIKES
A. Manufacturers and Products: Von Duprin 6000 Series
   1. Provide electric strikes designed for use with type of locks shown at each opening.
   2. Provide electric strikes UL Listed as burglary-resistant.
   3. Where required, provide electric strikes UL Listed for fire doors and frames.
   4. Provide fail-secure type electric strikes, unless specified otherwise.
   5. Coordinate voltage and provide transformers and rectifiers for each strike as required.
2.7 KEYS, KEYING, AND KEY CONTROL

A. See Keying Requirements in this section

2.8 CLOSERS

A. Surface Closers: LCN 4010/4110 Series

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. Certify surface mounted mechanical closers to meet fifteen million (15,000,000) full load cycles. ISO 9000 certify closers. Stamp units with date of manufacture code.

2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.

3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 11/16 inch (17 mm) diameter double heat-treated pinion journal.

4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.

5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.

6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.

7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within 6-inch (152 mm) top rail without use of mounting plate so that closer is not visible through vision panel from pull side.

8. Pressure Relief Valve (PRV) Technology: Not permitted.

9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).

10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

B. Surface Closers: LCN 1460 Series

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.

2. Provide door closers with fully hydraulic, full rack and pinion action cylinder.

3. Closer Body: 1-1/4 inch (32 mm) diameter, with 5/8 inch (16 mm) diameter heat-treated pinion journal.

4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.

5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Pressure Relief Valve (PRV) Technology: not permitted.
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.9 OTHER HARDWARE
A. Door stops: Provide stops to protect walls, casework or other hardware.
   1. Except as otherwise indicated, provide stops (wall, floor or overhead) at each leaf of every swinging door leaf.
   2. Where wall or floor stops are not appropriate, provide overhead holders.
B. Weatherstrip and Gasket
   1. Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled.
   2. Provide non-corrosive fasteners as recommended by the manufacturer for application indicated.
C. Thresholds
   1. Except as otherwise indicated, provide standard metal threshold unit of type, size and profile as detailed or scheduled.
D. Silencers
   1. Interior hollow metal frames, 3 for single doors, 2 for pairs of doors.
E. Kickplates
   1. Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

2.10 HARDWARE FINISH
A. Provide the following finishes unless noted differently in hardware groups:
   Hinges 630 Stainless Steel Exterior, 652 Dull Chrome Interior
   Locksets 626 Dull Chrome
   Exit Devices 626 Dull Chrome
   Closers 689 Aluminum
   Kickplates 630 Stainless Steel
   Other Hardware 626 Dull Chrome
   Thresholds Aluminum
   Weatherstrip/Sweeps Aluminum

2.11 KEYING REQUIREMENTS
A. All keyed cylinders shall be subject to a new Schlage Masterkey system. Everest 29 is keyway.
B. Furnish cylinders with construction cores. Following construction supply permanent keyed cores.
C. Cylinders to be furnished with visual key control with key code. Stamped on the face of the keys and marked on the back or side of the cylinders.
D. Key Quantities
   6  EA Master Keys
   4  EA Control Keys
   2  EA Construction Control Keys
   10 EA Construction Keys
   3  EA Change Keys per keyed alike group

PART 3 - EXECUTION

3.1 PREPARATION
   A. Ensure that walls and frames are square and plumb before hardware installation.
   B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes. Notify Architect of any code conflicts before ordering materials.

3.2 INSTALLATION
   A. Do not install surface mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation.
   B. Locate floor stops not more than 4 inches from the wall.
   C. Drill pilot holes for fasteners in wood doors and/or frames.

3.3 ADJUSTING
   A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.
   B. Hardware damaged by improper installation or adjustment methods to be repaired or replaced to Owner’s satisfaction.

3.4 FOLLOW UP INSPECTION
   A. Installer to provide letter of agreement to Owner that approximately 6 months after substantial completion, installer will visit project with representative of the manufacturers of the locking devices and door closers to accomplish the following:
      1. Re-adjust locks and closers
      2. Evaluate maintenance procedures and recommend changes or additions, and instruct Owner’s personnel.
      3. Identify items that have deteriorated or failed.

3.5 DEMONSTRATION
   A. Demonstrate electrical, electronic and pneumatic hardware system including adjustment and maintenance procedures

3.6 PROTECTION/CLEANING
   A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.
### DOOR HARDWARE GROUPS

**HARDWARE GROUP NO. 01:** Provide each SGL door(s) with the following:

<table>
<thead>
<tr>
<th>QTY</th>
<th>DESCRIPTION</th>
<th>CATALOG NUMBER</th>
<th>ITEMID</th>
<th>FINISH</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE 5BB1 4.5 X 4.5</td>
<td>652 IVE</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1</td>
<td>PASSAGE SET ND10S RHO</td>
<td>626 SCH</td>
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</tr>
<tr>
<td>1</td>
<td>SGL CYL DEADBOLT B560RF 12-294</td>
<td>626 SCH</td>
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<tr>
<td>1</td>
<td>FSIC CORE 23-030 EV29 S</td>
<td>626 SCH</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER 1461</td>
<td>689 LCN</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1</td>
<td>KICK PLATE 8400 10&quot; X 2&quot; LDW B-CS</td>
<td>630 IVE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DOOR STOP 060</td>
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<tr>
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<td>A ZER</td>
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<tr>
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<td>FSIC CORE 23-030 EV29 S</td>
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<td>DOOR SWEEP 39A</td>
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**HARDWARE GROUP NO. 02:** Provide each SGL door(s) with the following:

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<th>DESCRIPTION</th>
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<th>ITEMID</th>
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<th>MFR</th>
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<tbody>
<tr>
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<td>HINGE 5PB1 3.5 X 3.5</td>
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<td>PASSAGE SET F10 ELA</td>
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<td>DOOR STOP 060</td>
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<tr>
<td>3</td>
<td>SILENCER SR64/SR65</td>
<td>GRY IVE</td>
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**HARDWARE GROUP NO. 03:** Provide each SGL door(s) with the following:

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<tbody>
<tr>
<td>3</td>
<td>HINGE 5PB1 3.5 X 3.5</td>
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<tr>
<td>3</td>
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<td>GRY IVE</td>
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**HARDWARE GROUP NO. 04:** Provide each SL door(s) with the following:

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<tr>
<td>1</td>
<td>MULTIPLE BYPASS PACK 111MD</td>
<td>JOH</td>
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<td>FLUSH PULL 221</td>
<td>626 IVE</td>
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**HARDWARE GROUP NO. 05:** Provide each SL door(s) with the following:

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<td>FLUSH PULL 221</td>
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**HARDWARE GROUP NO. 06:** Provide each SGL door(s) with the following:

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<td>HINGE 5BB1 4.5 X 4.5 NRP</td>
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<td>STOREROOM LOCK ND80RD RHO</td>
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<td>FSIC CORE 23-030 EV29 S</td>
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## HARDWARE GROUP NO. 07: Provide each RU door(s) with the following:

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## HARDWARE GROUP NO. 08: Provide each PR door(s) with the following:

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<th>ITEMID</th>
<th>FINISH</th>
<th>MFR</th>
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</thead>
<tbody>
<tr>
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<td>IVE</td>
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</tr>
<tr>
<td>2</td>
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<td></td>
</tr>
<tr>
<td>1</td>
<td>RIM CYLINDER 20-057</td>
<td>619</td>
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<tr>
<td>1</td>
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<tr>
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<td>90 DEG OFFSET PULL 8190HD 12&quot; O</td>
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## HARDWARE GROUP NO. 09: Provide each PR door(s) with the following:

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<tbody>
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</tr>
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<td>PANIC HARDWARE 9847WDC-NL-OP-110WD-SNB</td>
<td>619</td>
<td>VON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>RIM CYLINDER 20-057</td>
<td>619</td>
<td>SCH</td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>FSIC CORE 23-030 EV29 S</td>
<td>626</td>
<td>SCH</td>
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<td></td>
</tr>
<tr>
<td>2</td>
<td>90 DEG OFFSET PULL 8190HD 12&quot; O</td>
<td>630</td>
<td>IVE</td>
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<td></td>
</tr>
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<td>2</td>
<td>SURFACE CLOSER 4111 EDA</td>
<td>689</td>
<td>LCN</td>
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<td></td>
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<tr>
<td>2</td>
<td>KICK PLATE 8400 10&quot; X 1&quot; LDW B-CS</td>
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</tr>
<tr>
<td>2</td>
<td>WALL STOP WS406/407CCV</td>
<td>630</td>
<td>IVE</td>
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<td></td>
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<tr>
<td>4</td>
<td>SILENCER SR64/SR65</td>
<td>GRY</td>
<td>IVE</td>
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## HARDWARE GROUP NO. 10: Provide each SGL door(s) with the following:

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<th>MFR</th>
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</thead>
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<td>HINGE 5BB1 4.5 X 4.5</td>
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<tr>
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<td></td>
</tr>
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<td>1</td>
<td>KICK PLATE 8400 10&quot; X 1&quot; LDW B-CS</td>
<td>630</td>
<td>IVE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE 8400 10&quot; X 2&quot; LDW B-CS</td>
<td>630</td>
<td>IVE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP WS406/407CCV</td>
<td>630</td>
<td>IVE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>SILENCER SR64/SR65</td>
<td>GRY</td>
<td>IVE</td>
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## HARDWARE GROUP NO. 11: Provide each SL door(s) with the following:

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<th>QTY</th>
<th>DESCRIPTION</th>
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<th>ITEMID</th>
<th>FINISH</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HARDWARE BY DOOR / FRAME MANUFACTURER BY SLIDER SUPPLIER</td>
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HARDWARE GROUP NO. 12: Provide each SGL door(s) with the following:

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<th>DESCRIPTION</th>
<th>CATALOG NUMBER</th>
<th>ITEMID</th>
<th>FINISH</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE</td>
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<td>652</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ENTRANCE/OFFICE</td>
<td>ND50RD RHO</td>
<td>626</td>
<td>SCH</td>
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</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030 EV29 S</td>
<td>626</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>WALL STOP</td>
<td>WS406/407CCV</td>
<td>630</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>SILENCER</td>
<td>SR64/SR65</td>
<td></td>
<td>GRY</td>
<td>IVE</td>
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HARDWARE GROUP NO. 13: Provide each SGL door(s) with the following:

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<th>DESCRIPTION</th>
<th>CATALOG NUMBER</th>
<th>ITEMID</th>
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<th>MFR</th>
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</thead>
<tbody>
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<td>3</td>
<td>HINGE</td>
<td>5BB1HW 4.5 X 4.5 NRP</td>
<td>630</td>
<td>IVE</td>
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<tr>
<td>1</td>
<td>PANIC HARDWARE</td>
<td>98-NL-OP-110MD</td>
<td>626</td>
<td>VON</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>RIM CYLINDER</td>
<td>20-057</td>
<td>619</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030 EV29 S</td>
<td>626</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>90 DEG OFFSET PULL</td>
<td>8190HD 12&quot; O</td>
<td>630</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>OH STOP</td>
<td>100S</td>
<td>630</td>
<td>GLY</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4111 EDA</td>
<td>689</td>
<td>LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 10&quot; X 2&quot; LDW B-CS</td>
<td>630</td>
<td>IVE</td>
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</tr>
<tr>
<td>1</td>
<td>GASKETING</td>
<td>50AA-S</td>
<td>AA</td>
<td>ZER</td>
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</tr>
<tr>
<td>1</td>
<td>DOOR SWEEP</td>
<td>39A</td>
<td>A</td>
<td>ZER</td>
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</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>655A-223</td>
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<tr>
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<td>RAIN DRIP</td>
<td>142A</td>
<td>A</td>
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HARDWARE GROUP NO. 14: Provide each SGL door(s) with the following:

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<td>652</td>
<td>IVE</td>
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</tr>
<tr>
<td>1</td>
<td>STOREROOM LOCK</td>
<td>ND80RD RHO</td>
<td>626</td>
<td>SCH</td>
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</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030 EV29 S</td>
<td>626</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4011</td>
<td>689</td>
<td>LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 10&quot; X 2&quot; LDW B-CS</td>
<td>630</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1</td>
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<td>630</td>
<td>IVE</td>
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<tr>
<td>3</td>
<td>SILENCER</td>
<td>SR64/SR65</td>
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HARDWARE GROUP NO. 15: Provide each SGL door(s) with the following:

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<th>MFR</th>
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</tr>
<tr>
<td>1</td>
<td>STOREROOM LOCK</td>
<td>ND80RD RHO</td>
<td>626</td>
<td>SCH</td>
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</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030 EV29 S</td>
<td>626</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4011</td>
<td>689</td>
<td>LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 10&quot; X 2&quot; LDW B-CS</td>
<td>630</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1</td>
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<td>WS406/407CCV</td>
<td>630</td>
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<tr>
<td>1</td>
<td>GASKETING</td>
<td>488SBK PSA</td>
<td>BK</td>
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HARDWARE GROUP NO. 16: Provide each SGL door(s) with the following:

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<tr>
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<td>FSIC CORE</td>
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<td>626</td>
<td>SCH</td>
<td></td>
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<tr>
<td>1</td>
<td>OH STOP</td>
<td>100S</td>
<td>630</td>
<td>GLY</td>
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</tr>
<tr>
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<td>SURFACE CLOSER</td>
<td>4111 EDA</td>
<td>689</td>
<td>LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 10&quot; X 2&quot; LDW B-CS</td>
<td>630</td>
<td>IVE</td>
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</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4011</td>
<td>689</td>
<td>LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>WS406/407CCV</td>
<td>630</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>GASKETING</td>
<td>488SBK PSA</td>
<td>BK</td>
<td>ZER</td>
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</tr>
<tr>
<td>1</td>
<td>DOOR SWEEP</td>
<td>39A</td>
<td>A</td>
<td>ZER</td>
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</tr>
<tr>
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<td>RAIN DRIP</td>
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HARDWARE GROUP NO. 17: Provide each SGL door(s) with the following:

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<th>MFR</th>
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<tbody>
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<td>NRP</td>
<td>652</td>
<td>IVE</td>
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<tr>
<td>1</td>
<td>WIRELESS ELECTRONIC LOCK OPERATED</td>
<td>NDE80RD RHO BATTERY</td>
<td>626</td>
<td>SCE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030 EV29 S</td>
<td>626</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4111 EDA</td>
<td>689</td>
<td>LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 10&quot; X 2&quot; LDW B-CS</td>
<td>630</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>WS406/407CCV</td>
<td>630</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4011</td>
<td>689</td>
<td>LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>WS406/407CCV</td>
<td>630</td>
<td>IVE</td>
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</tr>
<tr>
<td>1</td>
<td>GASKETING</td>
<td>488SBK PSA</td>
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HARDWARE GROUP NO. 18: Provide each SL door(s) with the following:

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<th>QTY</th>
<th>DESCRIPTION</th>
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<th>ITEMID</th>
<th>FINISH</th>
<th>MFR</th>
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<td>HARDWARE BY DOOR MANUFACTURER</td>
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HARDWARE GROUP NO. 19: Provide each SGL door(s) with the following:

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<td>FSIC CORE</td>
<td>23-030 EV29 S</td>
<td>626</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>RIM CYLINDER</td>
<td>20-057</td>
<td>619</td>
<td>SCH</td>
<td></td>
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<td>BALANCE OF HARDWARE BY GATE MANUFACTURER</td>
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HARDWARE GROUP NO. ENGAGE: Provide each SGL door(s) with the following:

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<th>DESCRIPTION</th>
<th>CATALOG NUMBER</th>
<th>ITEMID</th>
<th>FINISH</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
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<td>MULTITECH READER</td>
<td>MT20W ADD FOR SITE</td>
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<td>600</td>
<td>CREDENTIAL</td>
<td>9691T</td>
<td>BLK</td>
<td>SCE</td>
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END OF SECTION
SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes metal stud wall framing; metal channel ceiling framing; gypsum board and joint treatment; gypsum sheathing; cementitious backer board; and textured finish on existing and new gypsum surfaces.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

E. Related Sections:
   1. Section 06 10 00 – Rough Carpentry.
   2. Section 10 28 00 – Toilet and Bath Accessories.

1.2 REFERENCES

A. ASTM International:

B. Gypsum Association:
   1. GA 214 - Recommended Levels of Gypsum Board Finish.
   2. GA 216 - Application and Finishing of Gypsum Board.


F. Underwriters Laboratories Inc.:
   1. UL - Fire Resistance Directory.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Product Data: Submit data on metal framing, gypsum board, joint materials, fasteners, surface texturing products.
C. Product Data: Submit physical characteristics and product limitations. Include test data from an independent testing agency to substantiate fire protection and acoustic performance required by the floor/ceiling assemblies in the drawings.
D. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components. All adhesives must conform to the South Coast Air Quality Management District Rule 1168 and all sealants must conform to Bay Area Air Quality Management District – Regulation 8, Rule 51.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C840. ASTM C1280, GA-214, GA-216 and GA-600.
B. Fire Rated Wall, Floor and Roof Construction: Rating as indicated on Drawings. Tested Rating: Determined in accordance with ASTM E119.
   1. Fire Rated Partitions, ceilings, column framing, beam framing, and shaft wall assemblies: Listed assembly by UL number and/or GA File number shown.
C. Surface Burning Characteristics:
   1. Textile Wall Coverings: Comply with one of the following:
      a. Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
b. Comply with requirements of applicable code when tested in accordance with NFPA 265 Method A or Method B test protocols.

1.5 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
B. Installer: Company specializing in performing Work of this section with minimum three years experience.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES
A. Listed Manufacturer: G-P Gypsum Corp and those specifically noted on drawings as proprietary.
B. Other Manufacturers accepted:
   1. Celotex Building Products.
   2. USG Corporation.

2.2 COMPONENTS
A. Framing Materials:
   1. Studs and Tracks: ASTM C645; galvanized sheet steel; 16, 18 and 20 gauge thickness, "C" shape, with knurled faces. Use deflection head tracks for all wall locations where top of wall is fastened to building structural members.
   2. Furring, Framing, and Accessories: ASTM C645.
   4. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
B. Gypsum Board Materials:
   1. Standard Gypsum Board: ASTM C1396/C1396M; 1/2 inch and 5/8 inch thick, or as thick as required for specific application; ends square cut, tapered edges.
   2. Fire Rated Gypsum Board: ASTM C1396/C1396M; fire resistive type, UL or WH rated; 1/2 and 5/8 inch thick, maximum available length in place; ends square cut, tapered edges.
   3. Moisture Resistant Interior Gypsum Board, wall and ceiling applications: ASTM C1396 / D3273; 5/8 inch thick, maximum available length in place; ends square cut, tapered edges; moisture and mold resistant. USG Fiberock Brand Aqua-Tough Gypsum Interior Panels or approved equal, non-paper faced. **Required at all walls and ceiling in unit bathrooms.**
   4. Exterior Gypsum Soffit Board: ASTM C1396/C1396M; fire or non-fire rated type as indicated on the drawings, 5/8 inch thick, maximum
available length in place; ends square cut, tapered edges; non-paper faced.

5. Gypsum Backing Board: ASTM C1396/C1396M; fire and non-fire rated type as indicated on the drawings; 5/8 inch thick; tapered edges, ends square cut, maximum available size in place.

6. Cementitious Backing Board: ASTM C1325 High density, glass fiber reinforced, 1/2 inch thick; 2 inch wide, coated glass fiber tape for joints and corners.

7. For all types of gypsum board materials: minimum 10% recycled content post-consumer or 95% post-industrial.

2.3 ACCESSORIES

A. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.

B. Trim Accessories: Provide manufacturer's standard hot-dipped galvanized ASTM C 840 steel beaded units with nailing flanges for concealment in joint compound.
   1. Corner beads: Metal, or metal and paper combination.
   2. L-type and J-type trim beads, for flush joint compound use.
   3. Special shapes shown on the drawings and as needed to complete installation.

C. Joint Materials: ASTM C475; reinforcing tape, joint compound, adhesive, and water.


E. Paint Primer: refer to Section 09 90 00.

F. Fasteners: ASTM C1002, Type S12 for steel framing, W for wood framing.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.

C. Verify wood framing moisture content is 19% or lower.

3.2 INSTALLATION

A. Metal Stud Installation:
   1. Install studs in accordance with ASTM C754, GA-216 and GA-600.
   2. Metal Stud Spacing: 16 or 24 inches on center as indicated on the drawings.
   3. Refer to Drawings for indication of partitions extending stud framing through ceiling to structure above. Maintain clearance under structural
building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.

4. Door Opening Framing: Install double studs at doorframe jambs. Install stud tracks on each side of opening, at frame head height, and between studs and adjacent studs.

5. Blocking: Nail wood blocking to studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, wood frame openings, toilet accessories, hardware, and as otherwise indicated.

B. Wall Furring Installation:
1. Erect wall furring for direct attachment to concrete masonry units, concrete walls, or as otherwise indicated.
2. Erect furring channels horizontally or vertically as indicated; space maximum 16 oc, not more than 4 inches from floor and ceiling lines or abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
3. Erect metal stud framing tight to substrate materials, or spaced from substrate material as indicated on the drawings, attached by adjustable furring brackets.

C. Gypsum Board Installation:
1. Install gypsum board in accordance with GA-216 and GA-600.
2. Erect single layer board horizontal, with ends and edges occurring over firm bearing.
3. Erect single or double layer fire rated gypsum board as directed in the standards, with edges and ends occurring over firm bearing.
4. Erect exterior gypsum sheathing in accordance with ASTM C1280, horizontally, with edges butted and ends occurring over firm bearing.
5. Use screws when fastening gypsum board to metal furring or framing.
6. Use nails or screws when fastening gypsum board to wood furring or framing. Staples may not be used.
7. Double Layer Applications: Use gypsum backing board for first layer, placed perpendicular to framing or furring members. Use fire rated gypsum backing board for fire rated partitions and ceilings. Secure second layer to first with fasteners. Place second layer parallel to first layer. Offset joints of second layer from joints of first layer.
8. Erect exterior gypsum soffit board perpendicular to supports, with staggered end joints over supports.
9. Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.
10. Place control joints consistent with lines of building spaces or as otherwise directed.
11. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials, or as indicated on Drawings.
12. Install cementitious backing board over studs, plywood sheet, or gypsum board as indicated on the drawings.
13. Apply gypsum board to curved walls in accordance with GA-216.

D. Joint Treatment:
1. Finish in accordance NWCB Level 4 finish.
2. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
3. Feather coats on to adjoining surfaces so that camber is maximum 1/32 inch.
4. Taping, filling, and sanding are not required at surfaces behind adhesive applied ceramic tile.
5. Fill and finish joints and corners of cementitious backing board.
6. Wet sanding of joints required to meet indoor air quality standards only if sanding is done out-of-sequence.

E. Texture Finish: Spray applied finish texture coating to all new, patched and existing surfaces to make consistent texture finish throughout occupied spaces. Apply to all existing or new walls and ceilings.

3.3 ERECTION TOLERANCES
A. Section 01 40 00 - Quality Requirements: Tolerances.
B. Maximum Variation of Finished Gypsum Board Surface from Flat Surface: 1/8" in 10 ft.

3.4 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.1 SUMMARY
A. Section includes resilient flooring sheet and plank products; resilient base; and accessories.

B. The Owner has established sustainability goals for this project. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

C. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

D. Related Sections:
   1. Section 09 68 16 – Sheet Carpeting.

1.2 REFERENCES
A. ASTM International:

B. Federal Specification Unit:
   1. FS L-F-475 - Floor Covering Vinyl, Surface (Tile and Roll), with Backing.
   2. FS RR-T-650 - Treads, Metallic and Nonmetallic, Skid Resistant.


1.3 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Shop Drawings: Indicate seaming plan, custom patterns and inlay designs, only if indicated on the drawings or in this Section.
C. Product Data: Submit data describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions. Include standard line of product for Architect's selection/confirmation of colors.
D. Samples: Submit two sets of manufacturer's complete set of color samples for Architect's selection/confirmation of colors.
E. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components. All adhesives must conform to the South Coast Air Quality Management District Rule 1168 and all sealants must conform to Bay Area Air Quality Management District – Regulation 8, Rule 51.

F. Provide SCS FloorScore certification compliance documentation.

1.4 CLOSEOUT SUBMITTALS
A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
B. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.5 QUALITY ASSURANCE
A. Surface Burning Characteristics:
   1. Floor Finishes and Stair Coverings: Class I, minimum 0.45 watts/sq cm, or Class II, minimum 0.22 watts/sq cm when tested in accordance with NFPA 253.
   2. Base Material: Class I, minimum 0.45 watts/sq cm when tested in accordance with NFPA 253.

1.6 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
B. Protect roll materials from damage by storing in a method consistent with manufacturer's instructions.

1.8 ENVIRONMENTAL REQUIREMENTS
A. Section 01 60 00 - Product Requirements.
B. Maintain temperature in storage area between 55 degrees F and 90 degrees F, or as otherwise required by the manufacturer.
C. Store materials for not less than 48 hours prior to installation in area of installation at temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.
PART 2 PRODUCTS

2.1 VINYL SHEET FLOORING
A. Listed Manufacturer and Product: Mannington Commercial, Inc. “Jumpstart.”
B. Other Manufacturers:
C. Performance Characteristics:
   1. Meets or exceeds ASTM F-1303.
   2. Wear Layer Thickness: 10 mils.
   3. Static Coefficient of Friction: Meets slip resistance of ADA requirements when tested according to ASTM D2047.
   4. Fire resistance: Smoke density 450 or less when tested in accordance with ASTM E662 and NFPA 258.
   5. Critical radiant flux: Class 1 according to ASTM E648 and NFPA 253.
   6. Roll width: 72 inches.
   7. Seam Sealer: MLG 33.
   8. FloorScore Certified.
11. Locations: per finish schedule.

2.2 VINYL PLANK FLOORING
A. Listed Manufacturer and Product: Kentwood Floors, Evoke Luxury Vinyl - “Serena” Stick 3mm.
B. Substitutions: Section 01 25 13 – Product Substitution Procedures.
C. Performance Characteristics:
   1. Wear Layer: 30 mil.
   2. Plank Size: 7” wide x 48” long x 1/8” thick.
   5. FloorScore Certified.

2.3 UNDERLAYMENT
B. Substitutions: Section 01 25 13 – Product Substitution Procedures.
C. Performance Characteristics:
   1. Thickness: .070”.
   2. Roll Width: 72”.
   3. Fire resistance: Smoke density 450 or less when tested in accordance with ASTM E662.
   4. Radiant Flux: .045 m2 or greater Class 1 per ASTM E648.
   5. Installation: Full spread adhesive.
   6. FloorScore Certified.
   7. Warranty: Manufacturer’s 20-year commercial.
2.4 RESILIENT BASE
   A. Listed Manufacturer: Roppe Corp.
   B. Manufacturers:
      1. Armstrong World Industries, Inc.
      3. Mannington Commercial
      5. Burke Industries Inc.
   C. Base: ASTM F1861 Rubber; top set coved, solid color throughout.
      1. Height: 4-inch height as shown on the drawings and/or finish schedules.
      2. Locations: as shown on drawings and/or finish schedules
      4. Length: Roll.
      5. Accessories: Pre-molded external corners (miter internal corners).
      6. Rubber reducer strips at all edges of resilient flooring.
      7. Colors: Up to two (2), selected by the Architect/Owner from the full line.

2.5 ACCESSORIES
   A. Subfloor Filler: Cementitious or premix latex, type recommended by adhesive material manufacturer and flooring manufacturer, Low-VOC.
   B. Primers and Adhesives: Waterproof, Low-VOC, types recommended by flooring manufacturer.
   C. Moldings and Edge Strips: Same material as flooring, unless otherwise indicated.
   D. Sheet Flooring Vinyl Welding Rod: Solid vinyl bead produced by manufacturer of vinyl flooring for heat welding seams, in color matching field color.
   E. Filler for Coved Base: manufacturer's standard.
   F. Transition strip between carpet and resilient flooring sheet product, Roppe, or other listed manufactures. Color selected by architect.
   G. Sealer and Wax: Types recommended by flooring manufacturer rated for high-traffic areas. (2) coats minimum installed. Confirm with Owner.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
   B. Verify concrete floors are dry to maximum moisture content as recommended by flooring manufacturer, and exhibit negative alkalinity, carbonization, and dusting.
   C. An adhesive bond test shall be performed and passed prior to beginning installations.
3.2 PREPARATION
A. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface. Note that some manufacturers require only Portland cement based patching and leveling materials be used for their products.
B. Prohibit traffic until filler is cured.
C. Clean substrate.
D. Apply primer as required to prevent "bleed-thru" or interference with adhesion by substances that cannot be removed. Apply primer to surfaces required by the manufacturer.

3.3 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 carefully at seams.
B. Double cut sheet; provide heat-welded seams.
C. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.
D. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated. Secure resilient strips by adhesive.
E. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
F. Install flooring into the flange of floor drains. If flange-type drain is not installed, butt flooring to edge of drain and seal interface with same sealant used at other joints.
G. Install flooring in recessed floor access covers. Maintain floor pattern.
H. At movable partitions, install flooring under partitions without interrupting floor pattern.
I. Install feature strips and floor markings where indicated. Fit joints tightly.
J. Install flooring to run continuously under kitchen and bathroom cabinets.

3.4 INSTALLATION - BASE
A. Fit joints tightly and make vertical. Install roll stock, and maintain minimum dimension of 18 inches between joints.
B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
C. Install base on solid backing. Bond tightly to wall and floor surfaces.
D. Scribe and fit to doorframes and other interruptions.

3.5 CLEANING
A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
B. Remove excess adhesive from floor, base, and wall surfaces without damage.
C. Clean, seal, and maintain resilient flooring products.
3.6 WASTE MANAGEMENT
   A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
   B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
   C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
   D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
   E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
   F. Collect cut-offs and scraps and place in designated area for recycling.

3.7 PROTECTION OF INSTALLED CONSTRUCTION
   A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
   B. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY
A. Work includes sheet carpet installed over pad, over substrate, and accessories in residential units indicated by the finish schedule.
B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.
C. Project Specific Requirements:
   1. Carpet and pad must be CRI Green Label certified per the requirements of ESDS Criterion 7.2a.
   2. Carpet must not be installed at entry, kitchen or bathroom locations per the requirements of ESDS Criterion 7.2a.
D. Related Sections:
   1. Section 06 20 00 – Finish Carpentry.
   2. Section 09 65 00 – Resilient Flooring and Base.

1.2 REFERENCES
B. Certified Floor Covering Installers (CFI): CFI – Carpet Training and Certification.
C. Consumer Products Safety Commission:
   1. CPSC 16 CFR 1630 - Standard for the Surface Flammability of Carpets and Rugs.
D. National Fire Protection Association:
E. NSF International (NSF)
   1. ANSI/NSF 140 – Sustainable Carpet Assessment Standard.
F. Underwriters Laboratory (UL):

1.3 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Shop Drawings: Indicate seaming plan, method of joining seams, and direction of carpet pile.
C. Product Data: Submit data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
   1. Submit proof of CRI Green Label certification.
D. Samples: Submit two samples 12 x 12 inch in size illustrating color and pattern for each carpet color selected.

E. Manufacturer's Installation Instructions: Submit special procedures, perimeter conditions and conditions requiring special attention.

F. MSDS Materials: Include material safety and data sheets for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components.

G. ESDS Binder: Include manufacturer's product information showing CRI Green Label Plus certification and VOC content of adhesives under Criterion 7.2a.

H. Closeout submittal
   1. Section 01 70 00 - Execution & Closeout Requirements: Closeout procedures.
   2. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.4 QUALITY ASSURANCE
A. Surface Burning Characteristics:
   1. Floor Finishes: Comply with one of the following:
      a. Class I, minimum 0.45 watts/sq cm when tested in accordance with NFPA 253.
      b. CPSC 16 CFR 1630.

B. Qualifications:
   1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
   2. Installer: Company specializing in performing work of this section with minimum three years experience.
      a. CFI certified carpet installers.

1.5 ENVIRONMENTAL REQUIREMENTS
A. Section 01 60 00 - Product Requirements.
B. Store materials in area of installation for 48 hours prior to installation.
C. Maintain minimum 70 degrees F ambient temperature for three days prior to, during and 24 hours after installation.
D. Ventilate installation area during installation and for three days after installation.

1.6 EXTRA MATERIALS
A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Quantity: None required.

1.7 WARRANTY
A. Provide Owner with written manufacturer’s warranty covering the following:
   1. Warranty to be “non-prorate, full replacement warranty, including all labor”.
   2. Warranty to include:
      a. 10 years on surface wear.
      b. 10 years on backing delimitation.
c. 10 years on seam construction.

3. Submit warranty that carpet will not display any significant change in color due to exposure to atmospheric contaminants.

PART 2 PRODUCTS

2.1 CARPET
A. Listed Manufacturer: Shaw Contract Sentiment, 25 oz. solution-dyed polyester carpet.
B. Substitutions: Section 01 60 00 - Product Requirements.

2.2 COMPONENTS
A. Carpet Type
   1. Product Name and Style: Sentiment 60775
   2. Collection: Quiet Canvas.
   3. Description: 100% PureColor® solution dyed nylon.
   4. Color/Pattern: selected by Owner from manufacturer’s standard line of colors.
   5. Locations: Unit bedrooms, or where identified on finish schedules.

2.3 ACCESSORIES
A. Sub-Floor Filler: Cementitious Type recommended by flooring material manufacturer.
B. Pad: 7/16" thick with density of 6 lb per cubic foot, as recommended Carpet and Rug Institute.
C. Moldings and Edge Strips: Rubber or vinyl, color selected by Architect.
D. Seam Adhesive: Recommended by manufacturer.
E. Contact Adhesive: Recommended by carpet manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION
A. Section 01 30 00 - Administrative Requirements: Coordination & project conditions.
B. Verify floor surfaces are smooth and flat within industry tolerances and are ready to receive work.

3.2 PREPARATION
A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
C. Vacuum clean substrate.

3.3 INSTALLATION

A. In general, strictly comply with manufacturer's printed installation instructions and in accordance with CRI 104.

B. Verify carpet match before cutting to ensure minimal variation between dye lots.

C. Lay out carpet and locate seams in accordance with CRI 104:
   1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
   2. Do not locate seams perpendicular through door openings.
   3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
   4. Locate change of color or pattern between rooms under door centerline.
   5. Provide monolithic color, pattern, and texture match within each contiguous area.

D. Install carpet tight and flat on subfloor, well fastened at edges, with uniform appearance.

E. Make cuts straight, true, and unfrayed. Apply seam adhesive to cut edges of woven carpet immediately.

F. Stretch-In Installation: Follow installation recommendations per CRI 104 for installing carpet under tension over a separate cushion, using tack-strips fastened at walls and other vertical abutments.

G. Trim carpet neatly at walls and around interruptions.

3.4 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

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

C. Clean and vacuum carpet surfaces.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Do not permit traffic over unprotected floor surface.

C. Cover carpeting in traffic areas with protective non-staining building paper. Do not use plastic sheeting.

3.9 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section includes surface preparation and field application of paints, stains, varnishes, and other coatings. Also included are shop applied transparent finishes for interior millwork, doors and frames.

B. The Owner has established sustainability goals for this project. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. It is a specific requirement of this Section that all interior paints and coatings meet the current Green Seal Standards requirements. Refer to Section 01 81 15 & 01 81 19.

C. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

D. Related Sections:
1. Section 05 50 00 - Metal Fabrications.
2. Section 06 20 00 - Finish Carpentry.
3. Section 08 16 00 – Molded Composite Doors.
4. Section 08 32 16 - Fiberglass Exterior Doors.
5. Section 09 21 16 - Gypsum Board Assemblies.
6. Section 32 17 00 - Pavement Markings / Storm Drain Labels.

E. Definitions:
1. Conform to ASTM D16 for interpretation of terms used in this section.

1.2 REFERENCES

A. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE):
1. ASHRAE Handbook of Fundamentals.

B. ASTM International:

C. Federal Specifications (FS):

D. National Fire Protection Association (NFPA):

E. PDCA Painting and Decorating Craftsman Manual and Textbook.
F. SSPC: The Society for Protective Coatings
   1. MPI Architectural Painting Specification Manual

G. Underwriters Laboratories Inc. (UL):

H. Green Seal: GS-11 Green Seal Environmental Standard for Paints and Coatings.

1.3 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Product Data: Submit data on finishing products.
C. Samples:
   1. Submit four painted samples (draw-downs) illustrating selected colors for each color and system selected. Submit on illustration board stock 8x10 inch size.
   2. Submit two samples of wood door veneer with shop-applied transparent finish, 8x10 inch size, illustrating wood grain, stain color and sheen. Refer to Section 08 14 16 and 08 14 33.
D. Manufacturer’s Installation Instructions: Submit special surface preparation procedures, substrate conditions requiring special attention.
E. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components. All adhesives must conform to the South Coast Air Quality Management District Rule 1168 and all sealants must conform to Bay Area Air Quality Management District – Regulation 8, Rule 51. All interior paints and primers are required to be Green Seal certified under the current Green Seal Standards.
1.4 CLOSEOUT SUBMITTALS
A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
B. Operation and Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.5 QUALITY ASSURANCE
A. Surface Burning Characteristics: Fire Retardant Finishes: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.6 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years experience.
B. Applicators: Company specializing in performing work of this section with minimum three years experience.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
C. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
D. Paint Materials: Store at minimum ambient temperature of 45 degrees F and maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.8 ENVIRONMENTAL REQUIREMENTS
A. Section 01 60 00 - Product Requirements.
B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.
C. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.
D. Provide lighting level of 80 ft candle measured mid-height at substrate surface.

1.9 SEQUENCING
A. Section 01 10 00 – Summary: Work sequence.
B. Sequence application to the following:
   1. Do not apply finish coats until paintable sealant is applied.
   2. Back prime wood trim before installation of trim.

1.10 EXTRA MATERIALS
A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
B. Quantity: **None required.**
PART 2 PRODUCTS

2.1 PAINTS AND COATINGS
   B. Other Manufacturers:
      1. Benjamin Moore.
      2. Pratt & Lambert.
      4. The Glidden Co.
      5. Substitutions: Section 01 25 13 – Product Substitution Procedures.
   D. Other Manufacturers:
      1. Benjamin Moore.
      2. Pratt & Lambert.
      4. The Glidden Co.
   E. Substitutions: Section 01 25 13 – Product Substitution Procedures

2.2 COMPONENTS
   A. Coatings: Ready mixed, except field-catalyzed coatings. Prepare coatings:
      1. To soft paste consistency, capable of being readily and uniformly dispersed to homogeneous coating.
      2. For good flow and brushing properties.
      3. Capable of drying or curing free of streaks or sags.
   B. Low VOC content: required for all interior applications. Refer to limits in Section 01 81 15, & 01 81 19.
   C. Vapor-Retarder requirements for primer and topcoats, exterior wall assemblies: products shall be vapor semi-permeable, ASHRAE Class II, 1.0 perm or less and greater than 0.1 perm. (Do not provide if spray foam insulation is installed at exterior walls.)
   D. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve finishes specified; commercial quality.
   E. Patching Materials: Latex filler, Low-VOC (GS 11).
   F. Fastener Head Cover Materials: Latex filler, Low-VOC (GS 11).

PART 3 EXECUTION

3.1 EXAMINATION
   A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
   B. Verify substrate conditions are ready to receive Work as instructed by product manufacturer.
C. Examine surfaces scheduled to be finished prior to commencement of work. Report conditions capable of affecting proper application.

D. Test shop applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Plaster and Gypsum Wallboard: 12 percent measured in accordance with ASTM F2659.
   2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent measured in accordance with ASTM F2659.
   3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
   4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
   5. Concrete Floors: 8 percent measured in accordance with ASTM F2659.

3.2 PREPARATION

A. Surface Appurtenances: Remove [or mask] electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

B. Surfaces: Correct defects and clean surfaces capable of affecting work of this section. Remove or repair existing coatings exhibiting surface defects.

C. Marks: Seal with shellac those which may bleed through surface finishes.

D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

E. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high-pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

F. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

G. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

H. Copper Surfaces Scheduled for Paint Finish: Remove contamination by steam, high-pressure water, or solvent washing. Apply vinyl etch primer immediately following cleaning.

I. Copper Surfaces Scheduled for Natural Oxidized Finish: Remove contamination by applying oxidizing solution of copper acetate and ammonium chloride in acetic acid. Rub on repeatedly for required effect. Once attained, rinse surfaces with clear water and allow to dry.

J. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

K. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

L. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
M. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

N. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent. Apply treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

O. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

P. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

Q. Interior Wood Items Scheduled to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.

R. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior paintable caulking compound after prime coat has been applied.

S. Exterior Wood Scheduled to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior caulking compound after sealer has been applied.

T. Wood Doors Scheduled for Painting: Seal wood door top and bottom edge surfaces with tinted primer.

U. Metal Doors Scheduled for Painting: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

A. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

B. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless specified otherwise.

C. Sand wood and metal surfaces lightly between coats to achieve required finish.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Where clear finishes are required, tint fillers to match wood. Work fillers into grain before set. Wipe excess from surface.

F. Prime concealed surfaces (back-prime) of interior and exterior woodwork with primer paint.

G. Prime concealed surfaces of interior wood surfaces scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with thinner.

H. Finishing Mechanical And Electrical Equipment (exposed to view in the finished work):
   1. Paint shop primed equipment.
2. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

3. Prime and paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, with the exception of shop finished items or specifically noted to be left unpainted.

4. Paint interior surfaces of air ducts visible through grilles and louvers with one coat of flat black paint to visible surfaces. Paint dampers exposed behind louvers, grilles, to match face panels.

5. Paint exposed conduit and electrical equipment occurring in finished areas.

6. Color code equipment, piping, conduit, and exposed duct work in accordance with requirements indicated. Color band and identify with flow arrows, names, and/or numbering.

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

I. Do not apply finishes to the following materials:
   1. Metals as listed: brass, bronze, copper, plated metals, stainless steel, anodized aluminum.
   2. Acrylic wall coverings.
   3. Materials having a complete factory finish including: electrical switch plates, lighting fixtures, and finish hardware.
   4. Finished cabinets.
   5. Pre-finished wood.

J. Place used sealant tubes and near empty containers in areas designated for hazardous materials.

3.4 CLEANING
   A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
   B. Collect waste material that may constitute fire hazard, place in closed metal containers, and remove daily from site.

3.5 SCHEDULE – SHOP FINISHED ITEMS
   A. See 05 50 00 - Metal Fabrications and 05 52 00 - Metal Railings for shop finishes associated with exterior metal stairs.

3.6 SCHEDULE – EXTERIOR SURFACES
   A. General Prep:
      1. Caulk all splits and cracks. Press all caulking into gaps using a finger or appropriate tool. Use the specified patching compound for gaps exceeding 1/4 inch. Refer to manufacturer’s printed instructions for further instructions regarding caulking or patching compounds. Caulking shall be carefully completed and, if necessary, trimmed and smoothed to provide a uniform surface.
      2. Caulking: Sashco Big Stretch Caulk.
   B. Priming:
      1. All unprimed areas (except metal): Rodda 501601x First Coat Primer.
      2. All rust and unprimed metal with: Rodda 70822x Barrier III High Solids Metal Primer.
3. No primer over wood fencing.

C. Fiber Cement Panel / Lap Siding and Trim:
1. Rodda 521101x AC909 Satin
2. Follow fiber cement siding manufacturer’s printed painting instructions.
3. Apply by sprayer, brush and roll, 1 coat to all surfaces to be painted, minimum dry film thickness of 1.5 mils (4 mils wet).

D. Door and Wraps:
1. Rodda 542001x Unique II Semi-Gloss.
2. Apply 2 coats. Additional coats may be required, minimum dry film thickness of 1.5 per coat, 4 mils wet per coat.

E. Wood Fencing:
1. Cloverdale 06680 WeatherOne Semi-Transparent 100% Acrylic Stain
2. Apply 1 coats to cover, spray & back roll using.

3.7 SCHEDULE – INTERIOR SURFACES

A. Fiberglas Entry Door and Millwork:
1. One coat: Sherwin Williams B51W00620 PrepRite ProBlock Int/Ext Latex Primer/Sealer MPI#6
2. Two coats: Sherwin Williams A76W00051 SOLO Int/Ext 100% Acrylic, Semi-Gloss MPI#54.

B. Wood Door and Trim
1. One coat: Sherwin Williams B51W00620 PrepRite ProBlock Int/Ext Latex Primer/Sealer MPI#6.
2. Two coats: Sherwin Williams A76W00051 SOLO Int/Ext 100% Acrylic, Semi-Gloss MPI#54.

C. Gypsum Board Walls and Ceilings:
1. One Coat: Sherwin Williams B51W08670-Quick Dry Int/Ext Stain Blocking Primer MPI#149.
2. One Coat: Sherwin Williams B20W03050-Property Solutions Int Latex Eggshell.
3. Walls and Ceilings: Coats to cover, spray and backroll in all units and laundry rooms.

D. Bathrooms and Kitchens:
2. Additional mildew control additive - Trimaco Mildew Control (Solar Chemicals)

3.8 SCHEDULE - COLORS

A. For exteriors, allow up to three (3) building color schemes. For each building color scheme, allow two (2) total primary paint colors (6 colors total). Each building color scheme will use one (1) total color for exterior trim.

B. For interiors, allow up to two (2) primary paint colors and up to two (2) accent paint colors per building. Verify through submittal process; colors selected by Architect/Owner.
3.9  WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.

B. Where possible, give preference to suppliers who take back waste for re-use or recycling.

C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.

D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.

E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
SECTION 10 14 00
SIGNAGE

PART 1 GENERAL

1.1 SUMMARY
A. Section includes installing Owner-provided contractor-installed exterior and interior non-illuminated signs and contractor-provided and installed site signage.
B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.
C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.
D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

1.2 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
C. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components.

1.3 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
B. Package signs, labeled in name groups.
C. Store adhesive products at ambient room temperatures.

1.5 ENVIRONMENTAL REQUIREMENTS
A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
B. Do not install signs when ambient temperature is lower than recommended by manufacturer.
C. Maintain this minimum temperature during and after installation of signs.
PART 2 PRODUCTS

2.1 EXTERIOR AND INTERIOR SIGNS
   1. Owner provided. Contractor installed.

2.2 MATERIALS – SITE SIGNS – Contractor supplied and installed.
   A. **Sign Type A:** Accessible parking signs: located in walks at designated vehicle stalls.
   B. Mounting Locations: Refer to drawings for mounting requirements. Where location is not specifically identified on drawings, contact Architect for direction. Review location of all signs prior to installation with Architect.

2.3 MATERIALS – EXTERIOR SIGNS – Owner supplied. Contractor installed.
   A. **Sign Type B:** Typical exterior building & address identification placards: Raised characters on acrylic face. Mounting on 1/4" projected spacers. Two signs for each building at locations. Verify locations with Owner/Architect.
      1. Example: A 3015
      2. See G001 for list of Buildings and Addresses
   B. **Sign Type C:** Typical exterior building & address identification placards: Raised characters on acrylic face. Mounting on 1/4" projected spacers. One sign for each building/stair entry. Verify locations with Owner/Architect.
      1. Example: UNITS 17 – 20,
      2. See A002 & A003 for unit numbers
   C. **Sign Type D:** Typical exterior building & address identification placards: Raised characters on acrylic face. Mounting on 1/4" projected spacers. One sign for each building entry. Verify locations with Owner/Architect.
      1. OFFICE/COMMUNITY BUILDING
      2. POOL EQUIPMENT
      3. MAINTENANCE OFFICE
      4. MAINTENANCE SHOP

2.4 MATERIALS – INTERIOR SIGNS - Owner supplied. Contractor installed.
   A. **Sign Type E:** Typical apartment unit numbers: Provide Gatehouse 3.86" satin nickel unit numbers at entry door to each unit. Adhesive mounting. Number scheme per building as indicated on drawings.
   B. **Sign Type F:** Typical interior room/space placards: Raised characters on acrylic face. Adhesive mounting. One sign for each room as required by code. Verify locations with Owner/Architect.
   C. **Sign Type G:** Typical accessible toilet room placards: Raised characters on acrylic face. Adhesive mounting. One sign for each room as required by code. Verify locations with Owner/Architect. One sign for toilet room in Office building.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
3.2 INSTALLATION
A. Install signs after doors are installed and wall surfaces are finished, in locations directed.
B. Secure all items with tamperproof fasteners recommended by manufacturer and as specified.
C. Set level, plumb, and at the height indicated. Mounting surface shall be free from distortion or other defects in appearance.
D. If installation is on glass relites, install with double-backed foam tape on interior glass relite surfaces with a matching base plate for the reverse of the glass to hide tape.

3.3 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section includes toilet room accessories; shower and tub accessories; and utility room accessories.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

E. Related Sections:
   1. Section 06 10 00 – Rough Carpentry.
   2. Section 09 90 00 – Painting and Coating.
   3. Division 26 – Electrical

1.2 REFERENCES

A. ASTM International:
   4. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   5. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.


1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Product Data: Submit data on accessories describing size, finish, details of function, attachment methods.
C. Manufacturer's Installation Instructions: Submit special procedures, conditions requiring special attention.
D. Provide manufacturer’s certification that grab bars and mounting hardware satisfy UBC loading requirements (250 lbf).

1.4 COORDINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Coordinate the Work with placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2 PRODUCTS

2.1 TOILET AND BATH ACCESSORIES
A. Listed Manufacturers:
   1. Bobrick Washroom Accessories for Office Toilet Rooms.
   2. Franklin Brass: for Unit towel bars and toilet paper holders.
   3. Glacier Bay: for Unit shower rods & medicine cabinets.
   4. Section 01 25 13 – Product Substitution Procedures.

2.2 COMPONENTS
A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation. Grind welded joints smooth. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
B. Adhesive: Silicone, waterproof.
C. Fasteners, Screws, and Bolts: Stainless steel, tamper-proof.
D. Finish: as noted below, all items factory finished ready for field installation.
E. Refer to accessory schedule for specific room accessories. Refer to drawings for locations.

2.3 OFFICE TOILET ROOMS ACCESSORIES
A. Toilet Paper Dispenser: (Bobrick B-2888) two 5-1/4" dia. rolls, surface mounted type, satin finished stainless steel, keyed.
B. Paper Towel Dispenser/Waste Receptacle: (Bobrick B-369) recessed, stainless steel, satin finish, locking, 2 gallon capacity.
C. Soap Dispenser, Wall-mounted: (Bobrick B-2111) liquid soap dispenser, wall-mounted; push type soap valve.
D. Framed Mirrors: (Bobrick B-290 Series) size shown on drawings, angle frame for wall attachment, satin stainless frame finish.
E. Robe Hook: (Bobrick B-6727) satin stainless steel, concealed mounting.
2.4 TYPICAL UNIT BATHROOM ACCESSORIES

A. Toilet Paper Holder: Franklin Brass Futura D2408PC - surface mounted, die-cast zinc with polished chrome finish; spindle chrome-plated plastic.

B. Towel Bar: Franklin Brass Futura D2424PC - surface mounted, 24-inch die-cast zinc with polished chrome finish; locations and quantities as shown on the drawings. Advise Architect/Owner if selected size will not work in location identified.

C. Robe Hook: Franklin Brass Futura D2402PC – surface-mounted multi-purpose hook, die-cast zinc with polished chrome. 1 per bathroom.

D. Shower curtail rod: (Glacier Bay) adjustable 72” length carbon steel larger end caps, tension shower rod in white.

E. Medicine Cabinet: (Glacier Bay T30-WH-B) 30”x30” surface-mount tri-view mirrored medicine cabinet, white finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify exact location of accessories for installation.

C. Verify field measurements are as indicated on product data.

D. Verify that blocking has been installed in walls behind accessories.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install plumb and level, securely and rigidly anchored to substrate.

B. Mounting Heights and Locations: As indicated on Drawings. If location is not indicated, notify Architect for direction.

C. Provide solid blocking behind bathroom accessories as notes on drawings.

3.4 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.

B. Where possible, give preference to suppliers who take back waste for re-use or recycling.

C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.

D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.

F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
SECTION 10 60 00
INTERIOR AND EXTERIOR SPECIALTIES

PART 1  GENERAL

1.1  SUMMARY
A. Section includes supplying and installing miscellaneous interior and exterior specialties including mailbox enclosures, closet shelving, acrylic tub surrounds in apartment bathrooms, and deck coating for top landing of exterior entry stairs.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

E. Related Sections:
1. Section 06 10 00 – Rough Carpentry.
2. Section 09 21 16 – Gypsum Board Assemblies.
3. Section 09 90 00 – Painting and Coatings.

1.2  REFERENCES
A. ASTM International:
4. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
5. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

1.3  SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Product Data: Submit data on specialty products describing size, finish, details of function, attachment methods.
C. Samples: Submit four samples of each specialty product where Architect is required to make a finish selection, illustrating color and finish choices.
D. Manufacturer's Installation Instructions: Submit special procedures, and conditions requiring special attention.

E. VOC Limits: Include manufacturer's literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components. All adhesives must conform to the South Coast Air Quality Management District Rule 1168 and all sealants must conform to Bay Area Air Quality Management District – Regulation 8, Rule 51.

F. Submit certification from manufacturer stating the percentage of recycled content material, identifying post-consumer and post-industrial contents.

G. Provide manufacturer's literature certifying that steel products contain a minimum of 18% recycled scrap content. Identify post-consumer and post-industrial percentages.

1.4 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate the Work with placement of internal wall reinforcement.

PART 2 PRODUCTS

2.1 INTERIOR SPECIALTIES, MANUFACTURERS AND MODEL NUMBERS

A. Closet shelving: Locations and number shown on drawings. Coated steel ventilated wire closed mesh shelving. Install with wall brackets, end caps, hold-down clips and other accessories standard with the manufacturer for a complete installation. Provide solid blocking behind

1. Listed Manufacturer: Closetmaid and/or substitutions: Section 01 25 13 – Product Substitution Procedures.

2. Bedroom closets: nominal 12” deep with coat hanger rod under shelf.

3. Entry and hallway closets: nominal 16” deep. ClosetMaid or approved equal. Shelving in bedroom closets in units C5, J3, M5, and shall be adjustable to 42”-60” above finished floor (ESDS 1.2).

B. Tub surrounds: Mustee Durawall 350WT fiberglass wall system. At units where tub surrounds are scheduled for replacement. Compression- molded non-porous material with a durable baked-on industrial coating and very high shine that will not mold or mildew. Limited 5-year warranty for commercial applications. Do not install before installation of solid backing/blocking at future grab bar locations.

2.2 EXTERIOR SPECIALTIES, MANUFACTURERS AND MODEL NUMBERS

A. Manufacturer and/or product model substitutions: Section 01 25 13 – Product Substitution Procedures.


1. 3916S - Two (2) single column units.

2. 2916D - Six (6) double column units.

D. **Exterior Deck Coating:** Spray applied polyurethane or polyuria deck coating, applied at top landing of all exterior entry stairs. ArmorThane STS-300, Rhino Linings TuffGrip, or approved equal. Install in strict accordance with manufacturer’s written installation instructions. Provide all required accessories for warrantable installation.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
   B. Verify exact location of products for installation.
   C. Verify field measurements are as indicated on product data submittal.

3.2 PREPARATION
   A. Deliver inserts and rough-in frames to site for timely installation.
   B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION
   A. Install plumb and level, securely and rigidly anchored to substrate.
   B. Follow manufacturer's printed instructions, using manufacturer's standard attachment devices and procedures.
   C. For wall corner guards: position guard above wall base, and extend to a point 36" above the finished floor for painted walls, or to the top of the wall covering for walls with a specified wall covering finish.
   D. Adjust all moving parts to operate smoothly.
   E. Leave product and adjacent area clean and free of defects.

3.4 WASTE MANAGEMENT
   A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
   B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
   C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
   D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
   E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
   F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
SECTION 11 31 00
RESIDENTIAL APPLIANCE

PART 1  GENERAL

1.1 SUMMARY
A. Work includes but is not limited to residential and common kitchen as shown on drawings, including Owner-provided Contractor-installed appliances.
B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.
D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.
E. Related Sections:
   1. Section 12 35 30 – Casework.
   3. Division 26 – Electrical.

1.2 SUBMITTALS
A. Section 10 33 00 - Submittal Procedures: Submit procedures.
B. Setting drawings: Provide setting drawings showing all installation conditions for built-in equipment.
C. Product data: Submit copies of manufacturer’s product data, installation, and maintenance instructions for each appliance. Transmit extra copies of installation instructions to installer.
D. Provide templates, instructions, and directions required to insure accurate location of utility rough-in and anchorage devices.
E. Operation and Maintenance Data per Section 01 70 00: Submit in triplicate manufacturer’s printed directions.

1.3 QUALITY ASSURANCE
A. Section 01 41 00 - Regulatory Requirements: See referenced codes, ordinances, and the like.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Section 01 60 00 - Product Requirements.
B. Carefully crate and insulate against marring, and other damage in transit.
C. Acceptance at site: Carefully uncrate. Verify units in satisfactory condition.
D. Store out of harm’s way. Handle units carefully, prevent marring. Protect units at all times.
1.5 SERVICE AND WARRANTY
   A. Fully guarantee each unit against defects in function and appearance (not caused by abuse) for a period of two years minimum (or longer if standard with manufacturer) from date of Substantial Completion.
   B. Remove, reinstall new units, transport, furnish parts, labor and any other service or material necessary to correct defective units. All appliances are to be in perfect operating condition.
   C. Supplier to be in position to offer service contract after warranty expiration.

PART 2 PRODUCTS

2.1 MANUFACTURERS
   A. Listed Manufacturer: GE, unless otherwise noted.
   B. Substitutions: Section 01 25 13 – Product Substitution Procedures.
   C. Provide all product types from the same Manufacturer for consistency and uniformity.
   D. Submittal package shall indicate manufacturer’s current model number if different than the model listed.
   E. Color: white unless otherwise indicated.

2.2 DWELLING UNIT AND OFFICE KITCHEN APPLIANCES
   A. Owner-Provided and Contractor-Installed:
      1. ADA Oven/Range: GE # JBS45DFWW – Office building
         a. 30” wide free-standing electric range.
         b. ADA compliant.
      2. Oven/Range: GE # JB256DMWW - Units
         a. 30” wide free-standing electric range.
      3. Refrigerator/Freezer: GE # GTE16DTHWW - Office and Units
         a. Top-freezer refrigerator, white finish, 15.5 cu.ft.
            b. Energy Star labeled.
      C. Contractor Provided and Installed:
         1. Dishwasher: GE# GDF510PGMWW - Office and Units
            a. 24”, Built-in, front controls, white finish, plastic liner.
            b. Energy Star labeled
         2. Range hood: Air King ESDQ1308 - Office and Units
            1. 30” wide, white finish, LED lamp.
            2. Energy Star labeled.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Prior to all work of this section, carefully inspect work of all other trades and verify conditions as complete and satisfactory for appliance installation.
B. Verify that equipment may be installed in accordance with original design and manufacturer's recommendations.

C. Discrepancies: In the event of discrepancy, immediately notify Architect. Do not proceed until all discrepancies have been fully resolved.

3.2 INSTALLATION, POSITION
A. Install in accordance with all referenced regulation requirements and manufacturer’s directions.
B. Deliver self-supporting units to room.
C. Set in location indicated, level, and properly align with casework and other fixtures.
D. Secure as necessary.
E. Check operation. Appliances are to be in perfect operating condition. Remove all packing, paper wrapping, etc. prior to operating each appliance.
F. Arrange for and coordinate electrical and mechanical connections as applicable.
G. Arrange for and coordinate electrical and mechanical connection as applicable. Ranges shall sit flush against back walls – coordinate with Division 26 work & the installation of timer related equipment to assure that flush installation is achieved.

3.3 FIELD QUALITY CONTROL
A. Conduct inspection and tests of equipment in presence of Architect.
B. Remove, transport, reinstall, furnish parts, labor and any other service or material necessary to replace defective units.

3.4 ADJUSTMENTS AND CLEANING
A. Adjust unit as required for proper operation.
B. Leave installations clean; premises free from residue of work of this section.

3.5 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
F. Collect cut-offs and scraps and place in designated area for recycling.
3.6 PROTECTION OF INSTALLED WORK

A. Protect installed units against damage and deterioration during remainder of construction period.

END OF SECTION
SECTION 12 20 00
WINDOW TREATMENTS

PART 1 GENERAL

1.1 SUMMARY
A. Work includes but is not limited to vertical blinds as shown on drawings or scheduled herein including all required miscellaneous parts and accessory items for complete installations.
B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.
C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.
D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.
E. Related Sections:
   1. Section 08 53 00 – Plastic (PVC) Windows.
   2. Sections 09 21 16 – Gypsum Board Assemblies.

1.2 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
B. Shop drawings: Provide shop drawings showing all installation details, dimensions, fastenings and accessories.
C. Product data: Submit copies of manufacturer’s product data, performance data, installation, and maintenance instructions. Provide color chart or samples as required for Architect’s selection/confirmation of colors.
D. Operation and Maintenance Data per Section 01 70 00: Submit in triplicate manufacturer’s printed directions.
E. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components. All adhesives must conform to the South Coast Air Quality Management District Rule 1168 and all sealants must conform to Bay Area Air Quality Management District – Regulation 8, Rule 51.

1.3 QUALITY ASSURANCE
A. Section 01 40 00 Quality Requirements. Installer to be “specialist” as defined therein, and acceptable to product manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Section 01 60 00 - Product Requirements.
B. Deliver in protective wrappings.
C. Acceptance at site: Carefully unwrap. Verify units in satisfactory condition.
D. Store out of harm’s way. Handle units carefully, prevent marring. Protect units at all times.

PART 2 PRODUCTS

2.1 VERTICAL BLINDS
A. Listed Manufacturer: Levelor.
B. Other Manufacturers:
   1. Graber.
C. Style: Trim+Go, Vertical Blinds.
D. Louver: Vinyl S-Curved
E. Operation: Cordless; wand-operated.
F. Headrail formed of steel or extruded aluminum. Operating mechanisms fully enclosed.
G. Color: Selected by Architect/Owner from manufacturer's full color line. All blinds shall be of one color.
H. Sizes shall be as recommended by manufacturer for condition of installation, and based on field-measured openings. Size so that louvers rests 1/2” above windowsill and 1/2” clear of window liners. Field measure to confirm opening size prior to fabricating blinds.
I. Locations: at all exterior windows and sliding doors with lites within residential apartments. All windows and sliding at Office.
J. Fasteners, shims and the like as standard with the manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION
A. Prior to all work of this section, carefully inspect work of all other trades and verify conditions as complete and satisfactory for appliance installation.
B. Field verify window dimensions prior to fabrication.
C. Coordinate requirements for blocking and structural supports to ensure adequate means for installation of window shades.
D. Discrepancies: In the event of discrepancy, immediately notify Architect. Do not proceed until all discrepancies have been fully resolved.

3.2 INSTALLATION, POSITION
A. Install in accordance with manufacturer's written instructions and approved shop drawings.
C. Set window treatments at locations indicated; install level, and properly aligned to operate freely.
D. Position window treatments level, plumb, and at proper height relative to adjacent construction. Secure with brackets and fasteners recommended by manufacturer.

3.3 ADJUSTMENTS AND CLEANING
A. Check operation. Operate shade through complete cycle of lowering, stopping, and raising to ensure proper operation. Correct deficiencies and adjust for smooth operation.
B. Leave installations clean, and premises free from residue of work of this section.

3.4 PROTECTION OF INSTALLED WORK
A. Clean window treatment assemblies and protect from damage from construction operations. If damage occurs, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.

3.5 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
F. Collect cut-offs and scraps and place in designated area for recycling.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section includes modular cabinets and cabinet hardware in apartment kitchens.

B. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

C. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

D. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

E. Related Sections:
   1. Section 06 61 16 – Solid Surface Countertops.
   2. Section 09 68 16 – Resilient Flooring.

1.2 REFERENCES

A. American National Standards Institute:
   1. ANSI A156.9 - Cabinet Hardware.


1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal requirements.

B. Shop Drawings: Indicate casework locations, scale plans, elevations, rough-in and anchor placement dimensions and tolerances, and clearances required. Provide plan and elevation drawings based on as-built room dimensions, and indicate any filler panel location and sizes required.

C. Product Data: Submit component dimensions, configurations, construction details, joint details, and standard hardware.

D. Samples: Submit fully finished sample, including face frame, door and drawer fronts and hardware, including stain color finish options.

E. Urea Formaldehyde: Include manufacturer’s literature stating that no cabinetry components contain added urea formaldehyde.

F. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components. All adhesives must conform to the South Coast Air Quality Management District
Rule 1168 and all sealants must conform to Bay Area Air Quality Management District – Regulation 8, Rule 51.

G. Submit certification from manufacturer verifying the location of the manufacturer, including full address and phone number, and list of materials harvested, extracted or recovered within 500 miles of the project site.

H. Provide certification from manufacturer verifying the location of the fabricator for products of this Section. Include mailing address and phone number. Provide list of recovered or recycled steel within 500 miles of project site.

1.4 QUALITY ASSURANCE
A. Perform Work in accordance with ANSI A161.1 and KCMA certification.

1.5 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.6 WARRANTY
A. Provide manufacturer’s 5-year warranty on cabinets and limited lifetime warranty on drawer box, drawer guides and hinges.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS
A. Specifications are based on Aristokraft Cabinetry, Jasper, IN for all residential area cabinets. Other manufacturer’s offering products meeting requirements are:
   1. Canyon Creek, Monroe, WA.
   2. Substitutions: Section 01 25 13– Product Requirements

2.2 MATERIALS AND CONSTRUCTION FOR WOOD CABINETS
A. All materials/products to have no added urea formaldehyde (NAUF).
B. Finished Surfaces: All exposed ends and sides shall have matching material and finish. Cabinets with adjacent removable cabinets or self-supporting appliances shall have an adjacent finished side to allow for removal. Finished exteriors are factory hand-wiped stain, spray lacquer seal coat and catalyzed lacquer finish coat.
C. Cabinet Box: Sides, tops and bottoms from 3/8” and 1/2” plywood with birch veneer interior finish with natural UV finish and hardwood veneer exposed exterior.
D. Wood species and finish: Birch, Autumn finish.
E. Refer to cabinet elevations on drawings.
F. Shelves: 3/4” thick white laminate. Adjustable by the use of metal pegged shelf clips with holes at 2” o.c. Provide 200 extra clips for Owner’s stock.
G. **Drawer Guides:** 7/8 extension, 100 lb. load capacity. Epoxy coated white finish; one-sided captive guide rail; integrated self-closing feature, double STOP and rollout prevention; noise absorbing plastic rollers, brushed bearings.

H. **Cabinet Doors and Drawer Fronts:** Solid slab drawer fronts, 3/4” solid door rail and flat veneer center panel.

I. **Door Style:** Benton, Shaker style.

J. **Drawer Box:** Screwed to drawer front. Sides, front and back from 3/4” birch wood, dovetail joint. Bottom from 1/4” plywood.

K. **Box, shelf and drawer construction to meet referenced standards.**

L. **Hinges:** Self-closing, fully adjustable, concealed hinges; opening angle 110º.

M. **Pulls:** Provide Liberty 1-1/4” satin nickel, round solid knobs on doors and drawers. Typical in units.

N. **Door Bumpers:** Resilient plastic with adhesive back; clear color; 5/16” diameter x 3/64”.

O. **Cabinet construction to be a minimum 25% recycled content post-consumer.**

2.3 **COUNTERTOPS**

Refer to Section 06 61 16.

2.4 **APPLIANCES**

Appliances are supplied under Section 11 31 00. Coordinate cabinet design and installation to accommodate size and location of appliances shown.

2.5 **LOCATIONS**

See architectural interior elevations.

2.6 **FABRICATION**

P. **Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.**

Q. **Fabricate corners and joints without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.**

R. **Fabricate each unit rigid, not dependent on building structure adjacent units for rigidity.**

S. **Form edges smooth. Form material for counter tops from continuous sheets.**

T. **Provide cutouts for plumbing fixtures and appliances. Prime paint contact surfaces of cut edges.**

U. **When necessary to cut and fit on site, furnish materials with ample allowance for cutting. Furnish trim for scribing and site cutting.**

V. **Exposed To View Surfaces and colors: selected by the Architect from the manufacturer’s standard finish choices.**

W. **Interior Surfaces: manufacturer’s standard vinyl/melamine surfacing.**
PART 3 EXECUTION

3.1 EXAMINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Verify adequacy of support framing.

3.2 INSTALLATION
A. Install casework, components and accessories.
B. Use anchoring devices to suit conditions and substrate materials encountered.
C. Set casework items plumb and square, securely anchored to building structure.
D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Use filler strips; not additional overlay trim for this purpose.
E. Close ends of units, back splashes, shelves and bases. Joints between units to be tight and flush.
F. Sealants: Refer to Section 07 90 00 for type. Apply continuous bead of clear sealant at top of countertop splash-to-wall.

3.3 ADJUSTING
A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
B. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly.

3.5 CABINET INSTALLATION
A. Install cabinets to be true, level and plumb. Install in complete compliance with manufacturer's printed instructions.
B. Fasten adjacent cabinets with manufacturer’s installation screws through face frame edges (pre-drill). Joints between cabinets to be tight and flush.
C. Fit tight to walls and anchor to wall studs or solid blocking as prescribed by the manufacturer from interior of unit.
D. Closure strips to be scribed accurately to wall surface -- any gaps to be filled with sealant -- specified in Section 07 90 00.
E. Adjust all hardware to proper function and fit.

3.6 COUNTERTOP INSTALLATION
A. Attach countertops securely to base cabinets with continuous bead of construction adhesive applied to cabinet top frame stiffeners. Apply hand pressure or clamp to seat and screw from underside through cabinet frame into top.
B. Where joining more than one section or where mitering sections, apply carpenter's glue to both edges and draw panels together using 3 or more 3” minimum x 1/4” countertop drawbolts. Drawbolts are to be recessed into routed slot in underside of countertop.
C. Factory-made tops shall be mitered and joined accurately. Any minor gapping shall be filled with a matching seam filler
D. Provide cutouts for fixtures and appliances as indicated - seal penetrations (cut edges).
E. Install sealant at top of splash to wall. Sealant specified in Section 07 90 00.

3.7 WASTE MANAGEMENT
A. Separate waste in accordance with the Waste Management Plan. Set aside extra materials for reuse by Owner. Materials not required by the Owner should be donated to non-profit organizations (such as Habitat for Humanity or other similar programs) where feasible.
B. Where possible, give preference to suppliers who take back waste for re-use or recycling.
C. Determine local options for recycling, collect all remaining unused materials by type and transport to a legitimate recycling facility.
D. Close and tightly seal all partly used adhesive or sealant containers, and store protected in well-ventilated, fire-safe area at moderate temperature.
E. Place used sealant tubes and near empty containers in areas designated for hazardous materials.
F. Collect cut-offs and scraps and place in designated area for recycling.

3.8 CLEANING
A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
B. Clean casework, counters, shelves, and hardware.

3.9 PROTECTION OF INSTALLED CONSTRUCTION
A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
B. Do not permit finished casework to be exposed to continued construction activity.

END OF SECTION
SECTION 131100 – SWIMMING POOLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Renovation of existing swimming pool, surrounding concrete deck, barrier fence and related appurtenances as shown on the plans.
      a. The contractor shall be responsible for design and installation of the pool system as shown on the drawings and as specified herein.
   2. The Owner shall be responsible for submitting and securing necessary approvals and permits, including payment of design and permit fees, except for electrical permits which shall be the Contractor’s responsibility. The Contractor shall provide the necessary documentation, such as pictures, measurements, gauge readings as needed to secure final approvals from the applicable regulatory agencies.

B. Related Sections:
   1. See respective specifications for the following work:
      a. Excavation for electrical and plumbing lines.
      b. Pool deck replacement.
      c. Conduit wiring, receptacles and disconnects.
      d. Connection of deck drains.
      e. Connection of all pool equipment, starters and switches; grounding of pool, pool equipment, pool lights and niches, and wiring of pool & spa lights from electrical panel in equipment room.

1.2 REFERENCES

A. Applicable requirements of the following Specifications and Codes apply to work of this Section:
   2. American National Standards Institute (ANSI) Publications:
      a. A615 "Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement"
      b. C33 “Standard Specification for Concrete Aggregates”
   4. American Society of Mechanical Engineers (ASME) Publication
      a. “Coding and Labeling”
   5. Gunite Contractors Association (GCA): Publication
A. System shall include:
1. Provide systems of fully compatible components and construction methods required for complete and operable systems for swimming pool including but not limited to excavation, dewatering of construction area and removal of excess earth from site.
2. Gunite and shotcrete shell.
   a. Finish Plaster Mix
3. Demolition, hauling, excavating backfilling, grading and incidental work in conjunction with the swimming pool renovation.
   a. Handle and dispose of excess material, regardless of type, character, or composition.
4. Connections of water and gas to pool equipment. (By Mechanical Contractor)
5. Connection of motors, pumps, compressors, switches and timers, lights, and wiring necessary for interfacing of equipment.
   a. Filter Systems
   b. Flow Meters
   c. Water Treatment Systems
   d. Heaters
   e. Recirculation Pumps and Motors
   f. Piping
   g. Fittings, Lights and Accessories
   h. Deck Drain System
   i. Automatic Water Fill System and Fill Spout

1.4 SUBMITTALS
A. Submit “Letter of Conformance” in accordance with Submittal Section and with the following supporting data:
1. Product Data:
   a. Manufacturer's technical literature with installation and storage instructions for each product specified.
b. Pumps: Pump performance curves indicating GPM vs. TDH, maximum efficiency point, and maximum amperage draw, together with current characteristics and service factor of motor.

B. Shop Drawings
1. Submit the following Shop Drawings to the Owner’s Representative for approval:
   a. Complete design of swimming pool, including all component parts, attachments, devices, or other work, filtration filter, size, turn-over capacity, and supporting calculations.
   b. Sections through pool and construction details shall be included.
   c. Mechanical schematic.
   d. Detail for ladder and pool wall interface.
2. Show all shop erection details.
3. All Shop Drawings shall be certified and sealed by a Professional Engineer, registered in the state in which project is being submitted.
4. The pool manufacturer shall certify to the Owner that the depth and configuration of the pool is acceptable and compatible with all known safety standards for the manufacturer's designed product.

C. Samples:
1. Precast concrete pool coping deck and in pool and spa deck One-12” long section of coping, complete with stenciled depth marking, if requested.
2. Submit three (3) samples of each type and color of tile required.

D. Quality Control:

E. At the completion of the work, the Contractor shall furnish to the Engineer the following:
1. Operating Instructions
2. Equipment Literature with Parts List of all new Equipment
3. Water Chemistry Procedures and Plaster Care Instructions
4. Suggested Safety Procedures
5. Copies of all manufacturer's warranties
6. Test reports
7. Copies of all permitting agency reports
8. Pictures of main drain sumps and piping showing measurements of pipe size, sump size and sump depth
9. Pictures of recirculation pump vacuum and discharge port gauges with clean filter

F. At the completion of the work, the Pool Contractor shall fill the pool with water and instruct the Owner's operating personnel in the operation of all equipment.

G. The Pool Contractor shall test the Owner's natural water supply and furnish and supply start-up chemicals as required for start-up, including chlorine and requirements to balance total alkalinity and calcium hardness, and shall obtain same.
1.5 QUALITY ASSURANCE
A. All work under this Section must be performed by a Contractor experienced and regularly engaged in constructing and renovating, commercial swimming pools. Contractors bidding this work must have completed five (5) projects within the past ten years equal to or larger than this project. All subcontractors shall be specialized and experienced in their respective portions of the project.

B. Pool specification and related pool drawings are to be considered as performance guidelines only meeting minimum requirements which may change as result of local code and health department requirements.
   1. The project Drawings and Specifications supplement each other. In the event of a conflict, the Drawings shall govern. Piping locations are schematic. Precise locations of piping shall be determined by actual field condition. Fittings are not shown. The Contractor shall include all fittings normally required for a completed system.
   2. The Contractor shall be responsible for reviewing the complete set of Contract Documents and coordinate work with other trades.

C. All work under this Section shall be inspected and installed in accordance with all current local and state codes and regulations.
   1. The Pool Contractor shall obtain the following as applicable;
      a. Board of Health Inspections and Final Approval
      b. Structural and Electrical Inspections and Final Approvals on his Portion of the Work

D. Contractor shall submit, on his letterhead, a list of all variations and deviations found that differ between local code requirements and bid drawings.

1.6 PROJECT CONDITIONS
A. Coordination: Coordinate this work with the work of other Sections to avoid any delay or interference with other work.
   1. Filter room, decks, sealing of joints between pool and deck, fencing and landscaping shall be provided as work by others.
   2. Connection of all pool equipment, starters and switches; grounding of pool, pool equipment, pool lights and niches, and wiring of pool lights shall be performed by Electrical Contractor from electrical panel in equipment room.
   3. Connection of floor drains, deck drains and hose bibs shall be provided as work by other trades.
   4. Connection of pool heater.
   5. Connection of automatic water fill system and cold water lines from water source in equipment room shall be performed by Pool Contractor. Any backflow prevention devices shall be furnished by others and installed and tested by a certified installer. Pool Subcontractors responsibility shall begin downstream of the backflow prevention device.

B. Lines, Grades, and Elevations:
   1. The General Contractor shall establish a bench mark for elevations and control points for measurements and layouts. The Pool Contractor shall be responsible for lines, grades, and measurements from these points required for completion of the work.

C. Utilities:
1. The Owner shall supply the water required for construction and filling and testing of the pool from permanent accepted system.

1.7 WARRANTY
A. The Pool Contractor shall warranty his work against defects in labor and equipment, including paint, for a period of one year from Substantial Completion. Substantial Completion shall be defined as the date of acceptance by the Owner or initial usage, whichever occurs first. This warranty shall not include minor defects that do not affect the use of the pool such as scratches, minor dents, or concrete curing cracks.

PART 2 - PRODUCTS

2.1 MANUFACTURERS: The following manufacturers are approved for use as identified in the individual paragraphs below:
B. Approved Manufacturers:
   1. American Olean Tile Co. (800-933-8453)
   2. American Products
   3. Dal-Tile Corp. (800-933-8453)
   5. Frost Co. (Inter-Fab) (800-737-5386)
   6. Stegmeier
   7. Standard Quaker Plastics
   8. Inlays Inc. (800-426-6873)
   9. Rainbow, a Brand of Pentair, Inc. (800-831-7133)
  10. Coats Electric
  11. S. R. Smith Commercial (888.677-7776)
  12. Spectrum Products (800-791-8057)
  13. StaRite Pool and Spa Group a Pentair Company (800-843-5628)
  14. Stenner
  15. Taylor Technologies. (800-837-8548)
  16. Whitten (Aquatic Development Group) (518-783-0038)
  17. W. R. Meadows, Pool Deck Construction Products (800-542-7665)

2.2 POOL
A. Equipment: As noted on plans.
B. Plaster. Shall be white, near white in color, light reflectance of at least 70 percent. KrystalKrete or equivalent. Ivory or Krystal Blue per Owner.
C. Ceramic Tiling:
   1. Tile shall be manufactured in accordance with ANSI-A-7.1, as manufactured by Dal-Tile or approved equal.
   2. Waterline Tile. Shall be glazed ceramic tile, 2” x 2” size, color and pattern chosen by Owner from submittal documentation and samples.
3. Step Edge Tile. Shall be glazed ceramic tile, 1” x 1” size, non-slip texture, color as chosen by Owner from submittal documentation and samples.

4. Pool Depth Markings: Shall be glazed ceramic tile, 6” x 6” tile with 4” high lettering depth marking in feet and inches for skim line (smooth) and deck (non-slip), as required by local and state public swimming pool codes.
   a. Numbers with Small FT and Small M Tiles: “Ceramic FT & MDM Series”; Inlays Inc.

5. No Diving Sign Tile: Adjacent to each depth marker, provide international symbol "No Diving" sign tile. "No Diving" tile shall be 6” x 6” for skim-line and 6” x 6” for deck (non-slip) white ceramic with black lettering and markings and a red circle with cross hatch, as required by local and state public swimming pool codes. Where shown on Plans, provide 6” x 12” tile with 4” high lettering with text “NO DIVING”.
   b. Letters Only Tiles “No Diving”: “Ceramic TMG Series”; Inlays Inc.

6. Depth marking and no diving tiles shall be placed on the vertical pool walls as part of the 6” tile band below the coping so as to be easily readable from the water side. Depth marking and "No Diving" tiles on the horizontal surface of deck, shall be within 18” of the water edge and positioned to be read while standing on the deck facing the water. Pool markings shall be placed at maximum and minimum depths, all points of slope change, at every one foot of depth increment, and at major deviations in shape, or as shown on the Plans. Markers shall be spaced at no more than 20 foot intervals and arranged to be uniformly located.

7. Tile Mortar and Grout: Shall be a waterproof product complying with the recommendations of the Tile Council of America and ANSI A8.6 standards and compatible with pool use. Color shall be grey for dark backgrounds, and white for light backgrounds; verify colors with Owner.

D. Sealant and Back-Up Material: Per industry standard.

E. Precast Concrete Pool and Spa Coping:
   1. Arto Manufacturing Company, Roman Pool Coping Style 2, 14” x 24” x 2”.
   2. Approved Substitution, precast concrete, wet pour, white, 12-inches wide x minimum 2-feet long, safety hand grip style, raised safety edge, coping stone with raised slip resistant pattern on upper surface. Provide one-piece radius corners.

2.3 FILTER SYSTEM

A. High Rate Sand:
   1. As specified on plans. Listed as approved by the National Sanitation Foundation for sand filters at flow rates of 20 GPM per square foot of filter area, and bear the National Sanitation Foundation Seal of Approval.
   2. Include with each filter top mounted influent pressure gauge, reading 0 to 60 psi, manual air release valve, multi-port diameter valve, backwash site glass and transparent dome top.

B. Filter Media: Sand. Per manufacturer’s printed recommendations, generally a clean material with an effective size of 0.45 to 0.55 mm with uniformly coefficient of 1.6 maximum.

C. Filter Face Piping:
   1. Pipe, valves, and fittings shall make a complete unit from inlet to outlet.
2. Arrange piping to carry out operations of filtering, backwashing and by-pass of filter for pool draining.

3. Face pipe and fittings: PVC SCH 40.

2.4 FLOW METERS

A. Flow Meter:
   1. As specified on the Plans.

2.5 WATER TREATMENT SYSTEM

A. Chemical Feeder:
   1. Approved Manufacturers:
      a. Stenner, Model 45; 10 gpd, NSF 50.
      b. Becsys CO2 feed system, NSF 50.

B. Test Kit:
   1. Approved Manufacturers:
      a. K-1000 Taylor Technologies

2.6 POOL AND SPA HEATERS

A. Heaters:
   1. Coates, model as shown on plans. Heaters shall be UL Listed. Furnish in-line thermometer with 2 degree F. intervals and a minimum range of 60 to 120 degrees F.

2.7 RECIRCULATING PUMP AND MOTOR

A. Pumps:
   1. Pentair, model as shown on plans. Self-priming unit with hair and lint strainer capable of delivering the designated gpm at the designated head during the filtering operation without overloading along the full length of the pump curve.

2.8 PIPING

A. Piping within filter room: Polyvinyl chloride (PVC), Type 1-1220, Schedule 40 IPS, Class #135. N.S.F. approved and labeled.

B. Filtered water supply piping to pool: Schedule 40 PVC. N.S.F. approved.

C. Filter connection piping which connects the filter plant to the filter pump and to the recirculation piping, backwash piping and other piping associated with filter system: PVC, Type 1-1220, Schedule 40 IPS, Class #135. N.S.F. approved and labeled.

D. Fittings for PVC pipe: Whenever PVC pipe is used, all fittings shall be heavy weight, Schedule 40, of same manufacture as PVC pipe used.

E. The first 24" of piping coming from pool heater shall be CPVC; provide a transition connection.

F. Valves:
   1. Small Valves (up to and including 2-1/2" in size): Ball valves, PVC, 125 lb.
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Large valves (larger than 2-1/2"): Rubber lined, cast iron, water type butterfly valves.
Valves shall be hand operated with cadmium plated ductile iron discs, stainless steel
stems and pins, and Buna-N seats and rated for 125 psi.
3. Valve extension stems and keys: Provide as required to operate the system.
Pipe Joints:
1. Cement and thinners: Use for making solvent welded joints. Of type compatible with
kind of piping used.
2. Teflon tape (.003" min thickness): Use on the male threads of threaded pipe joints.
Fillers and levelers: Provide instrumentation sensors and valves to automatically fill and
maintain level of pool complete with wiring and controls.

PART 3 - EXECUTION
3.1

EXAMINATION
A. Examine areas in which work is to be performed. Report in writing to Owner's Representative
all prevailing conditions that will adversely affect satisfactory execution of work. Do not proceed with work until unsatisfactory conditions have been corrected.
B. Starting work constitutes acceptance of the existing conditions and this Contractor shall then,
at his expense, be responsible for correcting all unsatisfactory and defective work encountered.

3.2

INSTALLATION
A. Equipment:
1. Install in strict accordance with manufacturer’s instructions.
B. Piping:
1. Cut all pipe with mechanical cutter without damage to pipe.
2. Placing and Laying: Inspect pipe for defects before installation. Clean the interior of
pipe thoroughly of foreign matter and keep clean during laying operation. Pipe shall not
be laid in water or when trench conditions are unacceptable as determined by the Owner's
Representative. Water shall be kept out of the trench until the pipe is installed. When
work is not in progress, open ends of pipe and fittings shall be securely closed so that no
trench water, earth or other substance will enter the pipes or fittings.
3. Threaded Joints: After cutting and before threading the pipe shall be reamed and shall
have burrs removed. Screw joints shall be made with graphite or inert filter and oil or
with an approved graphite compound applied to male threads only. Threads shall be fullcut and not more than 3 threads on the pipe remain exposed. Use Teflon 11 tape on the
male threads of all threaded pipe joints. Caulking of threaded joints to stop or prevent
leaks will not be permitted. Unions shall be provided where required for disconnection
of exposed piping. Unions will be permitted where access is provided.
4. Solvent welded joints shall be made in accordance with the manufacturer's printed instructions and the following minimum standards:
a. Fittings shall fit easily on the pipe before applying cement. The outer surface area of
pipe and inner wall of fitting shall be dry and dean. Thinner is to be applied to the
outer surface of the pipe and to the inner surface of the fitting. Cement is to be applied to the outer surface of the pipe, or on the male section of fittings only. When

SWIMMING POOLS

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the outside surface area of the pipe is satisfactorily covered with cement allow ten (10) seconds open time to elapse before inserting pipe end into fitting. After full insertion of pipe into fitting, turn fitting about the pipe end approximately 1/8 to 1/4 of a turn. Wipe off excess cement at the joint in a neat cove bead.

b. Joints shall remain undisturbed for a minimum of 10 minutes from time of jointing the pipe and fitting. If necessary to apply pressure to a newly made joint, limit to 10% of rated pipe pressure, during the first 24 hours after the joint has been made.

c. Full working pressure shall not be applied until the joints have set for a period of 24 hours.

d. Make provisions for expansion and contraction by way of swing joints or snaking.

e. Protect plastic pipe from exposure to aromatic hydro-carbons, halogenated hydrides, and most of esters and ketones that attack the material. Protect all pipe from mechanical damage and long exposure to sunlight during storage.

5. Install piping without cross connections or inter-connection between distribution supply for drinking purposes and swimming pool that will permit backflow of water into potable water supply. Pipe openings shall be closed with caps or plugs during installation. Equipment and pool fittings shall be tightly covered and protected against dirt, water and chemical or mechanical injury. At completion of work fittings, materials and equipment shall be thoroughly clean and adjusted for proper operation.

6. Filter Face Piping: Arrange to carry out operations of filtering backwashing and filter draining.

7. Valve identification: Label all valves.

8. Testing and Flushing:

a. Pressure Piping: After the pipe is laid, the joints completed, and the trench partially backfilled leaving joints exposed for examination, subject new lines to a hydrostatic pressure of not less than 50 pounds per square inch. Joints shall remain watertight under this pressure for a period of two hours.

b. Gravity Lines: A water test shall be applied to all gravity drain piping system, either in their entirety or in sections. All openings shall be tightly plugged and each system filled with water and tested with at least a 10 foot head of water. Water shall be kept in the system, or in the portion under test's for at least 15 minutes before inspection starts. System shall be tight at all joints.

c. Flushing: Pipelines leading to the pool shall be thoroughly flushed clean with chlorinated water before the pool is filled and placed in use.

C. Tile Installation:

1. Install all ceramic tile in strict accordance with the P60-90 method of the 2017 Handbook for Ceramic Tile Installation of the Tile Council of America.

2. Install tile level, plumb, and square, and flush to finish grades and elevations of adjacent surfaces, within a tolerance horizontally of one in 200 and a tolerance vertically of one in 500. Waterline tile shall be level to 1/8 inch around the entire rim perimeter of swimming pool.

3. Follow grout manufacturer's printed recommendations as to grouting procedures and precautions. Remove all grout haze, splatter and other debris, observing grout manufacturer's recommendations as to use of acid and chemical cleaners.

4. Provide Owner with one box of replacement tiles for each type of tile used on the project.
D. Plaster Finish:
1. Entire interior surface of pool shall have all existing finishes, including paint, plaster and tile removed by use of a chipping gun and hydroblasting to bare concrete/gunite, exposing a clean rough surface.
2. Fill uneven surfaces and depressions in accordance with manufacturer's recommendations.
3. Wash all pool surfaces thoroughly with dilute solution of muriatic acid and flush with fresh water to assure a clean surface free of loose materials, dust, and foreign matter.
4. Plaster installation:
   a. Apply in accordance with manufacturer's installation instructions.
   b. Apply in two coats using the double-back method to obtain a total thickness of not less than 3/8" or more than ½". Use tile as screed. The walls shall be scratch-coated followed by a finish coat. Material applied to the floor after the walls have been applied shall be accelerated to assure uniform setting time throughout the pool surface. Float the plaster to a uniform plane and trowel to a smooth, dense, impervious surface using extreme care to avoid stains. Take special care in finishing around pool fittings, making sure to mask off or plug openings so as not to fill such openings with excess plaster. Be certain to completely enclose pool fittings with plaster to insure a leak-proof seal around pipes, fittings, lights, anchors, etc. Accurately interface with the finish planes of items installed.
5. Curing:
   a. Ensure the pool recirculation system is ready for operation prior to commencing pool plastering. Provide at least one month’s supply of pool chemicals; Contractor shall confirm adequate supply of chemicals is on-site. Setup in accordance with manufacturer's installation instructions.
   b. After the plaster has sufficiently dried and before drying has proceeded to a damaging point, cure the plaster by gradually filling the pool with water, preventing all damage to finished plaster surfaces. Flow the water continuously until the pool is filled. Keep the pool walls damp while the pool is filling as needed to protect the plaster.
   c. Properly balance and maintain swimming pool water chemistry for a minimum of 14 days after pool has been completely filled. Instruct pool operating personnel in requirements for continued water quality maintenance to protect completed work.

3.3 FIELD QUALITY CONTROL

A. Water Treatment
1. Obtain a chemical analysis of the source/make-up water supply and submit to Owner's Representative. Include the following:
   a. Total alkalinity/ppm
   b. Calcium hardness/ppm
   c. Chlorine/ppm
   d. pH
   e. Iron
   f. Copper
2. Treat and balance pool water prior to turnover of pool to Owner.
3. Balance water to establish:
Total alkalinity: 80-100 ppm
Calcium hardness: 20~275 ppm
Total Available CHL (Pool): 1.5 ppm
Free Available CHL (Pool): 1.5 ppm
Total Available CHL (Spa): 3.0 ppm
Free Available CHL (Spa): 3.0 ppm
pH: 7.4 - 7.6
Iron content: 0.0 ppm
Copper content: 0.0 ppm
Saturation Index -.3 - +.3
4. Stabilization (outdoor pool) 40 ppm

END OF SECTION 131100
SECTION 22 00 00

PLUMBING GENERAL CONDITIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Conform to General Conditions, Supplementary Conditions, the modifications thereto and Division 01 - General Requirements for all work in Division 22.

1.2 SUMMARY

A. Provide labor, materials and appliances necessary for satisfactory installation of mechanical work ready to operate in strict accordance with these specifications and drawings. Work of Division 22 includes, but is not limited to, that as delineated in the following specification sections:

   22 00 00 Plumbing General Conditions
   22 05 00 Common Work Results for Plumbing
   22 07 00 Plumbing Insulation
   22 11 00 Facility Water Distribution
   22 11 16 PEX Domestic Water Piping
   22 13 00 Facility Sanitary Sewerage
   22 30 00 Plumbing Equipment
   22 40 00 Plumbing Fixtures

B. TEST AND BALANCE: Provided by 23 05 93. Provide all necessary coordination, assistance and documentation.

1.3 CODES AND STANDARDS

A. Conform to following code and agency requirements having jurisdictional authority over mechanical installations.
   1. Uniform Plumbing Code (UPC) with local amendments.
   2. International Mechanical Code (IMC) with local amendments.
   6. Requirements of OSHA and EPA.
   8. ASME code for construction of pressure vessels.
10. ASTM, ANSI and NEMA standards, as referenced in subsequent sections.
11. Local Sewer District Requirements.
12. Local Water District Requirements.
13. Local Health Department Requirements.
15. ESDS Current Version.

1.4 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to International Building Code with local amendments, FM and UL for fire resistance ratings and surface burning characteristics.

B. Provide vibration isolation on motor driven equipment 0.5 hp or more, plus connected piping.

C. Provide minimum static deflection of isolators for equipment as follows:
   1. 5 hp and less: 1 inch
   2. Over 5 hp: 2 inch

D. Maintain rooms below the maximum sound levels, as defined by ASHRAE Handbook HVAC Applications and ANSI S1.8.

1.5 PRODUCT SUBSTITUTIONS:

A. Manufacturers and models of equipment and material indicated herein and on drawings are those upon which mechanical design is based. Other manufacturers with products considered equal in general quality may be listed without specific model designation. Manufacturers not listed must be submitted for approval.

B. Substitutions will be evaluated based on product manufacturer only. Specific product model, specifications, options and accessories will be evaluated during submittals. Approval of a manufacturer substitution does not constitute approval of the submitted product.

C. Any equipment other than the basis of design is considered a substitution.

D. In selecting substitute equipment, the Contractor is responsible for and must guarantee equal performance and fit. Cost of redesign and all additional costs incurred to accommodate the substituted equipment shall be borne by the Contractor.

E. Unless indicated otherwise, "or approved" may be assumed for all products in Division 22.

1.6 SUBMITTALS

A. Provide one electronic copy of product data submittals for all products listed under “Part 2 Products” of Division 22 and all additional products noted on drawings or required for completion of sequence of operations.
B. **Submittals shall be complete in one PDF file with bookmarks for each Division. Multi-part submittals will be returned without review.**

1. First Page: Name of Project, Owner, Location & Contracting Company.
2. Index Page: List of specification sections with contents by Tag or item.
3. Bookmarks: Electronic bookmark of each specification section corresponding to listing in index.

C. Clearly indicate on each page the equipment schedule designation (Tag) and/or specification section, as applicable. Indicate selected model and all accessories intended for use.

D. Equipment vendor cover page with contact information shall precede submittal by that vendor.

E. Submitted product information shall include (as applicable) but not be limited to the following information:

1. Product description
2. Manufacturer and model
3. Dimensions
4. Performance Ratings (i.e. capacity, rpm, HP, temperature)
5. Construction Materials
6. Ratings (i.e. UL, ASTM, NEMA, etc)
7. Electrical data
8. Sound level data (corresponding to scheduled values)
9. Vibration Isolation
10. Controls and wiring diagrams
11. Accessories
12. Engineering technical data (i.e. pressure drops, leakage rates, pump curves)

F. If requested by Architect or Engineer, submit Manufacturer’s Installation Instructions on any equipment, procedures, or certifications so requested.

G. Do no ordering, fabrication or manufacturing of products until return of approved submittals.

1.7 **SHOP DRAWINGS**

A. Plumbing Shop Drawings: Submit PDF copies of shop drawings for approval prior to beginning work, drawn to scale not smaller than 1/8 inch equals 1 foot, including but not limited to:

1. All products, systems, and system components.
2. All pipe sizes.
3. All elbows, offsets, and turns clearly identified.
4. Indicate all relevant pipe, ceiling, and structural elevations and clearances.
5. All required valves.
6. Special supports which are not a standard catalog product and which may be fabricated for the Contractor or by the Contractor.
7. Piping system schematic with electrical and connection requirements.
8. Mounting and installation details.
9. General layout of control and alarm panels.
11. Dimensions of tanks, tank lining methods, anchors, attachments, lifting points, taps, and drains.
12. Locations of access doors.
13. Flexible connectors, expansion joints, loops, offsets, and swing joints.
14. Weights of equipment.
15. Placement and location of openings, holes, or manholes.
16. Equipment substitutions and where installation will differ from design drawings.

B. The Contractor shall also submit drawings and/or diagrams for review and for job coordination in all cases where deviation from the Contract Drawings are contemplated because of job conditions, interference or substitution of equipment, or when requested by the Engineer for purposes of clarification of the Contractor’s intent. Also submit detailed drawings, rough-in sheets, etc., for all special or custom-built items or equipment. Drawings and details under the section shall include (but not be limited to) the following, where applicable to this project:
   1. Electrical interlock wiring diagrams.
   2. Piping layout plans and interference details.
   3. Custom sink layout.

C. By submission of plumbing shop drawings, the Contractor acknowledges that coordination has been done to ensure that all piping fits and no conflicts exist.

D. The Architect’s review of shop drawings shall not relieve the Contractor of responsibility for deviations from the Contract drawings or specifications, unless he has, in writing, called the attention of the Architect to such deviations at the time of the submission, nor shall it relieve him from responsibility for errors or omission in such shop drawings.

1.8 COMMISSIONING

A. Provide all necessary commissioning assistance, equipment and documentation as required by the Commissioning Plan.

B. The duty and responsibility for all Division 22 commissioning work shall be assigned to a specific individual. Inform the General Contractor, Commissioning Professional (CCXP) of the contact information for the person so assigned.

C. Perform corrective actions needed to resolve deficiencies identified during commissioning. Record action taken on commissioning deficiency log.

1.9 PLUMBING PERMIT

A. Plumbing contractor shall prepare all documents for plumbing permit application, submit for and obtain the permit. All costs and fees to obtain the permit shall be paid by the Plumbing Contractor.
B. Contractor shall not commence work until permit is obtained. Contractor is solely responsible to insure that the permit application and any revisions are submitted in a timely manner so as not to impact project schedule.

1.10 QUALITY ASSURANCE

A. Perform Work in accordance with ASME B31.9 – Building Services Piping for installation of piping systems and ASME Section IX – Welding and Brazing Qualifications for welding materials and procedures.

B. Perform Work in accordance with the Uniform Plumbing Code including State and local amendments.

C. Provide products requiring electrical connections listed and classified by UL as suitable for purpose specified and indicated.


1.11 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years’ experience.

B. Installer: Company specializing in performing Work of this section with minimum three years’ experience.

1.12 SEQUENCING

A. Sequence balancing between completion of systems tested and Date of Substantial Completion.

1.13 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. Protect all equipment, materials, and insulation from weather, construction traffic, dirt, water, chemicals, and damage by storing in original packaging and under cover. Where original packaging is insufficient, provide additional protection. Maintain protection in place until installation.

C. Inspect all products and materials for damage prior to installation.

D. Protect piping from all entry of foreign materials by providing temporary end caps or closures on piping and fittings. Furnish temporary protective coating on cast iron and steel valves.

E. Protect heat exchangers and tanks with temporary inlet and outlet caps. Maintain caps in place until installation.

F. Protect materials and finishes during handling and installation to prevent damage.
G. Comply with manufacturer’s installation instruction for rigging, unloading and transporting units.

H. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.14 ENVIRONMENTAL REQUIREMENTS

A. Do not apply fire stopping materials when temperature of substrate material and ambient air is below 60 degrees F. Maintain this minimum temperature before, during, and for minimum 3 days after installation of fire stopping materials.

B. Provide ventilation in areas to receive solvent cured materials.

C. Do not install underground piping or valves when bedding is wet or frozen.

D. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer. Maintain temperature during and after installation for minimum period of 24 hours.

E. Do not install instruments when areas are under construction, except rough in, taps, supports and test plugs.

1.15 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

B. Verify by field measurements, sizes and configurations are compatible with wall construction and layout.

C. Existing systems and utility lines indicated on drawings are in accordance with information furnished to the Architect and may not be complete. Contractor is responsible for locating, uncovering, disposing of or maintaining existing systems.

1.16 COORDINATION

A. Visit the site and become familiar with existing conditions affecting work.

B. Verify locations of any overhead or buried utilities on or near site. Determine such locations in conjunction with all public and private utility companies and with all authorities having jurisdiction.

C. Existing systems and utility lines indicated on drawings are in accordance with information furnished to the Architect and may not be complete. Contractor is responsible for locating, uncovering, disposing of or maintaining existing systems.

D. Plumbing drawings are diagrammatic and do not indicate all possible site conditions. The contractor shall verify all measurements, dimensions and connections on site and coordinate between trades to preclude interferences. The contractor shall provide adjustments to piping as necessary to fit conditions including but is not limited to relocation, offsets, and transitions.
E. In the event of a conflict with other trades of work, the following priority from highest to lowest shall be followed: Structural, lighting, HVAC, plumbing/piping and sprinklers. Starting with the lowest priority, the HVAC, plumbing, and sprinkler contractors shall provide whatever materials, offsets, labor etc. is required to resolve the conflict.

F. When discrepancies occur between plans and specifications, the Architect will determine which takes precedence and the Contractor shall perform the selected requirement at no additional cost.

G. Prior to ordering equipment cross-check plumbing and electrical drawings and specifications to assure proper location and electrical characteristics of connections serving mechanical and electrical equipment.

H. Advise the Architect of any modifications required to suit equipment furnished. Costs for modifications due to equipment substitution will be borne by the contractor.

I. Wherever conflicts occur between different parts of the Contract Documents the greater quantity, the better quality, or larger size shall prevail unless the Architect informs the Contractor otherwise in writing.

J. The scale of each drawing is relatively accurate, but the Contractor is warned to obtain the necessary dimensions for any exact takeoffs from the Architect. No additional cost to the Owner will be considered for failure to obtain exact dimensions where not clear or in error on the drawings. Any device or fixture roughed in improperly and not positioned on implied centerlines or as required by good practice must be repositioned at no cost to the Owner.

K. Where the word ‘verify’ is used on the documents, the contractor shall field verify the existing conditions and modify the scope of the installation as required to meet the verified conditions without additional cost to the Owner.

L. Coordinate trenching, excavating, bedding, backfilling of buried systems with requirements of this specification.

M. Coordinate wall openings, piping rough-in locations, concrete housekeeping pads, and electrical rough-in locations to accommodate Work of this Section.

1.17 CUTTING, FITTING, REPAIRING AND PATCHING

A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where necessary for installation of plumbing work. Perform work only with craftsmen skilled in their respective trades.

B. Avoid cutting, where possible, by setting sleeves, frames, etc., and by coordinating for openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for piping.

C. Cut all holes neatly and as small as possible to admit work. Perform cutting in manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.
1.18 SALVAGE

A. Remove excess piping and plug or cap any unused branch connections. Remove scrap pipe and all other excess materials from the site.

B. Comply with contractor’s Construction Waste Management Plan.

1.19 ELECTRICAL

A. Motors:
   1. Temperature Rating: Rated for 40 degree C environment with maximum 50 degree C temperature rise for continuous duty at full load.
   2. Starting Capability: Not less than 12 starts per hour.
   3. Phase Characteristics: Squirrel-cage induction poly-phase motors for 3/4 HP and larger, and capacitor-start single-phase motors for 1/2 HP and smaller. At equipment manufacturer's option, 1/6 HP and smaller may be split-phase type.
   4. Service Factor: 1.15 for polyphase motors and 1.35 for single-phase motors.
   5. Enclosure Type: Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation, and guarded drip-proof motors where exposed to contact by employees or building occupants. Weather-protected Type I for outdoor use, Type II, where not housed.
   7. Name Plate: Indicate full identification of manufacturer, ratings, characteristics, construction, special features and similar information.
   8. All motor efficiencies shall conform to Washington State Energy Code and NEMA MG-1.

B. Motor Starters: By plumbing equipment manufacturer where factory mounted controls are provided. Variable frequency drives by Division 22, all other starters provided by Electrical Contractor.

C. Power Wiring: By Electrical Contractor.

D. Control Wiring: Responsibility of Division 22, including all line and low voltage control wiring. Owner will not entertain additional cost due to lack of coordination between Plumbing Contractor and Electrical Contractor.

1.20 EXTRA MATERIALS

A. Furnish one set of mechanical seals for each pump where such seals exist.

1.21 PROJECT CLOSEOUT

A. Completion, submission and approval of the following is required for final project closeout.
   1. Execution of Architect’s and Engineer’s final observation reports (punchlist)
   2. Operating and Maintenance Instructions
   3. Operating and Maintenance Manual
4. Equipment and Pipe Cleaning
5. Record Drawings
6. Testing
7. Commissioning
8. Warranty

B. See Division 01 for additional requirements.

1.22 OPERATING AND MAINTENANCE INSTRUCTIONS

A. General: In addition to requirements of Division 01, following initial operation of plumbing systems and prior to acceptance by the Architect, perform the following services.

B. At least two weeks prior to each instruction period, give written notification of readiness to proceed to the Architect and Owner, and obtain mutually acceptable dates.

C. Conduct demonstrations and instructions for the Owner's representatives, pointing out requirements for operating, servicing and maintaining equipment and systems. Describe general system operation and specific equipment functions. Cover all equipment calibration, setpoint adjustment, safeties and alarms.

D. Furnish qualifications of Contractor's personnel in charge of the instruction; foreman position is minimum acceptable. Where equipment startup is performed by supplier's or manufacturer's personnel, those personnel should also provide training on that equipment.

E. During demonstrations and instructions include and reference information from maintenance manuals and contract drawings.
   1. Provide documentation of all instruction which includes:
      a. Date and time of instruction
      b. Name, affiliation and qualifications of the instructor
      c. Name and affiliation of the attendees
      d. Topics, systems, and equipment covered
      e. Length of instruction

F. Minimum duration of instruction periods:
   1. Plumbing Systems 4 hours

1.23 OPERATING AND MAINTENANCE MANUALS

A. Contents: Furnish, in accord with Division 1, one PDF and one bound copy of operating and maintenance manuals to include the following:
   1. Manufacturers, suppliers, contractor names, addresses and phone numbers.
   2. Warranty service contractors’ names, address and phone numbers (if different from above).
   3. Schedule and description of routine maintenance for each component to include oiling, lubrication and greasing data.
   4. Test data log.
5. Manufacturer's cuts and rating tables, including brochures for all submittal items.
6. Part numbers of all replaceable items.
7. Control diagrams and operation sequence.
8. Written guarantees.
9. Record drawings corrected and completed.
10. Completed equipment start-up forms and checklists.

B. Operation and Maintenance Data:
1. Submit frequency of treatment required for interceptors. Include, spare parts lists, exploded assembly views for pumps and equipment.
2. Submit fixture, trim, exploded view and replacement parts lists.
3. Submit replacement part numbers and availability, and nearest service depot location and telephone number.

C. Binders:
1. Furnish typewritten or printed index and tabbed dividers between principal categories.

D. Imprint on cover:
1. Name of project.
2. Owner.
3. Location of project.
5. Contractor.
6. Year of completion.

E. Imprint on backing:
1. Name of project.
2. Year of completion.

F. Submittals:
1. Preliminary Copies: Prior to scheduled completion of the project, submit one PDF copy for review by the Architect.
2. Final Copies: After approval of the preliminary copy, submit one PDF and one bound copy to the Owner.

1.24 EQUIPMENT AND PIPE CLEANING

A. Clean interior and exterior of all equipment. Equipment shall be free of dirt, construction debris, corrosion, etc.

B. Adequate provisions shall be made during construction to eliminate dirt, debris or other material from entering and collecting inside of pipe and equipment. Any collection of material shall be thoroughly cleaned before equipment startup and if necessary again before owner occupancy.

C. Clean exterior of all exposed pipe and equipment.
1.25 RECORD DRAWINGS
   A. Submit one digital file with all drawings in PDF format.
   B. Show location of equipment, location and size of piping. Locate all valves and similar equipment with tag or label identification. Indicate locations and elevations of exterior pipe and utility connections. Maintain continuously updated drawings during progress of project.
   C. Record actual locations of equipment, clean-outs, controlling devices, and all above grade, under-floor, and buried piping.

1.26 TESTING
   A. Provide completed start-up forms and checklists.
   B. Coordinate Test and Balance with Division 23 05 93. Provide all necessary assistance and documentation.

1.27 WARRANTIES AND CONTRACTOR'S GUARANTEE
   A. All work, material and equipment shall be free of defect, complete and in perfect operating order at time of delivery to Owner.
   B. Furnish one year warranty from date of substantial completion for all systems unless specifically noted otherwise.
   C. Without cost to Owner, correct all defects and failures discovered within one year from date of final acceptance, except when in the opinion of the Architect a failure is due to neglect or carelessness of the Owner.
   D. The guarantee of the Contractor is independent of shorter time limits by any manufacturer of equipment furnished. Submit with Operation and Maintenance Manual all guarantees that exceed one year (e.g.: water heaters).
   E. Make all necessary balancing and control adjustments during first year of operation.
   F. The presence of any inspector or observer during any construction does not relieve the Contractor from responsibility for defects discovered after completion of the work.

PART 2 NOT USED

PART 3 EXECUTION

3.1 DOCUMENTATION
   A. Additional plan submittals to reviewing authority: If additional drawing submittals are required at any time during construction contractor shall submit drawings,
review with authority, and pick up subsequent approved drawings. Engineer will revise and/or prepare drawings for submittal.

3.2 INSPECTION

A. Do not allow any work to be covered up or enclosed until inspected, tested and approved by the Architect and all authorities having jurisdiction over the work.

B. Should any work be enclosed or covered up before such inspection and test, Contractor shall at his own expense uncover work, and after it has been inspected, tested and approved, make all repairs as necessary to restore all work disturbed by him to its original condition.

3.3 FIELD QUALITY CONTROL

A. Inspect installed fire stopping for compliance with specifications and submitted schedule.

B. Inspect isolated equipment after installation for proper movement clearance.

C. Test domestic water piping system in accordance with applicable code and local authority having jurisdiction.

D. Test sanitary waste and vent piping system in accordance with applicable code and local authority having jurisdiction.

E. Test storm drainage piping system in accordance with applicable code and local authority having jurisdiction.

3.4 CLEANING

A. Clean adjacent surfaces of fire stopping materials.

B. Clean plumbing fixtures and equipment.

C. Use acceptable cleaning products per IAQ Management Plan.

3.5 MANUFACTURER'S FIELD SERVICES

A. Where PEX tubing or seismic joints are installed, furnish inspection services by manufacturer's representative and certify installation is in accordance with manufacturer's recommendations and equipment is performing satisfactorily.

3.6 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

B. Do not permit use of plumbing fixtures before final acceptance.

END OF SECTION
SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements and recommendations of Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Standards SP-58 and SP-69.

B. Comply with Federal "Reduction of Lead in Drinking Water Act" – 2011. Pipes, pipe fittings, plumbing fittings and fixtures shall be "Lead Free" meaning not more than a weighted average of 0.25% lead in wetted surfaces.

1.2 SCOPE

A. This section includes products, assemblies and methods applicable to more than one of the systems specified in the following sections of Division 22.

1.3 MATERIALS AND EQUIPMENT

A. Where two or more units of same class of equipment are required, use products of a single manufacturer. All equipment shall be new and free from damage.

B. Provide major equipment components with manufacturer's name, address, catalog number and capacity indicated on a nameplate, securely affixed in a conspicuous place.

C. Furnish standard and fabricated hangers and supports complete with necessary inserts, bolts, nuts, rods, washers and other accessories.

1.4 QUALITY ASSURANCE

A. Installed products shall have surface Burning Characteristics: 25/50 flame spread/smoke developed index when tested in accordance with ASTM E84.

B. Perform work in accordance with local jurisdiction’s requirements and AWS D1.1 for welding hanger and support attachments to building structure.

PART 2 PRODUCTS

2.1 GENERAL VALVE REQUIREMENTS

A. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted. Brass valves are not permitted.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
C. Valve Sizes: Same as upstream piping unless otherwise indicated.

2.2 GATE VALVES
A. Manufacturers: NIBCO or equal by Apollo, Hammond, Milwaukee, Stockham or approved equal.
B. 4 inches and Smaller: Use ball valve or butterfly valve in lieu of gate valve.

2.3 BALL VALVES
A. Manufacturers: NIBCO or equal by Apollo, Hammond, Milwaukee, Stockham or approved equal.
B. 2 inches and Smaller: Lead-Free, NSF-61-8, UPC-IGC-157, MSS SP 110, 600 psi WOG, two piece silicon performance bronze body, bronze trim, bronze ball, full port, PTFE seats, blow-out proof stem, solder or threaded ends with union, lever handle. For insulated piping provide 2" extended handles of non-thermal conductive material. Nibco Model T/S-585-80-LF.

2.4 BUTTERFLY VALVES
A. Manufacturers: NIBCO or equal by Apollo, Hammond, Milwaukee, Stockham, Victaulic or approved equal.
C. 2-1/2 inches to 6": Lead-Free, MSS-SP67, 300 psi CWP, grooved end, coated ductile iron body, suitable for bidirectional dead-end service at rated pressure without use of downstream flange. EPDM encapsulated disc, EPDM O-Ring seal, geometric drive, two-piece stainless steel stem. Lever operated with 10-position throttling plate. For insulated piping provide 2" extended neck. Nibco GD-4765.
D. 2-1/2" to 6" Grooved-End Copper Butterfly Valve: rated to 300 psi with copper tubing sized grooved ends. Cast bronze body, elastomer encapsulated ductile iron disc, ASTM A-536, Grade 65-45-12, with integrally cast stem. Bubble tight, dead-end or bi-directional service, with memory stop for throttling, metering or balancing service. Valve may be automated with electric, pneumatic, or hydraulic operators. Victaulic Series 608.

2.5 CHECK VALVES
A. Swing Check Valves:
   1. Manufacturers: NIBCO or equal by Apollo, Hammond, Milwaukee, Stockham or approved equal.
2. 2 inches and Smaller: Lead-Free, NSF-61-8, MSS SP 80, 200 psi CWP, silicone performance bronze body and cap, bronze disc with PTFE seat, Y-pattern design, solder or threaded ends. Nibco Model T/S-413-Y-LF.

3. 2-1/2 inches and Larger: Lead-Free, NSF-61-8, MSS SP 71, Class 125, 200 psi CWP, cast iron body, bronze trim, bronze disc and seat, flanged ends. Nibco Model F-910-LF.

B. Spring Loaded Check Valves:
   1. Manufacturers: NIBCO or equal by Apollo, Hammond, Milwaukee, Stockham, Titan or approved equal.
   2. 2 inches and Smaller: Lead-Free, NSF-61-8, MSS SP 80, 250 psi CWP, silicone performance bronze body, in-line spring lift check, silent closing, PTFE disc, integral seat, solder or threaded ends. Nibco Model T/S-480-Y-LF.
   3. 2-1/2 inches and Larger: Lead-Free, NSF-61-8, MSS SP 71, Class 125, 200 psi CWP, wafer style, cast iron body, Buna-N bonded to bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends. Nibco Model F-910-LF.

2.6 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports with incompressible insulation inserts and shields for all piping to be insulated per 220700.
   1. Manufacturer: Pipe Shields, INC or approved equal.
   2. Material: Calcium Silicate or Uretherne per temperature application.
   3. Thickness: Insert thickness shall match required insulation thickness per 220700.

B. Plumbing Piping - DWV: Cast-iron or PVC
   1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
   3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   4. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
   5. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
   7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   8. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.

C. Plumbing Piping - Water: Copper
   1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring, with rigid insulation inserts.
   2. Hangers for Cold Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis, with rigid insulation inserts and saddle.
   3. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis, with rigid insulation inserts and saddle.
4. Hangers for Hot Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll, double hanger, with rigid insulation inserts and saddle.
5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
6. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Larger: Steel channels with welded spacers and hanger rods, cast iron roll.
7. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
8. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
11. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
12. Floor Support for Hot Pipe Sizes 4 inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes 6 inches and Larger: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

D. Secondary Pipe Positioning and Supports:
1. Makeshift, field devised methods of plumbing pipe support, such as with the use of scrap framing materials, are not allowed. Support and positioning of piping shall be by means of engineered methods that comply with IAPMO PS 42-96. Hubbard "HOLDRITE" support systems or approved equal.
2. For vertical mid-span supports of piping 4" and under, use HOLDRITE Stout Brackets™ with HOLDRITE Stout Clamps or two-hole pipe clamps (MSS Type 26).
3. For plenum applications use pipe supports that meet ASTM E-84 25/50 standards, such as the HOLDRITE Flame Fighter™ or approved equal.

2.7 HANGER ACCESSORIES
A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.8 INSERTS
A. Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.9 ACCESS PANELS
A. Milcor or approved equal.
B. Include an allowance for a minimum of 16 access panels.
C. Architectural grade, 14 guage frame and door, painted steel or stainless steel based on application.

2.10 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:
1. Ferrous Piping: Class 150, 300 psi CWP, malleable iron, threaded.
2. Copper Piping: Class 150, 300 psi CWP, bronze unions.
3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
4. PVC Piping: PVC.
5. CPVC Piping: CPVC.

B. Flanges for Pipe 2-1/2 inches and Larger:
1. Ferrous Piping: Class 150, 300 psi CWP, forged steel, slip-on flanges.
2. Copper Piping: Class 150, 300 psi CWP, slip-on bronze flanges.
3. PVC Piping: PVC flanges.
4. CPVC Piping: CPVC flanges.
5. Gaskets: 1/16 inch thick preformed neoprene gaskets.

C. PVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent-weld socket to screwed joint adapters and unions, or Schedule 80 threaded PVC pipe (ASTM D2464).

2.11 FLEXIBLE PIPE CONNECTORS

A. Manufacturers: Metraflex, Mason or approved equal.

B. Victaulic Style flexible couplings may be used in lieu of flexible connectors for vibration isolation at equipment connections. Three (3) couplings, for each connector, shall be placed in close proximity to the source of vibration.

2.12 EXPANSION JOINTS

A. Manufacturers: Metraflex, Mason or approved equal.

2.13 FLASHING

A. Metal Flashing: 26 gage galvanized steel.

B. Metal Counterflashing: 22 gage galvanized steel.

C. Lead Flashing:
1. Waterproofing: 5 lb./sq. ft sheet lead.
2. Soundproofing: 1 lb./sq. ft sheet lead.

D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.14 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage galvanized steel.
B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage galvanized steel.

C. Sealant: Acrylic

D. Size large enough to allow for movement due to expansion and to provide for continuous insulation or installation of fire sealant at fire-rated walls. Note that insulation is discontinuous at fire walls.

2.15 MECHANICAL SLEEVE SEALS

A. Manufacturers: Metraflex Metraseal, Thunderline Link-Seal or approved equal.

B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.16 MECHANICAL FIRESTOPPING SLEEVE SEALS

A. Manufacturers: Metraflex Metraseal 120 or approved equal.

B. Product Description: Modular mechanical type, consisting of interlocking intumescent synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation. UL listed for 2 hour fire protection.

2.17 FORMED STEEL CHANNEL

A. Manufacturers: Allied Tube & Conduit, B-Line Systems, Unistrut or approved equal.

B. Product Description: Galvanized 12 gage steel with holes 1-1/2 inches on center.

2.18 SUPPORT ACCESSORIES

A. Pipe Alignment Guides: Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inch travel.

B. Swivel Joints: Bronze body, double ball bearing race, field lubricated, with rubber (Buna-N) o-ring seals.

2.19 ELECTRIC HEAT TRACE (Freeze Protection)

A. Manufacturers: Raychem XL-Trace or approved equal.

B. General: Provide a complete UL listed system of heating cables, components and control for preventing pipes from freezing.
C. Cable: Self-regulating cable with nickel-copper bus wires embedded in conductive polymer core with dielectric polyolefin jacket, braided tinned copper ground and outer jacket of polyolefin. Cable shall vary power output in response to temperature all along its length with a self-regulating factor of at least 90%.

D. Components: Control enclosures shall be NEMA 4X rated. Connection system shall not require stripping of wires.

E. Control: Thermostatic control with ambient sensor set at 40 F.

F. Installation:
1. Apply "Electric Traced" labels to outside of insulated pipe.
2. Attach cable to metal pipe with glass cloth tape and plastic pipe with aluminum tape.
3. Adjust pipe insulation size to accommodate maintenance tape.
4. Follow manufacturer's installation instructions.

2.20 FIRESTOPPING-APPLIED

A. Manufacturers: RectorSeal, Dow Corning, 3M Fire Protection or approved equal.

B. General:
1. Fire stopping materials shall conform to Flame (F) and Temperature (T) ratings as required by applicable building codes and tested by nationally accepted test agencies per ASTM E 814 or UL 1479 fire tests for through penetrations, and ASTM E 1966 or UL 2079 for construction joints, and UL 2307 for perimeter edge joints.
2. Fire stopping material shall be free of asbestos, PCBs, ethylene glycol, and lead.
3. Do not use any product containing solvents or that requires hazardous waste disposal.
4. Fire stopping shall be performed by a contractor trained or approved by firestop manufacturer.
5. Select products with rating not less than rating of wall or floor being penetrated.

C. Single Source Responsibility: Provide firestop systems for all conditions from a single supplier.

D. Product Description: Provide Latex caulk/sealant, Silicone caulk/sealant, Intumescent Wrap Strip, Firestop Putty, Firestop Collar or Intumescent Sleeve to meet each specific application and performance requirement.

E. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

F. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
1. Forming/Damming Materials: Mineral fiberboard, backer rod or other type recommended by Manufacturer's tested system.
2.21 VIBRATION ISOLATORS

A. Manufacturers: Mason, Amber Booth or approved equal.

B. Restrained Closed Spring Isolators:
   1. Spring Isolators:
      a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
      b. Code: Color code springs for load carrying capacity.
   2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
   3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
   4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance and limit stops.

C. Spring Hanger:
   1. Spring Isolators:
      a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
      b. Code: Color code springs for load carrying capacity.
   2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
   3. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators [rubber hanger with threaded insert].

D. Neoprene Pad Isolators:
   1. Rubber or neoprene-waffle pads.
      a. 30 durometer.
      b. Minimum 1/2 inch thick.
      c. Maximum loading 40 psi.
      d. Height of ribs: not to exceed 0.7 times width.

E. Rubber Mount or Hanger: Molded rubber designed for 0.5 inches deflection with threaded insert.

F. Glass Fiber Pads: Neoprene jacketed pre-compressed molded glass fiber.

G. Seismic Snubbers:
   1. Type: Non-directional and double acting unit consisting of interlocking steel members restrained by neoprene elements.
   2. Neoprene Elements: Replaceable, minimum of 0.75 inch thick.
   3. Capacity: 4 times load assigned to mount groupings at 0.4 inch deflection.
   4. Attachment Points and Fasteners: Capable of withstanding 3 times rated load capacity of seismic snubber.
2.22 TAGS
A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches high.
B. Metal Tags: Brass, Aluminum or Stainless Steel with stamped letters; tag size minimum 1-1/2 inches diameter with finished edges. Plain English designations.
C. Information Tags: Clear plastic with printed "Danger," "Caution," or "Warning" and message; size 3-1/4 x 5-5/8 inches with grommet and self-locking nylon ties.
D. Tag Chart: Plain English designations so no chart or index is required.

2.23 PIPE MARKERS
A. Color and Lettering shall conform to ASME A13.1 and UPC. Specific examples are noted in the table below.

<table>
<thead>
<tr>
<th>Service</th>
<th>Background Color</th>
<th>Letter Color</th>
<th>Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Cold Water</td>
<td>Green</td>
<td>White</td>
<td>DOMESTIC COLD WATER</td>
</tr>
<tr>
<td>Domestic Hot Water</td>
<td>Green</td>
<td>White</td>
<td>DOMESTIC HOT WATER</td>
</tr>
<tr>
<td>Domestic Recirculation</td>
<td>Green</td>
<td>White</td>
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<tr>
<td>Waste</td>
<td>Black</td>
<td>White</td>
<td>SANITARY SEWER</td>
</tr>
<tr>
<td>Vent</td>
<td>Black</td>
<td>White</td>
<td>SANITARY VENT</td>
</tr>
<tr>
<td>Condensate Drain</td>
<td>Black</td>
<td>White</td>
<td>CONDENSATE</td>
</tr>
<tr>
<td>Storm Drainage</td>
<td>Black</td>
<td>White</td>
<td>STORM</td>
</tr>
</tbody>
</table>
B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.
C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
D. Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, imprinted with service type in large letters, manufactured for direct burial service.
E. Underground Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with service type in large letters.

2.24 CEILING TACKS
A. Description: Steel with 3/4 inch diameter color-coded head.
B. Color code plumbing valves green.
2.25 LOCKOUT DEVICES

A. Lockout Hasps: Anodized aluminum hasp with erasable label surface; size minimum 7-1/4 x 3 inches.

B. Valve Lockout Devices: Nylon device preventing access to valve operator, accepting lock shackle.

PART 3 EXECUTION

3.1 EXISTING WORK

A. Provide access to existing piping and equipment and other installations remaining active and requiring access.

B. Extend existing piping installations using materials and methods compatible with existing installations.

3.2 SURFACE PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.

B. Remove incompatible materials affecting bond of adhesives or firestopping.

C. Install backing or damming materials to arrest liquid material leakage.

D. Obtain permission from Architect/Engineer before drilling or cutting structural members.

E. Degrease and clean surfaces to receive adhesive for identification materials.

3.3 INSTALLATION-CLEARANCE

A. Appliances and equipment shall be accessible for inspection, service, repair and replacement.

B. A minimum of 36” of clearance shall be provided in front of the control side of appliances and equipment. Provide additional space when required by NEC.

3.4 INSTALLATION - INSERTS

A. Install inserts for placement in concrete forms.

B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.5 INSTALLATION – ACCESS PANELS

A. Furnish access panels for installation at all concealed equipment which requires service, maintenance or adjustment to include but not limited to equipment, valves, open drains, control valves and controls.

B. Provide location layout and required size for all access panels to general contractor. Layout shall be regular and consistent, maintain a uniform wall panel height of 24” centerline above finished floor, unless noted otherwise.

C. Provide fire rated access panels where installed in fire rated assembly.

D. Provide stainless steel access panels where installed in tile surfaces.

E. Furnish access panels to general contractor for installation.

F. Paint installed access panels to match wall or ceiling. Verify that panels are not painted shut.

3.6 INSTALLATION - VALVES

A. Install valves with stems upright or horizontal, not inverted.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

D. Install valves with clearance for installation of insulation and allowing access.

E. Provide access panels where valves and fittings are not accessible.

F. Insulate valves according to application in Section 22 07 00.

G. For installation of valves in domestic water systems refer to Section 22 11 00.

3.7 VALVE APPLICATIONS

A. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

B. Install globe valves for throttling, bypass, or manual flow control services.

C. Install spring loaded check valves on discharge of pumps.

3.8 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.
B. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

F. Where piping is parallel and at same elevation, provide multiple pipe or trapeze hangers.

G. Adjust hangers and supports as required to bring system to proper line and grade. Piping shall be plumb with floor and parallel/perpendicular to building structure.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping, or sheet lead packing between pipe and hanger.

J. Design hangers for pipe movement without disengagement of supported pipe.

K. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

L. Provide clearance in hangers and from structure and other equipment for installation of insulation. Insulated piping shall have insulation run continuous through hangers and supports with use of rigid inserts. Insulation shall be glued to both sides of insert at hangers and supports, no insulation gaps are allowed. Refer to Section 22 07 00.

M. Support of pipe, tubing and equipment shall be accomplished by means of engineered products, specific to each application. Makeshift, field devised methods shall not be allowed.

N. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

3.9 INSTALLATION – SEISMIC CONTROLS

A. Provide seismic restraints and hangers in compliance with IBC 1613 and ASCE 7.

B. Seismic Bracing: Follow IBC 1613, ASCE 7, SMACNA Seismic Restraint Manual and the following.
   1. Bracing shall be bidder designed to resist seismic loading in accord with Chapter 16 of the International Building Code, ASCE 7 or the SMACNA guideline.
   2. Provide seismic calculations as required for Ip = 1.5.
3.10 INSTALLATION-PIPING PROTECTION

A. Provide protective shield plates in concealed locations where piping, other than cast-iron or steel, is installed in studs, joists or rafters. Plates shall be 16 gage steel and cover the pipe area plus 2”. Shields may be omitted if piping is more than 1-1/2” from nearest edge of structural member.

B. Prevent contact between dissimilar metals, such as copper tubing and steel, by use of copper-plated, plastic coated, or flexible materials. All supports which contact copper tubing shall be copper plated.

3.11 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 4 inches thick and extending 6 inches beyond supported equipment.

B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of steel members, formed steel channel or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

E. When water heaters and similar equipment are installed in a suspended application, an engineered and manufactured platform, such as the Hubbard Enterprises/HOLDRITE Suspended Water Heater Platform shall be used. Weight loading capability shall include a minimum safety factor of 2.

3.12 INSTALLATION - FLASHING

A. Provide flexible flashing and metal counterflashing where piping penetrates weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked 1 inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash, and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.

D. Seal drains watertight to adjacent materials.

E. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.13 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with mechanical sleeve seals.

B. Set sleeves in position in forms. Provide reinforcing around sleeves.
C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

E. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with insulation and caulk or fireproof airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

3.14 INSTALLATION – FIRESTOPPING AND SEALS AT PARTITIONS

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping and other items requiring firestopping.

B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating and to uniform density and texture. Remove dam material after firestopping material has cured.

D. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.

E. Place intumescent coating in sufficient coats to achieve rating required.

F. Clean adjacent surfaces of firestopping materials.

G. Fire Rated Surface:
   1. Seal opening at floor, wall, partition, ceiling, and/or roof as follows:
      a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
      b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
      c. Pack void with backing material.
      d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.

H. Non-Rated Surfaces:
   1. Seal opening through non-fire rated wall, partition, floor, ceiling, and/or roof opening as follows:
      a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
      b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
   2. Install escutcheons where piping penetrates non-fire rated surfaces in occupied spaces.
   3. Exterior wall openings below grade: Assemble rubber links of mechanical sealing device to size of piping and tighten in place, in accordance with manufacturer's instructions.
4. Interior partitions: Seal pipe penetrations air tight. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

3.15 INSTALLATION – VIBRATION ISOLATION

A. Install isolation for motor driven equipment.
B. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Provide line size flexible connectors.
C. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other ends. Install in horizontal plane unless indicated otherwise.
D. Provide grooved piping systems with minimum of three flexible couplings instead of flexible connector supported by vibration isolation.
E. Adjust equipment level.
F. Install spring hangers without binding.
G. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.
H. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.
I. Provide resiliently mounted equipment and piping with seismic snubbers. Provide each inertia base with minimum of four seismic snubbers located close to isolators. Snub equipment designated for post disaster use to 0.05 inch maximum clearance. Provide other snubbers with clearance between 0.15 inch and 0.25 inch.
J. Support piping connections to isolated equipment resiliently to nearest flexible pipe connector or as follows:
   1. Up to 4 inch Diameter: First three points of support.
   2. 5 to 8 inch Diameter: First four points of support.
   3. 10 inch Diameter and Over: First six points of support.
   4. Select three hangers closest to vibration source for minimum 1.0 inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0 inch static deflection or 1/2 static deflection of isolated equipment.

3.16 INSTALLATION - IDENTIFICATION

A. Install identifying devices after completion of coverings and painting.
B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
C. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.

D. Identify nonpotable water outlets with plastic permanent mounted sign in uppercase lettering which reads, “CAUTION: NONPOTABLE WATER, DO NOT DRINK.” Signage shall be black lettering on yellow background.

E. Nameplates: Identify plumbing equipment (water heaters, pumps, heat transfer equipment, tanks, and water treatment devices) with plastic nameplates.
   1. Identify in-line pumps and other small devices with name tags.
   2. Identify control panels and major control components outside panels with plastic nameplates.
   3. Identify description should be as numbered on drawings or plain English description. i.e. “WH-1” or “Rain Water Storage Tank”.
   4. Label automatic controls, instruments, and relays. Key to control schematic.
   5. Label wall controls and switches with associated equipment designation and control function, i.e. “DCP, Timer”.

F. Valve Tags: Identify valves in main and branch piping with tags.
   1. Do not provide numbered tags.
   2. Provide tags with plain English description of service and function. i.e. “Domestic Hot Water, Kitchen”

G. Pipe Labels: Identify piping, concealed or exposed, with plastic tape pipe markers.
   1. Identify service, flow direction, and pressure.
   2. Install in clear view and align with axis of piping.
   3. Locate identification on straight runs including risers and drops with spacing not to exceed 20 feet.
   4. Locate adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

H. Provide ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

I. Equipment and Valve Tag Index: Plain English designations so no chart or index is required.

3.17 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by firestoppping material installation.

3.18 SCHEDULES

A. Pipe Hanger Spacing

<table>
<thead>
<tr>
<th>PIPE MATERIAL</th>
<th>MAXIMUM HANGER SPACING (Feet)</th>
<th>HANGER ROD DIAMETER (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS (All sizes)</td>
<td>4</td>
<td>3/8</td>
</tr>
</tbody>
</table>
### Alphabetical List of Pipes

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity</th>
<th>Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum (All sizes)</td>
<td>10</td>
<td>1/2</td>
</tr>
<tr>
<td>Cast Iron (All Sizes)</td>
<td>5</td>
<td>3/8</td>
</tr>
<tr>
<td>Cast Iron (All Sizes) with 10 foot length of pipe</td>
<td>10</td>
<td>3/8</td>
</tr>
<tr>
<td>CPVC, 1 inch and smaller</td>
<td>3</td>
<td>1/2</td>
</tr>
<tr>
<td>CPVC, 1-1/4 inches and larger</td>
<td>4</td>
<td>1/2</td>
</tr>
<tr>
<td>Copper Tube, 1-1/4 inches and smaller</td>
<td>6</td>
<td>1/2</td>
</tr>
<tr>
<td>Copper Tube, 1-1/2 inches and larger</td>
<td>10</td>
<td>1/2</td>
</tr>
<tr>
<td>PVC (All Sizes)</td>
<td>4</td>
<td>3/8</td>
</tr>
<tr>
<td>Steel, 3 inches and smaller</td>
<td>6</td>
<td>1/2</td>
</tr>
<tr>
<td>Steel, 4 inches and larger</td>
<td>12</td>
<td>3/8</td>
</tr>
</tbody>
</table>

### Pipe Isolation Schedule

<table>
<thead>
<tr>
<th>Pipe Size Inch</th>
<th>Isolated Distance from Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>120 diameters</td>
</tr>
<tr>
<td>2</td>
<td>90 diameters</td>
</tr>
<tr>
<td>3</td>
<td>80 diameters</td>
</tr>
<tr>
<td>4</td>
<td>75 diameters</td>
</tr>
</tbody>
</table>

### Equipment isolation schedule:

<table>
<thead>
<tr>
<th>ISOLATED EQUIPMENT</th>
<th>BASE TYPE</th>
<th>THICKNESS</th>
<th>ISOLATOR TYPE</th>
<th>DEFLECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inline Pumps</td>
<td>N/A</td>
<td>N/A</td>
<td>Braided Flex</td>
<td></td>
</tr>
<tr>
<td>Skid/Base Pumps</td>
<td>Concrete</td>
<td>4&quot;</td>
<td>Braided Flex</td>
<td></td>
</tr>
<tr>
<td>Water Heater</td>
<td></td>
<td></td>
<td>Copper Flex</td>
<td></td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 22 07 00
PLUMBING INSULATION

PART 1 GENERAL

1.1 QUALITY ASSURANCE

A. Provide insulation tested for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.

B. All systems components subject to heat loss or gain, such as, piping, storage tanks, vessels, valves etc. shall be insulated to conform with the Washington State Energy Code and Evergreen Standards (as minimum).

1.2 IDENTIFICATION

A. Insulation shall bear a manufacturer’s mark indicating the product R-value or K-value and thickness. This mark shall be visible after installation and shall be repeated at an interval of no more than 10 feet.

PART 2 PRODUCTS

2.1 GLASS FIBER, RIGID

A. Manufacturers: Johns Manville Micro-Lok AP-T Plus or equal by Owens-Corning, Knauf, Manson or approved equal.

B. Insulation: Rigid, noncombustible. ASTM C547.
   1. ‘K’ factor: 0.23 at 75 degrees F.
   2. Fiberglass or Earthwool with ECOSE
   3. Maximum Service Temperature: 850 degrees F.
   4. Maximum Moisture Absorption: 0.2 percent by volume.
   5. Density: 3.0 lb/cu ft.

C. Vapor Retarder Jacket: ASJ+ or Type I, reinforced facing, paintable. Longitudinal acrylic adhesive closure system with factory supplied butt strips. ASTM C1136.

D. Rigid clamp/hanger insert: Preformed, incompressible (Calcium Silicate or similar), matching pipe size and insulation thickness.

2.2 GLASS FIBER, BLANKET

A. Manufacturers: Johns Manville Micro-Flex or equal by Owens-Corning, Knauf, Manson or approved equal.

B. Insulation: Semi-rigid, shot-free, continuous fiber, noncombustible. ASTM C1393.
   1. ‘K’ factor: 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F.
3. Maximum Moisture Absorption: 0.2 percent by volume.
4. Density: 2.5 lb/cu ft.

C. Vapor Retarder Jacket: Type I, reinforced facing, will accept paint. Seal with pressure sensitive tape. ASTM C1136.

2.3 POLYOLEFIN INSULATION
A. Manufacturers: IMCOA or similar.
B. Polyolefin or Polyethylene pipe insulation is NOT ACCEPTABLE for any application.

2.4 ELASTOMERIC CELLULAR FOAM
A. Manufacturers: Armacell AP/Armaflex, Aeroflex Aerocel or approved equal.
B. Preformed flexible, closed-cell, elastomeric thermal insulation: Type I, Tubular form, self-seal or continuous, 25/50-rated, CFC free, low VOC, 'K' factor: 0.27 at 75 degrees F. ASTM C534.

2.5 CLOSED CELL POLYURETHANE SYSTEM (BELOW GRADE)
A. Manufacturers: Thermacor Copper-Therm or approved equal.
B. Factory-fabricated, pre-insulated piping system including copper pipe, insulation, jacket, fittings and field installed joint covers.
C. Pipe: Type K copper
D. Insulation: Rigid 2.0 lb/cu. ft. polyurethane foam, 90% closed cell, 0.15 K factor per ASTM C518, CFC-free, bonded to pipe.
E. Jacket: Extruded white PVC, virgin NSF approved Class 12454-B conforming to ASTM D-1784 Type 1 Grade 1, minimum 60 mils thick. Jacket shall be bonded to insulation.
F. Fittings: Same insulation and jacket as piping.
G. Field Joints: Insulate with urethane foam to pipe insulation thickness, jacket with PVC sleeve and seal with pressure sensitive polyethylene backed rubberized bitumen adhesive tape 30 mils thick.
H. Installation: Factory field technicians shall inspect installation, field joints and pressure testing.

2.6 PIPE INSULATION AND EQUIPMENT JACKETS
A. PVC Plastic Pipe Jacket:
1. **Product Description:** One piece molded type fitting covers and sheet material, off-white color. ASTM D1784.

2. **Thickness:** 15 mil indoor, 30 mil outdoor.

3. **Connections:** Brush on welding adhesive.

**B. Canvas Equipment Jacket:**
1. **Fabric:** 6 oz/sq yd, plain weave cotton.
2. Composite of insulation, jacket and laces.

**C. Aluminum Pipe Jacket:**
1. **Thickness:** 0.016 inch thick sheet. ASTM B209.
2. **Finish:** Embossed
3. **Joining:** Longitudinal slip joints and 2 inch laps.
4. **Fittings:** 0.016 inch thick die shaped fitting covers with factory attached protective liner.
5. **Metal Jacket Bands:** 3/8 inch wide; 0.015 inch thick aluminum.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

A. Verify piping and equipment has been tested before applying insulation materials.

B. Verify surfaces are clean and dry, with foreign material removed.

**3.2 INSTALLATION**

A. Apply insulation when building is thoroughly dry to prevent shrinkage.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulate entire piping system including fittings, valves, unions, flanges, strainers, flexible connections, pump fittings, connections to equipment and expansion joints. Use canvas jackets for valves and other irregular shapes.

D. Insulate flanges and unions with removable sections and jackets.

E. **Piping Inserts and Shields:**
   1. Insulation shall be continuous through supports and hangers with incompressible inserts and shields. Do not directly clamp/support pipe scheduled to be insulated.
   2. **Shields:** Galvanized steel saddle between pipe clevis hangers or pipe rollers and insulation. Minimum 6 inches long, of contour matching adjoining insulation; may be factory fabricated.
   3. **Inserts:** Between pipe clamps, hangers or rollers and piping.
   4. **Insert material:** Compression resistant insulating material suitable for insulation type and planned temperature range and service.
   5. **Glue insulation to both sides of insert.**
   6. **Shields without inserts may be used at clevis hangers on refrigerant piping 5/8” and smaller with continuous insulation.**
F. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions.

G. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

H. Exterior Piping Applications: Use only elastomeric closed-cell foam insulation. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with sealant. Cover with aluminum jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal equipment.

I. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size insulation large enough to enclose pipe and heat tracer.

J. Exposed Equipment: Locate insulation and cover seams in least visible locations.

K. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

L. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

M. Finish insulation at supports, protrusions, and interruptions.

N. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

O. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.
3.3 SCHEDULES

A. Piping: Provide on piping as listed below. Exception: In residential units only, the water piping downstream of the submeters can be insulated per the minimum Washington State Energy Code requirements.

<table>
<thead>
<tr>
<th>Service</th>
<th>Insulation Type</th>
<th>&lt;1”</th>
<th>1” to 1-1/4”</th>
<th>1-1/2” to 4”</th>
<th>4” to 8”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Cold Water</td>
<td>Glass Fiber</td>
<td>1/2”</td>
<td>1/2”</td>
<td>1/2”</td>
<td>1/2”</td>
</tr>
<tr>
<td>Domestic Hot Water</td>
<td>Glass Fiber</td>
<td>1”</td>
<td>1”</td>
<td>1-1/2”</td>
<td>1-1/2”</td>
</tr>
<tr>
<td>Domestic Hot Water Recirc.</td>
<td>Glass Fiber</td>
<td>1”</td>
<td>1”</td>
<td>1-1/2”</td>
<td>1-1/2”</td>
</tr>
<tr>
<td>Domestic water H/C/R/T outside conditioned space</td>
<td>Glass Fiber</td>
<td>1-1/2”</td>
<td>1-1/2”</td>
<td>2”</td>
<td>2”</td>
</tr>
<tr>
<td>Condensate Drains</td>
<td>RIGID / FOAM</td>
<td>1/2”</td>
<td>1/2”</td>
<td>1/2”</td>
<td>1/2”</td>
</tr>
</tbody>
</table>

1. Do not insulate direct burial rain leader.
2. Do not insulate direct burial cold water.
3. For all exterior piping applications use only Elastomeric Cellular Foam with Aluminum jacket.
4. For all below grade piping application use only insulation specifically engineered for application. (Closed Cell Polyurethane System)

B. Equipment: Provide on equipment as listed below.

<table>
<thead>
<tr>
<th>Service</th>
<th>Insulation Type</th>
<th>Thickness</th>
<th>Jacket</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Water Storage Tank</td>
<td>Glass Fiber</td>
<td>4”</td>
<td>Reinforced White-Kraft Paper</td>
</tr>
<tr>
<td>Expansion Tank</td>
<td>Glass Fiber</td>
<td>2”</td>
<td>Reinforced White-Kraft Paper</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 22 11 00
FACILITY WATER DISTRIBUTION

PART 1 GENERAL

1.1 SCOPE
A. This section includes hot and cold water supply, equipment and accessories.
B. This section includes domestic hot and/or cold water consumption metering with data collection and billing software.

1.2 GENERAL REQUIREMENTS
A. Comply with Federal "Reduction of Lead in Drinking Water Act" – 2011. Pipes, pipe fittings, plumbing fittings and fixtures shall be "Lead Free" meaning not more than a weighted average of 0.25% lead in wetted surfaces.

1.3 SITE MAINS
A. Provide connections to Site water mains as indicated on drawings.

1.4 QUALITY ASSURANCE
A. The grooved coupling manufacturer’s factory trained representative shall provide on-site training for contractor’s field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review installation. (A distributor’s representative is not considered qualified to conduct the training or jobsite visit(s).)
B. The mechanical press fitting manufacturer’s factory trained representative shall provide on-site training for contractor’s field personnel in the use of press fittings and crimping tools. The representative shall periodically visit the jobsite and review installation. (A distributor’s representative is not considered qualified to conduct the training or jobsite visit(s).)

PART 2 PRODUCTS

2.1 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING
A. Copper Tubing: Type K hard drawn or annealed. ASTM B88.
   2. Joints: Brazed
      a. Copper to copper: Silver/phosphorus/copper alloy (15 percent silver). AWS A5.8 BCuP-5.
      b. Copper to brass or steel: AWS Bag-5 Silver (45 percent silver)

2.2 DOMESTIC WATER PIPING, ABOVE GRADE
A. Copper Tubing: Type L hard drawn seamless. ASTM B88.
1. Fittings:

2. Joints:
   a. Solder, lead free, 95-5 tin-antimony, or tin and silver. ASTM B32.
   b. Press connection, Viega ProPress or approved equal.

B. Copper Tubing: Type L hard drawn, rolled grooved ends. ASTM B88.
1. Copper Grooved-End Fittings: ASME B75 copper tube or bronze ASTM B584 bronze castings, with copper tube dimensioned grooved ends (flaring of tube and fitting ends to IPS dimensions is not permitted).
2. Joints: Grooved mechanical couplings meeting ASTM F1476. Victaulic or approved equal.
   a. Housing Clamps: ASTM A395 and ASTM A536 ductile iron cast with offsetting, angle-pattern bolt pads, copper-colored enamel coated, compatible with copper tubing sizes, to engage and lock designed to permit some angular deflection, contraction, and expansion.
   b. Gasket: Grade “EHP” EPDM.
   c. Accessories: Steel bolts, nuts, and washers.
   d. Design: “Installation Ready” designed for direct ‘stab’ installation onto roll grooved copper tube without prior field disassembly and no loose parts. Victaulic Style 607 QuickVic™.

C. CPVC Pipe (2" and larger): Schedule 80 CPVC, Charlotte Corzan or approved equal. ASTM D1784, ASTM F441, NSF 61.

D. PEX Pipe: See Section 22 11 16.

2.3 STEM TYPE THERMOMETERS
A. Manufacturers: Marsh, Trerice, Weiss or approved equal.

2.4 AUTOMATIC FLOW BALANCING VALVE
A. Manufacturers: Caleffi 127 or approved equal.

B. Construction: Low-lead brass body, anti-scale polymer flow cartridge, stainless steel spring, EPDM seals. 200 psi max working pressure. 200 F max temperature.

C. Control: Working pressure ranges 2-14 psid or 2-32 psid for flows from 0.5 gpm to 5 gpm.

2.5 WATER PRESSURE REDUCING VALVES
A. Manufacturers: Watts or equal by Apollo/Conbraco, Wilkens, Victaulic or approved equal.
B. 2 inches and Smaller: Lead-Free cast copper silicon body with stainless steel inlet strainer, reinforced EPDM diaphragm, replaceable stainless steel seat, adjustable outlet pressure between 25-75 psi, 300 psi working pressure, 33F-160F operating temperature range. Watts LFU5B.

C. 2-1/2 & 3 inch: Lead-Free brass body, inlet strainer with stainless steel screen, reinforced Buna-N diaphragm, EPDM valve disc, replaceable stainless steel seat, adjustable outlet pressure between 25-75psi, 300 psi working pressure, 33F-160F operating temperature range. Watts LFN223S.

D. 3 inches and Larger: Lead-Free cast iron body with inlet Y-strainer, Hycar diaphragm, stainless steel trim, direct operated, packless construction, adjustable outlet pressure between 30-80 psi, 200 psi working pressure, 150F operating temperature. Watts 2300.

2.6 RELIEF VALVES

A. Pressure Relief:

B. Temperature and Pressure Relief:

2.7 STRAINERS

A. Manufacturers: Apollo/Conbraco, Metraflex, Titan, Nibco or approved equal.

2.8 DOUBLE CHECK VALVE ASSEMBLY (DCVA)

A. Manufacturers: Watts or equal by Apollo/Conbraco, Wilkens or approved equal. Must be listed as acceptable by the State of Washington Cross Connection Manual.

B. 2 inches and Smaller: Lead-Free. Comply with ASSE 1015; two independently operating check valves with intermediate atmospheric vent. Cast copper silicon body, positive seating captured spring check valves with inlet Y-strainer, inlet and outlet shutoff ball valves, ball valve test cocks, replaceable seats and seat discs, 175 psi working pressure, 33-180 F operating temperature range. Watts model LF007

2.9 REDUCED PRESSURE BACKFLOW PREVENTERS (RPBA)

A. Manufacturers: Watts or equal by Apollo/Conbraco, Wilkens or approved equal. Must be listed as acceptable by the State of Washington Cross Connection Manual.
B. 2 inches and Smaller: Lead-Free. Comply with ASSE 1013. Cast copper silicone body with internal pressure differential relief valve located between two positive seating captured spring check valves, inlet Y-strainer, inlet and outlet shutoff ball valves, ball valve test cocks, replaceable polymer seats and silicone seat discs, air gap drain fitting, 175 psi working pressure, 33-180 F operating temperature range. Watts model LF919.

C. 2-1/2 inches and Larger: Lead-Free. Comply with ASSE 1013. Ductile iron body with internal pressure differential air-in/water-out relief valve located between two positive seating captured spring check valves, 100% fused epoxy coating inside/outside, epoxy coated inlet Y-strainer, inlet and outlet epoxy coated gate valves, ball valve test cocks, stainless steel internal parts, replaceable stainless steel seats, air gap drain fitting, 175 psi working pressure, 33-110 F operating temperature range. Watts model LF909.

D. 2-1/2 inches and Larger: Lead-Free. Comply with ASSE 1013. 300 stainless steel body with internal pressure differential air-in/water-out relief valve located between two positive seating captured spring check valves, epoxy coated inlet Y-strainer, inlet and outlet epoxy coated gate valves, ball valve test cocks, stainless steel internal parts, replaceable stainless steel seats, air gap drain fitting, 175 psi working pressure, 33-110 F operating temperature range. Watts model 994.

2.10 WATER HAMMER ARRESTORS

A. Manufacturers: Wade, PPP or approved equal.

B. ASSE 1010; stainless steel or copper construction, pre-charged, bellows or piston type sized in accordance with PDI WH-201.

2.11 ELECTRIC TEMPERATURE MAINTENANCE TAPE (Hot Water)

A. Manufacturers: Raychem HWAT or approved equal.

B. General: Provide a complete UL listed system of heating cables, components and control for maintaining water temperature in hot water or tempered water piping.

C. Cable: Self-regulating cable with nickel-copper bus wires embedded in conductive polymer core with dielectric polyolefin jacket, braided tinned copper ground and outer jacket of polyolefin. Cable shall vary power output in response to temperature with a self-regulating factor of at least 90%.

D. Components: Control enclosures shall be NEMA 4X rated. Connection system shall not require stripping of wires.

E. Controller: Adjustable temperature between 105 F and 140 F.

F. Installation:
   1. Apply "Electric Traced" labels to outside of insulated pipe.
   2. Attached cable to metal pipe with glass cloth tape and plastic pipe with aluminum tape.
3. Adjust pipe insulation size to accommodate maintenance tape.
4. Follow manufacturer's installation instructions.

2.12 THERMOSTATIC MIXING VALVES

A. Manufacturers:  Symmons, Lawler, Powers, Acorn or approved equal.

B. Valve:  Lead-Free cast brass body with [rough bronze] [chrome] finish, liquid filled thermal motor with bellows, stainless steel piston, integral temperature adjustment control.

C. Assembly:  Valve and piping assembly with wall mounting bracket, pipe unions, check valve and strainer stop inlets, outlet dial thermometer, outlet ball valve. Factory assembled and tested. Certified to ASSE 1017 standard.

D. Accessories:
   1. Steel cabinet with baked enamel finish
   2. Stainless steel cabinet

2.13 TEMPERING VALVE (PUBLIC LAV)

A. Manufacturers:  Symmons, Leonard, Powers, Acorn or approved equal.

B. General:  Lead-Free brass and bronze body with brass and stainless steel flow control components with check stops, vandal resistant lockable handle, rough [bronze] [chrome] finish. Certified to ASSE 1070 standard.

C. Accessories:
   1. Cabinet

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with groove couplings, flanges or unions.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.2 INSTALLATION - BURIED PIPING SYSTEMS

A. Verify connection to existing piping system size, location, and invert are as indicated on Drawings.

B. Provide connections to site mains as indicated on drawings.
C. Grade piping at 1/4” per foot where possible, but in no case less than 1/8” per foot. Install all main vertical soil and waste stacks with provisions for expansion and extend full size to roof line as vents.

D. Backfill trenching with pea-gravel if available at site for other purposes. If pea-gravel is unavailable, native soil may be used for backfill if all the following conditions are met.
   1. All broken concrete and sharp stones (+1” dia.) to be removed from backfill soil.
   2. All large stones (3’ dia. or bigger) to be removed from backfill soil.
   3. Piping shall be bedded on min. 2” thickness of replaced “rock free” soil and then checked for grade.

E. Establish elevations of buried piping with not less than 3 ft of cover.

F. Establish minimum separation from other services piping in accordance with Code.

G. Route pipe in straight line.

H. Install pipe to allow for expansion and contraction without stressing pipe or joints.

I. Install plastic ribbon tape continuous over top of pipe.

J. Install trace wire continuous over top of pipe.

3.3 INSTALLATION - ABOVE GROUND PIPING

A. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

B. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

C. Group piping whenever practical at common elevations.

D. Install piping on interior side of building insulation.

E. Provide heat tape for all piping in unheated areas.

F. Sleeve pipe passing through partitions, walls and floors.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Protection: Where piping, other than cast iron or steel, is installed in a concealed location through holes or notches in framing (i.e. studs, joists, rafters, etc.), less than 1-1/2 from framing edge, provide shield plates. Shield plates shall be 16 gauge steel and cover the piping area within framing plus 2” on each side along framing.
I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 00.

J. Grooved Joints: Install in accordance with the manufacturer’s (Victaulic) guidelines and recommendations. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

K. Provide access panel where valves and fittings are not accessible.

L. Install non-conducting dielectric connections wherever jointing dissimilar metals.

M. Slope piping and arrange systems to drain at low points. Provide hose bibb if low point is not at a plumbing fixture.

N. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

O. Insulate piping. Refer to Section 22 07 00.

P. Install pipe identification in accordance with Section 22 05 00.

3.4 INSTALLATION - DOMESTIC WATER PIPING SYSTEMS

A. Install domestic water piping system in accordance with ASME B31.9.

B. Grade piping to drain at low points. Provide hose bibb if low point is not at plumbing fixture.

C. Install water piping on interior side of building insulation. Provide heat tape for all piping in unheated areas.

D. Install water hammer arrestors on hot and cold water of each fixture group (e.g.: one arrestor may serve each service to a toilet). Select unit sizes and install in accord with PDI Standard WH-201.

3.5 VALVES

A. Use ball valves for up to 4” piping. Gate valves are not approved for use up to 4” piping. Gate valves are for 6” piping and larger only.

B. Gate valves which are part of a valve assembly are acceptable.
3.6 INSTALLATION - THERMOMETERS AND GAUGES

A. Install pressure gauges on each side of domestic water service assembly (i.e. double check, PRV, etc.).

B. Install one pressure gauge for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gauge.

C. Install gauge taps in piping.

D. Install pressure gauges with pulsation dampers. Provide needle valve or ball valve to isolate each gauge.

E. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.

F. Provide instruments with scale ranges selected according to service with largest appropriate scale.

G. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

H. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.7 INSTALLATION - SERVICE CONNECTIONS

A. Provide new water service complete with approved double check back-flow preventer, pressure reducing valve, by-pass valves, pressure gauges and strainer.

B. Provide sleeve in wall for service main and support at wall with reinforced-concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

C. Provide 18 gauge galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

3.8 FIELD QUALITY CONTROL

A. Test domestic water piping system at 100 psig minimum for a period of not less than 4 hours.

3.9 CLEANING

A. Flush system with water for minimum of 60 minutes to remove all dirt and foreign materials. Use minimum of 80 psi flushing pressure.

B. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain residual from 50 to 80 mg/L.
C. Bleed water from outlets to obtain distribution and test for disinfectant residual at a minimum of 15 percent of outlets.

D. Maintain disinfectant in system for 24 hours.

E. Flush disinfectant from system until residual concentration is equal to incoming water or 1.0 mg/L.

END OF SECTION
SECTION 22 11 16
PEX DOMESTIC WATER PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. PEX-a pipe and fittings for domestic water piping.

1.2 RELATED SECTIONS

A. Section 22 11 00 – Facility Water Distribution

1.3 REFERENCES

A. ASTM International (ASTM):
   1. ASTM D 2765 - Test Methods for Determination of Gel Content and Swell Ratio of Crosslinked Ethylene Plastics.

B. Uponor, Inc.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Installer shall have demonstrated experience on projects of similar size and complexity with documentation proving successful completion of plumbing system installation and/or training by the PEX tubing manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
   1. Store PEX tubing in original packaging to avoid dirt or foreign material from entering the tubing.
   2. Do not store PEX tubing or EP fittings outdoors or in direct sunlight. Do not use PEX tubing or EP fittings which has been exposed to direct sunlight for more than 30 days.
1.6 WARRANTY

A. Manufacturer's Warranty: PEX-a manufacturer system warranty shall cover piping and fittings for a duration of 25 years from the date of installation. Piping system warranty shall apply to potable water distribution and water service systems constructed of pipe and fitting products sourced from the same manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Uponor AquaPEX
B. Or equal by Viega
C. Substitutions: Not permitted.

2.2 PEX PIPE AND FITTINGS


B. ProPEX Ring: Reinforcing cold-expansion rings shall be manufactured from the same source as PEX-a piping manufacturer and marked ASTM F1960.

C. PEX-a Fittings: elbows, adapters, couplings, plugs, tees and multi-port tees (1/2 inch through 3 inch nominal pipe size): ASTM F1960 cold-expansion fitting manufactured from the following material types:
   1. UNS No. C69300 Lead-free (LF) Brass, NSF/ANSI 61.

D. (Below Grade) Pre-Sleeved Ecoflex Potable Piping (3/4 inch through 3 inch nominal pipe size): PEX-a piping, multilayered closed-cell insulation and a corrugated seamless high-density polyethylene (HDPE) jacket.

E. (Hot Water) Pre-Insulated Piping (1/2 inch through 1-1/4 inch nominal pipe size): PEX-a piping, with 1” closed-cell polyethylene foam insulation.

F. (Hot Water) Pre-Insulated Piping (1-1/2 inch through 2 inch nominal pipe size): PEX-a piping, with 1-1/2” closed-cell polyethylene foam insulation.

G. Multi-Port Tees: Multiple-outlet fitting complying with ASTM F 877; with ASTM F 1960 inlets and outlets.
   1. Engineered polymer branch multi-port tee.
   2. Engineered polymer flow-through multi-port tee.
   5. Engineered polymer commercial flow-through multi-port tee.
2.3 TRANSITION FITTINGS

A. PEX-to-Metal Transition Fittings:
   1. Manufacturers: Provide fittings from the same manufacturer of the piping.
   2. Threaded Brass to PEX-a Transition: one-piece brass fitting with male or
      female threaded adapter and ASTM F 1960 cold-expansion end, with
      PEX-a reinforcing cold-expansion ring.
   3. Brass Sweat to PEX-a Transition: one-piece brass fitting with sweat
      adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing
      cold-expansion ring.
   4. PEX-a to Flange Transition: Two-piece brass fitting with lead-free ProPEX
      adapter and steel flange conforming to ASME B 16.5.

B. PEX-to-Thermoplastic Transition Fittings: CPVC to PEX-a Transition:
   Thermoplastic fitting with one spigot or socket end and one ASTM F 1960 cold-
   expansion end, with PEX-a reinforcing cold-expansion ring.

2.4 VALVES

A. PEX-to-PEX (1/2 inch through 2 inch nominal pipe size):
   1. Manufacturers: Provide ball valve(s) from the same manufacturer as the
      piping system.
   2. Full-port ball valve: two-piece, ASTM F1960 cold-expansion ends, with
      PEX-a reinforcing cold-expansion ring.
   3. Lead Free (LF) Brass Ball Valve with a positive stop shoulder
      manufactured from C69300 brass.

B. All other valves per section 22 05 00.

2.5 PIPE SUPPORT

A. Horizontal Pipe Support: 23 ga galvanized-steel channel half-round, self-gripping
   for continuous, uninterrupted support of PEX pipe. Provide with nylon-coated,
   stainless-steel strapping with minimum 300-lb tensile strength.

B. 90-degree bend support: Snap-on metal or glass-reinforced nylon bend support
   sleeve for ½” and ¾” piping.

C. Drop ear bend support: Snap-on metal or glass-reinforced nylon bend support
   sleeve and stud wall mounting plate for ½” piping.

D. Out-of-the-Wall Support System: Wall support bracket, bend support and
   escutcheon.

E. Drop Ear Elbow: 90-degree brass elbow for showerhead.

F. Makeshift, field devised methods of plumbing pipe support, such as with the use
   of scrap framing materials, are not allowed. Support and positioning of piping
   shall be by means of engineered methods that comply with IAPMO PS 42-96.
   Hubbard "HOLDRITE" support systems or approved equal.
PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Verify that site conditions are acceptable for installation of the domestic water piping. Do not proceed with installation until unacceptable conditions are corrected.

3.2 SCHEDULE

A. Do not use PEX tubing smaller than ½”.

B. PEX piping up to 2” may be used on this project.

C. ½” and ¾” piping may be run through framing with appropriate isolators. 1” and larger piping shall be supported with hangers.

D. Domestic Cold Water: Use Blue PEX tubing.

E. Domestic Hot Water: Use Red PEX tubing, pre-insulated.

F. Domestic Hot Water Recirculation: Use White PEX tubing, pre-insulated.

3.3 INSTALLATION

A. Install plumbing system according to approved shop drawings and coordination drawings.

B. Comply with manufacturer’s product data, including product technical bulletins, installation instructions and design drawings.

C. Water velocity in piping for hot water recirculating systems shall not exceed 2 ft/sec.

D. Penetrations of tubing through framing members shall be made with engineered isolators.

E. Piping Installation:
   2. Install piping in compliance with manufacturer’s Plumbing Installation Guide.

F. Hangers and Supports:
   1. Horizontal PEX-a Piping with PEX-a Pipe Channel: Install hangers for PEX-a piping with horizontal support channel in accordance with local jurisdiction and manufacturer’s recommendations, with the following maximum spacing:
      a. 3/4 inch and below: Maximum span, 6 feet.
      b. 1 inch and above: Maximum span, 8 feet.
2. Provide pipe support channel for all horizontal piping to control linear thermal expansion. Provide fix transverse and longitudinal support struts every 65 ft for hot water piping and every 150 ft for cold water piping.

3. Vertical PEX-a Piping (<1"): Support PEX-a piping with maximum spacing of 5 feet.

4. PEX-a Riser Supports (1” and larger): Install CTS riser clamps at the base of each floor and at the top of every other floor for domestic hot-water systems. Install mid-story guides between each floor. Install CTS riser clamps at the base of each floor and at the top of every fourth floor for domestic cold-water systems. Install mid-story guides.

G. Piping Schedule:
1. Underground / under-building slab, domestic water piping (3 inch and below) shall be the following:
   a. 1/2 inch through 3 inch - PEX-a piping with engineered polymer (EP) or lead-free brass F1960 cold-expansion fittings. Insulate in compliance with Section - 9 "Plumbing Piping Insulation." Use the fewest possible joints and install per manufacturer’s recommendations.
   b. 1/2 inch through 2 inch - Pre-insulated PEX-a piping with PEX-foam insulation with engineered polymer (EP) or lead-free brass ASTM F 1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer’s recommendations.
   c. 3/4 inch through 2 inch - Pre-insulated PEX-a piping with multi-layer, closed-closed cell PEX-foam insulation and a corrugated HDPE jacket with engineered polymer (EP) or lead-free brass ASTM F 1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer’s recommendations.

2. In-slab, domestic water piping (3 inch and below) shall be the following: Bare PEX-a piping, pre-sleeved PEX-a piping, or pre-insulated PEX-a piping with engineered polymer (EP) or lead-free brass F1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer’s recommendations.

3. Aboveground domestic water piping (3 inch and below) shall be the following: PEX-a piping, with engineered polymer (EP) or lead-free brass F1960 cold-expansion fittings.


I. Field Quality Control: Do not expose PEX piping or EP fittings to direct sunlight for more than 30 days.

3.4 CLEARANCES AND WARNINGS

A. Do not weld, glue or use adhesives or adhesive tape on PEX tubing.

B. Do not apply open flame to PEX tubing or EP fittings.

C. Do not install PEX tubing within 6” of any gas appliance vent.
D. Do not install PEX tubing within the first 18" of a connection to a water heater.
E. Do not install PEX tubing within 12" of any recessed light fixture.
F. Do not solder within 18" of any PEX tubing or EP fittings.
G. Do not install PEX tubing between the tub/shower valve and tub spout.
H. Do not install PEX tubing in direct view of fluorescent lighting.
I. Do not install PEX tubing within five feet of UV light.
J. Prevent direct contact between urethane foam and EP fittings.
K. Do not reuse EP fittings. Brass fitting may be disconnected and reused.

3.5 PIPE LABELS
A. Use permanent, flexible, vinyl stickers with pressure-sensitive acrylic as approved by piping manufacturer.

3.6 MANUFACTURER’S FIELD SERVICES
A. Where PEX tubing or seismic joints are installed, furnish inspection services by manufacturer's representative and certify installation is in accordance with manufacturer's recommendations and equipment is performing satisfactorily.

END OF SECTION
SECTION 22 13 00
FACILITY SANITARY SEWERAGE

PART 1  GENERAL

PART 2  PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe & Fittings: ASTM A888, CISPI 301, hub-less. Made in USA by AB&I, Charlotte or Tyler marked with collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.
   1. Fittings: ASME B16.45 or ASSE 1043, long pattern cast iron, hubless.
   2. Joints: Heavy-Duty, Shielded, Stainless-Steel coupling with all type 304 stainless steel shield and band assembly, 80 in/lbs worm drive. ASTM C-564 Neoprene gasket. CISPI 310 and certified by NSF international. Minimum 4 clamps up to 4”, 6 clamps for 5” and larger. Husky SD 4000, Clamp-All 125 or approved equal.

B. ABS Pipe: Schedule 40, ABS material, DWV, Cellular Core, bell and spigot style solvent sealed ends. NSF Standard 14, ASTM F628, ASTM D3965.
   1. Fittings: ABS, DWV, ASTM D2661.


   1. Construction: 2.5 Mil epoxy exterior pipe coating and 5 Mil interior cross linked epoxy pipe coating.
   2. Fittings: Long pattern epoxy coated cast iron.
   3. Joints: Heavy-Duty, Shielded, Stainless-Steel coupling with all type 304 stainless steel shield and band assembly, 80 in/lbs worm drive. ASTM C-564 Neoprene gasket. CISPI 310 and certified by NSF international. Minimum 4 clamps up to 4”, 6 clamps for 5” and larger. Husky SD 4000, Clamp-All 125 or approved equal.

2.2 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe & Fittings: ASTM A888, CISPI 301, hub-less. Made in USA by AB&I, Charlotte or Tyler marked with collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.
   1. Fittings: ASME B16.45 or ASSE 1043, long pattern cast iron, hubless.
   2. Joints: Heavy-Duty, Shielded, Stainless-Steel coupling with all type 304 stainless steel shield and band assembly, 80 in/lbs worm drive. ASTM C-564 Neoprene gasket. CISPI 310 and certified by NSF international.
Minimum 4 clamps up to 4", 6 clamps for 5" and larger. Husky SD 4000, Clamp-All 125 or approved equal.

B. Copper Tube (Use only for short piping sections where dimensional constraints require thin wall pipe): ASTM B306 DWV.
   2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver.

C. Steel Pipe (water closet connections only): Schedule 40, galvanized. ASTM A53.
   1. Fittings: Cast Iron, ASME B16.4, threaded fittings.

   1. Fittings: ABS, DWV, ASTM D2661.

E. [VENT ONLY] PVC Pipe: Schedule 40 solid wall PVC, bell and spigot solvent sealed ends (If approved by local authorities). NSF Standard 14, ASTM D1785, ASTM D1784. **Not for use in air plenum.**

2.3 SANITARY SEWER PIPING, SPECIAL LOCATIONS:

A. The category may be used for piping installed in crawl spaces only.

B. Cast Iron Pipe: ASTM A888, CISPI 301, hub-less. Made in USA by AB&I, Charlotte or Tyler marked with collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.
   1. Fittings: ASME B16.45 or ASSE 1043, long pattern cast iron, hubless.
   2. Joints: Heavy-Duty, Shielded, Stainless-Steel coupling with all type 304 stainless steel shield and band assembly, 80 in/lbs worm drive. ASTM C-564 Neoprene gasket. CISPI 310 and certified by NSF international.
      Minimum 4 clamps up to 4", 6 clamps for 5" and larger. Husky SD 4000, Clamp-All 125 or approved equal.

   1. Fittings: ABS, DWV, ASTM D2661.

D. PVC Pipe: Schedule 40 solid wall PVC, bell and spigot solvent sealed ends (If approved by local authorities). NSF Standard 14, ASTM D1785, ASTM D1784.
2.4 NO-HUB TRANSITION COUPLING FOR JOINING CAST IRON AND PVC PIPE
   A. Coupling shall be Tested and Certified to ASTM C 1460 and be constructed with type 304 stainless steel shield, thickness 0.015, gasket material to meet ASTM C564, 1-1/2" - 4" will be 3" wide with four (4) 304 stainless steel bands and 6" - 10" will be 4" wide with six (6) 304 stainless steel bands and 3/8" 305 stainless steel hex head screws torqued to 80 inch pounds. Husky SD 4000 PVC x CI or approved equal.

2.5 EQUIPMENT DRAINS (CONDENSATE)
   A. Copper Tubing: Type L, hard drawn. ASTM B88.
      1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
      2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.
   
      1. Fittings: Schedule 40 CPVC. ASTM D2846.

2.6 FLOOR DRAINS
   A. Manufacturers: Zurn, Josam, J.R. Smith, Wade or approved equal.
   B. General Service: Cast iron body, membrane clamp, adjustable collar, polished nickel bronze strainer, trap primer connection. Provide funnel where scheduled.
   
   C. Garage: Square top heavy duty parking deck drain with coated cast iron body, gasketed drain support flange, heavy duty slotted grate, underdeck clamp.
   D. Manufacturers: Zurn, Josam, J.R. Smith, Wade or approved equal.
   E. Cast iron body with white acid resisting porcelain enamel coating on body and grate, sump dome strainer, trap primer connection.

2.7 CLEANOUTS
   A. Manufacturers: Zurn, J.R. Smith, Josam, Wade or approved equal.
   B. Exterior or interior vehicle areas: Heavy-Duty round coated cast iron body and cover with bronze plug.
   
   C. Exterior Surfaced Areas: Round cast nickel bronze access frame with bronze gasket threaded plug and non-skid cover.
   D. Exterior Unsurfaced Areas: Line type with lacquered cast iron body and bronze gasket threaded plug.
   E. Interior Finished Floor Areas: Type of ferrule, top and cover as required for the type of floor construction, finish surface and traffic conditions. Cleanout construction material to match waste piping with anchor flange, threaded top assembly, and round scored cover with gasket in service areas and round
depressed cover with gasket to accept floor finish in finished floor areas. For carpet provide marker. For cast iron construction provide bronze gasket threaded plug.

F. Interior Finished Wall Areas: Cleanout construction material to match waste piping, line type with round gasket threaded plug, and round stainless steel access cover secured with machine screw. For cast iron construction provide bronze gasket threaded plug.

G. Interior Unfinished Accessible Areas: Threaded type. Provide bolted stack cleanouts on vertical waste stacks.

2.8 BACKWATER VALVES

A. Manufacturers: Clean Check or approved equal.

B. Check: PVC tee-shaped valve body, top collar with stainless steel thumb screw and bottom collar with PVC flapper. Contractor to provide PVC access riser.

2.9 BACKWATER VALVES


B. Check: Automatic, bronze flapper, coated cast iron body, bronze threaded cover.

C. Gate: Automatic, counterweight, positive seal, gate style with cast iron body, stainless steel full port gate and PVC diaphragm/expansion chamber. Provide with 120 volt electronic alarm, sensor and wiring.

2.10 FLASHING AND COUNTERFLASHING

A. 3lb. lead soldered joints and seams, 24 x 24 base pad and counterflashed into pipe.

2.11 TRAP PRIMER

A. Manufacturers: PPP, Wade, J.R. Smith, Josam, Watts, Zurn or approved equal.

B. Construction: Automatic, bronze body, integral vacuum breaker.

2.12 TRAP SEAL MAINTENANCE DEVICE

A. Manufacturers: Sure-Seal, Jay R Smith or approved equal.

B. Inline floor drain trap sealer, commercial grade, neoprene rubber diaphragm and rubber sealing gaskets.

2.13 AIR GAP FITTING

A. Manufacturers: Zurn Z-1025 or equal by J.R. Smith or approved equal.

B. Construction: Inline, fixed air gap, coated cast iron.
2.14 SUMPS

PART 3 EXECUTION

3.1 PREPARATION

A. Remove scale and dirt, on inside and outside, before assembly.

B. Prepare piping connections to equipment with flanges or unions.

C. Verify and provide required extensions, clamps and drain styles to match floor construction and finish.

3.2 INSTALLATION

A. Coordinate location of floor drains in mechanical spaces with mechanical contractor equipment layout.

B. Protect floor drain strainer during construction.

C. TRAPS:
   1. Install trap seal maintenance devices only where called for on plans or approved by engineer; at all other drain locations provide automatic trap primers.
   2. Install automatic trap primers throughout at site drains and floor drains except those located in showers or provided with trap seal maintenance devices.
   3. Provide access panels for automatic trap primers.
   4. Adjust automatic trap primer pressure setting for proper operation.

D. Align square floor drains with floor tiles or parallel with walls.

E. Install interceptors with top flush with adjacent surface or grade. Provide quantity and size of vents as indicated in manufacturer’s literature. Terminate vents minimum 10 feet above grade or through roof at a location determined by the architect.

3.3 CONDENSATE PIPING

A. Provide condensate piping for air-conditioning and high-efficiency gas fired equipment. Coordinate quantity required with mechanical contractor. Provide minimum 3” deep p-trap at equipment.

B. Determine best routing to nearest indirect waste using minimum 3/4” piping with minimum 1/8” per foot slope. Acceptable indirect waste locations are service sink, laundry sink, floor drain or air gap fitting into waste pipe. Provide open drain box or access panel for air gap fitting as approved by local authority. Discharge onto roof or at grade is acceptable if allowed by local code, provide splash block.

C. If proper slope cannot be achieved advise Mechanical Contractor to provide condensate pump.
3.4 INSTALLATION - BURIED PIPING SYSTEMS

A. Verify connection to existing piping system size, location, and invert are as indicated on Drawings.

B. Provide connections to site mains as indicated on drawings.

C. Grade piping at 1/4" per foot where possible, but in no case less than 1/8" per foot. Install all main vertical soil and waste stacks with provisions for expansion and extend full size to roof line as vents.

D. Install buried ABS piping per ASTM D2321 and ASTM F1668.

E. Backfill trenching with pea-gravel if available at site for other purposes. If pea-gravel is unavailable, native soil may be used for backfill if all the following conditions are met.
   1. All broken concrete and sharp stones (+1” dia.) to be removed from backfill soil.
   2. All large stones (3’ dia. or bigger) to be removed from backfill soil.
   3. Piping shall be bedded on min. 2” thickness of replaced “rock free” soil and then checked for grade.

F. Establish elevations of buried piping with not less than 3 ft of cover.

G. Establish minimum separation from other services piping in accordance with Code.

H. Provide piping layout to satisfy the UPC requirements for suds relief.

I. Route pipe in straight line.

J. Install pipe to allow for expansion and contraction without stressing pipe or joints.

K. Install plastic ribbon tape continuous over top of pipe.

L. Install trace wire continuous over top of pipe.

3.5 INSTALLATION - ABOVE GROUND PIPING

A. Route piping in orderly manner and maintain gradient at 1/4" per foot where possible, but in no case less than 1/8" per foot. Route parallel and perpendicular to walls.

B. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

C. Group piping whenever practical at common elevations.

D. Install piping on interior side of building insulation.

E. Provide heat tape for all p-traps in unheated areas.

F. Sleeve pipe passing through partitions, walls and floors.
G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Protection: Where piping, other than cast iron or steel, is installed in a concealed location through holes or notches in framing (i.e. studs, joists, rafters, etc.), less than 1-1/2 from framing edge, provide shield plates. Shield plates shall be 16 gauge steel and cover the piping area within framing plus 2” on each side along framing.

I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

J. Provide access panel where valves and fittings are not accessible.

K. Install non-conducting dielectric connections wherever jointing dissimilar metals.

L. Establish invert elevations, slopes for drainage to 1/4 inch per foot minimum. Provide 1/8 inch per foot only where necessary and allowed by local jurisdiction. Maintain gradients.

M. Provide piping layout to satisfy the UPC requirements for suds relief.

N. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

O. Install piping penetrating roofed areas to maintain integrity of roof assembly.

P. Insulate piping. Refer to Section 22 07 00.

Q. Install pipe identification in accordance with Section 22 05 00.

3.6 INSTALLATION - SANITARY WASTE AND VENT SYSTEMS

A. Install sanitary waste and vent piping systems in accordance with ASME B31.9 and local plumbing code.

B. Support cast iron drainage piping at every joint.

C. Flash and counterflash. Install vents passing through roof with roof flashing and counterflashing assemblies. 3lb. lead soldered joints and seams, 24 x 24 base pad and counterflushed into pipe.

D. Install automatic trap primers throughout at floor drains except those located in showers. Provide access panel for trap primers.

E. Provide piping layout to satisfy the UPC requirements for suds relief.

F. Provide cleanouts every 50 feet and install at all locations required by code and to permit cleaning of all waste piping. Provide cleanouts full size of pipe, but no larger than 4”. Coordinate with Architect when cleanouts are located in finished rooms. Install cleanout threads with graphite. Locate cleanouts to clear cabinet work and to be easily accessible.
3.7 INSTALLATION – BACKWATER VALVES

A. Label all cleanouts upstream of a backwater valve with a permanent label which reads “Backwater Valve Downstream”.

3.8 INSTALLATION - PUMPS

A. Provide pumps operating at specified system fluid temperatures without vapor binding and cavitation, non-overloading in parallel or individual operation, and operating within 25 percent of midpoint of published maximum efficiency curve.

B. Provide shaft length allowing ejector pumps to be located minimum 24 inches below lowest invert into sump pit and minimum 6 inches clearance from bottom of sump pit.

C. Provide air cock and drain connection on horizontal pump casings.

D. Provide line sized ball valve and line sized soft seated check valve on pump discharge.

E. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump independently of pump casings. Install supports under elbows on pump discharge line sizes 4 inches and larger.

F. Check, align, and certify alignment of pumps prior to start-up.

3.9 FIELD QUALITY CONTROL

A. Obtain written approval of local Plumbing Authority prior to covering or concealing any work.

B. Test sanitary waste and vent piping system to hydrostatic test of 10 feet head of water.

END OF SECTION
SECTION 22 30 00
PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 SCOPE
A. Provide plastic venting and combustion air for water heaters and boilers in this section.

1.2 COORDINATION
A. For equipment which requires metal venting coordinate required material and location with Division 23.

1.3 QUALITY ASSURANCE
A. Water Heater Performance Requirements: Equipment efficiency not less than prescribed by Washington State Energy Code and scheduled on drawings.

PART 2 PRODUCTS

2.1 RESIDENTIAL ELECTRIC WATER HEATERS
A. Manufacturers: A.O. Smith, Bradford White, or approved equal.
B. Type: Automatic, electric, vertical storage.
C. Tank: Glass lined welded steel, minimum 2-1/2" thermal insulation, encased in corrosion-resistant steel jacket with baked-on enamel finish. Minimum energy factor 0.90, minimum 6 year warranty.
D. Controls: UL 174, automatic water thermostat with temperature range from 120 to 170 degrees F, flanged or screw-in copper or incoloy steel elements, enclosed controls and electrical junction box. Wire double element units so elements do not operate simultaneously.
E. Accessories: Brass water connections and dip tube, drain valve, aluminum/stainless steel or magnesium anode and ASME temperature and pressure relief valve.

2.2 COMMERCIAL ELECTRIC WATER HEATERS
A. Manufacturers: A.O. Smith DSE or equal by Bradford White, Laars or approved equal.
B. Type: Factory-assembled and wired, automatic, electric, vertical storage.
C. Tank: Welded steel ASME labeled pressure vessel, glass lined, 4 inch diameter inspection port, minimum 2" thermal insulation, encased in corrosion-resistant steel jacket; baked-on enamel finish.

D. Controls: Ventilated control cabinet with hinged door, factory-wired with solid state progressive sequencing step controller, fuses, magnetic contactor, control transformer, pilot lights indicating main power and heating steps, control circuit toggle switch, immersion water thermostat, electronic low-water (probe-type) cut-off, high temperature limit thermostat, temperature and pressure gages. Externally adjustable temperature range from 60 to 180 degrees F, flanged incoloy or goldenrod elements, UL listed.

E. Accessories: Brass water connections and dip tube, drain valve, magnesium anode, and ASME rated temperature and pressure relief valve.

2.3 INSTANTANEOUS ELECTRIC WATER HEATERS

A. Manufacturers: Chronomite or approved equal.

B. Type: Digital microprocessor controlled water temperature with anti-scalding setting, stainless steel heating coils, differential pressure flow switch.

2.4 DIAPHRAGM-TYPE EXPANSION TANKS

A. Manufacturers: Amtrol, Armstrong or approved equal.

B. Construction: Welded steel, tested and stamped in accordance with ASME Section VIII; with pre-charged flexible EPDM diaphragm sealed into tank; steel ring base (vertical) or saddles (horizontal)

C. Accessories: Pressure gage and air-charging fitting, tank drain.

D. Installation: Before installation, charge tank with Nitrogen gas to equal domestic water line pressure at tank. Permanently mark fill pressure on tank.

2.5 SYSTEM LUBRICATED CIRCULATORS

A. Manufacturers: Armstrong Astro 2, TACO, Grundfos or approved equal.

B. Type: Horizontal shaft, single stage, direct connected with wet rotor motor for in-line mounting, for 150 psig maximum working pressure, 230 degrees F maximum water temperature.

C. Casing: Lead-Free bronze or stainless steel with flanged pump connections. NSF 372 certified.

D. Impeller: Polyether Imide (PEI)

E. Shaft: Ceramic

F. Bearings: Ceramic

G. Bearing Seal: EPDM
H. Motor: 3-speed

I. Accessories:
   1. 24 hour time clock with on/auto/off switch.
   2. Clip-on aquastat with bi-metal disc, 85F on, 105F off.

2.6 IN-LINE CIRCULATOR PUMPS

A. Manufacturers: Armstrong ARMflo E Series or similar by B&G, Taco or approved equal.

B. Type: Horizontal shaft, single stage, direct connected, with dry motor for in-line mounting, for 150 psig maximum working pressure.

C. Casing: Cast iron, (all bronze for domestic water), with flanged pump connections.

D. Impeller: 30% glass-filled noryl.

E. Bearings: Sealed, permanently lubricated stainless steel.

F. Shaft: Stainless steel.

G. Seal: Silicon carbide enviroseal with viton elastomer. 230 degrees F maximum continuous operating temperature.

H. Drive: Two pole, single phase.

I. Accessories:
   1. 24 hour timer control.
   2. Temperature sensor.
   3. P/T test plugs

PART 3 EXECUTION

3.1 INSTALLATION – WATER HEATER

A. Maintain manufacturer’s recommended clearances around and over water heaters.

B. Install water heater on concrete housekeeping pad, minimum 4 inches high and 6 inches larger than water heater base on each side. For electric water heaters include incompressible insulated surface (R-10 min).

C. Anchor or strap to structure to resist horizontal displacement due to earthquake. IAPMO listed, galvanized steel, double body straps, Hubbard Quick Strap or approved equal.

D. Connect domestic hot water and domestic cold water piping to water heater connections.

E. Install the following piping accessories. Refer to Section 22 11 00.
1. On cold water:
   a. Strainer.
   b. Pressure gage.
   c. Shutoff ball valve.
2. On hot water:
   a. Shutoff ball valve.

F. Install discharge piping from relief valves and drain valves to nearest floor drain or indirect waste location. Determine best routing.

G. Provide pan where required or specified.

H. Install water heater trim and accessories furnished loose for field mounting.

I. Install electrical devices furnished loose for field mounting.

J. Install control wiring between water heater control panel and field mounted control devices.

3.2 INSTALLATION - PUMPS

A. Provide pumps to operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

B. Install long radius reducing elbows or reducers between pump and piping. Support piping adjacent to pump so no weight is carried on pump casings. For close coupled or base mounted pumps, install supports under elbows on pump suction and discharge line sizes 4 inches and over.

C. Provide line sized shut-off valve and strainer on pump suction, and line sized check valve, balancing valve, and shut-off valve on pump discharge.

D. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump so no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and larger.

E. Provide P/T test plugs.

F. Provide air cock and drain connection on horizontal pump casings.

G. Provide drains for bases and seals.

H. Where appropriate, lubricate pumps before start-up.

END OF SECTION
SECTION 22 40 00
PLUMBING FIXTURES

PART 1 GENERAL

1.1 SCOPE
A. This section includes all plumbing fixtures, trim and installation, to include owner furnished equipment.

1.2 REQUIREMENTS
A. All china fixtures shall be white or manufacturer's standard unless otherwise indicated.
B. Ensure that all china fixtures install in a room or area are the exact same color and hue, especially if from different manufacturers.
C. Fixtures by type and material shall be of the same manufacturer except when scheduled or approved otherwise.
D. Tank type water closets shall have a minimum MaP (Maximum Performance) of 500 g.
E. Fixtures shall be designed or equipped to meet the following water use efficiency standards and ESDS:
   1. Water closets (tank or flush valve) 1.1 GPF
   2. Shower heads 1.75 GPM
   3. Lavatory faucets (Private) 1.0 GPM
   4. Lavatory faucets (Public) 0.5 GPM
   5. Kitchen faucets 1.75 GPM

PART 2 PRODUCTS

2.1 TANK TYPE WATER CLOSETS
A. Manufacturers: Niagara, American Standard or approved equal
B. Gravity: white, vitreous china, floor mount, 12" rough-in, 15" rim height, gravity feed flush with 3" valve, elongated bowl, close-coupled closet combination, insulated vitreous china closet tank with fittings and lever flushing valve, siphon jet, 2-1/8" passageway, chrome plated bolt caps.
C. Gravity (ADA): white, vitreous china, floor mount, 12" rough-in, 16-1/2" rim height, ADA compliant, gravity feed flush with 3" valve, elongated bowl, close-coupled closet combination, insulated vitreous china closet tank with fittings and lever flushing valve, siphon jet, 2-1/8" passageway, chrome plated bolt caps.
2.2 WATER CLOSET SEATS
   A. Manufacturer: Bemis.
   B. Open Front: Heavy duty solid plastic, white, large molded-in bumpers, external check hinges with stainless steel posts, without cover.
   C. Closed Front: Heavy duty solid plastic, white, large molded-in bumpers, external check hinges with stainless steel posts, with cover.

2.3 LAVATORIES
   A. Manufacturers: Kohler and American Standard.
   B. Wall Hung: white, vitreous china, wall mounted, drilled for concealed arm carrier, overflow, ADA compliant. Provide with wall carrier.
   C. Counter Top: white, vitreous china, self-rimming, overflow, ADA compliant.
   D. Undercounter: white, vitreous china, unglazed rim for under counter mount with overflow.

2.4 SINKS
   A. Manufacturer: Elkay.
   B. Single Compartment: Seamless 18 gauge. Type 304 stainless steel, self-rimming, radius corners, sound deadening undercoat.
   C. Double Compartment: Seamless 18 gauge. Type 304 stainless steel, self-rimming, radius corners, sound deadening undercoat.

2.5 BATHTUBS
   A. Manufacturer: American Standard.
   B. White, porcelain enameled steel, acid resistant, recessed with integral apron and tiling flange, slip-resistant coating. Verify left or right hand outlet.

2.6 SHOWER/TUB ENCLOSURES
   A. Refer to Interior and Exterior Specialties Section 10 60 00.

2.7 FAUCET, LAVATORY
   A. Manufacturer: Moen.
   B. Centerset:
      1. Single Handle: Polished chrome plated cast brass, deck mount, metal lever handle, ceramic mixing cartridge, temperature limit stop, 1.0 gpm aerator (0.5 gpm for public use). Spout length, drain and hole spacing as scheduled.
2. Dual Handle: Polished chrome plated cast brass, deck mount, metal indexed wristblade handles. Spout length, drain and hole spacing as scheduled.

2.8 FAUCET, SINK

A. Manufacturer: Moen.

B. Swing Spout:
   1. Single Handle: Polished chrome plated cast brass, deck mount, metal lever handle, ceramic mixing cartridge, temperature limit stop. Spout length, drain and hole spacing as scheduled.

2.9 SHOWER/TUB VALVES

A. Manufacturer: Moen.

B. Shower: Pressure balancing valve that cycles from cold to hot, lever handle, chrome plated brass, integral service stops, complete with shower head, arm and flange.

C. Shower/Tub: Pressure balancing valve that cycles from cold to hot, lever handle, diverter tub spout, chrome plated brass, integral service stops, complete with shower head, arm and flange.

2.10 SHOWER HEADS

A. Manufacturer: Moen.

B. Solid brass construction, polished chrome finish, 6-jet showerhead, infinitely adjustable spray streams with operating handle, pressure-compensating auto-flow limit to 1.75 gpm.

2.11 HOSE BIBBS

A. Manufacturers: Woodford, Zurn, JR Smith or approved equal.

B. Exterior (Freeze Proof): Automatic draining, freezeless, hose connection backflow protection, two check valves, 3/4” hose thread, wheel handle wall clamp.

2.12 RECESSED VALVE BOX

A. Manufacturers: Guy Gray, Acorn, Oatey, Sioux Chief or approved equal.

B. General: Box construction shall match fire rating of wall.

C. Washing Machine: 2” drain socket, 3/4” hot & cold brass valves, wall brackets, face plate.

D. Water: 1/4 turn brass ball valve with recessed wall box, wall brackets, face plate.
2.13 FIXTURE SUPPLIES
   A. Manufacturers: Brass Craft, McGuire or approved equal.
   B. Chrome plated all brass angle stops with brass stems (no plastic). Fixed key metal handle and chrome plated escutcheon. Chrome plated copper flexible supplies for exposed connections, braided supplies acceptable where concealed. Provide stop and supply type as applicable to specific fixtures. Supply shall be marked with manufacturer’s name and comply with ANSI NSF 61 “No Lead”.

2.14 TRAPS
   A. Manufacturers: Brass Craft, Dearborn Brass, McGuire or approved equal.
   B. Adjustable type, polished chrome plated cast brass, 17 gauge, with escutcheon. Provide type as applicable to specific fixture installation. PVC acceptable only where concealed.

2.15 LAVATORY INSULATION KIT
   A. Manufacturers: Truebro, Plumberex, McGuire or approved equal.
   B. Where lavatories or sinks have exposed traps or supplies furnish the following for ADA compliance: Safety Covers conforming to ANSI A177.1 and consisting of insulation kit of molded closed cell vinyl construction, 3/16 inch thick, white color, for insulating tailpiece, P-trap, valves, and supply piping. Furnish with weep hole and angle valve access covers, antimicrobial, with flush reusable fasteners.
   C. Arms, lugs for floor and wall attachment, steel sleeves, alignment truss.

PART 3 EXECUTION
3.1 EXAMINATION
   A. Verify walls and floor finishes are prepared and ready for installation of fixtures.
   B. Verify electric power is available and of correct characteristics.
   C. For all lavatories and sinks verify required number of holes and hole spacing before ordering.

3.2 PREPARATION
   A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures and in accordance with manufacturer's details.
   B. Locate fixtures in accordance with architectural drawings, details on structural drawings and/or Engineer's direction in field. Mount ADA fixtures according to dimensions on architectural drawings.
C. If drain, tailpiece, strainer or other accessories are not furnished by fixture manufacturer then provide accessories by Brass Craft or approved equal.

D. Provide vandal proof features on faucets, aerators, bubblers and pop-up waste assemblies on fixtures in public areas.

3.3 INSTALLATION

A. Install shut-off valves on water lines servicing a fixture group.

B. Support piping at stop, valve or flush valve.

C. Align fixtures and equipment installed in accord with architectural drawings.

D. Locate shower head mounting height 80” minimum from drain to centerline of head pipe.

E. Locate shower curtain rod minimum 6’-3” AFF (verify with architect).

F. Locate floor service sink (mop sink) faucet rough-in at 36” AFF.

G. Locate water recessed valve boxes for refrigerators at 18” AFF.

H. Locate water recessed valve boxes for coffee makers per architectural plans.

I. Seal fixtures to wall and floor surfaces with silicon sealant, color to match fixture.

J. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

K. For ADA accessible water closets, install flush valve with handle to wide side of stall.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Review millwork shop-drawings. Confirm location and size of fixtures and openings before rough in and ordering.

3.5 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

B. Adjust flush lever or valve for intended flow rate and operation.

END OF SECTION
SECTION 23 00 00
HVAC GENERAL CONDITIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Conform to General Conditions, Supplementary Conditions, the modifications thereto and Division 01 - General Requirements for all work in Division 23.

1.2 SUMMARY

A. Provide labor, materials and appliances necessary for satisfactory installation of mechanical work ready to operate in strict accordance with these specifications and drawings. Work of Division 23 includes, but is not limited to, that as delineated in the following specification sections:

23 00 00 HVAC General Conditions
23 05 00 Common Work Results for HVAC
23 05 93 Testing, Adjusting and Balancing
23 07 00 HVAC Insulation
23 09 00 Instrumentation and Control for HVAC
23 23 00 Refrigerant Piping
23 31 00 HVAC Ducts and Casings
23 33 00 Air Duct Accessories
23 34 00 HVAC Fans
23 37 00 Air Outlets and Inlets
23 72 00 Energy Recovery Units
23 81 26 Split-System Air-Conditioners & Heat Pumps

1.3 CODES AND STANDARDS

A. Conform to following code and agency requirements having jurisdictional authority over mechanical installation.

1. Uniform Plumbing Code (UPC) with local amendments.
2. International Mechanical Code (IMC) with local amendments.
6. Requirements of OSHA and EPA.
8. ASME code for construction of pressure vessels.
10. ASTM, ANSI and NEMA standards, as referenced in subsequent sections.
11. Local Sewer District Requirements.
12. Local Water District Requirements.
13. Local Health Department Requirements.
15. LEED Requirements.
16. ESDS Current Version.

1.4 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to International Building Code with local amendments, FM, and UL for fire resistance ratings and surface burning characteristics.

B. Provide vibration isolation on motor driven equipment over 0.5 hp, plus connected piping and ductwork.

C. Provide minimum static deflection of isolators for equipment as follows:
   1. 5 hp and less: 1 inch
   2. Over 5 hp: 2 inch

D. Use concrete inertia bases for fans having static pressure in excess of 3.5 inches water column or motors in excess of 40 hp, and on base mounted pumps over 5 hp.

E. Maintain rooms below the maximum sound levels, as defined by ASHRAE Handbook HVAC Applications and ANSI S1.8.

1.5 PRODUCT SUBSTITUTIONS

A. Manufacturers and models of equipment and material indicated herein and on drawings are those upon which mechanical design is based. Other manufacturers with products considered equal in general quality may be listed without specific model designation. Manufacturers not listed shall be submitted for approval, see Division 01.

B. Substitutions will be evaluated based on product manufacturer only. Specific product model, specifications, options and accessories will be evaluated during submittals. Approval of a manufacturer substitution does not constitute approval of the submitted product.

C. Any equipment other than the basis of design is considered a substitution.

D. In selecting substitute equipment, the Contractor is responsible for and shall guarantee equal performance and fit. Cost of redesign and all additional costs
incurred to accommodate the substituted equipment shall be borne by the Contractor.

E. Unless indicated otherwise, “or approved” may be assumed for all products in Division 23.

1.6 SUBMITTALS

A. Provide one electronic copy of product data submittals for all products listed under “Part 2 Products” of Division 23 and all additional products noted on drawings or required for completion of sequence of operations.

B. Electronic: **Submittals shall be complete in one PDF file with bookmarks for each Division. Multi-part submittals will be returned without review.**
   1. First Page: Name of Project, Owner, Location & Contracting Company.
   2. Index Page: List of specification sections with contents by Tag or item.
   3. Bookmarks: Electronic bookmark of each specification section corresponding to listing in index.

C. Clearly indicate on each page the equipment schedule designation (Tag) and/or specification section, as applicable. Indicate selected model and all accessories intended for use.

D. Equipment vendor cover page with contact information shall precede submittal by that vendor.

E. Submitted product information shall include (as applicable) but not be limited to the following information:
   1. Product description
   2. Manufacturer and model
   3. Dimensions
   4. Performance Ratings (i.e. capacity, rpm, HP, temperature)
   5. Construction Materials
   6. Ratings (i.e. UL, ASTM, NEMA, etc)
   7. Electrical data
   8. Sound level data (corresponding to scheduled values)
   9. Vibration Isolation
   10. Controls and wiring diagrams
   11. Accessories
   12. Engineering technical data (i.e. pressure drops, leakage rates, pump curves, fan curves)

F. If requested by Architect or Engineer, submit Manufacturer’s Installation Instructions on any equipment, procedures, or certifications so requested.

G. Do no ordering, fabrication or manufacturing of products until return of approved submittals.

1.7 COMMISSIONING

A. See Division 01 for roles and responsibilities of commissioning.
B. Provide all necessary commissioning assistance, equipment and documentation as required by the Commissioning Plan.

C. The duty and responsibility for mechanical commissioning work shall be assigned to a specific individual. Inform the General Contractor and Certified Commissioning Professional (CCXP) of the contact information for the person so assigned.

D. Perform corrective actions needed to resolve deficiencies identified during commissioning. Record action taken on commissioning deficiency log.

1.8 HVAC PERMIT

A. HVAC contractor shall prepare all documents for mechanical permit application, submit for, and obtain the permit. HVAC Contractor shall pay all costs and fees to obtain the permit.

B. Contractor shall not commence work until permit is obtained. Contractor is solely responsible to insure that the permit application and any revisions are submitted in a timely manner so as not to impact project schedule.

C. Permit documents may include (but are not limited to) the following:
   1. Mechanical cover sheet.
   2. Mechanical Site Plan, Vicinity Map and Elevations.
   3. Mechanical Load Calculations (Mechanical Consultant will provide load calculations to the Contractor).
   4. Acoustical Reports. Mechanical Contractor shall obtain the required acoustical reports from the acoustical engineer for the project.
   5. Energy Compliance Forms.

D. Contractor shall retain services of a third party structural engineer to provide support, anchoring and seismic calculations for all applicable equipment.

1.9 QUALITY ASSURANCE

A. Perform Work in accordance with ASME B31.9 – Building Services Piping for installation of piping systems and ASME Section IX – Welding and Brazing Qualifications for welding materials and procedures.

B. Perform Work in accordance with the International Mechanical Code including State and local amendments.

C. Provide products requiring electrical connections listed and classified by UL as suitable for purpose specified and indicated.

D. Perform Work in accordance with Washington State Energy Code.

1.10 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years’ experience.
B. Installer: Company specializing in performing Work of this section with minimum three years’ experience.

1.11 SEQUENCING

A. Sequence balancing between completion of systems tested and Date of Substantial Completion.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. Protect all equipment, materials, and insulation from weather, construction traffic, dirt, water, chemicals, and damage by storing in original packaging and under cover. Where original packaging is insufficient, provide additional protection. Maintain protection in place until installation.

C. Inspect all products and materials for damage prior to installation.

D. Protect piping from all entry of foreign materials by providing temporary end caps or closures on piping and fittings. Furnish temporary protective coating on cast iron and steel valves.

E. Protect dampers from damage to operating linkages and blades.

F. Protect materials and finishes during handling and installation to prevent damage.

G. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors. Protect coils from entry of dirt and debris with pipe caps or plugs.

H. Comply with manufacturer's installation instruction for rigging, unloading and transporting units.

I. Dehydrate and charge refrigeration components including piping and receivers, seal prior to shipment. Maintain seal until connected into system.

J. Comply with contractor's construction Indoor Air Quality (IAQ) Plan.

1.13 ENVIRONMENTAL REQUIREMENTS

A. Do not apply fire stopping materials when temperature of substrate material and ambient air is below 60 degrees F. Maintain this minimum temperature before, during, and for minimum 3 days after installation of fire stopping materials.

B. Provide ventilation in areas to receive solvent cured materials.

C. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer. Maintain temperature during and after installation for minimum period of 24 hours.
D. Do not install instruments when areas are under construction, except rough in, taps, supports and test plugs.

E. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers. Maintain temperatures during and after installation of duct sealant.

F. Maintain water integrity of roof during and after installation of chimney or vent.

G. Do not install condensing unit foundation pad when ground is frozen or muddy.

1.14 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

B. Verify by field measurements, sizes and configurations are compatible with wall construction and layout.

C. Existing systems and utility lines indicated on drawings are in accordance with information furnished to the Architect and may not be complete. Contractor is responsible for locating, uncovering, disposing of or maintaining existing systems.

1.15 COORDINATION

A. Visit the site and become familiar with existing conditions affecting work.

B. Verify locations of any overhead or buried utilities on or near site. Determine such locations in conjunction with all public and private utility companies and with all authorities having jurisdiction.

C. Existing systems and utility lines indicated on drawings are in accordance with information furnished to the Architect and may not be complete. Contractor is responsible for locating, uncovering, disposing of or maintaining existing systems.

D. HVAC drawings are diagrammatic and do not indicate all possible site conditions. The contractor shall verify all measurements, dimensions and connections on site and coordinate between trades to preclude interferences. The contractor shall provide adjustments to piping or ductwork as necessary to fit conditions including but is not limited to relocation, offsets, and transitions.

E. In the event of a conflict with other trades of work, the following priority from highest to lowest shall be followed: Structural, lighting, HVAC, plumbing/piping and sprinklers. Starting with the lowest priority, the HVAC, plumbing, and sprinkler contractors shall provide whatever materials, offsets, labor etc. is required to resolve the conflict.

F. When discrepancies occur between plans and specifications, the Architect will determine which takes precedence and the Contractor shall perform the selected requirement at no additional cost.
G. Prior to ordering equipment cross-check mechanical and electrical drawings and specifications to assure proper location and electrical characteristics of connections serving mechanical and electrical equipment.

H. Advise the Architect of any modifications required to suit equipment furnished. Costs for modifications due to equipment substitution will be borne by the contractor.

I. Wherever conflicts occur between different parts of the Contract Documents the greater quantity, the better quality, or larger size shall prevail unless the Architect informs the Contractor otherwise in writing.

J. The scale of each drawing is relatively accurate, but the Contractor is warned to obtain the necessary dimensions for any exact takeoffs from the Architect. No additional cost to the Owner will be considered for failure to obtain exact dimensions where not clear or in error on the drawings. Any device or equipment roughed in improperly and not positioned on implied centerlines or as required by good practice shall be repositioned at no cost to the Owner.

K. Where the word ‘verify’ is used on the documents, the contractor shall field verify the existing conditions and modify the scope of the installation as required to meet the verified conditions without additional cost to the Owner.

L. Coordinate wall openings, piping rough-in locations, concrete housekeeping pads, and electrical rough-in locations to accommodate Work of this Section.

M. Coordinate all equipment with building control work.

N. Coordinate installation of
   1. Condensing units with concrete pad and roof structure.
   2. Air handling units with building structure.
   3. Unit installation with roof structure, piping systems, and ceiling for unit access.

1.16 CUTTING, FITTING, REPAIRING AND PATCHING

A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where necessary for installation of mechanical work. Perform work only with craftsmen skilled in their respective trades.

B. Avoid cutting, where possible, by setting sleeves, frames, etc., and by coordinating for openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for ducts and piping.

C. Cut all holes neatly and as small as possible to admit work. Perform cutting in manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.
1.17 SALVAGE

A. Remove excess piping and ductwork, plug or cap any unused branch connections. Remove scrap pipe and all other excess materials from the site.

B. Comply with contractor’s Construction Waste Management Plan. Retain and submit all trip and tip tickets for all construction debris and waste hauling, indicating material content, tonnage, date hauled and facility to where materials were hauled.

1.18 ELECTRICAL

A. Short-Circuit Current Rating (SCCR): All HVAC and refrigeration equipment with multi-motor or combination electrical loads shall comply with NEC 110.10 & 440.4 and must include a SCCR greater than the Available Interrupting Current (AIC) of the electrical circuit serving the equipment. See electrical drawings for required AIC kA rating. Equipment SCCR may be presented in writing from the manufacturer or shown on the unit nameplate. Refrigeration or air-conditioning equipment over 60 Amps MOCP must list the SCCR on the unit nameplate. If the AIC rating is unavailable or cannot be determined provide equipment with a minimum SCCR of 10kA.

B. Motors:
   1. Temperature Rating: Rated for 40 degree C environment with maximum 50 degree C temperature rise for continuous duty at full load.
   2. Starting Capability: Not less than 12 starts per hour.
   3. Phase Characteristics: Squirrel-cage induction poly-phase motors for 3/4 HP and larger, and capacitor-start single-phase motors for 1/2 HP and smaller. At equipment manufacturer's option, 1/6 HP and smaller may be split-phase type.
   4. Service Factor: 1.15 for polyphase motors and 1.35 for single-phase motors.
   5. Enclosure Type: Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation, and guarded drip-proof motors where exposed to contact by employees or building occupants. Weather-protected Type I for outdoor use, Type II, where not housed.
   7. Name Plate: Indicate full identification of manufacturer, ratings, characteristics, construction, special features and similar information.
   8. All motor efficiencies shall conform to Washington State Energy Code and NEMA MG-1.

C. Motor Starters: By mechanical equipment manufacturer where factory mounted controls are provided. Variable frequency drives by Division 23, all other starters provided by Electrical Contractor.

D. Power Wiring: By Electrical Contractor.

E. Control Wiring: Responsibility of Division 23, including all line and low voltage control wiring. Owner will not entertain additional cost due to lack of coordination between HVAC Contractor and Electrical Contractor.
1.19 PROJECT CLOSEOUT

A. Completion, submission and approval of the following is required for final project closeout.
   1. Execution of Architect’s and Engineer’s final observation reports (punchlist)
   2. Operating and Maintenance Instructions
   3. Operating and Maintenance Manual
   4. Equipment and Pipe Cleaning
   5. Record Drawings
   6. Testing
   7. Commissioning
   8. Warranty

B. See Division 01 for additional requirements.

1.20 OPERATING AND MAINTENANCE INSTRUCTIONS

A. General: In addition to requirements of Division 01, following initial operation of HVAC systems and prior to acceptance by the Architect, perform the following services.

B. At least two weeks prior to each instruction period, give written notification of readiness to proceed to the Architect and Owner, and obtain mutually acceptable dates.

C. Conduct demonstrations and instructions for the Owner’s representatives, pointing out requirements for operating, servicing and maintaining equipment and systems. Describe general system operation and specific equipment functions. Cover all equipment calibration, setpoint adjustment, safeties and alarms.

D. Furnish qualifications of Contractor’s personnel in charge of the instruction; foreman position is minimum acceptable. Where equipment startup is performed by supplier’s or manufacturer’s personnel, those personnel should also provide training on that equipment.

E. During demonstrations and instructions include and reference information from maintenance manuals and contract drawings.
   1. Provide documentation of all instruction which includes:
      a. Date and time of instruction
      b. Name, affiliation and qualifications of the instructor
      c. Name and affiliation of the attendees
      d. Topics, systems, and equipment covered
      e. Length of instruction

F. Minimum duration of instruction periods:
   1. HVAC Systems 2 hours
   2. Control Systems 2 hours
1.21 OPERATING AND MAINTENANCE MANUALS

A. Contents: Furnish, in accord with Division 1, one PDF and one bound copy of operating and maintenance manuals to include the following:

1. Manufacturers, suppliers, contractor names, addresses and phone numbers.
2. Warranty service contractors' names, address and phone numbers (if different from above).
3. Schedule and description of routine maintenance for each component to include oiling, lubrication and greasing data.
4. Manufacturer’s cuts and rating tables, including brochures for all submittal items.
5. Part numbers of all replaceable items.
6. Control diagrams and operation sequence.
7. Written guarantees.
8. Record drawings corrected and completed.
9. Completed equipment start-up forms and checklists.
10. Final copy of testing, adjusting, and balancing report.

B. Operation and Maintenance Data:

1. Include, spare parts lists, exploded assembly views for all equipment.
2. Submit installation instructions, adjustment instructions, spare parts lists, exploded assembly views for all equipment.
3. Submit inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
4. Submit manufacturer's descriptive literature, operating instructions, and maintenance and repair data. Include directions for resetting constant volume regulators.

C. Filters: Operation and Maintenance Data: Submit instructions for operation, changing, and periodic cleaning.

D. Binders:

1. Furnish typewritten or printed index and tabbed dividers between principal categories.

E. Imprint on cover:

1. Name of project.
2. Owner.
3. Location of project.
5. Contractor.
6. Year of completion.

F. Imprint on backing:

1. Name of project.
2. Year of completion.
G. Submittals:
   1. Preliminary Copies: Prior to scheduled completion of the project, submit one PDF copy for review by the Architect.
   2. Final Copies: After approval of the preliminary copy, submit one PDF and one bound copy to the Owner.

1.22 EQUIPMENT AND PIPE CLEANING
   A. Clean interior and exterior of all equipment. Equipment shall be free of dirt, construction debris, corrosion, etc.
   B. Adequate provisions shall be made during construction to eliminate dirt, debris or other material from entering and collecting inside of pipe, ductwork and equipment. Any collection of material shall be thoroughly cleaned before equipment startup and if necessary again before owner occupancy.
   C. Clean exterior of all exposed pipe and ductwork.

1.23 RECORD DRAWINGS
   A. Submit one digital file with all drawings in PDF format.
   B. Make all notes and revisions on PDF set in red.
   C. Show location of equipment, location and size of piping, location and size of ductwork. Locate all valves, control dampers and similar equipment with tag or label identification. Indicate locations and elevations of exterior pipe and utility connections. Maintain continuously updated drawings during progress of project.
   D. Record actual locations of tagged valves and control dampers; include valve tag numbers. Record actual locations of flexible connectors and expansion joints.
   E. Record actual locations of equipment, clean-outs, controlling devices, and all above grade, under-floor, and buried piping and ductwork. Provide dimensions from gridline or walls to indicate specific locations.

1.24 TESTING
   A. Provide completed start-up forms and checklists.
   B. Perform testing and balancing of HVAC systems as described in this Division and as required by applicable codes and ordinances.
   C. Provide changes in sheaves, belts, and dampers as required for correct balance.
   D. Provide commissioning of Control System, and all mechanical components in compliance with the applicable Energy Code, the commissioning notes on the drawings and commissioning specifications of this Division. Written verification of test to be signed by Owner's Representative.
1.25 WARRANTIES AND CONTRACTOR’S GUARANTEE

A. All work, material and equipment shall be free of defect, complete and in perfect operating order at time of delivery to Owner.

B. Furnish one year warranty from date of substantial completion for all systems unless specifically noted otherwise.

C. Without cost to Owner, correct all defects and failures discovered within one year from date of final acceptance, except when in the opinion of the Architect a failure is due to neglect or carelessness of the Owner.

D. The guarantee of the Contractor is independent of shorter time limits by any manufacturer of equipment furnished. Submit with Operation and Maintenance Manual all guarantees which exceed one year.

E. Make all necessary balancing and control adjustments during first year of operation.

F. The presence of any inspector or observer during any construction does not relieve the Contractor from responsibility for defects discovered after completion of the work.

PART 2 NOT USED

PART 3 EXECUTION

3.1 DOCUMENTATION

A. Additional plan submittals to reviewing authority: If additional drawing submittals are required at any time during construction contractor shall submit drawings, review with authority, and pick up subsequent approved drawings. Engineer will revise and/or prepare drawings for submittal.

3.2 INSPECTION

A. Do not allow any work to be covered up or enclosed until inspected, tested and approved by the Architect and all authorities having jurisdiction over the work.

B. Should any work be enclosed or covered up before such inspection and test, Contractor shall at his own expense uncover work, and after it has been inspected, tested and approved, make all repairs as necessary to restore all work disturbed by him to its original condition.

C. Energy Code C104 specifically requires the following inspections.
   1. Mechanical Equipment Efficiency and Economizer: To be made after all equipment and controls required by the Energy Code and this specification are installed and prior to the concealment of such equipment or controls.
   2. Mechanical Pipe and Duct Insulation: To be made after all pipe and duct insulation is in place, but before concealment.
3. Motor Inspections: To be made after installation of all equipment covered by the Energy Code and this specification but before concealment.

3.3 FIELD QUALITY CONTROL
A. Inspect isolated equipment after installation for proper movement clearance.

3.4 CLEANING
A. Clean adjacent surfaces of fire stopping materials.
B. Clean ductwork and equipment.

3.5 MANUFACTURER'S FIELD SERVICES
A. Where PEX tubing or seismic joints are installed, furnish inspection services by manufacturer's representative and certify installation is in accordance with manufacturer's recommendations and equipment is performing satisfactorily.

3.6 PROTECTION OF FINISHED WORK
A. Protect adjacent surfaces from damage by material installation.

END OF SECTION
SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements and recommendations of Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Standards SP-58 and SP-69.

B. Comply with requirements and recommendations of Sheetmetal and Air Conditioning Contractors National Association (SMACNA) HVAC Duct Construction Standards.

C. Conform to requirements of IBC 1613 and SMACNA "Seismic Restraint Manual Guidelines for Mechanical Systems".

1.2 MATERIALS AND EQUIPMENT

A. Where two or more units of same class of equipment are required, use products of a single manufacturer. All equipment shall be new and free from damage.

B. Protect stored material and equipment against weather, corrosion and dirt. Protect installed mechanical components, including but not limited to piping, ductwork, and equipment against weather damage, corrosion, dirt and construction dust. Seal equipment and ductwork where and when necessary to be kept clean.

C. Provide major equipment components with manufacturer’s name, address, catalog number and capacity indicated on a nameplate, securely affixed in a conspicuous place.

D. Furnish standard and fabricated hangers and supports complete with necessary inserts, bolts, nuts, rods, washers and other accessories.

1.3 REQUIREMENTS

A. Provide incompressible inserts and shields at all piping supports on pipe to be insulated per 23 07 00.

B. Provide vibration isolation on motor driven equipment, plus connected piping.

C. Provide structural work and equipment required for expansion and contraction of piping. Verify anchors, guides, and expansion joints provide and adequately protect system.

D. Firestopping Materials: Provide to achieve fire ratings as noted on architect’s drawings for adjacent construction, but not less than 1 hour fire rating. ASTM and UL.
1. Surface Burning: UL 723 with maximum flame spread / smoke developed rating of 25/50.

2. Firestop interruptions to fire rated assemblies, materials, and components.

E. Prevent contact between dissimilar metals, such as copper tubing and steel, by use of copper-plated, plastic coated, or flexible materials. All supports which contact copper tubing shall be copper plated.

F. Firestop interruptions to fire rated assemblies, materials and components.

1.4 QUALITY ASSURANCE

A. Installed products shall have surface Burning Characteristics: 25/50 flame spread/smoke developed index when tested in accordance with ASTM E84.

B. Perform work in accordance with local jurisdiction’s requirements and AWS D1.1 for welding hanger and support attachments to building structure.

C. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

PART 2 PRODUCTS

2.1 DUCT HANGERS AND SUPPORTS

A. Hanger straps and rods shall be in accord with SMACNA Duct Construction Standards.

B. Fasten bracing to ductwork, including riveting, bolting, and tack welding per SMACNA.

C. Provide galvanized steel band or fabricated angle iron brackets for wall supports.

D. Exposed ducts shall be supported/anchored to structure at closer spacing and using heavier materials, wherever so indicated on drawings.

E. Hanger Rods: Carbon Steel, with hex nuts and flat washers.

F. Beam Clamps and Attachments as required.

2.2 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports with incompressible insulation inserts and shields for all piping to be insulated per 230700.

1. Manufacturer: Pipe Shields, INC or approved equal.

2. Material: Calcium Silicate or Uretherne per temperature application.

3. Thickness: Insert thickness shall match required insulation thickness per 230700.
B. Refrigerant Piping:
   1. Hangers for rigid pipe: Carbon steel, adjustable swivel, split ring with Armacell Armafix insulated rigid insert.
   2. Hangers for flexible pipe: Carbon steel, adjustable, clevis with Armacell Armafix insulated rigid insert and saddle.
   3. Hangers for paired flexible pipe: Carbon steel, adjustable, clevis with 1” wide overlapping steel band and saddle.

2.3 HANGER ACCESSORIES
   A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.4 INSERTS
   A. Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.5 ACCESS PANELS
   A. Milcor or approved equal.
   B. Include an allowance for a minimum of 12 access panels.
   C. Architectural grade, 14 guage frame and door, painted steel or stainless steel based on application.

2.6 FLASHING
   A. Metal Flashing: 26 gage thick galvanized steel.
   B. Metal Counterflashing: 22 gage thick galvanized steel.
   C. Lead Flashing:
      1. Waterproofing: 5 lb./sq. ft sheet lead.
      2. Soundproofing: 1 lb./sq. ft sheet lead.
   D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.
   E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.7 SLEEVES
   A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.
   B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
   C. Sleeves for Ductwork: 18 gage thick galvanized steel.
D. Sealant: Acrylic

E. Size large enough to allow for movement due to expansion and to provide for continuous insulation or installation of fire sealant at fire-rated walls. Note that insulation is discontinuous at fire walls.

2.8 MECHANICAL SLEEVE SEALS

A. Manufacturers: Metraflex Metraseal, Thunderline Link-Seal or approved equal.

2.9 MECHANICAL FIRESTOPPING SLEEVE SEALS

A. Manufacturers: Metraflex Metraseal 120 or approved equal.

2.10 FORMED STEEL CHANNEL

A. Manufacturers: Allied Tube & Conduit, B-Line Systems, Unistrut or approved equal.

B. Product Description: Galvanized 12 gage thick steel, with holes 1-1/2 inches on center.

2.11 FIRESTOPPING-APPLIED

A. Manufacturers: RectorSeal, Dow Corning, 3M Fire Protection or approved equal.

B. General:
   1. Fire stopping materials shall conform to Flame (F) and Temperature (T) ratings as required by applicable building codes and tested by nationally accepted test agencies per ASTM E 814 or UL 1479 fire tests for through penetrations, and ASTM E 1966 or UL 2079 for construction joints, and UL 2307 for perimeter edge joints.
   2. Fire stopping material shall be free of asbestos, PCBs, ethylene glycol, and lead.
   3. Do not use any product containing solvents or that requires hazardous waste disposal.
   4. Fire stopping shall be performed by a contractor trained or approved by firestop manufacturer.
   5. Select products with rating not less than rating of wall or floor being penetrated.

C. Single Source Responsibility: Provide firestop systems for all conditions from a single supplier.

D. Product Description: Provide Latex caulk/sealant, Silicone caulk/sealant, Intumescent Wrap Strip, Firestop Putty, Firestop Collar or Intumescent Sleeve to meet each specific application and performance requirement.

E. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

F. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
1. Forming/Damming Materials: Mineral fiberboard, backer rod or other type recommended by Manufacturer’s tested system.

2.12 PENETRATIONS OF NON-RATED SURFACES

A. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.

B. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop type wall sleeve.

2.13 CONDENSATE PUMP

A. Manufacturer: BlueDiamond MicroBlue or approved equal.

B. GyRok pump technology, 1.3 gal/hr, 16 feet hd, 6 feet lift, 17 dba. Thermistor level sensing. Capable of running dry. Provide with reservoir and fascia kit (where noted).

2.14 CONDENSATE OVERFLOW SWITCH

A. Manufacturer: Rectorseal Safe-T-Switch or approved equal.

B. Sealed, waterproof reed/magnet float switch installed on the overflow outlet of drain pans or on an auxiliary drain pan. UL 508, 24 volt AC.

2.15 VIBRATION ISOLATORS

A. Manufacturers: Metraflex, Mason, Amber Booth or approved equal.

B. Restrained Closed Spring Isolators:
   1. Spring Isolators:
      a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
      b. Code: Color code springs for load carrying capacity.
   2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
   3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
   4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance and limit stops.

C. Spring Hanger:
   1. Spring Isolators:
      a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
      b. Code: Color code springs for load carrying capacity.
2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
3. Housings: Incorporate [neoprene isolation pad meeting requirements for neoprene pad isolators] [rubber hanger with threaded insert].

D. Neoprene Pad Isolators:
1. Rubber or neoprene-waffle pads.
   a. 30 durometer.
   b. Minimum 1/2 inch thick.
   c. Maximum loading 40 psi.
   d. Height of ribs: not to exceed 0.7 times width.

E. Rubber Mount or Hanger: Molded rubber designed for 0.5 inches deflection with threaded insert.

F. Glass Fiber Pads: Neoprene jacketed pre-compressed molded glass fiber.

G. Seismic Snubbers:
1. Type: Non-directional and double acting unit consisting of interlocking steel members restrained by neoprene elements.
2. Neoprene Elements: Replaceable, minimum of 0.75 inch thick.
3. Capacity: 4 times load assigned to mount groupings at 0.4 inch deflection.
4. Attachment Points and Fasteners: Capable of withstanding 3 times rated load capacity of seismic snubber.

2.16 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches high.

B. Metal Tags: Brass, Aluminum or Stainless Steel with stamped letters; tag size minimum 1-1/2 inches diameter with finished edges. Plain English designations.

C. Information Tags: Clear plastic with printed "Danger," "Caution," or "Warning" and message; size 3-1/4 x 5-5/8 inches with grommet and self-locking nylon ties.

D. Tag Chart: Plain English designations so no tag or valve chart is required.

2.17 PIPE MARKERS

A. Color and Lettering: Conform to ASME A13.1. Specific examples are noted in the table below.

<table>
<thead>
<tr>
<th>Service</th>
<th>Background Color</th>
<th>Letter Color</th>
<th>Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigerant</td>
<td>Purple</td>
<td>White</td>
<td>R-{TYPE} REFRIGERANT (EXAMPLE: R-410A REFRIGERANT)</td>
</tr>
<tr>
<td>Condensate</td>
<td>Black</td>
<td>White</td>
<td>CONDENSATE</td>
</tr>
</tbody>
</table>
B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, imprinted with service type in large letters, manufactured for direct burial service.

E. Underground Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with service type in large letters.

2.18 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color-coded head.

B. Color code as follows:
   1. HVAC equipment: Yellow.
   2. Fire dampers/smoke dampers: Red.

2.19 LOCKOUT DEVICES

A. Lockout Hasps: Anodized aluminum hasp with erasable label surface; size minimum 7-1/4 x 3 inches.

B. Valve Lockout Devices: Nylon device preventing access to valve operator, accepting lock shackle.

2.20 PAINT

A. Factory Finished Equipment: See individual equipment specification.

B. Ductwork: Paint interior of ductwork visible through grilles and diffusers with a flat black paint. Prepare and paint surfaces in accord with Division 9.

2.21 SEISMIC SUPPORTS

A. Provide seismic support as required by IBC 1613 and local authorities.

B. Sway bracing for ductwork, piping, and equipment shall consist of steel angles, rods or pipes. Shapes, lengths and methods of attachment shall be in accord with SMACNA “Guidelines for Seismic Restraints of Mechanical Systems”.

PART 3 EXECUTION

3.1 EXISTING WORK

A. Provide access to existing piping, ductwork, equipment and other installations remaining active and requiring access.
B. Extend existing piping and ductwork installations using materials and methods compatible with existing installations.

3.2 SURFACE PREPARATION
A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
B. Remove incompatible materials affecting bond of adhesives or firestopping.
C. Install backing or damming materials to arrest liquid material leakage.
D. Obtain permission from Architect/Engineer before drilling or cutting structural members.
E. Degrease and clean surfaces to receive adhesive for identification materials.

3.3 INSTALLATION-CLEARANCE
A. Appliances and equipment shall be accessible for inspection, service, repair and replacement.
B. Clearance shall be provided for the replacement of filters.
C. A minimum of 30" of clearance shall be provided in front of the control side of appliances and equipment. Provide additional space when required by NEC.
D. All control components shall be accessible for inspection and replacement.

3.4 INSTALLATION - PIPE HANGERS AND SUPPORTS
A. Support horizontal piping as scheduled.
B. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
C. Place hangers within 12 inches of each horizontal elbow.
D. Use hangers with 1-1/2 inch minimum vertical adjustment.
E. Support vertical piping at every floor.
F. Where piping is parallel and at same elevation, provide multiple pipe or trapeze hangers.
G. Support riser piping independently of connected horizontal piping.
H. Provide copper plated hangers and supports for copper piping.
I. Design hangers for pipe movement without disengagement of supported pipe.
J. Adjust hangers and supports as required to bring system to proper line and grade. Piping shall be plumb with floor and parallel/perpendicular to building structure.
K. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

L. Provide clearance in hangers and from structure and other equipment for installation of insulation. Insulated piping shall have insulation run continuous through hangers and supports with use of rigid inserts. Insulation shall be glued to both sides of insert at hangers and supports, no insulation gaps are allowed. Refer to Section 23 07 00.

M. Support of pipe, tubing and equipment shall be accomplished by means of engineered products, specific to each application. Makeshift, field devised methods shall not be allowed.

3.5 INSTALLATION-PIPING PROTECTION

A. Provide protective shield plates in concealed locations where piping, other than cast-iron or steel, is installed in studs, joists or rafters. Plates shall be 16 gage steel and cover the pipe area plus 2”. Shields may be omitted if piping is more than 1-1/2” from nearest edge of structural member.

3.6 INSTALLATION – DUCTWORK

A. Locate hangers, supports and accessories to handle loads imposed by ductwork, and air distribution devices and with maximum spacing noted.

B. Support all ductwork to prevent sag, undue play and swing.

C. Maximum support spacing per SMACNA standards. Spacing shall not exceed 10 feet.

D. Assemble and install hangers and supports on ductwork.

E. All supports and attachments for exposed ducts shall have non-removable fasteners.

F. Attachments to fireproofed steel structure shall be made prior to spraying of fireproofing material. If necessary to disturb fireproofing after initial spraying, provide respraying or repairs necessary to restore the integrity of the fireproofing.

G. Adjust hangers and supports as required to bring system to proper line and grade. Ductwork shall be plumb with floor and parallel/perpendicular to building structure.

3.7 INSTALLATION – SEISMIC CONTROLS

A. Provide seismic restraints and hangers in compliance with IBC 1613 and ASCE 7.

3.8 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 4 inches thick and extending 6 inches beyond supported equipment.
B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of formed steel channel or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.9 INSTALLATION - FLASHING

A. Provide flexible flashing and metal Counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms for sound control.

C. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.10 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with mechanical sleeve seals.

B. Set sleeves in position in forms. Provide reinforcing around sleeves.

C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

E. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with insulation and caulk or fireproof airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

3.11 INSTALLATION – ACCESS PANELS

A. Furnish access panels for installation at all concealed equipment which requires service, maintenance or adjustment to include but not limited to equipment, dampers, control valves, filters and controls.

B. Provide location layout and required size for all access panels to general contractor. Layout shall be regular and consistent, maintain a uniform wall panel height of 24” center line above finished floor, unless noted otherwise.

C. Furnish fire rated access panels where installed in fire rated assembly.

D. Provide stainless steel access panels where installed in tile surfaces.

E. Furnish access panels to general contractor for installation

F. Paint installed access panels to match wall or ceiling. Verify that panels are not painted shut.
3.12 INSTALLATION – FIRESTOPPING AND SEALS AT PARTITIONS

A. Installation of Firestop shall be performed by either a specialty contractor specializing in firestop application (FM G 4991 or UL Qualified Firestop Contractor), or general or sub-contractors with experience in similar applications and projects with installers qualified, trained, and certified by the firestop manufacturer. Installation shall be performed in strict accordance with manufacturer’s detailed installation procedures.

B. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, and other items, requiring firestopping.

C. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

D. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating, to uniform density and texture.

E. Install dams when required to properly contain Fire stopping materials within openings and as required to achieve required fire resistance rating. Combustible damming material must be removed after appropriate curing. Incombustible damming materials may be left as a permanent component of the Firestop system.

F. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.

G. Place intumescent coating in sufficient coats to achieve rating required.

H. Clean adjacent surfaces of firestopping materials.

I. Seal openings at surface as follows:
   1. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
   2. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
   3. Pack void with backing material.
   4. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.

3.13 INSTALLATION - PENETRATIONS OF NON-RATED SURFACES

A. Seal opening through non-fire rated wall, partition, floor, ceiling, and/or roof opening as follows:
   1. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
   2. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
B. Install escutcheons where piping penetrates non-fire rated surfaces in occupied spaces.

C. Exterior wall openings below grade: Assemble rubber links of mechanical sealing device to size of piping and tighten in place, in accordance with manufacturer's instructions.

D. Interior partitions: Seal pipe penetrations air tight. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

3.14 INSTALLATION-VIBRATION ISOLATION

A. Install isolation for motor driven equipment.

B. Adjust equipment level.

C. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.

3.15 INSTALLATION – CONDENSATE

A. For all cooling coils, and other equipment requiring condensate drainage, provide appropriately sized condensate pumps where gravity drainage is not possible or where scheduled.

B. Coordinate number and type of condensate pumps required with Plumbing Contractor.

C. Provide condensate overflow switches on cooling coils where damage to building components could occur as a result of overflow as required by IMC.

D. For wall mounted fan coils, condensate pump, reservoir, wiring and piping shall not be exposed to view. Field fabricated concealment is not acceptable.

E. For pumps located in equipment cabinet, above ceiling, fascia kit or unfinished space, obtain power for condensate pump directly from electrical terminal block on unit served. Coordinate with electrical contractor.

F. For wall mount fan coils with pumps located above a ceiling, obtain power from electrical circuit. Coordinate with electrical contractor.

G. Connect condensate pump alarm wiring to unit served power terminals per manufacturer’s installation instructions. Coordinate with electrical contractor.

3.16 INSTALLATION-IDENTIFICATION

A. Install identifying devices after completion of coverings and painting.

B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
C. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.

D. Install tags using corrosion resistant chain. Use plain English designations so no index or chart is required.

E. Nameplates: Identify mechanical equipment with plastic nameplates.

F. Provide ceiling tacks to locate dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

G. Equipment Index: Plain English designations so no chart or index is required.

3.17 CLEANING

A. Contractor shall make all mechanical components free of dust and dirt prior to startup.

3.18 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.
SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.1 SCOPE

A. Testing, adjusting and balancing of air systems.
B. Testing, adjusting and balancing of Division 22 domestic water systems.
C. Measurement of final operating conditions of above systems.
D. Duct pressure (leakage) testing as required by 23 31 00.
E. Preparation of formal report.

1.2 PERFORMANCE CRITERIA

A. Work shall be performed by approved independent testing and balancing agency.
B. Perform testing and balancing in accordance with Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB). All work shall be supervised.
C. Calibrate instruments used for testing and balancing within a period of six months of start of work.
D. Mechanical contractor shall assist Balancing Agency in testing and balancing of mechanical system.

1.3 SUBMITTAL

A. Provide three (3) additional copies of updated and/or corrected report for Final Commissioning Report.

1.4 FORMAT

A. Report shall consist of test sheets similar to AABC Standard Forms for Diffusers and Grilles, Air Handling Equipment, Exhaust Fans, and Pumps (i.e., Form 12666 for Diffusers and Grilles).

B. Report shall include the following.

1. Preface suggesting abnormalities and problems encountered.
2. Instrumentation List including type, model, manufacturer, serial number, and calibration dates.
3. System Identification reporting location of equipment, zones, supply, return, and exhaust openings.
4. Record following for each piece of air handling equipment.
   a. Manufacturer, model number, and serial number.
   b. Design and manufacturer rated data.
c. Actual CFM
d. Suction and discharge static pressure of each fan.
e. Outside-air and return-air total CFM.
f. Actual operating current, voltage, and brake horsepower of each fan motor.
g. Final RPM of each motor.
h. Fan and motor sheave manufacturer, model, size, number of grooves and center distance.
i. Belt size and quantity.
j. Static-pressure controls final operating set points.

1.5 QUALIFICATIONS

A. Work of this section shall be performed by independent Air Testing and Balance Agency specializing in testing and balancing of heating, ventilating, and cooling systems to balance, adjust, and test air moving equipment, air distribution, and exhaust systems.

B. Agency shall provide proof of having successfully completed at least five years of specialized experience in air and hydronic system balancing. Work by this Agency shall be done under direct supervision of qualified heating and ventilating engineer employed by Agency.

C. Agency shall be approved in writing by Owner.

D. Neither Architect’s engineering consultant nor anyone performing work on this Project under Division 23 shall be permitted to do this work.

1.6 ACCEPTABLE TEST AND BALANCE COMPANIES

A. AIRTEST Co., Inc. 425-313-0172

B. Neudorfer Engineers, Inc. 206-621-1810

C. Hardin & Sons 253-862-6645

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify systems are complete and in good working order before commencing work. Then, put all systems and equipment into operation and continue operation until all adjusting, balancing, testing, demonstrations, instructions and cleaning of systems have been completed. Verify the following:

1. Systems are started and operating in safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Pumps are rotating correctly.
13. Proper strainer baskets are clean and in place or in normal position.
14. Service and balancing valves are open.

3.2 PREPARATION

A. If requested, conduct tests in presence of Owner.
B. Instruments used by Agency shall be accurately calibrated and maintained in good working order.
C. Furnish instruments required for testing, adjusting, and balancing operations including ladders, scaffolding, additional dampers and clean filters.
D. Make instruments available to Owner to facilitate spot checks during testing.
E. During balancing technician’s initial test of air handling systems, the Mechanical Contractor shall have his sheetmetal foreman present to assist in any drive changes or dampers necessary.

3.3 INSTALLATION TOLERANCES

A. Diffuser, register and grille air flow rates shall be measured and adjusted to deliver final flow rates within 10% and within 50 cfm of design rates, whichever is less.
B. Fan air flow rates shall be measured and adjusted to deliver final flow rates within 10% and within 100 cfm of design rates, whichever is less.

3.4 ADJUSTING

A. Ensure that clean filters, of the type specified, are installed prior to air balancing.
B. Provide additional volume dampers as necessary to accomplish design balances.
C. Set minimum position of motorized dampers for scheduled minimum outside air.
D. Pumps shall be proportionally balanced to minimize throttling losses, and then the pump impeller shall be trimmed or the pump speed modified to meet design flow conditions.
E. Check motors for proper rotation, coupling and drive alignment, belt tension and freedom from vibration, etc.
F. Provide belt drive/sheave changes to adjust fan rpm as necessary to accomplish design balances.

G. Verify recorded data represents actual measured or observed conditions.

H. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

I. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.

J. Report defects and deficiencies noted during performance of services, preventing system balance.

K. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

L. After completion of testing and balancing, operate systems under normal conditions for at least two days of 8 hours each to demonstrate specified performance.

3.5 AIR SYSTEM PROCEDURE

A. Perform soloing testing and balancing functions in accordance with Associates Air Balance Council National Standards.

B. Adjust air handling and air distribution systems to obtain design supply, return, and/or exhaust air quantities.
   1. Test and adjust total system CFM by adjustment of fan speeds. Provide sheave drive changes as necessary.
   2. Perform tests at high and low speeds of variable speed systems.
   3. Adjust branch air quantities by damper regulation. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open to minimize throttling losses.
   4. Make air quantity measurements in main ducts and for outside air by Pitot tube traverse of entire cross sectional area of duct.
   5. Measure air quantities at air inlets and outlets.

C. Diffusers, Registers and Grilles:
   1. Adjust air distribution to obtain uniform space temperatures free from objectionable drafts.
   2. Use volume control devices to regulate air quantities only to the extent that the adjustments do not create objectionable air motion or sound levels.
   3. Effect volume control by using volume dampers located in ducts.

D. Provide system schematic:
   1. Identify the location and area of each grille, diffuser, register, and terminal box.
   2. Record the required and actual air quantities at each outlet or inlet.
3. Record size, type, and manufacturer of each diffuser, grille, and register on air outlet data sheets.

E. Air Temperature:
1. Measure wet and dry bulb air temperatures on entering and leaving side of each cooling coil and unit in cooling mode.
2. Measure dry bulb temperatures on entering and leaving side of each heating coil and unit in heating mode.

F. Pressure:
1. Measure static pressure conditions on air units, including filter and coil pressure drops, and total pressure across fan with suction and discharge pressures.
2. Make air balancing allowances for 50 percent loading of filters.
3. Measure building static pressure.

G. Electrical:
1. Record nameplate motor current and voltage.
2. Measure actual motor current and voltage at balanced condition.

H. Dampers:
1. Adjust outside air, return air, and exhaust dampers for design conditions.
2. At modulating damper locations, take measurements and balance at extreme conditions.

I. Permanently mark all outside air, supply air, and return air damper positions after balancing has been completed.

3.6 PLUMBING PROCEDURE

A. Domestic pump circulators:
1. Test total system GPM and head.
2. Adjust branch flows by circuit setters for equal flow distribution.

3.7 FINAL INSPECTION AND ADJUSTMENTS

A. System shall be balanced and reports submitted before substantial completion inspection.

B. Balancing Agency shall be represented at inspection meeting(s) by qualified testing personnel with balancing equipment and two copies of current air balancing test report.
1. Owner will choose and direct spot balancing. Differences greater than specified tolerance between the spot balance and test report will be justification for requiring repeat of testing and balancing for entire building and submission of a new test report. In such case a new inspection will be made.
2. Perform rebalancing in presence of Owner and subject to their approval.
3. If re-balancing is required, submit revised air test and balance reports to Owner before Substantial Completion.
4. Spot balance and rebalance shall be performed at no additional cost to Owner.
C. Where systems provides over 5 percent more air than schedule requirements, rooms supplied by that system shall have their supply air quantities increased by ratio of actual total air quantity supplied to minimum air quantity required by system schedule.

END OF SECTION
SECTION 23 07 00
HVAC INSULATION

PART 1 GENERAL

1.1 QUALITY ASSURANCE
   A. Insulation must have maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.
   B. All systems components subject to heat loss or gain, such as, piping, storage tanks, vessels, valves etc. shall be insulated to conform with the Washington State Energy Code and ESPS current version (as minimum) and this section.

1.2 IDENTIFICATION
   A. Insulation shall bear a manufacturer’s mark indicating the product R-value or K-value and thickness. This mark shall be visible after installation and shall be repeated at an interval of no more than 10 feet.
   B. External duct insulation shall be legibly printed or indentified at intervals not greater than 36 inches with name of manufacturer, R-value, thickness, flame spread and smoke-developed index.
   C. R-values shall be based on insulation only at 75 F mean temperature difference.
   D. For rigid or spray foam the aged R-value per inch shall be provided in submittals.

PART 2 PRODUCTS

2.1 POLYOLEFIN INSULATION
   A. Manufacturers: IMCOA or similar.
   B. Polyolefin or Polyethylene pipe insulation is NOT ACCEPTABLE for any application.

2.2 ELASTOMERIC CELLULAR FOAM (PIPE)
   A. Manufacturers: Armacell AP/Armaflex, Aeroflex Aerocel or approved equal.
   B. Preformed flexible, closed-cell, elastomeric thermal insulation: Type I, Tubular form, self-seal or continuous, 25/50-rated, CFC free, low VOC, 'K' factor: 0.27 at 75 degrees F. ASTM C534.
2.3 FLEXIBLE GLASS FIBER DUCT LINER (SOUND LINER)
A. Manufacturers: Johns Manville Linacoustic RC or equal by Knauf, Manson or approved equal.
B. Description: Flexible duct liner, glass fiber bonded with thermosetting resin, airstream surface protected with reinforced coating.
   1. ASTM E84, UL 723
   2. Installed R Value: 1" R-4.2, 2" R-8.0
   3. Maximum service temperature: 250 degrees F.
   4. Maximum Velocity on Coated Air Side: 6,000 fpm.
   5. Acrylic polymer coating to prevent dust incursion and biological growth.
C. Liner Fasteners: Galvanized steel, impact applied or welded with integral head.
D. Field coat edges with Superseal edge treatment.

2.4 ELASTOMERIC CELLULAR FOAM DUCT LINER (SOUND LINER)
A. Manufacturers: Armacell AP/Coilflex or approved equal.
B. Description: Fiber-free, non-particulating, formaldehyde-free, low VOC elastomeric form roll which conforms to duct corners without compression. Microban antimicrobial protection inhibits mold and mildew.
   1. ASTM E84, UL 723
   2. Installed R Value: 1" R-4.2, 1-1/2" R-6.0
   3. Maximum service temperature: 180 degrees F
   4. Maximum velocity: 10,000 fpm.
C. Install as a cross-section single piece fitting around corners.
D. Apply with water based adhesive.

2.5 POLYESTER DUCT LINER (SOUND LINER)
A. Manufacturers: Ductmate PolyArmor or approved equal.
B. Description: Fiberglass free, hypoallergenic polyester blanket with FSK facing.
   1. ASTM E84, UL 723
   2. Installed R Value: 1" R-4.2, 1-1/4" R-5, 1-1/2" R-6.0, 2" R-8.0
   3. Maximum service temperature: 250 degrees F
   4. Maximum velocity: 4,000 fpm.
C. Provide metal nosing and water based edge coating.
D. Apply with water based adhesive and pins.

2.6 GLASS FIBER ROUND DUCT LINER (SOUND LINER)
A. Manufacturers: Johns Manville Spiracoustic Plus or equal by Knauf, Manson or approved equal.
B. Description: High-density fiber glass board with kerfs; acrylic polymer meeting ASTM G21 impregnated surface coat. ASTM C1071.
   1. 'K' factor: 0.23 at 75 degrees F.
   2. Installed R Value: 1" R-4.3, 2" R-8.4
   3. Maximum service temperature: 250 degrees F.
   4. Maximum Velocity on Coated Air Side: 4,000 fpm.

2.7 ELASTOMERIC CELLULAR FOAM ROUND DUCT LINER (SOUND LINER)

A. Manufacturers: Armacell AP/Spiralflex or approved equal.

B. Description: Fiber-free, non-particulating, formaldehyde-free, low VOC elastomeric form roll which is self-supporting and conformable to round duct. Microban antimicrobial protection inhibits mold and mildew.
   1. ASTM E84, UL 723
   2. 'K' factor: 0.28 at 75 degrees F
   3. Installed R Value: 1" R-4.2
   4. Maximum service temperature: 180 degrees F
   5. Maximum velocity: 10,000 fpm.

2.8 GLASS FIBER DUCT WRAP

A. Manufacturers: Johns Manville Microlite XG 75 or equal by Owens-Corning, Knauf, Manson or approved equal.

B. Description: Formaldehyde-free, flame-attenuated glass fibers bonded with thermosetting acrylic resin, FSK facing.
   1. ‘ASTM E84, UL 723
   2. Installed R Value: 1-1/2" R-4.2, 2" R-5.6, 3" R-8.3.
   3. Maximum Service Temperature: 250 degrees F.
   4. Density: 0.75 lb/cu ft

C. Vapor Retarder Jacket: Reinforced FSK facing. Seal with pressure sensitive 2" tape.

D. Identification: At intervals not greater than 36" print the name of manufacturer, the thermal resistance R-value at insulation thickness, the flame spread and smoke developed indexes.

2.9 PIPE INSULATION AND EQUIPMENT JACKETS

A. PVC Plastic Pipe Jacket:
   1. Product Description: One piece molded type fitting covers and sheet material, white color. ASTM D1784.
   2. Thickness: 15 mil indoor, 30 mil outdoor.

B. Canvas Equipment Jacket:
   2. Composite of insulation, jacket and laces.
C. Aluminum Pipe Jacket:
   1. Thickness: 0.016 inch thick sheet. ASTM B209.
   2. Finish: Embossed
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.1 EXAMINATION

   A. Verify piping and equipment has been tested before applying insulation materials.

   B. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

   A. Apply insulation when building is thoroughly dry to prevent shrinkage.

   B. Exposed Piping: Locate insulation and cover seams in least visible locations.

   C. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions.

   D. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

   E. Exterior Piping Applications: Use only elastomeric closed-cell foam insulation. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with sealant. Cover with aluminum jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal equipment.

   F. Exposed Equipment: Locate insulation and cover seams in least visible locations.

   G. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

   H. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

   I. Finish insulation at supports, protrusions, and interruptions.

   J. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.
K. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

L. Insulate exhaust air ductwork where it is outside the insulated building envelope to prevent condensation.

M. For all insulated ductwork:
   1. Provide insulation with vapor retarder jackets.
   2. Finish with tape and vapor retarder jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

N. Ductwork Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with canvas jacket sized for finish painting.

O. Exterior Ductwork and Equipment: Provide liner. Do not provide exterior insulation on ductwork or equipment.

P. Duct and Plenum Liner Application:
   1. Adhere insulation with adhesive for 100 percent coverage.
   4. Seal liner surface penetrations with adhesive.
   5. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

3.3 SCHEDULES

A. Piping: Provide on piping as listed below.

<table>
<thead>
<tr>
<th>Service</th>
<th>Insulation Type</th>
<th>PIPE SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&lt;1&quot;</td>
</tr>
<tr>
<td>Condensate</td>
<td>Glass Fiber RIGID</td>
<td>1&quot;</td>
</tr>
<tr>
<td>Refrigerant Suction(1)</td>
<td>Elastomeric Cellular FOAM</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>Refrigerant Hot Gas</td>
<td>Elastomeric Cellular FOAM</td>
<td>1&quot;</td>
</tr>
</tbody>
</table>

1. Note: Insulate Refrigerant Liquid lines same as Suction lines on all Mitsubishi brand equipment, where noted by manufacturer or called for on plans.

2. For all exterior piping applications use only Elastomeric Cellular Foam with Aluminum jacket.

3. For all below grade piping application use only insulation specifically engineered for application. (Closed Cell Polyurethane System)
B. **Ductwork:** Provide on ductwork as listed below. Insulation thickness is provided as reference; each application must meet minimum installed R-Value.

<table>
<thead>
<tr>
<th>Service</th>
<th>Location</th>
<th>Insulation Type</th>
<th>Approx. Thickness</th>
<th>Min. Installed R-Value</th>
<th>Jacket</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply, Return</td>
<td>Building Exterior</td>
<td>Glass Fiber Duct Liner</td>
<td>3&quot;</td>
<td>R-8</td>
<td>-</td>
</tr>
<tr>
<td>Supply, Return</td>
<td>Attic, crawlspace or uninsulated areas within building.</td>
<td>Glass Fiber Duct Wrap</td>
<td>2&quot;</td>
<td>R-6</td>
<td>FSK</td>
</tr>
<tr>
<td>Supply, Return, Exhaust</td>
<td>Unconditioned Space Inside Bldg.</td>
<td>Glass Fiber Duct Wrap</td>
<td>2&quot;</td>
<td>R-6</td>
<td>FSK</td>
</tr>
<tr>
<td>Supply</td>
<td>Concealed Space (3)</td>
<td>Glass Fiber Duct Wrap</td>
<td>1-1/2&quot;</td>
<td>R-3.3</td>
<td>FSK</td>
</tr>
<tr>
<td>Supply</td>
<td>Exposed (4) in Space With Supply Air Temp ≤55 F or ≥105 F</td>
<td>Glass Fiber Duct Wrap / Duct Liner</td>
<td>1-1/2&quot;</td>
<td>R-3.3</td>
<td>FSK</td>
</tr>
<tr>
<td>Supply</td>
<td>Exposed in Space With Supply Air Temp Between 56-104F</td>
<td>None, Except Duct Liner shown on Plans.</td>
<td>None</td>
<td>None</td>
<td>-</td>
</tr>
<tr>
<td>Outside Air</td>
<td>Within Building &lt;2800 cfm (4)</td>
<td>Glass Fiber Duct Wrap / Duct Liner</td>
<td>3&quot;</td>
<td>R-7</td>
<td>FSK</td>
</tr>
<tr>
<td>Exhaust Air</td>
<td>Outside the Insulated Building Envelope</td>
<td>Glass Fiber Duct Wrap</td>
<td>2&quot;</td>
<td>R-6</td>
<td>FSK</td>
</tr>
<tr>
<td>Exhaust Air</td>
<td>Between backdraft damper &amp; building exterior.</td>
<td>Glass Fiber Duct Wrap</td>
<td>3&quot;</td>
<td>R-7</td>
<td>FSK</td>
</tr>
</tbody>
</table>

1. Secure duct wrap with mechanical fasteners spaced 12” on center, minimum. For horizontal ducts 24” or more in width, duct wrap shall also be secured with mechanical fasteners spaced 18” on centerline of bottom of duct.
2. Insulation is not required on sound lined ductwork with sufficient insulating value.
3. Concealed space: Any space within the insulated building envelope that is concealed from view, i.e. behind ceiling, wall, shaft, soffit, etc.
4. For exposed ductwork in finished spaces which is required to be insulated provide internal liner with equivalent R-value.

5. Insulation required from exterior to shutoff damper or equipment. After damper provide R-7 insulation.

END OF SECTION
SECTION 23 09 00
INSTRUMENTATION AND CONTROL FOR HVAC

PART 1  GENERAL

1.1  SCOPE
A. The mechanical contractor shall install a complete, properly adjusted and effective temperature control system.
B. This section includes field assembled instrumentation and temperature controls for air conditioning, heating, ventilation and exhaust systems.
C. See drawings for Sequence of Operation.
D. See Equipment Schedules and associated specification sections for controls integral to HVAC equipment.
E. See 23 09 19 for meter wiring and controls.
F. Controls shall be electric/electronic systems.
G. Manufacturers of components shall be Honeywell or approved.
H. Any additional parts necessary to or incidental for a complete and operating system shall be the responsibility of the contractor.

1.2  MAINTENANCE SERVICE
A. Furnish service and maintenance of control system for one year from Date of Substantial Completion.
B. Furnish complete service of controls systems, including callbacks and service calls.
C. Include systematic examination, adjustment, and lubrication of unit, and controls checkout and adjustments. Repair or replace parts in accordance with manufacturer's operating and maintenance data. Use parts produced by manufacturer of original equipment.
D. Perform work without removing units from service during building normal occupied hours.
E. Provide emergency call back service during working hours for this maintenance period.
F. Maintain locally, near Place of the Work, adequate stock of parts for replacement or emergency purposes. Have personnel available to ensure fulfillment of this maintenance service, without unreasonable loss of time.
G. Perform maintenance work using competent and qualified personnel under supervision and in direct employ of manufacturer or original installer.

1.3 QUALITY ASSURANCE

A. Control Air Damper Performance: Test in accordance with AMCA 500.

1.4 SUBMITTALS

A. Provide submittal to include one PDF of control components, control diagrams and operational sequences.

PART 2 PRODUCTS

2.1 THERMOSTATS

A. Manufacturers: Honeywell (or as noted below) or approved equal.

B. Bi-metal thermostats are not allowed for any application.

C. Line Voltage Cooling Thermostat (Dial): T651 or equal.
   2. Accuracy: +/- 2 degrees F.

D. Line Voltage Heating Thermostat (Programmable Electronic): King ESP230, Honeywell TL8230A or equal.
   1. Integral manual On/Off switch, single-pole.
   2. Accuracy: +/- 1.5 degrees F.
   3. Load / Motor capacity rating of 22 amps, 208/240 volt.
   4. Electronic thermistor temperature sensor with 40 F to 95 F range.
   5. 7 day independent programmable schedules with 4 daily setpoints.
   6. LCD display showing day, time, room temperature and setpoint, Green LED backlight, Red LED heat on Indicator, temperature adjustment buttons.
   7. Positive off position/function to serve as NEC required disconnect.

E. Low Voltage Heating Thermostat (Electronic Non-Programmable): TH1100
   2. Accuracy: +/- 1 degrees F.
   3. 24 VAC or 750 mV control.
   4. LCD backlight display.
   5. Dual powered battery/hardwire.

F. Stand-Alone Controllers: T775 Series
   1. 2 sensor input
   2. Programmable control logic
   3. Multiple input and output relays
   4. Modulating output option

G. Room Thermostat Accessories:
   1. Insulating Bases: For thermostats located on exterior walls.
2. Thermostat Guards: Locking transparent plastic mounted on separate base.
3. Adjusting Key: Matching device.

2.2 TIMERS
A. Manufacturers: Intermatic or approved equal.
B. Spring wound twist timer, 120 volt, 1 HP (20 amp inductive) rated. ‘Brushed metal’ gray polycarbonate faceplate. Select time range and hold as scheduled or noted in sequence.

2.3 CONTROL AIR DAMPERS
A. See Section 23 33 00.

2.4 ELECTRIC DAMPER ACTUATORS
A. Manufacturers: Belimo or approved equal.
B. Operation: Two-position or proportional as required for application. [Reversing type proportional motor], spring-return.
C. Enclosure Rating: NEMA 250 Type 2 Enclosure.
D. Mounting: Direct mount.
E. Stroke: 30 seconds end to end full stroke, 15 seconds return to normal for spring return.
F. Protection: Electronic stall protection.
G. Control Input: 0-10 VDC or 0-20 mA DC.
H. Power: Nominal 24 \ 120 volt AC.
I. Torque: Size for minimum 150 percent of required duty.
J. Duty cycle: rated for 65,000 cycles.
K. Accessories:
   1. Cover mounted transformer.
   2. Auxiliary potentiometer.
   3. Damper linkage.
   4. Direct drive feedback potentiometer.
   5. Output position feedback.
   6. Field selectable rotational, spring return direction, field adjustable zero and span.
   7. End switch.
2.5 ENCLOSURES

A. All enclosures to be UL listed and all metal construction. All controls and instruments logically assembled at one or more panels.

2.6 CONTROL RELAYS

A. Shall be rated for the application, with a minimum of two sets of Form C contacts, enclosed in a dust proof enclosure. Relays shall be rated for a minimum life of one million operations. Operating time shall be 20 milliseconds or less, with release time of 10 milliseconds or less. Relays should be equipped with coil transient suppression devices to limit transients to 150% of rated coil voltage.

2.7 WIRING

A. Electric wiring and wiring connections required for the installation of the temperature control system as herein specified, shall be provided by the temperature control contractor. All wiring shall comply with the requirements of local and national electrical codes, and with applicable requirements of Electrical Division. Install all wiring in conduit.

B. Line voltage wiring type and size shall be per NEC.

C. Low voltage wiring type and size shall be per control manufacturer’s recommendations based on application and length of run.

2.8 CONTROL POWER

A. Provide transformers to supply power for control equipment operating at less than normal lighting circuit voltage. Do not connect wiring to lighting circuits.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify building systems to be controlled are ready to operate.

B. Verify air handling units and ductwork have been accepted and air filters are in place before installing sensors in air streams.

C. Verify location of thermostats and other exposed control sensors with Drawings before installation.

3.2 COORDINATION

A. Furnish all control products to accomplish the specified sequence of operation, except those products specifically furnished under other sections.

B. Install all control products and connections, except where already installed by the equipment manufacturer.
C. Thermostats located in electrical transformer vaults shall be model approved by electrical utility.

3.3 INSTALLATION

A. General:
1. Install controls by mechanics skilled in erection of control systems employed by and under direct supervision of control manufacturer's representative.
2. Mount control equipment and devices as recommended by manufacturers and as shown on drawings; in case of conflicts between manufacturer's instructions and the drawings, consult the Project Manager for direction.
3. Fasten all equipment securely to structure. Install equipment and exposed piping and conduit runs parallel to building lines, plumb and level.

B. Wiring:
1. Provide line voltage and/or low voltage wiring as required to serve the complete system; conform to code.
2. Provide EMT or rigid conduit for exposed control wiring outside of cabinets or enclosures. Concealed low voltage wiring need not be in conduit, except in walls (see “3”).
3. Provide rigid conduit for control wiring concealed in partition walls, until conduit emerges from wall above ceilings.
4. Run low voltage control wiring separate from line voltage wiring and segregate from other systems to avoid Electromagnetic Interference (EMI).
5. All low voltage control wiring shall be home runs between components without splices.

C. Install thermostats, space temperature sensors, and other exposed control sensors after locations are coordinated with other Work.

D. Install freeze protection thermostats using flanges and element holders.

E. Provide separable sockets for liquids and flanges for air bulb elements.

F. Install thermostats in aspirating boxes in public areas and as indicated on Drawings.

G. Install control panels adjacent to associated equipment on vibration free walls or freestanding supports. Install engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

H. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.

3.4 THERMOSTATS AND SENSORS

A. Mount thermostats and other human interface devises at 48" centerline above finished floor to comply with ADA accessibility per ANSI A117.1. Align thermostats and devises with light switches and other controls.
B. Coordinate wall location of thermostats and other wall mount devices with light switches and controls provided by others. All devices in the same vicinity should be grouped at a common elevation with regular horizontal spacing intervals.

3.5 FIELD QUALITY CONTROL

A. After completion of installation, start-up, test and adjust each system. Submit data showing set points, final adjustments of controls and compliance with sequence of operations.

B. Conduct functional tests on complete systems, or individual portions as approved.

C. Conduct operational tests; set controls to operating conditions, record settings and readings of each control device.

D. Work in close coordination with testing and balancing Agency to set up control devices, set damper flow rates, and provide control system in perfect operating order. See Section 23 05 93.

3.6 DEMONSTRATION AND TRAINING

A. Demonstrate complete operation of systems, including sequence of operation prior to Date of Substantial Completion.

B. Not less than 60 days after beneficial occupancy by the Owner, recheck entire control system for compliance with Sequence of Operation.

C. Recheck controls for proper operation at the start of the heating season, if other than above timing, and again during the first warm weather period following winter operation.

END OF SECTION
PART 1  GENERAL

1.1  SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections when joining dissimilar metals in systems.

B. Provide flanges, unions, or couplings at locations requiring servicing. Use unions, flanges, or couplings downstream of valves and at equipment connections. Do not use direct welded or threaded connections to valves or equipment.

C. Provide receivers on systems as required by manufacturer’s installation instructions, sized to accommodate pump down charge.

D. Provide receivers on systems with piping runs exceeding manufacturer’s published limitations.

E. Flexible Connectors: Use at spring isolated air handlers and condensers greater than six tons.

F. Size piping in accord with equipment manufacturer’s refrigerant piping design guidelines based on actual piping installation lengths. Use long line calculations when applicable.

1.2  QUALITY ASSURANCE

A. Perform Work in accordance with ASME B31.5 code for installation of refrigerant piping systems.

1.3  DELIVERY, STORAGE, AND HANDLING

A. Dehydrate and charge refrigeration components including piping and receivers, seal prior to shipment. Maintain seal until connected into system.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

PART 2  PRODUCTS

2.1  REFRIGERANT PIPING

A. Copper Tubing: ASTM B280, Type ACR hard drawn or annealed.

2.2 COPPER PRESSURE-SEAL FITTINGS FOR REFRIGERANT PIPING

A. Manufacturers: Parker Hannifin – Zoomlock

B. Flame-Free press fittings: UL 207 Listed. Refrigerant Grade Copper in accordance with ASTM B75 or ASTM B743. O-Rings: HNBR.

C. Tools: Manufacturer's approved special tools.

D. Ratings:
   2. Continuous Operating Temperature: 250 deg F.
   3. O-Ring Temperature Rating: -40 to 300 deg F.
   4. Minimum Burst Pressure in accordance with UL 207: 2100 psig.
   6. Complies with UL 109 for vibration resistance.
   7. Approved for the following oils: POE, PVE, PAG.

E. Approved Tubing Materials: Copper-to-copper connections with the following copper tubing:
   1. Hard Drawn Copper, 1/4 to 1-3/8 inch (6.4 to 35 mm): Type ACR, M, L, K.
   2. Soft (Annealed) Copper 1/4 to 1-3/8 inch (6.4 to 35 mm): Type ACR, L, K.

2.3 REFRIGERANT LINE SET

A. Copper Tubing: ASTM B280, annealed, Type ACR
   1. Flared ends with brass nuts and protective caps.
   2. Pre-insulated, dual tube, liquid and vapor lines with closed-cell elastomeric foam.

2.4 UNIONS, FLANGES, AND COUPLINGS

A. Copper Pipe: Bronze, soldered joints.

2.5 REFRIGERANT MOISTURE AND LIQUID INDICATORS

A. Manufacturers: Alco Controls, Parker Hannifin, Sporlan Valve or approved equal.

B. Indicators:
   1. Port: Single, UL listed.
   2. Body: Copper or brass, flared or solder ends.
   4. Maximum working pressure: 500 psig
   5. Maximum working temperature: 200 degrees F.

2.6 VALVES

A. Manufacturers: Alco Controls, Parker Hannifin, Sporlan Valve or approved equal.
B. Diaphragm Packless Valve:
1. UL listed for refrigeration service.
2. Globe or angle pattern, forged brass body and bonnet solder or flared ends.
3. Phosphor bronze and stainless steel diaphragms, rising stem and hand wheel.
4. Stainless steel spring, nylon seats, disc with positive back seating.
5. Maximum working pressure: 500 psig.
6. Maximum working temperature: 275 degrees F.

C. Packed Angle Valve:
1. Forged brass, solder or flared ends.
2. Forged brass seal caps with copper gasket, rising stem and seat, molded stem packing.
4. Maximum working temperature: 275 degrees F.

D. Ball Valves:
1. Two piece forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals.
3. Maximum working temperature: 300 degrees F.

E. Service Valve:
1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve.
3. Maximum working temperature: 300 degrees F.

F. Globe Check Valve:
1. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc.
3. Maximum working temperature: 300 degrees F.

G. Straight Through Check Valve:
1. Spring, neoprene seat.
3. Maximum working temperature: 250 degrees F.

2.7 REFRIGERANT PIPING SERVICE VALVE

A. Manufacturer: Diamondback or approved equal.

B. Full port, forged brass ball valve with Schrader valve, flare connections, Teflon seals and gaskets. 700 psig rated, R-410A compatible, fully factory assembled and pressure tested.

C. Provide with insulation cover of polyethylene foam with PVC cover and tape.
2.8 REFRIGERANT STRAINERS

A. Manufacturers: Alco Controls, Parker Hannifin, Sporlan Valve or approved equal.

B. Straight Line or Angle Line Type:
   1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass.

2.9 REFRIGERANT FILTER-DRYERS

A. Manufacturers: Alco Controls, Parker Hannifin, Sporlan Valve or approved equal.

B. Replaceable Cartridge Angle Type:
   1. For systems six tons and larger.
   2. Shell: ARI 710, UL listed, brass or steel, removable cap, for maximum working pressure of 500 psig.
   3. Filter Cartridge: Pleated media with integral end rings, stainless steel support.

C. Permanent Straight Through Type:
   1. ARI 710, UL listed, steel shell with molded desiccant filter core, for maximum working pressure of 500 psig.
   2. Rating: ARI 710 moisture rating, ARI 730 flow capacity.

2.10 REFRIGERANT SOLENOID VALVES

A. Manufacturers: Alco Controls, Parker Hannifin, Sporlan Valve or approved equal.

B. Valve: ARI 760, pilot operated, copper or brass body and internal parts, synthetic seat, stainless steel stem and plunger assembly, integral strainer, with flared, solder, or threaded ends; for maximum working pressure of 500 psig. Stem designed to allow manual operation in case of coil failure.

C. Coil Assembly: UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box.

2.11 FLEXIBLE PIPE CONNECTORS

A. Manufacturers: Packless Ind, Metraflex, Mason or approved equal.

B. Braided Refrigeration Piping Connection
   1. Bronze flexible hose and bronze braided outer covering.
   2. Copper sweat connections, cleaned de-greased, and bagged.
   3. R410a rated, 650 psi working pressure.
2.12 REFRIGERANT PIPING PROTECTION

A. Manufacturers: Mitsubishi Line-Hide or approved equal.

B. Material: UV stabilized PVC/ABS enclosure with snap-on covers, couplings, elbows and caps forming a complete system.

C. Assembly: Stainless steel screws.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.2 INSTALLATION PIPING SYSTEMS

A. Route piping parallel to building structure and maintain gradient.

B. Install piping to conserve building space, and not interfere with use of space.

C. Group piping whenever practical at common elevations.

D. Sleeve pipe passing through partitions, walls and floors.

E. Protection: Where piping, other than cast iron or steel, is installed in a concealed location through holes or notches in framing (i.e. studs, joists, rafters, etc.), less than 1-1/2 from framing edge, provide shield plates. Shield plates shall be 16 gauge steel and cover the piping area within framing plus 2” on each side along framing.

F. Use rigid Armacell Armafix pipe clamp assembly at all supports.

G. Determine equivalent line length and size piping per manufacturer’s installation instructions. Provide solenoid valve and other required piping accessories for long line installation.

H. Refrigerant piping shall not be installed in elevators, public stairways, stair landing or means of egress spaces.

I. Install pipe identification.

J. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

K. Provide access where valves and fittings are not exposed.
L. Arrange refrigerant piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

M. Flood refrigerant piping system with nitrogen during brazing. Keep piping open with nitrogen flow for zero pressure while brazing.

N. Install valves with stems upright or horizontal, not inverted.

O. Insulate piping and equipment.

P. Provide replaceable cartridge filter-dryers, with isolation valves and bypass with valve.

Q. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

R. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

S. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

T. Fully charge completed system with refrigerant after testing.

U. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.

V. Install refrigerant piping in accordance with ASME B31.5.

3.3 INSTALLATION-EXTERIOR PIPING

A. Protect exterior piping with application specific piping protection cover system or field fabricated GSM cover with steel angle supports.

B. Provide waterproof pipe entry into building with trim and flashing.

C. Protect exposed insulated pipe with aluminum jacket.

3.4 INSTALLATION - REFRIGERANT SPECIALTIES

A. Refrigerant Liquid Indicators: Install line size liquid indicators in main liquid line downstream of condenser.

B. Refrigerant Valves: Install service valves on compressor suction and discharge.

C. Strainers: Install shut-off valves on each side of strainer.

D. Install pressure relief valves on ASME receivers. Install relief valve discharge piping to terminate outdoors.

E. Filter-Dryers:
   1. Install permanent filter-dryers in low temperature systems.
2. Install permanent filter-dryer in systems containing hermetic compressors.
3. Install replaceable cartridge filter-dryer vertically in liquid line adjacent to receivers.
4. Install replaceable cartridge filter-dryer upstream of each solenoid valve.

F. Solenoid Valves:
1. Install in liquid line of systems operating with single pump-out or pump-down compressor control.
2. Install in liquid line of single or multiple evaporator systems.

3.5 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.

B. Pressure test refrigeration system with dry nitrogen to 400 psig. Perform final tests at 27 inches vacuum and 400 psig using halide torch or electronic leak detector.

C. Repair leaks.

D. Retest until no leaks are detected.

END OF SECTION
SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 PERFORMANCE REQUIREMENTS

A. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

B. Standards: Comply with most stringent requirements and recommendations of International Mechanical Code or SMACNA (Sheet Metal and Air Conditioning Contractors National Association) Duct Construction Standards for fabrication, construction and sealant of duct, fittings, and accessories.

C. Construct ductwork to NFPA 90A.

1.2 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures during and after installation of duct sealant.

PART 2 PRODUCTS

2.1 DUCT MATERIALS

A. Galvanized Steel Ducts: ASTM A653 galvanized steel sheet, lock-forming quality, having G60 zinc coating of in conformance with ASTM A90.

B. Steel Ducts: ASTM A1008.

C. Fasteners: Rivets, bolts, or sheet metal screws.

D. Hanger Rod: ASTM A36; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 INSULATED FLEXIBLE DUCTS

A. Manufacturers: Thermaflex M-KC or approved equal.

B. Product Description: Insulated assembly with inner duct of woven and coated fiberglass permanently bonded to coated steel wire helix, 1" fiberglass insulation and vapor barrier jacket of fiberglass reinforced metallized film laminate, UL 181 Class 1 complying with NFPA 90A & 90B.

1. Pressure Rating: 10 inches wg positive and 2 inches wg negative.
3. Temperature Range: -20 degrees F to 250 degrees F.
4. Thermal Resistance: R-4.2

C. Accessories:
   1. Hanger Strap: Thermaflex FlexTie – 1-1/2” wide, adjustable, plenum rated.
   2. Elbow: Thermaflex FlexFlow Elbow – One piece adjustable design installs over flex duct.

2.3 SINGLE WALL SPIRAL ROUND DUCTS

A. Manufacturers: McGill AirFlow, Semco or approved equal.

B. Product Description: UL 181, Class 1, round spiral lockseam duct constructed of galvanized steel.

C. Joints: 16” and larger flange with gasket material.

D. Elbows: Smooth radius or 5 section, 1.5D.

E. Application: Required for all exposed round ductwork; all round ductwork 12” dia. and larger; all round ductwork with static pressure over 1” w.g.. Optional for all round ductwork.

F. Construct duct with the following minimum gages:

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 inches to 14 inches</td>
<td>26</td>
</tr>
</tbody>
</table>

G. Construct fittings with the following minimum gages:

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 inches to 14 inches</td>
<td>24</td>
</tr>
</tbody>
</table>

2.4 SINGLE WALL ROUND DUCTS (SNAP-LOCK)

A. Application: Residential dwelling unit venting only, concealed.

2.5 DUCT SEALANT

A. Manufacturer: Design Polymericics, United McGill or approved equal.

B. Sealant shall be water based and formulated to withstand working temperatures of -25°F to +200°F. All sealants shall exceed 500 hours under ASTM C 732 (artificial weathering) and pass ASTM C 734 (low temperature flexibility after artificial weathering). All sealants shall be of an elastomeric nature, have a weight per gallon not to exceed 12.5, have solids by weight of 66% ± 2%, pass UL 723 with a flame spread of 5 and smoke developed of 5.

2.6 DUCTWORK FABRICATION

A. Fabricate and support rectangular and round ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible. Provide duct material,
gages, reinforcing, and sealing for operating pressures corresponding to the ESP (external static pressure) of the fan system. i.e. Ductwork for a fan with an ESP of 0.75" w.g. should be constructed per SMACNA 1" w.g. pressure standard.

B. Construct T’s, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide airfoil turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.

C. Indicated dimensions on drawings are net inside. Allow for thickness of duct lining where indicated.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

E. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

F. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.

2.7 CLOTHES DRYER EXHAUST DUCTWORK

A. Rigid galvanized sheet metal of minimum 26 gauge with smooth interior finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify sizes of equipment connections before fabricating transitions.

3.2 INSTALLATION

A. Make field measurements to establish locations of hangers and supports where installation will not damage building construction.

B. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

C. Where ducts pass through partitions, ceilings or floors. Provide 1" clearance and insulate from structure with insulation material. Provide flanged sheet metal closure.

D. Where ducts pass through rated walls or assemblies without fire dampers, provide 1/4” to 1” annular space and fill with firestop sealant. Ductwork shall be minimum 26 gauge metal.

E. Isolate joints between dissimilar metals with fiber gasket.
F. Drawings do not attempt to show all offsets in ductwork. Make such offsets as necessary for installation of work without additional cost to Owner. 15 degree maximum angle of offset.

G. Exposed ductwork shall be Appearance Grade. Ductwork located in crawl spaces, shafts, and suspended ceiling spaces are not considered exposed.
1. All round ductwork shall be spiral seam (no snap-lock joints).
2. All joints clean and workmanlike.
3. Ductwork entirely free of dents.
4. Ductwork subject to denting due to space function construct one gauge heavier than SMACNA standard for size indicated.
5. All hangers trimmed of excess metal.
6. Plumb, level, parallel or perpendicular to building structure.
7. Sealed with transparent, paintable sealant to avoid streaking.

H. Flexible Duct:
1. Install insulated flexible duct in full extended condition free of sags and kinks.
2. Use minimum length required to make connection.
3. Length shall not exceed 10 feet.
4. Supported on 36" centers with minimum 1-1/2" wide strap. Do not crush.
5. Connect flexible ducts to metal ducts with draw bands.

I. Install duct hangers and supports in accordance with Section 23 05 00.

J. Use double nuts and lock washers on threaded rod supports.

K. See 23 05 00.

3.3 DUCT SEALING

A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible. Ductwork shall be sealed using welds, gaskets, or mastic. Duct tape is not permitted as a sealant on any ducts with the exception of that on fiberglass ducts specifically made for such use.

B. For all ductwork seal all transverse joints and longitudinal seams. For 2” w.g. and higher pressure class ductwork also seal all duct wall penetrations (i.e. screw, fastener, rod or wire).

C. Low pressure ductwork (less than 3” w.g.) shall be sealed to a leakage rate not to exceed 6 percent of the system airflow. All deficient ductwork shall be re-sealed until compliant.

3.4 PRESSURE (DUCT LEAKAGE) TESTING (RESIDENTIAL ENERGY CODE)

A. Perform duct leakage rate testing in accordance with WSU- RS-33. Test Procedures for the following.
1. Meet all requirements of Washington State Energy Code, Residential Provisions, Section R403.3.
2. Rough-in Test: Total leakage less than 4 CFM per 100 square feet of conditioned floor area, when tested and 0.1 inches w.g. across the system, including air handler. Seal all air outlets during the test.

3. Post Construction Test: Total leakage less than 4 CFM per 100 square feet of conditioned floor area, when tested and 0.1 inches w.g. across the system, including air handler. Seal all air outlets during the test.

B. All ductwork found deficient by testing shall be resealed and retested until leakage compliance is reached.

C. Provide written documentation of testing to be included with the Test and Balance report, see 23 05 93. Include drawing(s) indicating where test measurements were taken.

3.5 CLOTHES DRYER DUCT INSTALLATION

A. Ducts shall terminate outside the building and be equipped with a backdraft damper. No screens shall be used at termination.

B. Ducts shall not be constructed with sheet metal screws or other fasteners that enter the airstream. Ductwork shall be metal with smooth interior finish. The male end of duct joints shall extend in the direction of airflow.

C. Dryer ducts which penetrate a wall of ceiling membrane shall be fire caulked.

D. Dryer ducts shall be supported at minimum 4 foot intervals and secured in place.

E. Provide protective shield plates where duct is in concealed locations within framing. Plates shall be 16 gage steel and cover the duct area plus 2”. Shields may be omitted if duct is more than 1-1/2” from nearest edge of structural member.

3.6 INTERFACE WITH OTHER PRODUCTS

A. Install openings in ductwork where required to accommodate thermometers and controllers. Install pitot tube openings for testing of systems. Install pitot tube complete with metal can with spring device or screw to prevent air leakage. Where openings are provided in insulated ductwork, install insulation material inside metal ring.

B. Connect diffusers or light troffer boots to low pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp.

C. Connect air outlets and inlets to supply ducts with five foot maximum length of flexible duct. Do not use flexible duct to change direction.

3.7 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air flow, clean one half of system completely before proceeding to other half. Protect equipment with potential to be harmed by excessive dirt with temporary filters, or bypass during cleaning.
3.8 SCHEDULES

A. Ductwork Material Schedule:

<table>
<thead>
<tr>
<th>AIR SYSTEM</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply, Return, Exhaust, Relief</td>
<td>Galvanized Steel, Aluminum</td>
</tr>
</tbody>
</table>

B. Ductwork Pressure Class Schedule: Install higher pressure class than indicated where corresponding fan system ESP (external static pressure) is higher.

<table>
<thead>
<tr>
<th>AIR SYSTEM</th>
<th>PRESSURE CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant Volume Low Pressure Supply</td>
<td>Minimum 1 inch wg.</td>
</tr>
<tr>
<td>Return, Exhaust</td>
<td>Minimum 1 inch wg</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 COORDINATION
A. Verify locations for access panels with Architect.
B. Coordinate damper power, control and fire alarm interface with other trades.
C. See 23 09 00 for Electric Damper Actuators.

1.2 QUALITY ASSURANCE
A. Dampers tested, rated and labeled in accordance with the latest UL requirements.
B. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.

PART 2 PRODUCTS

2.1 MANUAL BALANCING DAMPERS
A. Manufacturers: Ruskin, Greenheck or approved equal
B. Frames: Galvanized steel, minimum 20 gage.
C. Blades: Galvanized steel, minimum 20 gage, attached to minimum 3/8 inch shafts with locking handle quadrant. Provide 2” standoff for insulated ductwork applications.
D. Maximum Velocity: 1500 fpm.
E. Rectangular: 24” and under on a side Ruskin MD25; over 24” on a side Ruskin MD35 or equal.
F. Round: Ruskin MDRS25 or equal.

2.2 CONTROL DAMPERS
A. Manufacturers: Tamco, Ruskin, Greenheck or approved equal
B. Frame: Extruded aluminum (6063T5) channel of minimum 0.080” thickness with mounting flanges on both sides.
C. Blades: Extruded aluminum (6063T5) airfoil. Maximum blade size 6 inches wide, 48 inches long, attached to minimum 7/16 inch hex shafts.
D. Bearings: Celcon inner bearing fixed to blade pin, rotating within a polycarbonate outer bearing inserted in the frame.

E. Seals: EPDM blade seals and silicone frame seals.

F. Damper Leakage: AMCA Pressure Class 1A, maximum leakage rate of 3.0 cfm/ft\(^2\) at 1.0 inch w.g. pressure differential.

G. Maximum Pressure Differential: 6 inches w.g.

H. Rectangular: Tamco 1000, Ruskin CD50, Greenheck VCD-43 or equal.

I. Round: Ruskin CDRS25, Greenheck VCDR-53 or equal up to 12” diameter, for larger sizes use rectangular damper with manufacturer’s square-to-round transitions.

J. Options:
   1. Provide parallel blade action for two position (open/closed) applications.
   2. Provide opposed blade action for modulation or control applications.

2.3 REMOTE OPERATED BALANCING DAMPERS (MANUAL)

A. Manufacturers: Young, MAT or approved equal.

B. Damper:
   1. Round butterfly or radial damper with external control hardware, 5020-CC, RT-250.
   2. Round butterfly or radial damper with internal control hardware, 5020-CC-2, RT-150.
   3. Rectangular opposed blade damper with external control hardware, 830A-CC, RT-200.
   4. Rectangular opposed blade damper with internal control hardware, 830A-CC-2, RT-100.

C. Remote Damper Operator:
   1. External cable control, 3” cover plate, 270-301
   2. Internal cable control, 270-275
   3. Remote cable wall control, 700 (where indicated).

2.4 BACK-DRAFT DAMPERS

A. Manufacturers: Tamco Series 7000 or approved equal.

B. Frame: Extruded aluminum (6063T5) channel of minimum 0.060” thickness with mounting flanges on both sides.

C. Blades: Extruded aluminum (6063T5) blades of minimum 0.060” thickness. Maximum blade size 6 inches wide, 48 inches long, attached to minimum 1/2 inch shafts.

D. Bearings: Celcon bearing rotating on zinc-plated steel pivot points.

E. Seals: Silicone blade and side seals.
F. Linkage: System of hard alloy aluminum (6005T6) crank arms fastened to aluminum pivot rods.

G. Damper Leakage: Maximum air leakage rate of 20 cfm/ft$^2$ at 1.0 inch w.g. back pressure on a 24”x24” damper.

H. Operating Temperature Range: -72F to 212F.

I. Options:
   1. For dampers with a dimension over 48” provide multiple sections.

2.5 COMBINATION FIRE AND SMOKE DAMPERS (INLINE)

A. Manufacturers: Ruskin FSD60/FSD60LP, FSDR60, equal by Greenheck, or approved equal.

B. Application: Provide FSD60LP (low pressure) model for dampers 14” in height and smaller. All others provide standard FSD60.

C. Fabricate in accordance with NFPA 90A, UL 555, and UL 555S.

D. Fire Resistance: 1-1/2 hours or 3 hours depending on rating of wall.

E. Leakage Rating: Class I, maximum of 8 cfm at 4 inches wg differential pressure.

F. Damper Temperature Rating: 350 degrees F.

G. Frame: 16 gage, galvanized steel.

H. Blades:
   3. Orientation: Horizontal.
   5. Width: Maximum 7 inches.

I. Bearings: Stainless steel or bronze.

J. Seals: Silicone blade edge seals and flexible stainless steel jamb seals.

K. Linkage: Concealed in frame.

L. Provide with duct transition connection.

M. Release Device: Close in controlled manner and allow damper to be reset.

N. Actuator: Belimo, electric 120 volt, 60 hertz, two-position, fail close.

O. Resetable Link Release Temperature: 165 degrees F.

P. Factory installed sleeve and mounting angles. Furnish silicone caulk factory applied to sleeve at damper frame to comply with leakage rating requirements.
2.6 DRYER BOX
   A. Manufacturers: Guy Gray, In-O-Vate Technologies or approved equal.
   B. 22 gauge aluminized steel manufactured wall recessed dryer vent hose receptacle with opening for 4” dia. duct. UL Classified for a one hour wall. Installation per manufacturer’s instructions.

2.7 FLEXIBLE DUCT CONNECTIONS
   A. Manufacturers: Duro-Dyne or approved equal
   B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
   C. Double fold “Grip-Loc” metal-to-fabric connection.
   D. Indoor Connector: “Metal-Fab”, 24 ga, 3”metal - 3” fabric - 3” metal.
      1. Fabric: UL listed fire-retardant Neoprene coated woven glass fiber fabric conforming to NFPA 90A, minimum density 30 oz per sq yd, 500 lbs tensile strength.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Verify rated walls are ready for fire damper installation.
   B. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

3.2 INSTALLATION.
   A. Install in accordance with NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.
   B. See Section 23 34 00, paragraph 1.4 for damper installation.
   C. Provide motorized in lieu of gravity back-draft dampers per Energy Code.
   D. Provide control dampers where not furnished with packaged equipment.
   E. Provide insulated control dampers where:
      1. The damper is installed behind a louver.
      2. The damper is installed in a roof penthouse or gravity ventilator.
      3. The damper is unducted and open to a conditioned space.
F. Provide shroud (matching duct material) over flexible duct connections when installed outside.

G. Install remote operated dampers for balancing where damper is located in an inaccessible location.

H. Access Doors: Install access doors at the following locations and as indicated on Drawings:
   1. Before and after each fire damper, smoke damper and combination fire and smoke damper.
   2. Where access is required for a valve or damper.
   3. Install at locations for cleaning kitchen exhaust ductwork in accordance with NFPA 96.

I. Access Door Sizes: Install minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated on Drawings. Review locations prior to fabrication.

J. Install temporary duct test holes as required for testing and balancing purposes. Cut or drill in ducts. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

K. Install fire dampers, combination fire and smoke dampers and smoke dampers at locations as indicated on Drawings. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
   1. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92A.
   2. Install dampers square and free from racking with blades running horizontally.
   3. Do not compress or stretch damper frame into duct or opening.
   4. Handle damper using sleeve or frame. Do not lift damper using blades, actuator, or jack shaft.
   5. Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.

3.3 DEMONSTRATION

A. Demonstrate re-setting of fire dampers to Owner's representative.

END OF SECTION
PART 1 GENERAL

1.1 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 210 and bear AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.

C. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

D. Balance Quality: Conform to AMCA 204.

E. Energy Recovery Unit Wheel Energy Transfer Rating: Meet ARI 1060.

1.2 DAMPERS

A. A gravity backdraft or motorized control damper is required on every exhaust fan.

B. Fans which are noted to operate continuously or have a capacity of 300 cfm or less shall have a gravity backdraft damper unless noted otherwise. All other fans shall have a motorized control damper.

C. See 23 33 00 for motorized control dampers.

D. Provide insulated control dampers where scheduled or where required by 23 33 00.

1.3 FAN EFFICIENCY

A. Single fan or multiple fans in parallel with combined motor nameplate over 5hp shall have a Fan Efficiency Grade (FEG) of 67 or higher and shall be selected to operate within 15% of the maximum total efficiency of the fan.

PART 2 PRODUCTS

2.1 CENTRIFUGAL INLINE FANS

A. Manufacturers: Greenheck, Cook or approved equal.

B. Construction: Square galvanized steel with duct collars, two removable access panels. Backward inclined aluminum (composite) wheel and inlet, statically and dynamically balanced.
C. Belt Drive:
1. Motor: Premium efficiency, heavy duty ball bearing type with steel frame mounted on vibration isolators out of the air stream. Selected operating horsepower to be a maximum of 80% of rated motor horsepower without using safety factor.
2. Bearings: Pillow block type, self-aligning, permanently sealed, lubricated ball bearings, with L-10 life at 100,000 hours.
3. Shafts: Hot rolled steel, ground and polished, with key way.
4. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, keyed. Variable and adjustable pitch sheaves selected so required rpm is obtained with sheaves set at mid-position. Matched belts, and drive rated minimum 1.5 times nameplate rating of motor.
5. Accessories:
   a. Gravity backdraft \ Motorized Control damper. (See Part I, Dampers)
   b. NEMA rated disconnect switch.
   c. Insulated housing with 1" liner.
   d. Insulated motor cover.
   e. Extended lubrication lines.
   f. Spring isolators.

D. Direct Drive:
1. Motor: Electronic Commutation DC brushless motor with internal solid state AC/DC converter circuitry and heavy duty ball bearings. Speed controllable down to 20% of full speed. Minimum 85% efficient at all speeds.
   a. Motor mounted potentiometer speed control dial.
   b. [or] 0-10 volt control signal speed input.
2. Accessories:
   a. Gravity backdraft \ Motorized Control damper. (See Part I, Dampers)
   b. Nema rated disconnect switch.
   c. Insulated housing with 1" liner.
   d. Speed Control.
   e. Neoprene isolators

2.2 RESIDENTIAL CEILING FANS
A. Manufacturers: Panasonic “Whisper Ceiling” or approved equal.
B. Construction: Enamel painted galvanized steel with built in backdraft damper, mounting bracket and detachable ceiling grille.
C. Certification:
2. UL listed
3. HVI rated 0.3 sones max @ 0.1" w.g, 0.5 sones max @ 0.25" w.g.
D. Motor: Four-pole totally enclosed condenser, rated to run continuously.
1. < 90 cfm: Minimum efficacy of 1.4 cfm/watt.
2. 90 cfm or more: Minimum efficacy of 2.8 cfm/watt.
2.3 RESIDENTIAL CEILING FANS

A. Manufacturers: Panasonic “Whisper Green” or approved equal.

B. Construction: Enamel painted galvanized steel with built in backdraft damper, mounting bracket and detachable ceiling grille.

C. Certification:
   2. UL listed
   3. HVI rated 0.5 sones max @ 0.1” w.g.

D. Control:
   1. Automatic speed control to adjust fan speed to desired CFM independent of static pressure.
   2. Variable speed controls shall be built-in allowing low speed continuous CFM setting and time delay high speed timer.

E. Motor: Totally molded DC brushless, rated to run continuously.
   1. < 90 cfm: Minimum efficacy of 1.4 cfm/watt.
   2. 90 cfm or more: Minimum efficacy of 2.8 cfm/watt.

F. Accessories:
   1. Gravity backdraft damper
   2. Motion sensor as scheduled
   3. Sloped roof cap as scheduled
   4. Hooded wall cap as scheduled

2.4 INLINE CABINET FANS

A. Manufacturers: Greenheck, Panasonic or approved equal.

B. Construction: Galvanized steel with 1/2” acoustical insulation, built in spring loaded backdraft damper and mounting bracket. Direct drive forward curved centrifugal fan; dynamically balanced.

C. Motor: Totally enclosed, rated to run continuously, thermal overload protection, mounted on vibration isolators.

D. Accessories:
   1. Speed control
   2. Gravity backdraft \ Motorized Control damper. (See Part I, Dampers)
   3. Round duct adapter
   4. Hanging isolation kit
   5. Sloped roof cap
2.5 DRYER BOOSTER FAN

A. Manufacturers: Fantech, Soler & Palau or approved equal.

B. Inline centrifugal, direct drive, backward inclined airfoil fan; housed in heavy gauge galvanized sheet metal with a powder coated finish. Motor shall be a permanently sealed self lubricating ball bearing type with automatic reset thermal overload protection, rated for continuous duty. Fan air flow and sound performance shall be certified by AMCA. Fan shall be tested and approved by UL.

C. Accessories
   1. Fan speed control
   2. Fully automatic duct pressure switch to enable fan when dryer is running.

PART 3 EXECUTION

3.1 MANUFACTURER'S FIELD SERVICES

A. Furnish services of factory trained representative for minimum of one day to start-up, calibrate controls, and instruct Owner on operation and maintenance.

3.2 CLEANING

A. Vacuum clean inside of fan cabinet.

3.3 DEMONSTRATION

A. Demonstrate fan operation and maintenance procedures.

3.4 PROTECTION OF FINISHED WORK

A. Do not operate fans for until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

END OF SECTION
SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 QUALITY ASSURANCE

A. Diffuser, register, and grille performance shall be tested and rated in accordance with ASHRAE 70.

B. Louver performance shall be tested and rated in accordance with AMCA 500.

PART 2 PRODUCTS

2.1 ROUND DIFFUSER

A. Manufacturers: Titus, Price, Krueger or approved equal.

B. Type: Round, adjustable pattern, stamped or spun, multi-core diffuser to discharge air in 360 degree pattern.

C. Fabrication: Steel with baked enamel white finish.

2.2 RECTANGULAR CEILING DIFFUSER

A. Manufacturers: Titus, Price, Krueger or approved equal.

B. Type: Square, stamped, multi-core, adjustable pattern diffuser.

C. Frame: Surface mount with flat frame or T-bar lay-in.

D. Fabrication: Steel with baked enamel white finish.

E. Accessories:
   1. Field fabricated steel plenum, internal baffle and round side duct inlet assembly.

2.3 LOW-FLOW RECTANGULAR CEILING DIFFUSER (Outside Air)

A. Manufacturers: Titus TJD or approved equal.

B. Type: Square plaque, induction nozzles, removable face panel.

C. Frame: 24”x24” module for lay-in T-bar ceilings or plaster frame for surface mount GWB ceiling.

D. Fabrication: Steel with baked enamel white finish.

E. Accessories:
   1. Field fabricated steel plenum, internal baffle and round side duct inlet assembly.
2.4 SUPPLY REGISTER

A. Manufacturers: Titus, Price, Krueger or approved equal.

B. Type: Contoured and individually adjustable blades, 3/4" blade spacing, two-way deflection.

C. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

D. Fabrication: Steel with factory white enamel finish.

2.5 EXHAUST/RETURN GRILLE

A. Manufacturers: Titus, Price, Krueger or approved equal.

B. Type: Fixed blades, 1/2 inch blade spacing, with blades set at 35 degrees.

C. Frame: 1-1/4 inch margin with countersunk screw mounting, welded corners.

D. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, with factory white enamel finish.

E. Accessories:
   1. Opposed blade damper.
   2. Field fabricated steel plenum, internal baffle and round side duct inlet assembly.

2.6 EGGCRATE EXHAUST/RETURN GRILLE

A. Manufacturers: Titus, Price, Krueger or approved equal.

B. Type: Fixed grilles of 1/2 x 1/2 x 1/2 inch aluminum core.

C. Frame: 1-1/4 inch margin with countersunk screw mounting or channel lay-in frame for suspended grid ceilings.

D. Fabrication: Aluminum with factory white enamel finish.

2.7 LOUVERS

A. Manufacturers: Greenheck ESD-403, Ruskin, Wonder Metal or approved equal.

B. Product Description: Stationary, drainable blade. AMCA certified.

C. Type: 4 inch deep with blades on 45 degree slope, heavy channel frame. Minimum initial point of water penetration of 900 fpm.

D. Fabrication: 12 gage thick extruded aluminum, welded assembly, with factory 2-coat 70% Kynar finish, color to be selected.

E. Mounting: Furnish with flanges, mullions, and hardware for installation.

F. Bird Screen: Aluminum 3/4" x 0.051" flattened expanded metal.
2.8 GRAVITY ROOF VENTILATORS

A. Manufacturers: Greenheck, Cook, Price or approved equal.

B. Product Description: aluminum; aluminum wire bird screen and insect screen; square base to suit roof curb with continuous curb gaskets.

C. Roof Curb: Galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, 1 inch insulation with liner, damper tray, curb seal and factory installed nailer strip. Matched to roof pitch.

D. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.

E. Motor Operated Damper: Aluminum multiple blade construction, sealed edged with offset hinge pin, nylon bearings, blades linked and motor drive, power open, spring return.

2.9 GOOSENECKS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, of minimum 18 gage aluminum. Provide termination insect screen.

2.10 CAPS

A. Pitched Roof Cap: Steel construction with black enamel finish, integral flashing flange, built in birdscreen with damper. Greenheck RJ (6x9 or larger) or approved equal.

B. Flat Roof Cap: All aluminum exterior construction, galvanized steel internal supports, integral birdscreen without damper, built in flashing flange. Greenheck GRSF or approved equal.

C. Wall Cap (round connection): Aluminum construction, aluminum finish, built in birdscreen with damper. Greenheck WC or approved equal.

D. Wall Cap (rectangular): Steel construction with black enamel finish, built in birdscreen with damper. Greenheck WC or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify inlet and outlet locations with Architectural Plans.

B. Verify ceiling/wall type before ordering.

C. Verify diffuser air patterns are as indicated before starting air balance.
3.2 INSTALLATION
   A. Install diffusers to ductwork with airtight connection.
   B. Install balancing dampers on duct take-off to diffusers, grilles, and registers, whether or not dampers are furnished as part of diffuser, grille, and register assembly.
   C. Paint visible portion of ductwork behind air outlets and inlets matte black

3.3 INTERFACE WITH OTHER PRODUCTS
   A. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

END OF SECTION
PART 1 GENERAL

1.1 PERFORMANCE REQUIREMENTS

A. Conform to ARI 850 Section 7.4.

B. Dust Spot Efficiency: Plus or minus 5 percent.

PART 2 PRODUCTS

2.1 DISPOSABLE, PLEATED FILTERS

A. Manufacturers: Camfil, Flanders, Airguard, Viledon or approved equal.

B. MERV 6: UL900 Class 2, pleated, cotton and synthetic blend, radial pleat with welded wire grid, cardboard frame. 1" with maximum initial resistance of 0.09" @ 175 fpm. (Camfil Aeropleat IV)

C. MERV 8: UL 900 Class 2, pleated, cotton and polyester blend, radial pleat with welded wire grid, cardboard frame. 1", 2" & 4". (Camfil 30/30)

D. MERV 11 (65%): UL 900 Class 2, pleated, synthetic media, corrosion resistant expanded metal backing and moisture resistant enclosing frame. 1", 2" & 4". (Flanders 62RM11, Camfil AP-Eleven)

E. MERV 13 (85%): UL 900 Class 2, pleated synthetic media with three layers, spunbond polyester prefilter, electrostatically spunpolycaronate microfiber middle layer and spunbond polyester downstream layer. 2" & 4" (Viledon Mini 85)

F. MERV 13 (85%): UL 900 Class 2, extended surface mini pleated, fiberglass or synthetic media, corrosion-resistant metal frame. 4" (Flanders PrecisionCell II)

2.2 FILTER FRAMES AND HOUSINGS

A. General: Fabricate filter frames and supporting structures of 16 gage galvanized steel or extruded aluminum T-section construction with necessary gaskets between frames and walls.

B. Standard Sizes: For interchange ability of filter media of other manufacturers; minimum 2 inches thick; for extended surface and high efficiency particulate air filters, provide for upstream mounting of panel filters.

C. Side Servicing Housings: Flanged for insertion into ductwork, of reinforced 16 gage galvanized steel; access doors with continuous gaskets and positive locking devices on both sides; extruded aluminum tracks or channels for filters with positive sealing gaskets.
PART 3 EXECUTION

3.1 INSTALLATION

A. Install filters with felt, rubber, or neoprene gaskets to prevent passage of unfiltered air around filters.

B. Install filter gage static pressure tips upstream and downstream of filters. Mount filter gages on outside of filter housing or filter plenum, in accessible position. Adjust and level.

C. Do not operate fan system until filters are in place. Replace filters used during construction before testing, with clean set. Provide owner with replacement set of filters.

END OF SECTION
SECTION 23 72 00
ENERGY RECOVERY UNITS

PART 1  GENERAL

1.1  QUALITY ASSURANCE
A. Entire unit shall be ETL Certified per U.L. 1995 and bear an ETL sticker.
B. Blowers shall be AMCA Certified for airflow.
C. Energy Wheel shall be AHRI Certified per Standard 1060.

1.2  COORDINATION
A. Coordinate size and location of all building penetrations required for installation of each unit and associated hydronic, gas and electrical systems.
B. Contractor shall coordinate with roofing contractor to ensure curb unit is properly flashed.

1.3  EXTRA MATERIALS
A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Filters: 3 sets of disposable filters for each unit.
   2. One set of fan and energy wheel belts

1.4  ELECTRICAL
A. Short-Circuit Current Rating (SCCR): All HVAC and refrigeration equipment with multi-motor or combination electrical loads shall comply with NEC 110.10 & 440.4 and must include a SCCR greater than the Available Interrupting Current (AIC) of the electrical circuit serving the equipment. See electrical drawings for required AIC kA rating. Equipment SCCR may be presented in writing from the manufacturer or shown on the unit nameplate. Refrigeration or air-conditioning equipment over 60 Amps MOCP must list the SCCR on the unit nameplate. If the AIC rating is unavailable or cannot be determined provide equipment with a minimum SCCR of 10kA.

PART 2  PRODUCTS

2.1  ENERGY RECOVERY VENTILATOR (ERV)
A. Manufacturer: Lossnay or approved equal.
B. Quality Assurance:
   1. Tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the UL label.
2. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
3. Rated in accordance with Air-conditioning Refrigeration Institute’s (ARI) Standard 1060 and bear the ARI Certification label.
5. Energy Transfer Core shall have a ten (10) year warranty against defects in material or workmanship from date of installation.

C. General:
1. Factory assembled, wired and run tested.
2. Contained within the unit shall be all factory wiring, control circuit board and blowers with motors, filters, and insulated foam air guides.
3. Each unit will have an automatic by-pass damper system for economic operation under certain conditions.
4. The unit shall have factory installed control board with functions for local, remote, and optional control modes.

D. The cabinet shall be fabricated of galvanized steel, and covered with polyurethane foam insulation as necessary with steel mounting points securely attached.

E. Direct drive centrifugal blowers running simultaneously supplying and extracting air at the same rate for balanced ventilation air flow. The blower motors shall be a directly connected to the blower wheels and have permanently lubricated bearings.

F. The Lossnay® heat exchanger element shall be constructed of specially treated cellulosic fiber membrane separated by corrugated layers to allow total heat (sensible and latent) energy recovery from the exhaust air to the supply air or from the supply air to the exhaust air as determined by design conditions. Protective filters installed at both the supply and exhaust sides with an access cover to allow easy maintenance.

G. The ERV shall have an automatic supply side by-pass damper to allow inbound ventilation air to by-pass the Lossnay® energy transfer core when outside weather conditions warrant.

H. Control: Mitsubishi LCD independent remote controller.

PART 3 EXECUTION

3.1 INSTALLATION

A. Secure unit with cadmium plated steel lag screws to roof curb.

B. Install flexible connections between unit and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

C. Provide sheaves required for final air balance.
3.2 MANUFACTURER'S FIELD SERVICES
   A. Furnish services of factory trained representative for minimum of one day to
      start-up, calibrate controls, and instruct Owner on operation and maintenance.

3.3 CLEANING
   A. Vacuum clean coils and inside of fan cabinet.
   B. Install clean filters.

3.4 DEMONSTRATION
   A. Demonstrate fan operation and maintenance procedures.

3.5 PROTECTION OF FINISHED WORK
   A. Do not operate fans for until ductwork is clean, filters in place, bearings
      lubricated, and fan has been test run under observation.

END OF SECTION
PART 1  GENERAL

1.1 MAINTENANCE SERVICE

A. Furnish service and maintenance of equipment for one year from Date of Substantial Completion. Include maintenance items as shown in manufacturer's operating and maintenance data, including filter replacements, fan belt replacement, and controls checkout and adjustments.

B. Furnish 24-hour emergency service on breakdowns and malfunctions for this maintenance period.

1.2 QUALITY ASSURANCE

A. Capacity rating in accordance with ARI.

B. Sound rating is accordance with ARI 270.

C. Insulation and adhesives: Meet requirements of NFPA 90A.

1.3 ELECTRICAL

A. Short-Circuit Current Rating (SCCR): All HVAC and refrigeration equipment with multi-motor or combination electrical loads shall comply with NEC 110.10 & 440.4 and must include a SCCR greater than the Available Interrupting Current (AIC) of the electrical circuit serving the equipment. See electrical drawings for required AIC kA rating. Equipment SCCR may be presented in writing from the manufacturer or shown on the unit nameplate. Refrigeration or air-conditioning equipment over 60 Amps MOCP must list the SCCR on the unit nameplate. If the AIC rating is unavailable or cannot be determined provide equipment with a minimum SCCR of 10kA.

1.4 QUALIFICATIONS

A. The system shall be installed by a Mitsubishi authorized CITY MULTI Diamond Dealer. The contractor service and install training should be performed by the manufacturer.

PART 2  PRODUCTS

2.1 DUCTLESS SPLIT SYSTEM AIR CONDITIONING & HEAT PUMP UNITS

A. Manufacturers: Mitsubishi or approved equal.

B. General: Indoor/Outdoor unit combination shall be manufacturer paired. ETL labeled, AHRI 240 rated. R-410a Refrigerant. Cooling operation from 14F to
115F. Heating operation from -4F to 75F. 5 year Manufacturer parts and defect warranty, 7 year compressor warranty.

C. Indoor unit: Factory assembled, wired and run tested ductless evaporator unit with white finish.
   1. Fan: Two speed, direct drive fan with permanently lubricated bearings, statically and dynamically balanced. Adjustable guide vane and motorized air sweep louver.
   2. Filter: Removable washable.
   3. Coil: Smooth plate aluminum fins on copper tubing with inner grooves, silver alloy brazed, pressure tested, condensate pan and drain.
   4. Control: Microprocessor controlled self-diagnostic, run time delay, auto restart, test run switch, automatic cooling, display set point and room temperature, 24/7 programmability.

D. Outdoor unit: Horizontal discharge condensing unit constructed of galvanized steel with powder coat baked enamel finish.
   1. Fan: Direct drive, permanently lubricated bearings, mounted for quiet operation, fan guard.
   2. Coil: Corrugated aluminum fins on copper tubing with protective metal guard and metering orifice.
   3. Compressor: Rotary with crankcase heater, accumulator, internal thermal overload, high pressure safety switch.

E. Accessories:
   1. Low ambient operation to 0 F.
   2. Pre-charged refrigerant tubing.
   3. Compressor restart time delay.

2.2 MULTI-ZONE HEAT PUMP SYSTEM

A. Manufacturers: Mitsubishi or approved equal.

B. General: Variable capacity multi-zone system with multiple indoor fan coils, controls and an inverter driven heat pump. Indoor/Outdoor units combination shall be manufacturer paired. ETL labeled, AHRI 240 rated. R-410a Refrigerant. Cooling operation from 14F to 115F. Heating operation from 5F to 75F. 5 year Manufacturer parts and defect warranty, 7 year compressor warranty.

C. Indoor unit (Wall Mounted):
   2. Filter: Removable washable Catechin, Antioxidant Pre-filter and a separate Anti-allergy blue enzyme filter.
   3. Coil: Smooth plate aluminum fins on copper tubing with inner grooves, silver alloy brazed, pressure tested, condensate pan and drain. Provide with condensate lift pump.
2.3 SPLIT SYSTEM HEAT PUMPS OUTDOOR CONDENSING UNIT

A. Manufacturers: Mitsubishi or approved equal.

B. General: Variable capacity, heat pump system capable of single or multiple zones.

C. Units shall be equipped with multiple circuit boards that interface to the control system and shall perform all functions necessary for operation, be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.
   1. Sound pressure rating no higher than 59 dB(A).
   2. All refrigerant lines shall be individually insulated.
   3. Accumulator with refrigerant level sensors and controls.
   4. High pressure safety switch, over-current protection and DC bus protection.
   5. Capable of operating in heating down to \(-13^\circ\)F ambient temperature without additional low ambient controls.
   6. High efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

D. Unit Cabinet: The casing shall be fabricated of galvanized steel, bonderized and finished with powder coated baked enamel.

E. Fan: Direct drive, variable speed propeller type fan with inherent protection, permanently lubricated bearings, mounted for quiet operation, raised guard and horizontal discharge airflow.

F. Refrigerant: R410A refrigerant is required.

G. Coil: Nonferrous construction with lanced or corrugated plate fins on copper tubing with an integral metal guard. Fins shall have corrosion resistant blue-fin finish.

H. Compressor: High performance, inverter driven, modulating capacity scroll compressor with a factory mounted crankcase heater, an inverter to modulate capacity, internal thermal overload, mounted to avoid the transmission of vibration.

I. Electrical: The unit shall be controlled by integral microprocessors with the control circuit between the indoor units and the outdoor unit being 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

2.4 PKFY INDOOR UNIT (wall-mounted)

A. Manufacturers: Mitsubishi or approved equal.

B. General: Wall mounted indoor unit section with a slim silhouette and a modulating linear expansion device.

C. Indoor Unit: Factory assembled, wired and run tested with all factory wiring, piping, electronic modulating linear expansion device, control circuit board, fan
motor, self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

D. Unit Cabinet: White finish, same for all model sizes. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining. Separate back plate which secures the unit firmly to the wall.

E. Fan: An assembly with one or two line-flow fan(s) direct driven by a single motor. Statically and dynamically balanced to run on a motor with permanently lubricated bearings. Multi-speed fan with two speeds selected by the room controller. Manual adjustable guide vane with the ability to change the airflow from side to side (left to right). Motorized air sweep louver with automatic change in airflow by directing the air up and down to provide uniform air distribution.


G. Coil: Nonferrous construction with smooth plate fins on copper tubing, inner grooves for high efficiency heat exchange, phos-copper or silver alloy brazed joints, pressure tested at the factory. A condensate pan and drain shall be provided under the coil. Both refrigerant lines to the PKFY indoor units shall be insulated.

H. Controls: Unit controls to be provided with unit as part of VFRZ system to perform functions necessary to operate the system. The unit shall be able to control external backup heat.

I. Accessories:
   1. Provide with BlueDiamond condensation pump complete with reservoir and accessories. Provide model MicroBlue for units up to 15 MBH and MaxiBlue for units 18 MBH and larger. Provide power from fan coil unit.

2.5 REFRIGERANT PIPING SERVICE VALVE

A. Manufacturer: Diamondback or approved equal.

B. Full port, forged brass ball valve with Schrader valve, flare connections, Teflon seals and gaskets. 700 psig rated, R-410A compatible, fully factory assembled and pressure tested.

C. Provide with insulation cover of polyethylene foam with PVC cover and tape.

2.6 REMOTE CONTROLLERS

A. Manufacturers: Mitsubishi or approved equal.

B. Remote controllers shall operate indoor units. The wiring for the remote controllers shall be simple, non-polar, two-wire connections. All remote controllers shall be wall-mounted with an LCD display and contain a microprocessor that constantly monitors operation to maintain smooth indoor unit operation. Set temperature shall be adjusted in increments of 1°F or 2°F,
depending on the systems and controllers. In the event of an abnormality, the remote controller shall display a four-digit error code and the indoor unit address.

C. PAR-U01MEDU-J: Smart ME Remote Controller
   1. Backlit touch screen.
   2. Capable of controlling up to 16 indoor units (defined as 1 group).
   3. Displays: Room temperature, relative humidity, operation status, setpoint.
   4. Control the following operations: On/Off, Operation Mode (cool, heat, auto, dry, and fan), temperature setting, fan speed setting, setback, hold and airflow direction setting.
   5. Timer settings of on/off/temperature up to 8 times in a day in 5-minute increments with an Auto Off timer and able to limit the set temperature range.
   6. Room temperature shall be sensed at the Controller.

2.7 CONDENSATE PUMPS

   A. See Section 230500.

PART 3 EXECUTION

3.1 EXAMINATION

   A. Coordinate size and location of concrete pad for condensing unit. Provide inserts for mounting.
   B. Coordinate size and location of sleeves or block-outs needs for refrigerant piping.
   C. Determine refrigerant pipe routing to efficiently minimum run length and avoid interference.

3.2 INSTALLATION

   A. Install condensate piping with trap and determine route from drain pan to nearest waste with 1/4" slope. Provide condensate pump where drain is not available, or slope cannot be made.
   B. Install components furnished loose for field mounting.
   C. Install refrigerant piping from condensing unit to indoor unit(s). Install refrigerant specialties furnished with unit.
   D. Insulate both liquid and vapor refrigerant piping on all runs.
   E. Evacuate refrigerant piping and install initial charge of refrigerant.
   F. Install electrical devices furnished loose for field mounting.
   G. Install control wiring between air handling unit, condensing unit, and field installed accessories.
3.3 INSTALLATION – FAN COIL UNIT
A. Install condensate piping with trap and determine route from drain pan to nearest waste with 1/4" slope. Provide condensate pump where drain is not available or slope cannot be made.
B. Install fan coil units on vibration isolators.

3.4 INSTALLATION - CONDENSING UNIT
A. Install condensing units at grade on concrete foundations with anchors.
B. Install condensing units on neoprene vibration isolators.

3.5 INSTALLATION - CONDENSATE PUMPS
A. See Section 230500.

3.6 MANUFACTURER’S FIELD SERVICES
A. Furnish initial start-up and commissioning. During first year of operation, including routine servicing and checkout.

3.7 CLEANING
A. Vacuum clean coils and inside of unit cabinet if necessary.
B. Install new filters in units at Substantial Completion.

3.8 DEMONSTRATION
A. Demonstrate unit operation and maintenance.
B. Furnish services of manufacturer's technical representative for one day to instruct Owner's personnel in operation and maintenance of units. Schedule training with Owner, provide at least 7 days’ notice to Architect/Engineer of training date.

3.9 PROTECTION OF FINISHED WORK
A. Do not operate indoor units during construction for temporary heat.
B. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

END OF SECTION
SECTION 26 00 00

ELECTRICAL GENERAL CONDITIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Conform to General Conditions, Supplementary Conditions, the modifications thereto and Division 01 - General Requirements for all work in Divisions 26 and 27.

1.2 SUMMARY

A. Design Intent: The project includes renovation of the Electrical systems for the Abbey Ridge apartment complex, a multi-building complex consisting of (13) existing apartment buildings, (1) existing office building, and (2) new maintenance & equipment buildings located in the City of SeaTac, Washington.

1. The Electrical Contractor shall provide complete and fully operational and coordinated Electrical systems that meet all requirements of the Owner, local AHJ and as per the Project Contract Documents.

2. The replacement of the existing Telecom/Cable TV System with a complete new system is Design-Build; Contract Documents (performance specifications) are meant to provide information (scope, performance requirements, preliminary quantities and locations, etc) for Bidding by Design-Build Contractors only. All final quantities and locations of equipment and devices shall be coordinated with the Architect and Owner prior to the start of construction. See Specification Section 27 00 00 for Intercom System requirements.

3. The Low Voltage Design-Build Contractor shall be a subcontractor to the Electrical Contractor.

B. The Electrical Contractor shall provide all labor, materials, equipment and devices, supports, etc necessary for satisfactory installation of electrical work ready to operate in strict accordance with Code requirements and these specifications and drawings. Work includes, but is not limited to, that as delineated in the following specification sections:

26 00 00 ELECTRICAL GENERAL CONDITIONS.
26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.
26 05 19 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.
26 05 26 GROUNDING AND BONDING.
26 05 33 RACEWAYS AND BOXES FOR ELECTRICAL AND LOW VOLTAGE SYSTEMS.
26 05 53 IDENTIFICATION FOR ELECTRICAL SYSTEMS.
26 24 16 PANELBOARDS.
26 27 26 WIRING DEVICES.
26 28 13 FUSES AND ENCLOSED SWITCHES AND CIRCUIT BREAKERS.
26 51 19 INTERIOR AND EXTERIOR LIGHTING
27 00 00 LOW VOLTAGE GENERAL CONDITIONS FOR THE DESIGN BUILD CONTRACTOR
28 46 00 FIRE ALARM GENERAL CONDITIONS

C. Related Sections: All Division 01, 26, 27 and 28 Specification Sections included in the Contract Documents.

D. Commissioning Activities and Submittals: The Project shall be commissioned. The Contractor shall coordinate with the Owner and Architect and provide support for the complete commissioning process as required. See Division 01 for additional information.

1.3 CODES AND STANDARDS:

A. All work shall meet or exceed the requirements of the current versions of all applicable Federal, State, and Local Codes and Standards including but not limited to:
3. International Fire Code (IFC) with Local Amendments.
5. International Mechanical Code (IMC) with Local Amendments.
6. Uniform Plumbing Code (UPC) with Local Amendments.
7. The Americans with Disabilities Act (ADA).
10. Applicable Standards of the following organizations (see subsequent Division 26 and 27 sections for additional information):
   c. Building Industry Consulting Services International (BICSI)
   d. Institute of Electrical and Electronics Engineers (IEEE)
   e. National Electrical Manufacturer’s Association (NEMA)
   f. Underwriter’s Laboratories (UL) standards.

1.4 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to international Building Code, Fire Marshal, and UL for fire resistance ratings and surface burning characteristics.
1.5 PRODUCT SUBSTITUTIONS

A. Manufacturers and models of equipment and material indicated in Divisions 26 and 27 Specifications and on drawings are those upon which the electrical design is based and upon which the intercom system’s design is to be based; other manufacturers with products considered equal in general quality may also be listed without specific model designation. Manufacturers not listed shall be submitted for approval prior to submission of Bid by the Contractor, see Division 01.

B. Any equipment other than the basis of design is considered a substitution; this includes equipment from any alternate manufacturers listed without specific model designation in the Contract Specifications and / or Drawings.

C. Pre-Bid Substitutions will be evaluated based on product manufacturer only. Specific product model, specifications, options and accessories will be evaluated during submittals. Approval of a manufacturer substitution does not constitute approval of the submitted product.

D. In selecting substitute equipment, the Contractor is responsible for and shall guarantee equal performance and fit. Cost of redesign and all additional costs incurred to accommodate the substituted equipment shall be borne by the Contractor.

E. Approval of proposed substitution does not grant the Contractor approval for deviation from the contract requirements.

F. Unless indicated otherwise, “or approved equal” may be assumed for all products in Divisions 26 and 27.

1.6 SUBMITTALS

A. Provide one electronic copy of product data submittals for all products listed under “Part 2 Products” of Divisions 26 and 27 Specification Sections and all additional products noted on drawings or required for completion of sequence of operations.

B. Provide the Submittals so as not to delay the construction schedule; allow at least two weeks for review of each submittal and re-submittal.

C. Electronic: Submittals shall be complete in one PDF file for each Division with bookmarks for each Specification Section and Principal Category. Multi-file submittals will be returned without review.
   1. First Page: Name of Project, Owner, Location & Contracting Company.
   2. Index Page: List of specification sections and principal categories with contents by Tag or item.
   3. Bookmarks: Electronic bookmark of each specification section and principal category corresponding to listing in index.

D. Clearly indicate on each page the equipment schedule designation (Tag or Mark) and/or specification section, as applicable. Indicate selected model and all accessories intended for use.
E. Equipment vendor cover page with contact information shall precede submittal by that vendor.

F. Submitted product information shall include but not be limited to the following information (as applicable):
   1. Product description.
   2. Manufacturer and model.
   3. Dimensions.
   4. Performance Ratings.
   6. Finish.
   7. Ratings (i.e. UL, ASTM, NEMA, etc).
   8. Electrical characteristics (Voltage, Phase, Wattage, Breakers, etc).
   9. Engineering technical data.
   10. Sound level data.
   13. Seismic qualification data.
   15. Accessories.

G. Where a third party structural engineer has been engaged by the Contractor to provide support, anchoring and seismic calculations, the Contractor shall include these calculations and designs in their Submittal Package.

H. If requested in subsequent Specification Sections or by the Architect or Engineer, submit Manufacturer's Installation Instructions on any equipment, procedures, or certifications so requested.

I. Do no ordering, fabrication or manufacturing of products until return of approved submittals.

J. The Contractor agrees to pay for the Engineer’s review cost of the Division 26 and 27 Submittals beyond one resubmittal where resubmittals are required due to deficiencies in the Contractor’s Submitted material.

1.7 SHOP DRAWINGS
   1. For Electrical Gear (switchboards, panelboards, etc).
   2. Slab plans marked up with all penetrations required for electrical and intercom systems. Sizes of penetrations shall be indicated on the plans and penetration locations shall be dimensioned from major building lines. The Contractor shall submit these slab plans to the Architect for review.
   3. As requested in subsequent Division 26 and 27 Specification Sections.
   4. For all special or custom-built items or equipment.
   5. In all cases where deviation from the Contract Drawings are contemplated because of job conditions, interference or substitution of equipment, or when requested by the Engineer for purposes of clarification of the Contractor’s intent.
      a. By submission of revised design shop drawings, the Contractor acknowledges that coordination has been done with all other trades to ensure that all equipment fits and remains accessible with all Code required clearances and that no conflicts exist.
B. The Architect’s review of shop drawings shall not relieve the Contractor of the responsibility for deviations from the Contract drawings or specifications, unless he has, in writing, called the attention of the Architect to such deviations at the time of the submission, nor shall it relieve him from responsibility for errors or omission in such shop drawings.

1.8 COMMISSIONING

A. See the Commissioning notes in the Drawing Set and Division 01 for requirements.

B. Perform corrective actions needed to resolve deficiencies identified during commissioning. Record action taken on commissioning deficiency log.

1.9 PERMITS

A. In addition to the requirements in other Specification Sections, the Electrical Contractor shall make all required submissions to the Authorities Having Jurisdiction (AHJ) for Permits and approval. The Contractor shall pay all fees related to said submissions and shall submit all comments received from the AHJ to the Architect and Engineer.

B. The Contractor shall not commence work until a permit (or “get started” permit where allowed by the AHJ) is obtained. The Contractor is solely responsible for ensuring that the permit application and any revisions are submitted in a timely manner so as not to impact the project schedule.

C. The Contractor shall retain the services of a third party structural engineer to provide support, anchoring and seismic calculations for all applicable equipment where required by the AHJ.

1.10 QUALITY ASSURANCE

A. The Contractors shall perform all work per current versions of all applicable Codes and Standards with state and local amendments – see “Codes and Standards” paragraph above.

B. All equipment and devices shall be UL-Listed and Labeled and shall be acceptable to the Authority Having Jurisdiction as suitable for the use and location for which they are intended.

C. Provide all like items (receptacles, circuit breakers, electrical gear, etc) from one manufacturer.

1.11 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in Divisions 26 and 27 Specification Sections with a minimum of three years’ experience.

B. Installer: Company specializing in performing Work included in Divisions 26 and 27 on projects of similar type and scale with a minimum of three years’ experience.
1.12 SCHEDULING

A. The Scope of the project is to be completed in Phases. Coordinate phasing of construction with Owner and Architect.

B. The building is intended to remain completely occupied during construction. Coordinate the scheduling of access with the Owner.

1.13 DELIVERY, STORAGE AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. The Contractor shall keep all equipment, devices, conduit, etc in a dry, secured, protected area. The location shall be coordinated with the Architect and Owner prior to the start of Construction. See Division 01 for additional delivery, storage and handling requirements.

C. Where original packaging is insufficient, provide additional protection. Maintain protection in place until installation.

D. Inspect all products and materials for damage prior to installation.

E. Protect conduit from all entry of foreign materials by providing temporary end caps or closures on conduit and fittings.

F. Protect materials and finishes during handling and installation to prevent damage.

G. Comply with manufacturer's installation instruction for rigging, unloading and transporting equipment.

1.14 ENVIRONMENTAL REQUIREMENTS

A. Do not apply fire stopping materials when temperature of substrate material and ambient air is below 60 degrees F. Maintain this minimum temperature before, during, and for minimum 3 days after installation of fire stopping materials.

B. Coordinate with Owner to have ventilation provided in areas to receive solvent cured materials.

1.15 FIELD MEASUREMENTS

A. The Contractor shall visit the site and become familiar with existing conditions affecting work. The Contractor shall include in their Bid the costs for all work and / or materials required to comply with the requirements of the Contract Documents based on the actual existing conditions. Failure to visit the Site and verify actual existing conditions does not relieve the Contractor of these requirements; no change orders will be paid due to lack of verification of existing conditions whether they are specifically noted in the Contract Documents or not.

B. Existing systems and utility lines indicated on drawings are in accordance with information furnished to the Architect and may not be complete and completely
accurate. Contractor is responsible for locating, uncovering, disposing of or maintaining and documenting exact locations of existing systems.

C. Verify field measurements prior to ordering gear.

D. Verify by field measurements that equipment sizes and configurations are compatible with wall construction and layout.

1.16 COORDINATION

A. Where the word ‘verify’ is used on the documents, the contractor shall field verify the existing conditions and modify the scope of the installation as required to meet the verified conditions without additional cost to the Owner.

B. Electrical drawings are diagrammatic and do not indicate all possible site conditions. The contractor shall verify all measurements, dimensions and connections on site and coordinate between trades to preclude interferences. The contractor shall provide adjustments as necessary to fit actual conditions.

C. The scale of each drawing is relatively accurate, but the Contractor is warned to obtain the necessary dimensions for any exact takeoffs from the Architect. No additional cost to the Owner will be considered for failure to obtain exact dimensions where not clear or in error on the drawings. Any device or equipment roughed in improperly and not positioned on implied centerlines or as required by good practice shall be repositioned at no cost to the Owner.

D. In the event of a conflict with other trades of work, the following priority from highest to lowest shall be followed: Structural, lighting, HVAC, plumbing/piping and sprinklers. Starting with the lowest priority, the Electrical, HVAC, and low voltage contractors shall provide whatever materials, offsets, labor etc. is required to resolve the conflict.

E. Advise the Architect of any modifications required to suit the equipment furnished. Costs for modifications due to equipment substitution will be borne by the contractor.

F. When discrepancies occur between plans and specifications, the Architect will determine which takes precedence and the Contractor shall perform the selected requirement at no additional cost.

G. Wherever conflicts occur between different parts of the Contract Documents the greater quantity, the better quality, or larger size shall prevail unless the Architect informs the Contractor otherwise in writing.

H. Coordinate wall openings, rough-in locations, concrete housekeeping pads, and conduit rough-in locations to accommodate Work of Divisions 26 and 27.

I. The Contractor shall coordinate with the Architectural plans and Project structure when locating equipment and devices and routing conduit and cabling.

J. The Contractor shall coordinate with the Owner and provide slab plans marked up with all penetrations required for electrical and intercom systems. Sizes of
penetrations shall be indicated on the plans and penetration locations shall be dimensioned from major building lines. The Contractor shall submit these slab plans to the Architect for review.

K. The Contractor shall coordinate conduit and cabling routing and equipment and device locations with all other trades to ensure all Code required clearances are maintained and equipment and devices remain accessible after the work of all trades is complete.

L. The Contractor shall consult the approved shop drawings of all other trades and crafts to ensure coordination with final locations of cabinetry, counters, appliances, equipment, structural members, etc. Conflicts are to be resolved with the Architect and General Contractor prior to rough-in. The Contractor shall not be paid for relocation work (including cutting, patching, and finishing) required due to a lack of coordination prior to installation.

M. See the Architectural drawings for the exact locations of electrical and low voltage devices. The Contractor shall make minor changes (less than 6-feet in any direction) in the location of conduit, boxes, devices, etc from the locations shown in the drawings without extra charge to the Owner where required by coordination or if directed by the Architect or Owner.

N. Motor Starters: By mechanical equipment manufacturer where factory mounted controls are provided. Variable frequency drives by Division 23. All other starters are to be provided by Electrical Contractor; coordinate with Mechanical and Plumbing Contractors to ensure compatibility with their equipment.

O. Wiring for HVAC Equipment:
   1. Power Wiring for HVAC equipment: By Electrical Contractor.
   2. Control Wiring for HVAC equipment: Responsibility of Division 23.
   3. Owner will not entertain additional cost due to lack of coordination between HVAC Contractor and Electrical Contractor.

1.17 PROJECT CLOSEOUT

A. Completion, submission and approval of the following is required for final project closeout:
   1. Walk through the Project with the Owner and Architect to make note of deficiencies.
   2. Execution of Owner’s, Architect’s and Engineer’s final observation reports (punchlist).
   3. Operating and Maintenance Instructions.
   5. Equipment Cleaning.
   6. Record Drawings.
   7. Testing.

B. See other Divisions 26 and 27 Specification Sections for additional requirements.

C. See Division 01 for additional requirements.
1.18 OPERATING AND MAINTENANCE INSTRUCTIONAL TRAINING

A. General: In addition to requirements of Division 01, following initial operation of Electrical systems and prior to acceptance by the Architect, perform the following services:

1. At least two weeks prior to each instruction period, give written notification of readiness to proceed to the Architect and Owner, and obtain mutually acceptable dates.

2. Conduct demonstrations and instructions for the Owner’s representatives, pointing out requirements for operating, servicing and maintaining equipment and systems. Describe general system operation and specific equipment functions. Cover all equipment calibration, lighting controls setpoint and system adjustment, and safeties and alarms.

3. Furnish qualifications of Contractor’s personnel in charge of the instruction; foreman position is minimum acceptable. Where equipment startup is performed by supplier’s or manufacturer’s personnel, those personnel should also provide training on that equipment.

4. During demonstrations and instructions include and reference information from maintenance manuals and contract drawings.
   a. Provide documentation of all instruction which includes:
      1) Date and time of instruction.
      2) Name, affiliation and qualifications of the instructor.
      3) Name and affiliation of the attendees.
      4) Topics, systems, and equipment covered.
      5) Length of instruction.

5. Minimum duration of instruction periods:
   a. Electrical Power Systems 4 hours
   b. Intercom Systems See Section 27 00 00

1.19 OPERATING AND MAINTENANCE MANUALS

A. Contents: Furnish, in accord with Division 01, one PDF and one bound copy of operating and maintenance manuals to include the following:

1. The Job name and address.

2. Names, addresses and telephone numbers of the Contractor, subcontractors and local companies responsible for maintenance of each system or piece of equipment.

3. Manufacturers, suppliers, contractor names, addresses and phone numbers.

4. Written guarantees.

5. Warranty service contractors’ names, address and phone numbers (if different from above).

6. Copies of approved brochures and Shop Drawings as applicable for all submittal items.

7. Manufacturer’s printed operating procedures to include start-up and routine and normal operating instructions; and control, shutdown, and emergency instructions.

8. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; and adjusting instructions.

9. Part numbers of all replaceable items.
10. Control diagrams and operation sequence.
11. Record drawings corrected and completed.
12. Completed systems start-up forms and checklists.
13. Final copy of testing reports.

B. Operation and Maintenance Data:
   1. Include spare parts lists for all equipment as applicable.
   2. Submit installation instructions, adjustment instructions, and spare parts lists for all equipment.
   3. Submit inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
   4. Submit manufacturer's descriptive literature, operating instructions, and maintenance and repair data.

C. Binders:
   1. Furnish typewritten or printed index and tabbed dividers between Specification Sections and principal categories.
   3. Imprint on Cover:
      a. Name of Project.
      b. Owner.
      c. Location of project.
      d. Architect.
      e. Contractor.
      f. Year of Completion.
   4. Imprint on backing:
      a. Name of Project.
      b. Year of completion.

D. PDFs:
   1. Provide PDF with bookmarks for each Specification Section and Principal Category.
      a. First Page: Name of Project, Owner, Location & Contracting Company.
      b. Index Page: List of specification sections with contents by Tag or item.
      c. Bookmarks: Electronic bookmark of each specification section corresponding to listing in index.

E. Submittal:
   1. Preliminary Copies: Prior to scheduled completion of the project, submit one PDF copy for review by the Architect.
   2. Final Copies: After approval of the preliminary copy, submit one PDF and one bound copy to the Owner.

1.20 RECORD DRAWINGS

A. Prepare record documents in accordance with the requirements of Division 01 Specification Section "Contract Closeout."

B. Label each drawing as "Record Drawing" with Electrical Contractors’ name and date.
C. During construction, maintain an accurate record set of the drawings of the installation on project site at all times; keep this set in a safe location, protected from the environment.

D. Submit one digital file with all drawings in PDF format.

E. Make all notes and revisions on PDF set in red.

F. In addition to the requirements specified in Division 01 and in other Divisions 26 and 27 Specification Sections, indicate installed conditions (locations, sizes, arrangements, etc) for:
   1. Major raceway systems dimensioned from prominent building lines.
   2. Control devices, equipment disconnects, distribution and branch electrical circuitry, and fuse and circuit breakers.
   3. Equipment locations (exposed and concealed) shown to scale and dimensioned from prominent building lines.
   4. Final schedules for panelboards, lighting controls, etc.
   5. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

1.21 TESTING

A. Provide completed start-up forms and checklists.

B. Written verification of testing to be signed by Owner's Representative.

1.22 WARRANTY AND CONTRACTOR'S GUARANTEE

A. All work, material and equipment shall be free of defect, complete and in perfect operating order at time of delivery to Owner.

B. The Contractor shall, without cost to the Owner, correct all defects and failures discovered within one year from date of final acceptance for all electrical and intercom systems, except when in the opinion of the Architect a failure is due to neglect or carelessness of the Owner.
   1. See individual Specification Sections for additional requirements.

C. The guarantee of the Contractor is independent of shorter time limits by any manufacturer of equipment furnished. Submit with Operation and Maintenance Manual all guarantees which exceed one year.

D. The presence of any inspector or observer at any point during construction does not relieve the Contractor from responsibility for defects discovered after completion of the work.

E. Refer to Division 01, 26 and 27 Specification Sections for additional Warranty requirements.
PART 3  EXECUTION

3.1  DOCUMENTATION
A. Additional plan submittals to reviewing authority: If additional drawing submittals are required at any time during construction the Contractor shall submit drawings, review with authority, and pick up subsequent approved drawings. The Engineer will revise and/or prepare drawings for submittal.

3.2  INSTALLATION
A. The Contractor shall conceal all conduit, cabling and boxes in finished areas unless indicated otherwise or granted specific permission by the Architect. Install all conduit and cabling perpendicular to or parallel with building lines wherever possible.
B. In open ceiling areas, all cabling shall be installed in conduit. In front of house (public) areas, conduit shall be painted; color as selected by the Architect.
C. Coordinate the locations of electrical conduit and cabling, equipment and devices with all other trades.

3.3  INSPECTION
A. Do not allow any work to be covered up or enclosed until inspected, tested and approved by the Architect and all authorities having jurisdiction over the work.
B. Should any work be enclosed or covered up before such inspection and testing, the Contractor shall at his own expense uncover said work, and after it has been inspected, tested and approved, make all repairs as necessary to restore all work disturbed by him to its original condition including paying other trades to repair work under their scope that was disturbed.

3.4  FIELD QUALITY CONTROL
A. Conducts tests of equipment, devices, and systems as required by NFPA, BICSI, local Codes and the local AHJ.
   1. Provide a Journeyman Electrician with all tools, instruments, etc required to complete required tests.
   2. Coordinate with the Owner and Architect; tests should be performed in the presence of the Owner and Architect unless given specific permission otherwise in writing.
B. Refer to individual Divisions 26 and 27 Specification Sections for additional requirements.

3.5  CLEANING
A. Clean adjacent surfaces of fire stopping materials.
B. Clean interior and exterior of all equipment. Equipment shall be free of dirt, construction debris, corrosion, etc.

C. Adequate provisions shall be made during construction to eliminate dirt, debris or other material from entering and collecting inside of conduit and equipment. Any collection of material shall be thoroughly cleaned before owner occupancy.

D. Clean exterior of all exposed conduit.

E. Use ESDS Compliant Products: Materials intended for use inside the building envelope, including those used for patching, painting, touch-up, and cleaning, must contain acceptable levels of VOC’s per ESDS requirements and contain no added urea-formaldehyde.

3.6 CUTTING, FITTING, REPAIRING AND PATCHING

A. The Owner shall arrange and pay for all cutting, fitting, repairing, patching and finishing of work necessary for installation of electrical work.

B. Avoid cutting where possible by setting sleeves, frames, etc., and by coordinating for openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for electrical installations.

C. Drill holes required to be cut in floors without breaking out around holes.

3.7 SALVAGE

A. Remove excess conduit and conductors. Remove scrap and all other excess materials from the site.

B. Comply with Owners’s Construction Waste Management Plan. Retain and submit all trip and tip tickets for all construction debris and waste hauling, indicating material content, tonnage, date hauled and facility to where materials were hauled.

3.8 MANUFACTURERS’ FIELD SERVICES

A. Refer to individual Divisions 26 and 27 Specification Sections for requirements.

3.9 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION
SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

PART 1  GENERAL

1.1  SUMMARY

A.  Section Includes:
   1.  Hangers and Supports.
   2.  Vibration and Seismic Controls.
   3.  Firestopping.
   5.  Execution.

1.2  GENERAL REQUIREMENTS:

A.  The Contractor shall retain the services of a third party structural engineer currently licensed in the State of Washington to provide hangers, restraint, support, anchoring and seismic calculations and details for all applicable equipment where required by the AHJ.

B.  The Contractor shall design supports for equipment, devices and raceways capable of supporting the combined weight of the supported systems and their contents. Anchoring, support and seismic restraint systems shall meet the requirements of applicable Codes with local amendments and the requirements of the local AHJ.

C.  Seismic Performance:
   1.  The Contractor shall provide seismic support as required by IBC 1613 with local amendments and the local AHJ.
   2.  Seismic restraint and hangers and supports systems shall meet the seismic performance requirements of Code and the local AHJ.
   3.  The supported equipment and/ or devices will remain in place without any separation and will be fully operational after a seismic event of a strength per Code/ AHJ requirements.

D.  Field Welding shall comply with AWS D1.1/D1.1M and D1.2/D1.2M as applicable.

E.  Obtain permission from Architect before drilling or cutting structural members.

1.3  REQUIREMENTS

A.  Provide major equipment components with manufacturer's name, address, catalog number and capacity indicated on a nameplate, securely affixed in a conspicuous place.

B.  Protect stored material and equipment against weather, corrosion and dirt. Protect installed electrical and intercom systems' components and equipment
against weather damage, corrosion, dirt and construction dust. Seal equipment and conduit where and when necessary to be kept clean and weathertight.

C. Furnish standard and fabricated hangers and supports complete with necessary inserts, bolts, nuts, rods, washers and other accessories.

D. Provide structural work and equipment required for expansion and contraction of conduit. Verify anchors, guides, and expansion joints provide and adequately protect system.

E. Installed hangers, supports and restraints (as applicable) shall have a flame rating of Class 1 and shall be self-extinguishing per ASTM D635 when tested per ASTM 84 requirements unless the requirements of Code or the local Fire Marshal or AHJ are more stringent.

F. Firestop interruptions to fire rated assemblies, materials and components.

G. Firestopping Materials: Provide to achieve fire ratings as noted on architect’s drawings for adjacent construction, but not less than 1 hour fire rating. ASTM and UL.
   1. Ratings may be 3-hours for firestopping in through-penetrations of 4-hour fire rated assemblies unless otherwise required by applicable codes or otherwise indicated on architectural or structural drawings or specifications.
   2. Firestop interruptions to fire rated assemblies, materials, and components.

1.4 SUBMITTALS:

A. Provide product data for each type of product in Part 2 below. Mark on submittals specific equipment and devices intended for installation on product where multiple equipment and/ or devices are shown on a single catalog page. Include rated capacities and furnished specialties and accessories.

B. See Specification Section 26 00 00 “Electrical General Conditions” for additional requirements.

PART 2 PRODUCTS

2.1 HANGERS AND SUPPORTS

A. Manufacturers: Contingent upon meeting requirements of the Project, Code and local AHJ, provide products by one or more of the following:
   1. Allied Tube & Conduit
   2. Cooper B-Line, Inc.
   3. ERICO Global Company; part of Pentair.
   4. O-Z / Gedney; Emerson Electric Co.
   5. Thomas & Betts Corporation.
   6. Unistrut; a part of atkore International.

B. Metallic Slotted Support Systems

2. Channels:
   a. Channels shall be 6063-T6 aluminum alloy.
   b. Channel widths shall be as required for the applicable load criteria and per requirements of Code.

3. Fittings and Accessories shall be 5052-H32 aluminum alloy.

C. Support Devices for Conduit and Cable:
   1. Designed for type and size of conduit / cabling being supported.

D. Support Devices for Conductors in Vertical Conduit:
   1. Designed to adequately support the intended cabling plus safety factors without damaging the insulation or reducing the amount of insulation in the area where the cable is supported.
   2. Body Material: Malleable iron.

E. Fabricated Metal Supports:
   1. Design for weight and dimensions of supported equipment plus safety factor; coordinate with third-party structural engineer as required.
   2. Material: Black, Galvanized Structural Steel per ASTM A36/ A36M. Comply with Section 05 50 00 for steel shapes and plates.

F. Components for Mounting, Anchoring and Attachment:
   1. Manufacturers: Contingent upon meeting requirements of the Project, Code and local AHJ, provide products by one or more of the following:
      a. Cooper B-Line, Inc
      b. Hilti, Inc.
      c. ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      d. MKT Fastening, LLC.
      e. Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
      f. Unistrut; a part of atkore International.
   2. Provide fasteners listed for use in building material where used and with tension, shear and pullout capacities as required to support intended loads.
   3. Coordinate with and receive approval from the Structural Engineer for all locations of Powder-Actuated Fasteners prior to installation.
   4. Provided threaded steel hanger rods.
   5. Concrete Inserts:
      a. Continuous channel slotted support system.
      b. Universal, malleable iron - Type 18, FS WW-H-171.
   6. Provide beam clamps and attachments as required.

2.2 VIBRATION AND SEISMIC CONTROLS

A. Vibration Isolators
   1. Where pad-style vibration isolators are used, arrange pads in a single or multiple layers so as to allow for uniform loading over the entire pad area as per the direction of the Architect. Coordinate dimensions with the equipment to be supported. Pads are to be of a resilient material; exact material to be per the Architect or Acoustic Consultant.
2. For wall-mounted equipment, provide neoprene and steel assemblies intended for use for rigid equipment mountings. Match to type and size of anchorage assemblies used.

B. Seismic Controls
1. Manufacturers: Contingent upon meeting requirements of the Project, Code and local AHJ, provide products by one or more of the following:
   a. Cooper B-Line, Inc
   b. Hilti, Inc
   c. Kinetics Noise Control, Inc
   d. Mason Industries, Inc
   e. Unistrut; a part of atkore International
2. Match equipment seismic control restraints and restraint systems to the type and size of the anchor bolts and studs used. Coordinate with Structural Engineer and General Contractor.

PART 3 EXECUTION

3.1 EXISTING WORK
A. Provide access to existing conduit, equipment and other installations remaining active and requiring access.
B. Extend existing cabling and conductor and conduit installations using materials and methods compatible with existing installations.

3.2 SURFACE PREPARATION
A. Examine areas and equipment for conditions that would affect performance of the Work. Proceed with installation only after unsatisfactory conditions have been addressed.
B. Degrease and clean surfaces of any matter that would affect the bond of paint, adhesives or firestopping material.
C. Remove incompatible materials affecting bond of paint, adhesives or firestopping.
D. Degrease and clean surfaces to receive adhesive for identification materials.
E. Obtain permission from Architect before drilling or cutting structural members.
F. For adhesive anchors, clean holes and prepare per manufacturer’s instructions prior to installation.

3.3 COORDINATION
A. Coordinate the locations of embedded anchors and other connection hardware with equipment attachment points (based on actual equipment to be provided for the project). Locate and avoid the locations of concrete reinforcement, formwork, prestressed tendons, and other embedded items prior to drilling holes.
B. Coordinate the locations of anchors, supports and seismic control assemblies and hardware with equipment mounting points and locations of concrete reinforcement, prestressed tendons, conduit, etc and other embedded items prior to drilling holes. Do not damage existing reinforcing or embedded items.
   1. Notify the Architect immediately if any embedded items are encountered during drilling.

C. Coordinate with the Architect to drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab where required.

3.4 INSTALLATION – CLEARANCE

A. Devices, equipment and control components shall be accessible for inspection, service, repair and replacement.

B. Ensure Code-required clearances are provided at all applicable equipment.

3.5 INSTALLATION – HANGERS AND SUPPORTS

A. Comply with NFPA 70, NECA 1, NECA 101, NECA 102 and NECA 105 for installation and application of hangers and supports for electrical equipment and systems except if requirements in this Section, Manufacturer’s written instructions, Structural Engineer or of the AHJ are stricter.

B. Install hangers, supports, anchors, etc per Code and manufacturer and Structural Engineer’s instructions.

C. Minimum hanger rod size shall be 1/4-inch (6 mm) in diameter.

D. Space supports as required by NFPA 70.

E. Secure raceways and cables with devices approved for the intended use by an agency acceptable to the AHJ. For conduit 1-1/2-inch (38 mm) and smaller above suspended ceilings, spring-steel clamps designed for supporting single conduits without bolts may be used for fastening conduit to trapeze supports.

F. Size and install support assembly components to meet the present and anticipated future loads with appropriate safety factors. Install hanger rod stiffeners where required to prevent the buckling of hanger rods by seismic forces. Coordinate with structural engineer as required.

G. Size and install trapeze-style support systems where used such that conduit / cabling capacity can be increased by at least 25% in the future. Coordinate with structural engineer as required.

H. Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise required by Code or Architectural drawings or specifications.
   1. To Wood: Lag screws or Through Bolts.
   2. To Existing Concrete: Expansion Anchor Fasteners.
   3. To Hollow Masonry: Approved Toggle-type Bolts.
5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M with lock washers and nuts / Beam Clamps (MSS SP-58, Type 19, 21, 23, 25 or 27) complying with MSS SP-69 / Spring Tension Clamps.
6. To Light Steel: Sheet Metal Screws.
7. To Hollow Walls and Nonstructural Building Surfaces: Mount on slotted channel racks attached to substrate per seismic restraint and anchorage requirements and per structural engineer.

I. Use:
   1. Interior Locations: Zinc-coated steel anchors

J. Holes for expansion anchors shall be drilled to avoid the need for reinforcing bars.

K. Protect anchors from damage during installation.

L. Secure raceways and cabling to trapeze supports in a manner approved by the local AHJ.

M. Installation shall allow for the free movement of equipment within its intended normal mode of operation.

N. Install fabricated metal supports per requirements of Specification Section “Metal Fabrications.”

3.6 INSTALLATION – VIBRATION AND SEISMIC CONTROLS

A. Provide hanger rod stiffeners where required by Code, local AHJ or Architect.

B. Install vibration and seismic control assemblies and devices per Code, local AHJ, Manufacturer’s written instructions and Architect.

C. Select and install seismic support assemblies where required to provide adequate strength to carry present and future static and seismic loads within loading limits per the requirements of Code, the local AHJ and the Architect.

D. Install resilient bushing assemblies for wall-mounted equipment.

E. Install resilient, bolt-isolation washers where the clearance between an anchor and the adjacent surface exceeds 0.125 inch (3.2 mm).

F. Unless otherwise required by Code, the local AHJ or the Architect, anchor bracing to structure at flanges of beams, upper truss chords of bar joists, or at concrete members.

G. Install flexible connections in raceway, cable trays, busways, etc where they cross seismic joints, where adjacent sections are supported by different structural elements and where terminating to equipment that is anchored to a different structural element than the one supporting them where they approach said equipment.
H. Installation shall allow for the free movement of equipment within its intended normal mode of operation.

3.7 EXAMINATION AND TESTING

A. Examine anchors and support rough-in work prior to the installation of equipment and raceways to verify actual locations and other conditions potentially affecting the completion of the installation.

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

C. The Contractor shall test at least five of each type and size of installed anchors and fasteners as selected by the Architect to 90 percent of the rated proof load of the device. If any of the test group of the installed anchors and fasteners fail the testing, all others of the same type installed on the project shall also be tested to 90 percent of the rated proof load of the device.

D. Equipment, devices, anchors, hangers, supports, etc will be considered defective if they do not pass tests and inspections.

E. The Contractor shall provide a test and inspection report summarizing all tests and inspections in this Section, the results or said tests and inspections, what actions were taken to correct any unsatisfactory conditions and devices, and retesting results confirming that any originally deficient installations have been corrected.

3.8 PAINTING

A. See Specification Sections 09 91 13 “Exterior Painting” / 09 91 23 “Interior Painting” / 09 96 00 “High Performance Coatings” for requirements.

B. For galvanized surfaces, after cleaning and preparing surface, apply a galvanizing-repair paint per ASTM A780.

END OF SECTION
SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
   A. Section Includes:
      1. Copper building wire rated 600 V or less.
      2. Aluminum building wire rated 600 V or less.
      3. Metal-clad cable, Type MC, rated 600 V or less.
      4. Armored cable, Type AC, rated 600 V or less.
      5. Connectors, splices, and terminations rated 600 V and less.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Product Schedule: Indicate type, use, location, and termination locations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS: Subject to compliance with requirements, provide products by one of the following:
   A. Cerro Wire LLC.
   B. General Cable Corporation.
   C. Southwire Company.

2.2 COPPER BUILDING WIRE
   A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
   B. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.

C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

D. Conductor Insulation:
   1. Type USE-2 and Type SE: Comply with UL 854.
   2. Type THHN and Type THWN-2: Comply with UL 83.
   3. Type UF: Comply with UL 83 and UL 493.
   4. Type XHHW-2: Comply with UL 44.

2.3 ALUMINUM BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn aluminum current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Standards:
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
   2. RoHS compliant.

C. Conductors: Aluminum, complying with ASTM B800 and ASTM B801.

D. Conductor Insulation:
   1. Type USE-2 and Type SE: Comply with UL 854.
   2. Type THHN and Type THWN-2: Comply with UL 83.
   3. Type XHHW-2: Comply with UL 44.

2.4 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Standards:
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
   2. Comply with UL 1569.
   3. RoHS compliant.

C. Circuits:

D. Conductors:
1. Feeders and branch circuits smaller than #4 AWG: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

2. Feeders #4 AWG and Larger: Aluminum, complying with ASTM B 800 and ASTM B 801.

E. Ground Conductor: Bare or insulated.

F. Conductor Insulation:

1. For Copper MC Cable: Type THHN/THWN-2: Comply with UL 83.
2. For Aluminum MC Cable: Type XHHW-2: Comply with UL 44.

G. Armor: Aluminum, interlocked.

H. Jacket: PVC applied over armor.

2.5 ARMORED CABLE, TYPE AC

A. Description: A factory assembly of insulated current-carrying conductors with or without an equipment grounding conductor in an overall metallic sheath.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.

C. Circuits:


D. Conductors:

1. Feeders and branch circuits smaller than #4 AWG: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
2. Feeders #4 AWG and Larger: Aluminum, complying with ASTM B 800 and ASTM B 801.

E. Ground Conductor: Bare or insulated.

F. Conductor Insulation:

1. Type THHN/THWN-2. Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

G. Armor: Aluminum, interlocked.
2.6 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. 3M; Electrical Products Division.
   2. AFC Cable Systems, Inc.
   4. O-Z/Gedney; EGS Electrical Group LLC.
   5. Thomas & Betts Corporation

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

D. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

E. Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN/THWN-2 or Type XHHW-2, single conductors in metallic raceway. For exposed feeders that do not leave the Electrical Rooms and that are not subject to physical damage, the Electrical Contractor may also use Metal-clad cable, Type MC as allowed by Code.
B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2 or Type XHHW-2, single conductors in raceway or Metal-clad cable, Type MC as allowed by Code.

C. Exposed Branch Circuits: Type THHN/THWN-2, single conductors in metallic raceway.

D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC as allowed by Code.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material.

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test feeder conductors for compliance with requirements.

2. Perform each of the following visual and electrical tests:

   a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.

   b. Inspect compression-applied connectors for correct cable match and indentation.

   c. Inspect for correct identification.

   d. Inspect cable jacket and condition.

B. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519
SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS: Subject to Code requirements, provide products by one of the following:

2. ERICO International Corporation.
4. Siemens Industry, Inc.
5. Thomas & Betts Corporation.
2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
   3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
   4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

G. Conduit Hubs: Mechanical type, terminal with threaded hub.

H. Straps: Solid copper, copper lugs. Rated for 600 A.

I. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Grounding Conductors: Green-colored insulation with continuous yellow stripe.
C. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
   1. Feeders and branch circuits.
   2. Receptacle circuits.
   4. Three-phase motor and appliance branch circuits.
   5. Flexible raceway runs.
   6. Armored and metal-clad cable runs.
   7. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

C. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

D. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

C. Grounding system will be considered defective if it does not pass tests and inspections.

END OF SECTION 260526
SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
   A. Section Includes:
      1. Metal conduits and fittings.
      2. Surface raceways.
   B. Related Requirements:
      1. Section 078413 "Penetration Firestopping" for firestopping at conduit and box entrances.

1.3 DEFINITIONS
   A. GRC: Galvanized rigid steel conduit.
   B. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS
   A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS
   A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1. AFC Cable Systems, Inc.
      4. Republic Conduit.
5. Southwire Company
7. Western Tube and Conduit Corporation.
8. Wheatland Tube Company; a division of John Maneely Company.

B. Metal Conduit:
1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. GRC: Comply with ANSI C80.1 and UL 6.
3. IMC: Comply with ANSI C80.6 and UL 1242.
4. EMT: Comply with ANSI C80.3 and UL 797.
5. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

C. Metal Fittings:
1. Comply with NEMA FB 1 and UL 514B.
2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fittings, General: Listed and labeled for type of conduit, location, and use.
5. Fittings for EMT:
   a. Material: Steel.
   b. Type: Setscrew.

6. Expansion Fittings: Match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

D. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements provide products by one of the following:
   1. Cooper B-Line, Inc.
   2. Hoffman; a Pentair company.
   4. Square D; a brand of Schneider Electric.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise required by Code or AHJ, and sized according to NFPA 70.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
D. Wireway Covers: Screw-cover type with tamper resistant screws unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.3 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Manufacturers: Subject to compliance with requirements provide products by one of the following:
   1. Hubbell Incorporated.
   3. Wiremold/ Legrand.

C. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect. Where noted on drawings, provided barried raceways for line- and low- voltage wiring.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Technologies Company; Cooper Crouse-Hinds.
   2. EGS/Appleton Electric.
   3. Hoffman; a Pentair company.
   4. Hubbell Incorporated; Killark Division.
   5. Milbank Manufacturing Co.
   7. O-Z/Gedney; a brand of EGS Electrical Group.
   8. RACO; a Hubbell Company.
   10. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

G. Gangable boxes are allowed.
H. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise required by Code/ AHJ.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

I. Cabinets:

1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
   a. Loading dock.
   b. Parking garage.
   c. Mechanical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in damp or wet locations.

B. Minimum Raceway Size: 1/2-inch (16-mm) trade size.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. EMT: Use setscrew steel fittings. Comply with NEMA FB 2.10.
3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

D. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface raceways only where indicated on Drawings.

3.2 INSTALLATION

A. Comply with requirements in Section 260000 for hangers and supports.

B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.

D. Do not fasten conduits onto the bottom side of a metal deck roof.

E. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

F. Complete raceway installation before starting conductor installation.

G. Arrange stub-ups so curved portions of bends are not visible above finished slab.

H. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

J. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

K. Support conduit within 12 inches (300 mm) of enclosures to which attached.

L. Stub-Ups to Above Recessed Ceilings:

   1. Use EMT for raceways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
M. Threaded Conduit Joints, Exposed to Wet or Damp Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer’s written instructions.

N. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

O. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

P. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

Q. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

R. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

S. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

T. Surface Raceways:
   1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
   2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer’s written instructions. Tape and glue are not acceptable support methods.

U. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

V. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Conduit extending from interior to exterior of building.
   3. Conduit extending into pressurized duct and equipment.
4. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
5. Where otherwise required by NFPA 70.

W. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

X. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RNC and EMT conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
   a. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

Y. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC in damp or wet locations not subject to severe physical damage.

Z. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to bottom of box unless otherwise indicated.

AA. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a watertight connection between box and cover plate or supported equipment and box.

BB. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
CC. Locate boxes so that cover or plate will not span different building finishes.

DD. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

EE. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION 260533
SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
4. Tapes and stencils.
5. Tags.
7. Cable ties.
9. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.
B. Comply with NFPA 70.
D. Comply with ANSI Z535.4 for safety signs and labels.
E. Comply with NFPA 70E requirements for arc-flash warning labels.
F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:
   1. Match existing color scheme being used in building.
   2. Legend: Indicate voltage and circuit(s).

B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Match existing color scheme being used in building.
   1. Color shall be factory applied.

C. Warning Label Colors:
   1. Identify system voltage with black letters on an orange background.

D. Warning labels and signs shall include, but are not limited to, the following legends:
   1. Workspace Clearance Warning: "WARNING - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR XX INCHES." Where XX is the Code required clearance for the specific piece of electrical equipment.

E. Equipment Identification Labels:
   1. Black letters on a white field.

2.3 LABELS

A. Self-Adhesive Wraparound Labels: Preprinted or Write-on, 3-mil- (0.08-mm-) thick, vinyl flexible label with acrylic pressure-sensitive adhesive.
   1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
   2. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
   3. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

B. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
   1. Minimum Nominal Size:
      a. 1-1/2 by 6 inches (37 by 150 mm) for raceway and conductors.
      b. 3-1/2 by 5 inches (76 by 127 mm) for equipment.
      c. As required by authorities having jurisdiction.
2.4 BANDS AND TUBES

A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameters and that stay in place by gripping action.

2.5 SIGNS

A. Laminated Acrylic or Melamine Plastic Signs:
   1. Engraved legend.
   2. Thickness:
      a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.
      b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
      c. Engraved legend with white letters on a black background.
      d. Self-adhesive.
      e. Minimum letter height shall be 3/8 inch (10 mm).

2.6 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
   1. Minimum Width: 3/16 inch (5 mm).
   2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
   3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
   1. Minimum Width: 3/16 inch (5 mm).
   2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
   3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
   1. Minimum Width: 3/16 inch (5 mm).
   2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 7000 psi (48.2 MPa).
   3. UL 94 Flame Rating: 94V-0.
   4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
   5. Color: Black.
2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.


I. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

J. Vinyl Wraparound Labels:
1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

K. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

L. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

M. Self-Adhesive Labels:
   1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
   2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.

N. Laminated Acrylic or Melamine Plastic Signs:
   1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
   2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use labels 2 inches (50 mm) high.

O. Cable Ties: General purpose, for attaching tags, except as listed below:
   1. Outdoors: UV-stabilized nylon.
   2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in pull and junction boxes use vinyl wraparound labels to identify the phase.
   1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

D. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.
1. Apply to exterior of door, cover, or other access.


F. Operating Instruction Signs: Self-adhesive labels.

G. Equipment Identification Labels:
   1. Indoor Equipment: Self-Adhesive label or laminated acrylic or melamine plastic sign.
   2. Equipment to Be Labeled:
      a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved laminated acrylic or melamine label.
      b. Enclosures and electrical cabinets.
      c. Access doors and panels for concealed electrical items.
      d. Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
      e. Enclosed switches.
      f. Enclosed circuit breakers.
      g. Enclosed controllers.
      h. Variable-speed controllers.
      i. Contactors.

END OF SECTION 260553
SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. ATS: Acceptance testing specification.
B. GFCI: Ground-fault circuit interrupter.
C. GFEP: Ground-fault equipment protection.
D. MCCB: Molded-case circuit breaker.
E. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.
   1. Include materials, switching and overcurrent protective devices, accessories, and components indicated.
   2. Include dimensions and manufacturers’ technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details.
   2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
   3. Detail enclosure types including mounting and anchorage, covers and doors, gaskets, hinges, and locks.
   4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of NRTL listing for series rating of installed devices.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA PB 1 and NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

1.9 FIELD CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   a. Ambient Temperature: Not exceeding 104 deg F (plus 40 deg C).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
   1. Ambient temperatures within limits specified.
   2. Altitude not exceeding 6600 feet (2000 m).

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
   1. Notify Owner no fewer than fifteen working days in advance of proposed interruption of electric service.
   2. Do not proceed with interruption of electric service without Owner’s written permission.
   3. Comply with NFPA 70E.

1.10 WARRANTY
A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
   1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DISTRIBUTION PANELS AND PANELBOARDS COMMON REQUIREMENTS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
   1. APP EPIS.
   2. Eaton Corporation; Cutler-Hammer Products.
   4. Square D.

B. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NEMA PB 1.

F. Comply with NFPA 70.

G. Enclosures: Surface-mounted, dead-front cabinets.

   1. Rated for environmental conditions at installed location.

      a. Indoor Dry and Clean Locations: NEMA 250, Type 1.

   2. Height: 84 inches (2.13 m) maximum.

   3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.

   4. Finishes:

      a. Panels and Trim: Factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.

H. Phase, Neutral, and Ground Buses:

   1. Material: Tin-plated aluminum or hard-drawn copper, 98 percent conductivity.

      a. Plating shall run entire length of bus.

      b. Bus shall be fully rated the entire length.

   2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.

   3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.


I. Conductor Connectors: Suitable for use with conductor material and sizes.

   1. Material: Tin-plated aluminum or hard-drawn copper, 98 percent conductivity.

   2. Terminations shall allow use of 75 deg C rated conductors without derating.

   3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.

   4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.

   5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

J. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices. See drawings for quantities.

K. Panelboard Short-Circuit Current Rating: Match existing system. See single-line diagram and field verify.

L. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to local Code requirements.

1. The term "withstand" means "the unit will remain in place and remain in operation without separation of any parts from the device when subjected to the seismic forces specified."

2.2 DISTRIBUTION PANELS

A. Panelboards: NEMA PB 1, distribution type.

B. Mains: As indicated on drawings.

C. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

D. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

E. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

B. Mains: As indicated on drawings.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

D. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.
2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: UL 489, with series-connected rating to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:
   a. Inverse time-current element for low-level overloads.
   b. Instantaneous magnetic trip element for short circuits.
   c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.


3. Electronic Trip Circuit Breakers:
   a. RMS sensing.
   b. Field-replaceable rating plug or electronic trip.
   c. Field-Adjustable Settings:
      1) Instantaneous trip.
      2) Long- and short-time pickup levels.
      3) Long and short time adjustments.
      4) Ground-fault pickup level, time delay, and I squared T response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.

5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).

6. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).


8. MCCB Features and Accessories:
   a. Standard frame sizes, trip ratings, and number of poles.
   b. Breaker handle indicates tripped status.
   c. UL listed for reverse connection without restrictive line or load ratings.
   d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
   e. Application Listing: Appropriate for application.
   f. Multipole units enclosed in a single housing with a single handle or factory assembled to operate as a single unit.
   g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
   h. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.5 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
B. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.

   1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to Code requirements.

D. Equipment Mounting:
   1. Attach panelboard to the vertical finished or structural surface behind the panelboard.

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

F. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.

G. Mount panelboard cabinet plumb and rigid without distortion of box.

H. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

I. Install filler plates in unused spaces.
3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panels with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.
   3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Panelboards will be considered defective if they do not pass tests and inspections.

END OF SECTION 262416
SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section Includes:
   1. Standard-grade receptacles, 125 V, 20 A.
   2. Toggle switches, 120/277 V, 20 A.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS
A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS
A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
B. Comply with NFPA 70.
C. RoHS compliant.
D. Comply with NEMA WD 1.
E. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
   1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with requirements in this Section.

F. Devices for Owner-Furnished Equipment:
   1. Receptacles: Match plug configurations.
   2. Cord and Plug Sets: Match equipment requirements.

G. Device Color:
   1. Wiring Devices Connected to Normal Power System: **As selected by Architect** unless otherwise indicated or required by NFPA 70 or device listing.

H. Wall Plate Color: For plastic covers, match device color.

I. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

   A. Manufacturers: Subject to compliance with requirements, for the following Sections provide products from one of the following:
      1. Cooper Wiring Devices: Division of Cooper Industries, Inc.
      2. Hubbell Incorporated.

   B. Duplex Receptacles, 125 V, 20 A:
      1. Description: Two pole, three wire, and self-grounding.
      2. Configuration: NEMA WD 6, Configuration 5-20R.
      3. Standards: Comply with UL 498 and FS W-C-596.

   C. Weather-Resistant Duplex Receptacle, 125 V, 20 A:
      1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
      2. Configuration: NEMA WD 6, Configuration 5-20R.
      4. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.

2.3 TOGGLE SWITCHES, 120/277 V, 20 A

   A. Manufacturers: Subject to compliance with requirements, for the following Sections provide products from one of the following:
      1. Cooper Wiring Devices: Division of Cooper Industries, Inc.
      2. Hubbell Incorporated.

   B. Single-Pole Switches, 120/277 V, 20 A:
PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes, and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
   1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall comply with NFPA 70, Article 300, without pigtails.
   4. Existing Conductors:
      a. Cut back and pigtail, or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
      c. Pigtailling existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:
   1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
   3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
   4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
   5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 FIELD QUALITY CONTROL

A. Tests for Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault-current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

B. Wiring device will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 262726
SECTION 262813 – FUSES AND ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Cartridge Fuses.
4. Molded-case circuit breakers (MCCBs).
5. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.
B. NO: Normally open.
C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of a nationally recognized testing laboratory (NRTL) listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Data: Certificates, for enclosed switches and circuit breakers, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
      a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: One year(s) from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to Code.
   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with NFPA 70.

2.3 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ABB.
   2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   4. Square D; a brand of Schneider Electric.

B. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Type HD, Heavy Duty, Six Pole, Single Throw, 240-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
E. Type HD, Heavy Duty, Double Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

F. Accessories: Provide accessories as required for specific installation/usage.

2.4 CARTRIDGE FUSES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Bussmann, Inc.
   2. Edison Fuse, Inc.
   3. Ferraz Shawmut, Inc.

B. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.5 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ABB.
   2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   4. Square D; a brand of Schneider Electric.

B. Type GD, General Duty, Three Pole, Single Throw, 240-V ac, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Three Pole, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

E. Type HD, Heavy Duty, Three Pole, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

F. Accessories: Provide accessories as required for specific installation/usage.

2.6 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ABB.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
4. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Any series rated combination used shall be marked on the end-use equipment along with the statement "Caution - Series Rated System. ____Amps Available. Identical Replacement Component Required."

D. MCCBs shall be equipped with a device for locking in the isolated position.

E. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.


H. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
   1. Instantaneous trip.
   2. Long- and short-time pickup levels.
   3. Long- and short-time time adjustments.
   4. Ground-fault pickup level, time delay, and I-squared t response.

I. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

J. Integriered Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.


L. Ground-Fault Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

M. Features and Accessories: Provide features/accessories as required for specific installation/usage. Including but not limited to:
   1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.

2.7 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Wet or Damp, Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 PREPARATION

A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
1. Notify Owner no fewer than fifteen working days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Owner's written permission.
4. Comply with NFPA 70E.
3.3 INSTALLATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NFPA 70 and NECA 1.

3.4 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.

2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:
   a. Inspect physical and mechanical condition.
   b. Inspect anchorage, alignment, grounding, and clearances.
   c. Verify that the unit is clean.
   d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
   e. Verify that fuse sizes and types match the Specifications and Drawings.
   f. Verify that each fuse has adequate mechanical support and contact integrity.
   g. Verify correct phase barrier installation.
   h. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

C. Tests and Inspections for Molded Case Circuit Breakers:

1. Visual and Mechanical Inspection:
   a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify that the unit is clean.
e. Operate the circuit breaker to ensure smooth operation.
f. Inspect operating mechanism, contacts, and chutes in unsealed units.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges.

END OF SECTION 262816
SECTION 26 51 19 - INTERIOR AND EXTERIOR LIGHTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes interior and exterior luminaires, exit signs, and emergency lighting units.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.
B. CRI: Color Rendering Index.
C. Fixture: See "Luminaire."
D. IP: International Protection or Ingress Protection Rating.
E. LED: Light-emitting diode.
F. Lumen: Measured output of lamp and luminaire, or both.
G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Arrange in order of luminaire designation.
   2. Include data on features, accessories, and finishes.
   3. Include physical description and dimensions of luminaires.
   4. Include emergency lighting units, including batteries and chargers.
   5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
   6. For each pole, accessory:
      a. Include data on construction details, profiles, EPA, cable entrances, materials, dimensions, weight, rated design load, and ultimate strength of individual components.
      b. Include finishes for lighting poles and luminaire-supporting devices.
      c. Anchor bolts.
      d. Manufactured pole foundations.
   7. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides" for each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project IES LM-79 and IES LM-80.
a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.
1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
1. Provide a list of all luminaires and lamp types used on Project; use ANSI and manufacturers' codes.
2. Copies of all Manufacturers' Warranties.

1.6 QUALITY ASSURANCE

A. Provide luminaires from a single manufacturer for each luminaire type.

B. Source Limitations: For poles, obtain each color, grade, finish, type, and variety of pole from single source with resources to provide products of consistent quality in appearance and physical properties.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

B. Store poles on decay-resistant skids at least 12 inches (300 mm) above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Retain factory-applied pole wrappings on fiberglass and laminated wood poles until right before pole installation. Handle poles with web fabric straps.

D. Handle wood poles so they will not be damaged. Do not use pointed tools that can indent pole surface more than 1/4 inch (6 mm) deep. Do not apply tools to section of pole to be installed below finished grade.
E. Retain factory-applied pole wrappings on metal poles until right before pole installation. Handle poles with web fabric straps.

1.8 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

C. Warranty Period for Corrosion Resistance: Five years from date of Substantial Completion.

D. Warranty Period for Color Retention: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance:
   1. Luminaires shall withstand the effects of earthquake motions determined according to the requirements of the local AHJ and the Project Structural Engineer.
   2. Foundation and pole shall withstand the effects of earthquake motions determined according to ASCE/SEI 7, the requirements of the local AHJ and the Project Structural Engineer.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers’ mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
   1. Label shall include the following lamp characteristics:
      a. "USE ONLY" and include specific lamp type.
      b. Lamp diameter, shape, size, wattage, and coating.
      c. CCT and CRI.

C. Recessed luminaires shall comply with NEMA LE 4.

D. See Luminaire Schedule in Contract Drawing Set for Luminaire Requirements for each Luminaire Type, Basis of Design manufacturers, Approved Alternate Manufacturers, etc.
2.3 POLE REQUIREMENTS

A. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

B. Grounding and Bonding Lugs: Welded 1/2-inch (13-mm) threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size indicated, and accessible through handhole.

C. Fasteners: Galvanized steel, size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.
   1. Materials: Compatible with poles and standards as well as to substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.

D. Handhole: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches (65 by 130 mm), with cover secured by stainless-steel captive screws

2.4 MATERIALS

A. Metal Parts:
   1. Free of burrs and sharp corners and edges.
   2. Sheet metal components shall be steel unless otherwise indicated.
   3. Form and support to prevent warping and sagging.

B. Steel:
   1. ASTM A36/A36M for carbon structural steel.
   2. ASTM A568/A568M for sheet steel.

C. Stainless Steel:
   1. Manufacturer's standard grade.
   2. Manufacturer's standard type, ASTM A240/240M.

D. Galvanized Steel: ASTM A653/A653M.

E. Aluminum: ASTM B209.

2.5 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.6 LUMINAIRE SUPPORT

A. Comply with requirements in Section 260500 for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
C. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm) or as required by Structural Engineer and local AHJ, whichever is larger.

D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 EXECUTION

3.1 EXAMINATION

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

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

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

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Supports:
   1. Sized and rated for luminaire weight.
   2. Able to maintain luminaire position after cleaning.
   3. Provide support for luminaire without causing deflection of ceiling or wall.
   4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

D. Flush-Mounted Luminaires:
   1. Secured to outlet box.
   2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
   3. Trim ring flush with finished surface.

E. Wall-Mounted Luminaires:
1. Attached to structural members in walls or as per Manufacturer's Instructions and Structural Engineer’s requirements.
2. Do not attach luminaires directly to gypsum board.

F. Suspended Luminaires:
1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

G. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 POLE AND BOLLARD FOUNDATIONS

A. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Structural steel complying with ASTM A36/A36M and hot-dip galvanized according to ASTM A123/A123M; and with top-plate and mounting bolts to match pole-base flange and strength required to support pole, luminaire, and accessories. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

B. Pre-Cast Foundations: Factory fabricated, with structural steel complying with ASTM A36/A36M and hot-dip galvanized according to ASTM A123/A123M; and with top-plate and mounting bolts to match pole-base flange and strength required to support pole, luminaire, and accessories. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

C. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A36/A36M and hot-dip galvanized according to ASTM A123/A123M; and with top-plate and mounting bolts to match pole-base flange and strength required to support pole, luminaire, and accessories.
   1. Baseplate: Stamped with manufacturer's name, date of production, and cable entry.

D. Direct-Buried Foundations: Install to depth required by Structural Engineer. Add backfill as required by Structural Engineer, tamping each layer before adding the next. To ensure a plumb installation, continuously check pole orientation with plumb bob while tamping.

E. Anchor Bolts: Install plumb using manufacturer-supplied template, uniformly spaced.

3.5 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on drawing or required by the Utilities, Code or the AHJ.
1. Fire Hydrants and Water Piping: 60 inches (1520 mm)
2. Water, Gas, Electric, Communications, and Sewer Lines: 10 feet (3 m)
3. Trees: 15 feet (5 m) from tree trunk

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."

D. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level according to pole manufacturer's written instructions.
1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
3. Install base covers unless otherwise indicated.
4. Use a short piece of 1/2-inch (13-mm) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole

E. Poles and Pole Foundations Set in Concrete-Paved Areas: Install poles with a minimum 6-inch- (150-mm-) wide, unpaved gap between the pole or pole foundation and the edge of the adjacent concrete slab. Fill unpaved ring with pea gravel. Insert material to a level 1 inch (25 mm) below top of concrete slab.

F. Raise and set pole using web fabric slings (not chain or cable) at locations indicated by manufacturer.

3.6 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum using insulating fittings or treatment.

B. Steel Conduits: Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50-percent overlap.

3.7 GROUNDING

A. Ground Metal Poles and Support Structures: Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."
1. Install grounding electrode for each pole.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground Nonmetallic Poles and Support Structures: Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."
1. Install grounding electrode for each pole.
2. Install grounding conductor and conductor protector.
3. Ground metallic components of pole accessories and foundation.
3.8 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
   2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
   3. Inspect poles for nicks, mars, dents, scratches, and other damage.

B. Luminaires will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to one visit to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
   1. During adjustment visits, inspect all luminaires. Replace luminaires that are defective.
   2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

END OF SECTION 265119
SECTION 27 00 00 - LOW VOLTAGE SYSTEM GENERAL CONDITIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Conform to General Conditions, Supplementary Conditions, the modifications thereto and Division 01 - General Requirements for all work in Division 26.

1.2 SUMMARY

A. Section Includes:
   1. General Requirements for the Low Voltage Contractor.
   2. System Requirements (functionality requirements, manufacturer, etc) for the Telecom System.

B. Design Intent: The project includes replacement of the existing Telecom/Cable TV system (including all wiring) with a new system per the requirements of this specification. The Telecom System is to be Design-Build; Contract Documents (performance specifications) are meant to provide information (scope, performance requirements, preliminary quantities and locations, etc) for Bidding by Design-Build Contractors only. All final quantities and locations of equipment and devices shall be coordinated with the Architect and Owner prior to the start of construction. The Design-Build Contractors shall design and provide a complete and fully operational and coordinated Telecom System that meets all requirements of the Owner and as per the Project Contract Documents.
   1. See Specification Section 26 00 00 for additional information and requirements.

C. The Contractors shall provide all labor, materials, equipment and devices, supports, etc necessary for satisfactory demolition of the existing intercom system and wiring and the design and installation of a new intercom system in strict accordance with Code requirements and these specifications. Work includes, but is not limited to, that as delineated in the following specification sections:

   26 00 00 ELECTRICAL GENERAL CONDITIONS.

   26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.

D. Related Sections: All Division 01, 26 and 27 Specification Sections included in the Contract Documents.

1.3 CODES AND STANDARDS:

A. All work shall meet or exceed the requirements of the current versions of all applicable Federal, State, and Local Codes and Standards including but not limited to:
   3. International Fire Code (IFC) with Local Amendments.
5. International Mechanical Code (IMC) with Local Amendments.
6. Uniform Plumbing Code (UPC) with Local Amendments.
7. The Americans with Disabilities Act (ADA).
10. Applicable Standards of the following organizations (see subsequent Division 26, 27 and 28 sections for additional information):
   c. Building Industry Consulting Services International (BICSI)
   d. Institute of Electrical and Electronics Engineers (IEEE)
   e. National Electrical Manufacturer’s Association (NEMA)
   f. Underwriter’s Laboratories (UL) standards.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. The existing Cable Television service is the only telecom connection to each building on the site. That service and cabling is to be replaced at every building.

B. The existing telecom cabinets are mounted to the building exterior and are wired from there into each unit. These cabinets are to be repurposed as pull boxes and new service cabling will be pulled to new service terminals inside a new Demarc Room.

C. One existing storage room in each apartment building will be repurposed to become the new Demarc Room for all the apartment units. The contractor will provide new terminal boards, patch panels and cable & conduit running from the Demarc to each tele/data outlet in the units.

D. The Contractor shall coordinate directly with Comcast Cable to provide a complete and functional system between the demark room and the units.

E. Low voltage cabling should not be “daisy-chained” between unit devices, rather each device should have a direct home run to the Demarc room.

1.5 PRODUCT SUBSTITUTIONS

A. Manufacturers and models of equipment and material indicated in Division 27 Specifications are those upon which intercom system’s design is to be based. Manufacturers not listed shall be submitted for approval prior to submission of Bid by the Contractor, see Division 01.

B. Any equipment other than the basis of design is considered a substitution.

C. Pre-Bid Substitutions will be evaluated based on product manufacturer only. Specific product model, specifications, options and accessories will be evaluated during submittals. Approval of a manufacturer substitution does not constitute approval of the submitted product.
D. In selecting substitute equipment, the Contractor is responsible for and shall guarantee equal performance and fit. Cost of redesign and all additional costs incurred to accommodate the substituted equipment shall be borne by the Contractor.

E. Approval of proposed substitution does not grant the Contractor approval for deviation from the contract requirements.

F. Unless indicated otherwise, “or approved equal” may be assumed for all products in Divisions 26 and 27.

1.6 COORDINATION MEETINGS

A. The Low Voltage Contractor shall anticipate two constructability meetings with the owner, architect and Comcast Cable prior to start of work. Additional meetings may be required to ensure work scope can be coordinated and completed within the schedule durations. Provide a line item cost for each additional 2 hour meeting on site.

1.7 DESIGN DRAWINGS

A. The Design-Build Contractor shall submit drawings and diagrams for review and for job coordination:
   1. Construction Drawings for review. These drawings shall be submitted at two milestones as selected by the Architect in electronic PDF format.
      a. The Contractors’ drawings shall match the layout of the Architectural drawings.
      b. The Drawing Sets shall include at a minimum:
         1) Symbols, Legend and drawing list sheets.
         2) Equipment Schedules.
         3) Intercom System floor plan drawings, including demolition drawings.
         4) Intercom System riser diagrams.

1.8 SUBMITTALS

A. Provide one electronic copy of product data submittals for all products associated with the Intercom System and as required for completion of sequence of operations.

B. Provide the Submittals so as not to delay the construction schedule; allow at least two weeks for review of each submittal and re-submittal.

C. Electronic: Submittals shall be complete in one PDF file for each Division with bookmarks for each Specification Section and Principal Category. Multi-file submittals will be returned without review.
   1. First Page: Name of Project, Owner, Location & Contracting Company.
   2. Index Page: List of specification sections and principal categories with contents by Tag or item.
   3. Bookmarks: Electronic bookmark of each specification section and principal category corresponding to listing in index.
D. Clearly indicate on each page the equipment schedule designation (Tag) and/or specification section, as applicable. Indicate selected model and all accessories intended for use.

E. Equipment vendor cover page with contact information shall precede submittal by that vendor.

F. Submitted product information shall include (as applicable) but not be limited to the following information:
   1. Product description.
   2. Manufacturer and model.
   3. Dimensions.
   4. Performance Ratings.
   6. Ratings (i.e. UL, ASTM, NEMA, etc).
   7. Electrical characteristics (Voltage, Phase, Wattage, Breakers, etc).
   8. Engineering technical data.
   10. Accessories.

G. If requested in subsequent Specification Sections or by Architect or Engineer, submit Manufacturer's Installation Instructions on any equipment, procedures, or certifications so requested.

H. Do no ordering, fabrication or manufacturing of products until return of approved submittals.

I. The Contractor agrees to pay for the Engineer’s review cost of the Division 27 Submittals beyond one resubmittal where resubmittals are required due to deficiencies in the Contractor’s Submitted material.

1.9 SHOP DRAWINGS

A. The Contractor shall submit drawings and/or diagrams for review and for job coordination:
   1. Slab plans marked up with all penetrations required for low voltage systems. Sizes of penetrations shall be indicated on the plans and penetration locations shall be dimensioned from major building lines. The Contractor shall submit these slab plans to the Architect for review.
   2. For all special or custom-built items or equipment.
   3. In all cases where deviation from the Contract Documents are contemplated because of job conditions, interference or substitution of equipment, or when requested by the Engineer for purposes of clarification of the Contractor’s intent.
      a. By submission of revised design shop drawings, the Contractor acknowledges that coordination has been done with all other trades to ensure that all equipment fits and remains accessible with all Code required clearances and that no conflicts exist.

B. The Architect’s review of shop drawings shall not relieve the Contractor of the responsibility for deviations from the Contract drawings or specifications, unless he has, in writing, called the attention of the Architect to such deviations at the
time of the submission, nor shall it relieve him from responsibility for errors or omission in such shop drawings.

1.10 QUALITY ASSURANCE

A. The Contractors shall perform all work per current versions of all applicable Codes and Standards with state and local amendments – see “Codes and Standards” paragraph above.

B. All equipment and devices shall be UL-Listed and Labeled and shall be acceptable to the Authority Having Jurisdiction as suitable for the use and location for which they are intended.

C. Equipment furnished for the Intercom System shall be standard devices by a single manufacturer for system compatibility.

D. Firestopping: Conform to International Building Code, local Fire Marshal, and UL for fire resistance ratings and surface burning characteristics.

1.11 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in Divisions 27 Specification Sections with a minimum of three years’ experience.

B. Installer: Company specializing in performing Work included in Divisions 27 on projects of similar type and scale with a minimum of three years’ experience.

1.12 DELIVERY, STORAGE AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. The Contractor shall keep all equipment, devices, conduit, etc in a dry, secured, protected area. The location shall be coordinated with the Architect and Owner prior to the start of Construction. See Division 01 for additional delivery, storage and handling requirements.

C. Where original packaging is insufficient, provide additional protection. Maintain protection in place until installation.

D. Inspect all products and materials for damage prior to installation.

E. Protect conduit from all entry of foreign materials by providing temporary end caps or closures on conduit and fittings.

F. Protect materials and finishes during handling and installation to prevent damage.

G. Comply with manufacturer's installation instruction for rigging, unloading and transporting equipment.
1.13 ENVIRONMENTAL REQUIREMENTS

A. Do not apply fire stopping materials when temperature of substrate material and ambient air is below 60 degrees F. Maintain this minimum temperature before, during, and for minimum 3 days after installation of fire stopping materials.

B. Coordinate with Owner to have ventilation provided in areas to receive solvent cured materials.

1.14 FIELD MEASUREMENTS

A. Verify field measurements prior to ordering all equipment.

B. Verify by field measurements that equipment and devices are compatible with wall construction and layout.

1.15 COORDINATION

A. The Contractor shall visit the site and become familiar with existing conditions affecting work. The Contractor shall include in their Bid the costs for all work and materials required to comply with the requirements of the Contract Documents based on the actual existing conditions. Failure to visit the Site and verify actual existing conditions does not relieve the Contractor of these requirements; no change orders will be paid due to lack of verification of existing conditions whether they are specifically noted in the Contract Documents or not.

B. Existing systems indicated on drawings are in accordance with information furnished to the Architect and may not be complete. Contractor is responsible for locating, uncovering, disposing of or maintaining existing systems.

C. Where the word ‘verify’ is used on the documents, the contractor shall field verify the existing conditions and modify the scope of the installation as required to meet the verified conditions without additional cost to the Owner.

D. Electrical drawings are diagrammatic and do not indicate all possible site conditions. The contractor shall verify all measurements, dimensions and connections on site and coordinate between trades to preclude interferences. The contractor shall provide adjustments as necessary to fit actual conditions.

E. The scale of each drawing is relatively accurate, but the Contractor is warned to obtain the necessary dimensions for any exact takeoffs from the Architect. No additional cost to the Owner will be considered for failure to obtain exact dimensions where not clear or in error on the drawings. Any device or equipment roughed in improperly and not positioned on implied centerlines or as required by good practice shall be repositioned at no cost to the Owner.

F. In the event of a conflict with other trades of work, the following priority from highest to lowest shall be followed: Structural, lighting, HVAC, plumbing/piping and sprinklers. Starting with the lowest priority, the Electrical, HVAC, plumbing, and sprinkler contractors shall provide whatever materials, offsets, labor etc. is required to resolve the conflict.
G. Advise the Architect of any modifications required to suit the equipment furnished. Costs for modifications due to equipment substitution will be borne by the contractor.

H. When discrepancies occur between plans and specifications, the Architect will determine which takes precedence and the Contractor shall perform the selected requirement at no additional cost.

I. Wherever conflicts occur between different parts of the Contract Documents the greater quantity, the better quality, or larger size shall prevail unless the Architect informs the Contractor otherwise in writing.

J. Coordinate wall openings, rough-in locations, and conduit rough-in locations to accommodate Work of Divisions 26 and 27.

K. The Contractor shall coordinate with the Architectural plans and Project structure when locating equipment and devices and routing conduit and cabling.

L. The Contractor shall coordinate with the Owner and provide slab plans marked up with all penetrations required for electrical, fire alarm and low voltage systems. Sizes of penetrations shall be indicated on the plans and penetration locations shall be dimensioned from major building lines. The Contractor shall submit these slab plans to the Architect for review.

M. The Contractor shall coordinate conduit and cabling routing and equipment and device locations with all other trades to ensure all Code required clearances are maintained and equipment and devices remain accessible after the work of all trades is complete.

N. The Contractor shall consult the approved shop drawings of all other trades and crafts to ensure coordination with final locations of cabinetry, counters, appliances, equipment, structural members, etc. Conflicts are to be resolved with the Architect and Owner prior to rough-in. The Contractor shall not be paid for relocation work (including cutting, patching, and finishing) required due to a lack of coordination prior to installation.

O. Prior to the start of Construction, coordinate locations and connection requirements for all line voltage power connections with the Electrical Contractor and Engineer.

1.16 PROJECT CLOSEOUT

A. Completion, submission and approval of the following is required for final project closeout:
   1. Walk through the Project with the Owner and Architect to make note of deficiencies.
   2. Execution of Owner's, Architect's and Engineer's final observation reports (punchlist).
   3. Operating and Maintenance Instructions.
   5. Equipment Cleaning.
   6. Record Drawings.
7. Testing.
8. Warranty.

B. See Divisions 01 Specification Sections for additional requirements.

1.17 OPERATING AND MAINTENANCE INSTRUCTIONAL TRAINING

A. General: In addition to requirements of Division 01, following initial operation of Electrical systems and prior to acceptance by the Architect, perform the following services:

1. At least two weeks prior to each instruction period, give written notification of readiness to proceed to the Architect and Owner, and obtain mutually acceptable dates.

2. Conduct demonstrations and instructions for the Owner's representatives, pointing out requirements for operating, servicing and maintaining equipment and systems. Describe general system operation and specific equipment functions. Cover all equipment and device calibration; systems set up, adjustments and programming; and safeties and alarms.

3. Furnish qualifications of Contractor's personnel in charge of the instruction; foreman position is minimum acceptable. Where equipment startup is performed by supplier's or manufacturer's personnel, those personnel should also provide training on that equipment.

4. During demonstrations and instructions include and reference information from maintenance manuals and contract drawings.

   a. Provide documentation of all instruction which includes:
      1) Date and time of instruction.
      2) Name, affiliation and qualifications of the instructor.
      3) Name and affiliation of the attendees.
      4) Topics, systems, and equipment covered.
      5) Length of instruction.

5. Minimum duration of instruction periods:

   a. Building Intercom System 3 hours

1.18 OPERATING AND MAINTENANCE MANUALS

A. Contents: Furnish, in accord with Division 01, one PDF and one bound copy of operating and maintenance manuals to include the following:

1. The Job name and address.

2. Names, addresses and telephone numbers of the Contractor, subcontractors and local companies responsible for maintenance of each system or piece of equipment.

3. Manufacturers, suppliers, contractor names, addresses and phone numbers.

4. Written guarantees.

5. Warranty service contractors' names, address and phone numbers (if different from above).

6. Copies of approved brochures and Shop Drawings as applicable for all submittal items.

7. Manufacturer's printed operating procedures to include start-up and routine and normal operating instructions; and control, shutdown, and emergency instructions.
8. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; and adjusting instructions.

9. Part numbers of all replaceable items.


11. Record drawings corrected and completed.

12. Completed equipment start-up forms and checklists.

13. Final copy of testing reports.

B. Operation and Maintenance Data:

1. Include spare parts lists for all equipment as applicable.

2. Submit installation instructions, adjustment instructions, and spare parts lists for all equipment.

3. Submit inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

4. Submit manufacturer's descriptive literature, operating instructions, and maintenance and repair data.

C. Binders:

1. Furnish typewritten or printed index and tabbed dividers between principal categories.


3. Imprint on Cover:
   a. Name of Project.
   b. Owner.
   c. Location of project.
   d. Architect.
   e. Contractor.
   f. Year of Completion.

4. Imprint on backing:
   a. Name of Project.
   b. Year of completion.

D. PDFs:

1. Provide PDF with bookmarks for each Specification Section and / or Principal Category.
   a. First Page: Name of Project, Owner, Location & Contracting Company.
   b. Index Page: List of specification sections with contents by Tag or item.
   c. Bookmarks: Electronic bookmark of each specification section corresponding to listing in index.

E. Submittal:

1. Preliminary Copies: Prior to scheduled completion of the project, submit one PDF copy for review by the Architect.

2. Final Copies: After approval of the preliminary copy, submit one PDF and one bound copy to the Owner.
1.19 RECORD DRAWINGS

A. Prepare record documents in accordance with the requirements of Division 01 Specification Section "Contract Closeout."

B. Label each drawing as "Record Drawing" with Low Voltage Contractors’ name and date.

C. During construction, maintain an accurate record set of the drawings of the installation on project site at all times; keep this set in a safe location, protected from the environment.

D. Submit one digital file with all drawings in PDF format.

E. Make all notes and revisions on PDF set in red.

F. In addition to the requirements specified in Division 01 Specification Sections, indicate installed conditions (locations, sizes, arrangements, etc) for:
   1. Major raceway systems dimensioned from prominent building lines.
   2. Equipment locations (exposed and concealed) shown to scale and dimensioned from prominent building lines.
   3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

1.20 TESTING

A. Provide completed start-up forms and checklists.

B. Written verification of testing to be signed by Owner's Representative.

1.21 WARRANTY AND CONTRACTOR'S GUARANTEE

A. All work, material and equipment shall be free of defect, complete and in perfect operating order at time of delivery to Owner.

B. The Contractor shall, without cost to the Owner, correct all defects and failures discovered within one year from date of final acceptance for the Intercom System, except when in the opinion of the Architect a failure is due to neglect or carelessness of the Owner.

C. The guarantee of the Contractor is independent of shorter time limits by any manufacturer of equipment furnished. Submit with Operation and Maintenance Manual all guarantees which exceed one year.

D. The Contractor shall make all necessary control adjustments during first year of operation.

E. The presence of any inspector or observer at any point during construction does not relieve the Contractor from responsibility for defects discovered after completion of the work.

F. Refer to Division 01 Specification Sections for additional Warranty requirements.
3.1 INSTALLATION

A. Wiring should not be “daisy-chained” between units, rather each unit should have a direct home run to the nearest communications room board.

B. The Contractor shall conceal all conduit, cabling and boxes in finished areas unless indicated otherwise or granted specific permission by the Architect. Install all conduit and cabling perpendicular or parallel with building lines wherever possible.

C. In open ceiling areas, all cabling shall be installed in conduit. Conduit shall be painted; color as selected by the Architect.

D. Coordinate the locations of equipment and outlets with all other trades.

3.2 INSPECTION

A. Do not allow any work to be covered up or enclosed until inspected, tested and approved by the Architect and all authorities having jurisdiction over the work (including the electric and telecom utility providers for utility service infrastructure work).

B. Should any work be enclosed or covered up before such inspection and testing, the Contractor shall at his own expense uncover said work, and after it has been inspected, tested and approved, make all repairs as necessary to restore all work disturbed by him to its original condition including paying other trades to repair work under their scope that was disturbed.

3.3 FIELD QUALITY CONTROL

A. The complete system shall be tested to be free of grounds, shorts or open circuits. Operation of the complete system shall be tested and the system left in full operating condition.
   1. Provide a Service Technician with all tools, instruments, etc required to complete required tests.
   2. Coordinate with the Owner and Architect; tests should be performed in the presence of the Owner and Architect unless given specific permission otherwise.

B. The Low Voltage Contractor shall correct all deficiencies found during start-up and/or testing or the Intercom System.

3.4 CLEANING

A. Clean adjacent surfaces of fire stopping materials.

B. Clean interior and exterior of all equipment. Equipment shall be free of dirt, construction debris, corrosion, etc.
C. Adequate provisions shall be made during construction to eliminate dirt, debris or other material from entering and collecting inside of conduit and equipment. Any collection of material shall be thoroughly cleaned before owner occupancy.

D. Clean exterior of all exposed conduit.

E. Use ESDS Compliant Products: Materials intended for use inside the building envelope, including those used for patching, painting, touch-up, and cleaning, must contain acceptable levels of VOC’s and contain no added urea-formaldehyde.

3.5 CUTTING, FITTING, REPAIRING AND PATCHING

A. The Owner shall arrange and pay for all cutting, fitting, repairing, patching and finishing of work necessary for installation of electrical work.

B. Avoid cutting where possible by setting sleeves, frames, etc., and by coordinating for openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for electrical installations.

C. Drill holes required to be cut in floors without breaking out around holes.

3.6 SALVAGE

A. Remove excess conduit and cabling. Remove scrap and all other excess materials from the site.

B. Comply with Owner’s Construction Waste Management Plan. Retain and submit all trip and tip tickets for all construction debris and waste hauling, indicating material content, tonnage, date hauled and facility to where materials were hauled.

3.7 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION
PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work includes but is not limited to the following:
   1. Provide temporary erosion and sedimentation control facilities.
   2. Keep SWPPP updated throughout construction.
   3. Remove site vegetation including all noxious and invasive weeds within areas to be cleared for new construction and as indicated on plans.
   4. Remove curbs, fencing, pavement, and all miscellaneous other items as required to construct new improvements.
   5. Grub and remove materials from below the ground surface within areas to be cleared for new construction.
   6. Dispose of materials off site.
   7. Identify, coordinate with utility Owner, disconnect, cap and remove utilities as required.
   8. Protect from harm any trees, or other objects to remain.
   9. Update Department of Ecology Construction Stormwater General Permit (CSGP) prior to starting construction and provide all compliance actions required to maintain and satisfy DOE CSGP permit coverage and requirements.

1.2 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Project Manual, including but not limited to following:

   Section 01 56 39 - Temporary Tree and Plant Protection
   Section 01 57 00 - Temporary Facilities and Controls
   Section 01 71 23 - Field Engineering
   Section 31 20 00 - Earthwork

1.3 REFERENCES

   WSDOT-APWA  2016 Standard Specifications for Road, Bridge, and Municipal Construction. All references to measurement and payment therein shall be deleted from consideration.


   KCSWDM  King County Surface Water Design Manual

   COS  City of SeaTac standards
1.4 SUBMITTALS

A. Prepare and submit SWPPP to City of Seatac and Department of Ecology (DOE) as required for review, and update DOE Notice of Intent Application with required information regarding On-site Contact Person.

B. Contractor shall provide all monitoring, sampling, testing, reporting, documentation and coordination required by City of Seatac and DOE CSGP permit coverage.

C. Submit manufacturer’s data on all proposed TESC materials. Submit all required documentation to permitting authorities for all proposed TESC processes, equipment and materials.

1.5 DESCRIPTION

A. Design and construct erosion and sedimentation control in accordance with KCSWDM, COS, and DOE requirements, except as modified herein. Clear, strip and grub portions of site to receive improvements. Save and protect from all harm any trees, or other objects to remain. Remove, from area to be cleared, all other growth unless otherwise indicated or directed. Remove existing improvements, including but not limited to utilities, paving, slabs, and walks as indicated on plans and as directed by Architect. Perform work incrementally as necessary to minimize areas of exposed soils and avoid exposure of bare soils to precipitation.

1.6 EXISTING CONDITIONS

A. Protection of Existing Improvements: Provide, erect and maintain barricades, coverings, or other types of protection necessary to prevent damage to existing improvements to remain. Restore any site improvements to remain, including but not limited to landscaping, pavement, walks, structures, fences and utilities, damaged by work of this contract, to their original condition, as acceptable to Owner.

B. Contact utility companies and request meter readings, utility cutoffs, and meter and line removals. Verify that all appropriate services have been disconnected. Contractor shall pay for all fees and costs associated with utility disconnects, capping, line and meter removals.

C. Do not shut off or cap utilities without prior notice. Utilities shall remain in service unless otherwise directed or indicated. Coordinate work with Division 1 requirements. Maintain drains and sewers open for free drainage. Provide all means necessary to prevent damage to existing utilities to remain, including but not limited to monitoring, steel plating, vehicular load restrictions, and any other measures required for preservation and protection.

D. Objectionable Noises: Limit use of air hammers and other noisy equipment. Conform with local governing requirements regarding Noise Control.
E. Maintain vehicular and pedestrian traffic routes:
   1. Do not close or obstruct streets, parking lots, access drives, fire lanes, sidewalks, alleys or passageways without permission from authorities having jurisdiction.
   2. Coordinate with governing authorities and provide alternate routes around closed or obstructed traffic ways.

1.7 DIMENSIONS AND LAYOUT
   
   A. The Contractor shall be responsible for furnishing, setting and marking all line, location and layout stakes.

   B. The Contractor shall be responsible for deriving layout information from an AutoCad file provided to him for this purpose.

PART 2 - PRODUCTS

2.1 EROSION CONTROL PRODUCTS

   A. All products utilized for erosion control shall be in conformance with KCSWDM/DOE and the details in the drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

   A. Verify clearing and grubbing and site improvement removal may safely and appropriately begin.

   B. Obtain required use permits and permission from local governing authorities and Owner prior to commencing work.

3.2 EROSION CONTROL

   A. Contractor shall design, construct, maintain, upgrade and adjust the erosion control system in accordance with the drawings and his operations in order to maintain compliance with all project permits and approvals. Contractor shall pay for all costs associated with the design, construction, maintenance, upgrading and adjustment of the erosion control system throughout project duration.

   B. Contractor shall procure all permits and approvals required for his handling of stormwater discharges from the site during construction. Contractor shall provide all equipment, materials and labor necessary to meet all permit requirements related to construction storm water or groundwater discharge from the site, including but not limited to storage, filtration, pumping, sampling and testing.
C. Contractor shall provide all compliance actions required by DOE and City of Seatac Permit coverage, including but not limited to permit acquisition for Contractor designed systems, monitoring, sampling, testing, reporting, documentation and coordination with City of Seatac and DOE. A qualified Construction Erosion Sediment Control Lead (CESCL) with experience using the DOE online Discharge Monitoring Report form must be assigned to the Contractor's crew for this work and shall be on site at all times when TESC work is being performed, together with all necessary equipment, supplies and instruments related thereto.

D. Access Streets and Roadways: Provide wheel cleaning facilities to clean wheels and undercarriage of trucks before leaving site, as necessary to prevent dirt from being carried onto public streets. If streets are fouled, clean immediately in conformance with AHJ and all governing requirements and regulations.

E. Provide catch basin protection between frame and grate of existing catch basins in and adjacent to work area. Provide catch basin protection between frame and grate of new catch basins and area drains following installation, until site paving is completed.

F. Provide stockpile covering in accordance with Section 312000.

G. Provide temporary cover measures to prevent direct exposure of bare soils to precipitation. Approved cover methods are mulching (straw or wood fiber cellulose), erosion control blankets, clean crushed rock, and hydroseeding. Straw mulch shall be applied uniformly to provide a minimum in place thickness of 3”. Wood fiber cellulose shall be applied uniformly to provide 30 lbs. per 1000 SF.

H. Remove all TESC facilities prior to completion of work and coincident with final stabilization of contributing drainage area served by each facility.

3.3 TREE AND SHRUB PROTECTION

A. The Contractor shall preserve and protect existing trees and vegetation which are outside areas to be cleared or indicated to be protected, per Section 01 56 39 and the tree protection plan.

3.4 CLEARING

A. Remove trees, underbrush, and all vegetation within areas to be cleared as noted. Perform removal operations in a manner to protect adjacent property and improvements to remain.

B. Save and protect trees within tree protection areas. Protect all off-site trees to remain along adjacent roadways and on surrounding properties throughout duration of project construction. Repair/replace damaged trees as required.

3.5 STRIPPING TOPSOIL

A. Strip full depth of topsoil within areas to be cleared.
3.6 GRUBBING

A. General: Grub areas within areas to be cleared.
   1. Excavate and remove all stumps to a depth of 2'-0" below proposed or existing grade, whichever is lower.
   2. Excavate and remove roots larger than 1-1/2 inches in diameter, rocks, boulders, and the like, as well as other objectionable materials to a depth of 2'-0" below proposed or existing grade, whichever is lower.

3.7 SITE IMPROVEMENT REMOVALS

A. Completely remove and dispose of pavement, structures, fences, culverts and other obstructions, unless indicated to be saved. Break up, load, and dispose of pavements. Take care in removing pavement, structures, and all other items that damage does not occur to existing improvements which are to remain in place. Make a neat vertical saw cut at the boundaries of all areas to be removed. Sawcut all concrete walk removals at the next adjacent score line or joint. Replace adjacent materials designated to remain that are damaged due to Contractor's operations at no additional cost to the Owner.

B. At locations to receive paving, remove underground structures to a depth of 2 feet below existing or final grade, whichever is lower. At locations to receive planting, remove underground materials other than soil to a depth 3 feet below existing or final grade, whichever is lower.

C. Slabs and underground structures to be abandoned in place shall be fully fractured into a suitable number of pieces to allow for water passage to underlying materials and prevent hydrostatic buildup above the slab.

D. Sprinkle excavated material and access roads as necessary to limit dust to lowest practicable level. Do not use water to extent causing flooding, contaminated runoff or icing.

E. Remove all underground piping and utility structures designated for removal. All piping to be abandoned in place shall be fully plugged with cement concrete at each end, to a distance of 3’ from the pipe end.
   1. Repair damage to existing utilities to remain at Contractor's expense.
   2. In the event the Contractor encounters utility lines not shown on the site plan or otherwise indicated to be saved, removed or abandoned, the location of such lines shall be marked in the field and the Architect/Engineer notified.
   3. Contractor shall secure all permits and provide all measures required for working with and disposing of Asbestos Concrete Pipe, in accordance with all applicable laws and regulations.
3.8 DRAINAGE

A. Keep on site and off site drainage systems open for drainage at all times. Mud/sediment build-up shall be removed and not flushed into the downstream system. If sediment is discharged to on site or offsite drainage systems, such systems shall be cleaned of all debris and sediment.

B. Keep open pits and holes caused as a result of demolition work free of standing water.

3.9 FILLING DEPRESSIONS

A. Fill depressions caused by clearing, grubbing, demolition and utility removal operations with compacted imported structural fill material unless further excavation or earthwork is indicated. Imported structural fill material shall be placed and compacted in accordance with Section 31 20 00.

3.10 DISPOSAL OF MATERIALS

A. Dispose of material off site in a manner consistent with all government regulations. In no case shall material be left on the project site, shoved onto abutting private properties, or be buried in embankments or trenches on the project site. Do not deposit debris in any stream or body of water, or in any street or alley, or upon any private property except by written consent of the private property owner. Maintain hauling routes clean and free of any debris resulting from work of this Section.

END OF SECTION 311000
SECTION 31 11 00
TREE REMOVAL, CLEARING & GRUBBING

PART 1 GENERAL

1.1 SUMMARY
A. This Section includes specifications for clearing, grubbing, and disposing of vegetation, brush, stumps, roots, rubbish, refuse, trash, and debris within the indicated site limits. This work shall also include the preservation from injury or defacement of all vegetation and objects designated to remain.

B. Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work:
   1. Section 01 56 39 - Temporary Tree, Plant, and Soil Protection
   2. Section 31 00 00 – Site Preparation

PART 2 PRODUCTS

2.1 MATERIALS & EQUIPMENT
A. Furnish materials, tools, equipment, facilities, and services as required for performing tree removal, clearing, grubbing.

PART 3 EXECUTION

3.1 PREPARATION
A. Prior to any tree removal or clearing and grubbing, attend an on-site meeting with the Owner to review requirements for salvage of logs and arborist woodchips and review the location, limits, and methods to be used before clearing work. Perform clearing and grubbing in compliance with all local, state, and federal laws and requirements pertaining to clearing and grubbing.

B. Note that logs may be salvaged from trees to be removed and used, if the materials meet the specification and upon Owner’s approval, for logs called out in the plans. Salvaged logs to be Douglas Fir, meet the dimensions shown in the plans, and be de-limbed with sharp protrusions sanded down. Propose a location on-site for salvaged materials, to be approved by the Owner.

C. Note that Arborist Woodchip Mulch (see Section 32 93 00 Landscape Planting for definition) may be salvaged and used, if the materials meet the specification and upon Owner’s approval, for planting area mulch, temporary tree protection and mulch paths called out in the plans. Propose a location on-site for salvaged materials, to be approved by the Owner.

D. Except for salvaged materials to be re-used, dispose of cleared, grubbed, and removed material away from the site. Burying and burning of materials at the site is not permitted. Stockpile salvaged material in a secured location.

E. Clear and restore areas used for the Contractor’s convenience; restore areas to original condition providing planting soil, mulching, seeding, and planting as required.
F. Protect survey markers and monuments, existing improvements, and adjacent properties from removal and damage.

G. Protect all trees, lawns, and planted areas that are not in direct conflict with the work shown on the Contract Documents. Restore all on-surface disturbed areas to a condition satisfactory to the Engineer.

H. Care of Existing Trees: Protect trees and plants indicated in the Contract Documents to remain and to be preserved as specified in Section 01 56 39 - Temporary Tree & Plant Protection.

3.2 TREE REMOVAL, CLEARING AND GRUBBING

A. Clear the site within the limits indicated on the drawings, move salvaged materials to approved location, and remove cleared materials and debris from the site.

1. Trees shall be felled and removed in such a manner as to avoid injury to other trees or other objects designated to remain.

2. Clearing: Shall include the cutting and removal of all trees, shrubs, groundcovers, brush and other designated unwanted growth and the removal and disposal of logs, rubbish piles, refuse, and other objectionable or unwanted matter.

3. Invasive plants such as English Ivy shall be removed as completely as possible, including roots, from the entire site.

4. Grubbing/Stump Grinding: Shall include the removal of all stumps, roots and other objectionable or unwanted matter, lying wholly or in part below the surface of the ground to a minimum depth of 3 feet below grade.

3.3 DISTURBANCE

In case of injury to the bark, limbs or roots of vegetation designated to remain, the Contractor shall repair such damage by corrective pruning or other methods, to be approved by the Owner. Low hanging branches and unsound or unsightly branches on trees or shrubs designated to remain shall be removed as directed. All trimming shall be done by an ISA Certified Arborist and in accordance with good tree surgery practices.

3.4 DEMOLITION/REMOVAL

A. Coordinate the work of this Section with the work of Section 02 41 00, Demolition, as required to remove existing pavements, curbs, structures, and site improvements which interfere with new construction and where demolition is not indicated.

3.5 DISPOSAL OF CLEARED VEGETATION, GRUBBED MATERIAL AND WASTE

A. Dispose of in a safe, acceptable manner, in accordance with applicable laws and ordinances.

1. Do not bury or burn trash and/or debris on the site.

2. Remove cleared vegetation, grubbed material and waste from the site at frequent intervals so that its presence will not delay the progress of the Work or cause hazardous conditions for workers and the public.

3. Removed materials, waste, trash, and debris shall become the property of the Contractor. Remove such materials from the Site and dispose of in a
legal manner. It is the responsibility of the Contractor to locate disposal sites and determine length of haul route.

B. Backfill: Backfill excavations resulting from work under this Section in accordance with applicable requirements of Section 31 00 00 – Earthwork.

END OF SECTION
SECTION 31 20 00
EARTHWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work includes but is not limited to the following:
   1. Accomplishing indicated and required excavation, filling, backfilling, compaction, subgrade preparation, rough and finish grading, and all other earthwork above design subgrades.
   2. Providing Removal of Unsuitable Soil below design subgrade as required and in accordance with this Section and Section 012200.
   3. Providing Imported Structural Fill below design subgrade as required and in accordance with this Section and Section 012200.
   4. Providing gravel surfacing and capillary break material.
   5. Providing required imported materials.
   6. Utility and utility structure trenching, excavation, bedding and backfilling.
   7. Removing materials from the site which are either:
      a. not approved for reuse
      b. in excess of that required.
   8. Coordinating earthwork operations and requirements with other work of the project.

1.2 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Specifications, including but not limited to following:

   Section 01 56 39 – Temporary Tree and Plant Protection
   Section 01 57 00 - Temporary Facilities and Controls
   Section 01 71 23 - Field Engineering
   Section 31 10 00 – Site Preparation
   Section 32 93 00 – Landscape Planting

1.3 REFERENCES

   WSDOT-APWA 2016 Standard Specifications for Road, Bridge, and Municipal Construction. All references to measurement and payment therein shall be deleted from consideration.

   ASTM D1557 Methods of Test for Moisture-Density Relations of Soils, Using 10 lb (4.5 kg) Rammer and 18 In. (457 mm) Drop


1.4 SUBMITTALS

A. Product information for all imported materials to be used shall be submitted 30 days in advance of use. Information shall identify the supplier of the imported material, and shall comprise of a certified gradation curve from an established testing agency demonstrating compliance with the specified gradation. Testing for compliance shall have been performed no more than 4 months prior to the date of submittal.

1.5 QUALITY ASSURANCE

A. Testing for benefit of Owner:
   1. Owner’s Geotechnical Engineer will take samples and perform moisture content, gradation, compaction, and density tests during placement of fill and backfill materials to check compliance with these Specifications, for the benefit of the Owner.
   2. The Contractor shall remove material at locations designated by the Geotechnical Engineer and provide such assistance as necessary for sampling and testing.
   3. The Geotechnical Engineer may direct the Contractor to construct inspection trenches in compacted or consolidated materials to determine that the Contractor has complied with these Specifications.
   4. Tests will be made by an outside Testing Agency for the following items, but not limited to:
      a. Moisture content - ASTM D3017
      b. Gradation - ASTM C136, ASTM D422
      c. Density in-place - ASTM D2922, or equivalent.
      d. Moisture-density relationships - ASTM D1557

B. Contractor shall be responsible for performing any and all testing necessary for his verification of proper compaction.
1.6 DEFINITIONS

A. Compaction: The degree of compaction is specified as percent compaction. Maximum or relative densities refer to dry soil densities obtainable at optimum moisture content.

B. Excavation slope: Defined as an inclined surface formed by removing material from below existing grade.

C. Fill slope: Defined as an inclined surface formed by placement of material above existing grade.

D. Unsuitable soil: Unsuitable soil is defined as soil not meeting the requirements for structural fill per paragraph 2.1 of this Section. Structural fill material which is outside the range of optimum soil moisture content at the time of excavation shall not be considered unsuitable soil.

E. Design Subgrade: The following shall define the design subgrade:
   1. Areas of proposed fill: The elevation of existing grade (following clearing, grubbing and stripping operations).
   2. Foundations and Footings: The elevation of existing grade (following clearing, grubbing and stripping operations), or the bottom of the foundation or footing, whichever is lower.
   3. Building Slab on Grade: The elevation of existing grade (following clearing, grubbing and stripping operations), or the bottom of the imported structural fill subbase under the slab on grade, whichever is lower.
   4. Walkways and Paving: The elevation of existing grade (following clearing, grubbing and stripping operations) or the bottom of the imported materials comprising the paving section, whichever is lower.
   5. Utility Trenches and structures: The elevation of existing grade (following clearing, grubbing and stripping operations), or the bottom of the utility/structure bedding material (or bottom of structure if not bedded), whichever is lower.
   6. Landscaped Areas: The elevation of existing grade (following clearing, grubbing and stripping operations), or the bottom of the proposed improvement section, whichever is lower.

F. Utility: In-ground facilities for provision of utilities, including but not limited to storm drainage, potable water, irrigation, sanitary sewer, plumbing, gas and electrical improvements, piping, conduits, raceways, structures, handholes and vaults.

1.7 BASE BID WORK

A. Include in Base Bid the cost of achieving the design subgrades and finish grades defined by the Contract Documents, beginning with the existing conditions. Base Bid work shall comprise all work related to subgrade preparation as well as all work above design subgrade and the catch slope surfaces extending there from, including but not limited to excavation, moisture conditioning and other soil preparation, segregating, stockpiling, protecting, filling, backfilling, import of
materials, hauling, removal of unsuitable material, removal of excess and non approved material, and disposal.

1. The Contractor shall be responsible for preparing on site material for reuse, including but not limited to segregating, moisture conditioning, amending and treating, or shall remove such material. Such removed material shall be replaced with imported structural fill.

2. The Contractor will be responsible for removing material, including previously approved material, that is deemed not approved at the intended time of use. Such removed material shall be replaced with imported structural fill.

1.8 DIMENSIONS AND LAYOUT

A. All layout shall be provided by the Contractor. See Paragraph 311000 - 1.7.

B. The Contractor is responsible for preserving all benchmarks and stakes and the replacement of any that are displaced or missing.

C. The Contractor is responsible for review of all records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all utilities damaged as a result of the Contractor’s operations at its own expense.

D. The Contractor is to notify the Engineer immediately of underground utilities encountered, which are not shown on the plans.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: All materials shall be naturally occurring. No recycled materials shall be allowed.

B. Material for making fills shall be suitable on site material or imported structural fill.

C. Bedding material for utilities other than gas, electrical and communications shall be crushed surfacing top course per WSDOT/APWA Section 9-03.9(3), unless noted as controlled density fill (CDF). Where required, CDF shall have a 28 day compressive strength of 50 psi.

D. Bedding material for gas, electrical and communications shall be Class 2 fine aggregate per WSDOT/APWA Section 9-03.1(2).

E. Material for utility trench backfill shall be imported structural fill.

F. Material for utility structure backfill shall be imported structural fill.
G. Suitable on site material: Excavated on site granular soils cleaned of organic and deleterious materials and rocks or clumps greater than 6 inches in overall dimension. Moisture content of suitable on site material at the time of placement shall be such that the specified compaction can be readily attained.

1. On site material is extremely moisture sensitive and may be over optimum moisture at the time of excavation. The Contractor shall be responsible for preparing on site material for reuse, including but not limited to segregating, moisture conditioning and amending, or shall remove such material. Such removed material shall be replaced with imported structural fill.

2. On site material suitability will be influenced by the weather conditions and the Contractor’s handling and protection of the material. The Contractor will be responsible for removing material, including previously approved material, that is deemed unsuitable at the intended time of reuse and replacing with suitable imported structural fill.

H. Imported structural fill: Clean, naturally occurring, granular, well-graded sand and gravel materials from offsite sources, free of organic or recycled material, debris and other deleterious material. Imported structural fill shall conform to the following gradation requirements:

<table>
<thead>
<tr>
<th>U.S. Standard</th>
<th>Percent Passing by Dry Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sieve Size</td>
<td></td>
</tr>
<tr>
<td>3 inch</td>
<td>100</td>
</tr>
<tr>
<td>3/4 inch</td>
<td>50 - 100</td>
</tr>
<tr>
<td>No. 4</td>
<td>25 - 65</td>
</tr>
<tr>
<td>No. 10</td>
<td>10 - 50</td>
</tr>
<tr>
<td>No. 40</td>
<td>0 - 20</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 – 5</td>
</tr>
</tbody>
</table>

I. Capillary Break Material: Crushed or partially crushed granular stone and/or rock material conforming to the following gradation:

<table>
<thead>
<tr>
<th>U.S. Standard</th>
<th>Percent Passing by Dry Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sieve Size</td>
<td></td>
</tr>
<tr>
<td>3/4 inch</td>
<td>100</td>
</tr>
<tr>
<td>1/2 inch</td>
<td>45 - 80</td>
</tr>
<tr>
<td>No. 4</td>
<td>0 - 10</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 – 2</td>
</tr>
</tbody>
</table>

PART 3 EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENT CONTROL

A. All work shall conform to the Contract Documents and applicable permits.
3.2 PROTECTION OF EXISTING FACILITIES

A. Utilities: The Contractor shall protect from damage private and public utilities in accordance with 1-07.17 of WSDOT-APWA, except subsections 1-07.17(1) and 1-07.17(2) shall not apply.

B. Pavement: The Contractor shall protect from damage all pavement, paved or graveled areas intended to remain.

C. Access Streets and Roadways: Provide and maintain wheel cleaning stations to clean wheels and undercarriage of trucks before leaving site, as necessary to prevent dirt from being carried onto public streets. If streets are fouled, they must be cleaned immediately in conformance with KCHA, COS, and all governing requirements and regulations.

D. Repair and/or replacement of damaged facilities will be accomplished at the Contractor's expense.

3.3 EXCAVATION, FILL AND BACKFILL

A. General:
1. Provide excavation of whatever nature required for construction of the work; verify character, quality, and disposition of material to be excavated prior to commencing. Blasting will not be permitted.
2. Contractor shall design, provide, maintain, upgrade and adjust dewatering systems as required to keep excavations free from water. Contractor shall obtain all permits and approvals required for his groundwater discharges to storm water and sanitary sewer systems during construction. Contractor shall provide for all requirements related to such discharges, including but not limited to storage, filtration, pumping, sampling, testing and reporting to AHJ.
3. At the time of placement, fill and backfill material placed shall be within 2% of the material's optimum moisture content.
4. The Contractor shall be responsible for preparing on site material for reuse, including but not limited to segregating, moisture conditioning, amending and treating, or shall remove such material. Such removed material shall be replaced with imported structural fill.
5. The Contractor will be responsible for removing material (including previously approved material) that is deemed not approved at the intended time of use. Such removed material shall be replaced with imported structural fill.
B. Trench Excavation:
1. Excavation and preparation of the trench shall be in accordance with Section 7-08.3(1) of WSDOT-APWA
2. Grade and smooth bottoms of trenches to furnish uniform bearing and support for pipelines; remove rocks and similar material causing point bearings.
3. Form bell holes and depressions for joints after grading of bottom. Limit such depressions to lengths, depths, and widths required for particular type of joint.
4. Excavate to depths allowing for required bedding.

C. Catch basins, manholes, vaults and other utility structures
1. Excavate to furnish a minimum of 12 inches between sides of excavation and outer surfaces of structure. Take care to excavate to exact depths required; fill low areas with compacted imported structural fill.
2. Provide minimum 4” thick compacted base of CSTC under structure.

D. Foundations and Footings:
1. Grade and smooth subgrade to furnish uniform bearing and support; remove rocks and similar material causing point bearings.
2. Where bottom of foundation/footing is above bearing stratum, remove material below bottom of foundation/footing down to bearing stratum. Width of removal shall extend laterally from the sides of the foundation/footing a distance equal to the depth of the removal below the foundation/footing.
3. Where bottom of foundation/footing is below bearing stratum, remove existing material to a depth of 1 ft below bottom of foundation/footing and replace with imported structural fill.

E. Fill and Backfill:
1. All areas that are to receive fill or backfill shall be observed by the Engineer prior to the placement of any material. Where existing slopes exceed 25%, fill shall be keyed and benched into the existing slope. Horizontal width of each bench cut shall be a minimum of four feet into native soil and vertical depth of each bench cut shall be a minimum of two feet into native soil.
2. Fill and backfill material shall be placed and compacted in accordance with Paragraph 3.7 of this Section.
3. Bedding for Utilities: Properly place material in trenches. Do not disturb sides of trenches. Compact and shape material to conform to the utility being installed to ensure continuous firm bedding for full length of utility.

3.4 SUBGRADE PREPARATION

A. Beneath pavement and structures: Design subgrade surfaces shall be scarified to a depth of at least twelve inches, unless noted otherwise. The scarified soil shall be moisture-conditioned to attain soil moisture content necessary for required compaction. The scarified soil shall be compacted to 95% relative compaction per Paragraph 3.7 of this section. Prepared subgrades shall be proof rolled with a loaded dump truck or heavy compactor to verify proper density.
B. Beneath landscaped areas: Per Section 329300.

C. Control grading to prevent flow of water into subgrade areas.

D. Protect and maintain subgrades and repair any deficient subgrades prior to placing any materials on subgrade surfaces.

3.5 STABILIZATION OF EXCAVATIONS AND TRENCHES

A. The Contractor shall exercise sound engineering and construction practices for excavations and trenches and maintain them so that no damage will occur to any foundation, structure, pole line, pipe line, utility, paving or other facility because of sloughs or slopes, or from any other cause. If, as a result of the excavation or trenching, there is disturbance of the ground which may endanger such facilities or other property, or require repair, the Contractor shall take remedial action at no expense to the Owner.

B. The Contractor shall provide dewatering, shoring, and any other types of stabilization, in addition to the shoring required for safety by State codes, as required to maintain the integrity of the trench or excavation and protect nearby existing utilities and structures. All earthwork shall conform to the Washington Administrative Code (WAC) 296-155 requirements for Excavation, Trenching, and Shoring. If the Contractor elects to provide stabilization by open pit excavation or flatter side slopes, no additional compensation will be made for the work including excavation, imported backfill material, backfilling, and protection and restoration of existing facilities.

C. Provide, erect and maintain temporary support systems for existing utilities to remain during excavation work, or remove and replace utility and provide temporary bypassing during outage. Support systems shall allow affected utility to remain in service during excavation and backfill work, and shall prevent any movement of utility.

3.6 SITE GRADING

A. Should indicated elevations or figures conflict with proposed improvements, notify Engineer immediately for direction. Grade to within 1/20 foot of specified elevations.

B. Control grading to prevent flow of water into excavated areas and ponding.

C. Remove all concrete, rocks, rubble and debris larger than 1 inch on a side from surface of paving areas.

D. Grade to slopes indicated by proposed contours and elevations, and to provide positive drainage to storm drainage and/or TESC facilities. Localized low spots and rises will not be allowed except as indicated. Provide slope rounding and uniform transitions between areas of different slopes.
E. Protect and maintain finished surfaces. Allow no heavy objects to be moved over finish grade surfaces. Repair any ruts or holes in finished surfaces, and any obstructions to positive drainage. Repair areas showing settlement.

3.7 COMPACTION

A. Water settling or jetting will not be permitted as a means of compaction, unless noted otherwise. Compaction shall be achieved with power operated tampers, rollers, idlers, or vibratory equipment, except as follows:
   1. Use pneumatic hand tampers for trenches and areas not accessible to heavy equipment.

B. Material type, maximum uncompacted layer depth, relative compaction, and general application are specified in Table A below. Relative compaction is defined as the ratio of the in-place soil dry density to the maximum dry density as determined by the ASTM D1557-78 test method.

TABLE A

<table>
<thead>
<tr>
<th>Max. Uncompacted Layer Depth (in.)</th>
<th>Min. relative compaction (%)</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>95</td>
<td>Footing subgrade</td>
</tr>
<tr>
<td>8</td>
<td>95</td>
<td>Footing bearing pads</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>Footing and stemwall backfill</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>Slab-on-grade floor subgrade and subbase</td>
</tr>
<tr>
<td>8</td>
<td>95</td>
<td>Retaining wall subgrade</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>Retaining wall backfill</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>Concrete sidewalk subgrade</td>
</tr>
<tr>
<td>8</td>
<td>95</td>
<td>Asphalt pavement subgrade (upper 2 feet)</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>Utility trench backfill (more than 2’ below finish subgrade elevation)</td>
</tr>
<tr>
<td>8</td>
<td>95</td>
<td>Utility trench backfill (less than 2’ below finish subgrade elevation)</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>General site filling</td>
</tr>
</tbody>
</table>

3.8 HAULING AND STOCKPILING

A. Hauling and traffic patterns:
   1. When hauling is done over highways or city streets, the loads shall be trimmed and the vehicle shelf areas shall be cleaned after each loading. The loads shall be watered after trimming to minimize dust.
   2. Limit traffic patterns on site to areas which have been armored or otherwise protected to preserve the stability of the exposed soil and prevent erosion and sediment suspension in runoff from said areas.
B. Stockpiling:
   1. All stockpiles shall be covered. Proposed stockpile locations shall be coordinated with Owner. Submit stockpiling plan for approval and as accepted by Owner indicating locations and dimensions of proposed stockpiles, and obtain Owner approval prior to construction of stockpiles.
   2. Stockpiles shall be constructed in accordance with KCSWDM/COS and WAC requirements. Side slopes shall be appropriate for the material to prevent sloughing, erosion, or instability.
   3. Stockpile covering shall consist of plastic sheeting. Staked sandbags or other means shall be provided to secure stockpile covering to surface of stockpile and prevent exposure of stockpiled materials to the elements, contamination with moisture, and erosion of stockpile materials.

3.9 FIELD QUALITY CONTROL

A. Conduct in-place field density tests on the compacted material to check for adequate moisture content and the required relative compaction. Where less than the required relative compaction is achieved, the soil shall be removed and replaced or the soil shall be moisture-conditioned and additional compactive effort applied as necessary until the relative compaction as specified in 3.7 of this Section is attained.

3.10 REMOVAL OF MATERIALS

A. Remove all material in excess of that required and all material not approved for use, and legally dispose of off site.

END OF SECTION 312000
SECTION 32 12 00
ASPHALT PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work includes but is not limited to the following:
   1. Furnishing and placing crushed surfacing.
   2. Furnishing and placing asphalt concrete pavement.
   3. Pavement patching.
   4. Grind and overlay of existing pavement surfaces.

B. Work shall be in accordance with WSDOT-APWA Section 5-04, except as modified herein.

1.2 RELATED SECTIONS

A. Coordinate related requirements specified in other parts of the Specifications, including but not limited to following:

   Section 31 10 00 - Site Preparation
   Section 31 20 00 - Earthwork

1.3 REFERENCES

WSDOT-APWA 2016 Standard Specifications for Road, Bridge, and Municipal Construction. All references to measurement and payment therein shall be deleted from consideration.

COS City of Seatac Standards

ASTM D1557 Methods of Test for Moisture-Density Relations of Soils, Using 10 lb (4.5 kg) Rammer and 18 In. (457 mm) Drop


APAW Designs and Specifications for Asphalt Concrete Pavements and Bases, 1990 Edition


1.4 SYSTEM DESCRIPTION

A. New ACP shall consist of multiple courses of plant mixed asphalt concrete placed on crushed surfacing in accordance with these Specifications and in conformity with the lines, grades, thicknesses, and typical cross-sections shown in the plans or established by the Engineer.
1.5 SUBMITTALS

A. Submit Certificates: Furnish certification that all materials comply with Specification requirements; include laboratory test reports verifying compliance.
   1. Mixing plant to be member of Asphalt Paving Association of Washington (APAW) and approved by Engineer.
   2. Certified test results that meet WSDOT-APWA.

1.6 PROJECT SITE CONDITIONS

A. Environmental Requirements:
   1. In accordance with referenced standard specifications and the following:
      a. Do not paving in rain or when subgrade or base is wet or frozen.
      b. Do not apply tack coats when temperature is below 50 degrees F. or when base is wet.
      c. Apply asphalt concrete paving only when temperature is above 40 degrees and when base is dry.

1.7 WARRANTY

A. Work correction is to include aggregate separation, soft spots, and excess porosity.

B. Repair cracks; repair unsatisfactory elevation irregularities immediately upon notification; replace any paving not draining properly.

1.8 DIMENSIONS AND LAYOUT

A. All layout shall be provided by the Contractor. See Paragraph 31 10 00 - 1.7.

B. The Contractor is responsible for preserving all benchmarks and stakes and the replacement of any that are displaced or missing.

C. The Contractor is responsible for review of all records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all utilities damaged as a result of the Contractor’s operations at its own expense.

D. The Contractor is to notify the Engineer immediately of underground utilities encountered, which are not shown on the plans.
PART 2 PRODUCTS

2.1 GENERAL

A. Comply with "Quality Control" provisions, "References", Specifications, and Manufacturer's data. Where these may be in conflict, the more stringent requirements govern.

2.2 CRUSHED SURFACING

A. Crushed surfacing top course shall meet all requirements of WSDOT-APWA Section 9-03.9(3).
B. Crushed surfacing base course shall meet all requirements of WSDOT-APWA Section 9-03.9(3).

2.3 TACK COAT

A. Tack coat for paving joints shall be a diluted emulsion, type SS-1, SS-1h, CSS-1 or CSS-1h, with equal parts of water.

2.4 ASPHALT CONCRETE

A. Aggregate shall be Class 3/8” conforming to Section 9-03.8 of WSDOT-APWA except no recycled materials shall be allowed. Asphalt binder shall be PG 64-22, and shall comply with Section 9-02 of WSDOT-APWA. Asphalt concrete mixing and proportioning shall comply with Section 5-04 and 9-03.8 of WSDOT-APWA.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes your acceptance of conditions as satisfactory.

3.2 PREPARATION

A. Protect surrounding areas and surfaces to preclude damage from work of this Section.
   1. Protect work of other trades. Take special care in work adjacent to buildings.
   2. Should any defacement or damage occur, repair or replace as directed.
   3. Where new pavement is to abut existing concrete or asphalt pavement, the existing pavement shall be sawcut to provide a neat and straight edge at the joint.
   4. Allow new pavement surfaces to cure for a period of not less than 30 days before application of marking materials. Thoroughly clean all surfaces to be marked before application of the paint. Remove dust, dirt
and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water or a combination of the methods as required. Completely remove rubber deposits, surface laitance, and other coating adhering to the pavement with scrapers, wire brushes, sandblasting, approved chemicals or mechanical abrasion as directed.

B. Preparation of Asphalt Patches:
   1. Where existing asphalt concrete pavement is required to be removed due to trenching, the area shall be uniformly defined in size and shape. The existing asphalt shall be removed by sawcutting pavement vertically at a sufficient distance of at least 6 inches outside the undisturbed base surface, and then the affected pavement shall be broken up and removed.

C. Preparation of existing surfaces:
   1. Existing paved surfaces to receive new ACP shall be prepared in accordance with WSDOT-APWA Sec. 5-04.3(5)A, and all cracks shall be sealed.
   2. Planing of existing ACP shall be in accordance with WSDOT-APWA Sec. Section 5-04.3(14).

D. Subgrade shall be prepared in accordance with Section 31 20 00

E. Traffic Control: Traffic Control shall be provided in accordance with AHJ requirements and the Manual on Uniform Traffic Control Devices.

3.3 CRUSHED SURFACING

A. Placement of crushed surfacing shall comply with Section 4-04 of WSDOT-APWA. Degree of compaction shall be a minimum of 95 percent of maximum dry density as determined in accordance with ASTM D2922.

B. Prior to asphalt concrete placement the prepared surface shall be treated in accordance with Section 5-04.3 of WSDOT-APWA.

3.4 TACK COAT

A. A tack coat shall be applied to all existing pavement surfaces to be abutted with new asphaltic pavement. Tack coat shall be applied at a rate of 0.05 to 0.15 gal/sy. No tack coat shall be placed when the surface temperature of the pavement is below 50 degrees F or when rain is imminent.
3.5 ASPHALT CONCRETE

A. Placement of asphalt shall be in accordance with Section 5-04 of WSDOT-APWA. Spreading, finishing and compaction shall be in accordance with Sections 5-04.3(9) and 5-04.3(10), except maximum lift depth shall be 2 inches.

B. Joints shall be constructed in accordance with WSDOT Sec. 5-04.3(12). Surface smoothness shall be in accordance with Section 5-04.3(13). Paving shall be accomplished in accordance with the weather limitations outlined in Section 5-04.3(16).

C. Placement of the final lift of ACP in areas of overlay and full section paving shall be coordinated to provide a uniform final surface with no joints at interface of overlay and full section pavement areas.

D. Sampling and testing of asphalt concrete shall be in accordance with WSDOT Sec. 5-04.3(8).

3.6 CLEANING

A. After completion of paving operations, clean surfaces of excess or spilled asphaltic materials. Do not permit vehicular traffic on asphaltic paving until it has cooled and hardened, and in no case sooner than six (6) hours after placing.

B. Provide barricades and warning devices as required and in accordance with WSDOT/APWA, MUTCD, and AHJ requirements.

END OF SECTION 321000
SECTION 32 14 00  
CEMENT CONCRETE PAVEMENT  

PART 1 - GENERAL 

1.1 SECTION INCLUDES 

A. Work includes but is not limited to the following:  
   1. Provide Portland Cement Concrete Pavement and base course on a 
      prepared subgrade at the locations shown on the project drawings.  

B. Work shall be in accordance with WSDOT-APWA Section 5-05, except as 
   modified herein.  

1.2 RELATED SECTIONS 

A. Coordinate related work specified in other parts of the Project Manual, including 
   but not limited to the following:  

   Section 31 20 00 - Earthwork  
   Section 32 16 00 – Curbs and Sidewalks  

1.3 REFERENCES  

   WSDOT-APWA  
   2016 Standard Specifications for Road, Bridge, and Municipal 
   Construction. All references to measurement and payment 
   therein shall be deleted from consideration.  

   ASTM D1557  
   Methods of Test for Moisture-Density Relations of Soils, Using 10 
   lb (4.5 kg) Rammer and 18 In. (457 mm) Drop  

   ASTM D2922  
   Standard Test Methods for Density of Soil and Soil-Aggregate in 
   Place by Nuclear Methods. 

   MUTCD  

1.4 SUBMITTALS  

A. Submit Certificates: Furnish certification in accordance with Section 00710 that 
   all materials comply with Specification requirements; include laboratory test 
   reports verifying compliance. 
   1. Certified test results (no more than 6 months old at the time of submittal) 
      that meet WSDOT-APWA.  

B. Submit scoring and joint layout plan for new concrete pavement to Architect for 
   review and approval. Drawing shall indicate direction for broom finish and type(s) 
   of joints. Obtain approval prior to beginning construction of concrete pavement.
1.5 DIMENSIONS AND LAYOUT

A. All layout shall be provided by the Contractor. See Paragraph 311000 - 1.7.

B. The Contractor is responsible for preserving all benchmarks and stakes and the replacement of any that are displaced or missing.

C. The Contractor is responsible for review of all records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all utilities damaged as a result of the Contractor’s operations at its own expense.

D. The Contractor is to notify the Engineer immediately of underground utilities encountered, which are not shown on the plans.

PART 2 - PRODUCTS

2.1 CEMENT CONCRETE

A. Materials for cement concrete shall conform to WSDOT/APWA Section 5-05.2.

B. Cement concrete for pavement shall be air entrained concrete Class 4000 conforming to the requirements of WSDOT-APWA Section 8-06. Coarse aggregate shall be AASHTO No.57.

2.2 REINFORCING BARS

A. Reinforcing bars shall be epoxy coated, and shall conform to WSDOT/APWA Section 9-07.5 and 9-07.6.

PART 3 - EXECUTION

3.1 GENERAL

A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes Contractor’s acceptance of conditions as satisfactory.

B. Protect surrounding areas and surfaces to preclude damage from work of this Section.
   1. Protect work of other trades. Take special care in work adjacent to buildings.
   2. Should any defacement or damage occur, repair or replace as directed.

C. Provide barricades and warning devices as required by AHJ and in accordance with the current Manual on Uniform Traffic Control Devices.

D. Develop joint layout plan for new concrete pavement and submit to Architect for review and approval. Obtain approval prior to beginning construction of concrete pavement.
3.2 SUBGRADE PREPARATION
   A. Field preparation of subgrade shall conform to Section 312000

3.3 CEMENT CONCRETE PAVEMENT
   A. Install cement concrete pavement in accordance with WSDOT/APWA Section 5-05.3, except as noted.
   B. Concrete pavement finishes shall be per the details in the Landscape Architectural drawings.

3.4 CONCRETE PAVEMENT JOINTS
   A. Joints in concrete pavement shall be as indicated on the plans.

3.5 FIELD QUALITY CONTROL
   A. Take one set of 3 cylinders each day or each 100 cubic yards of concrete placed, whichever is greater, in accordance with ASTM C31.
   B. Test cylinders in accordance with ASTM C39.

3.6 CLEANING
   A. Leave premises clean and free of residue of work of this Section.

END OF SECTION 321400
PART 1 GENERAL

1.1 SUMMARY

A. Section includes: Work includes but is not limited to pavers as shown on Landscape plans.

B. The Contractor/Installer shall examine the site to determine existing conditions, extent of work and clearing operations required.

C. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

D. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

E. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

F. RELATED SECTIONS
   1. Section 31 10 00 — Site Preparation
   2. Section 31 20 00 — Earthwork
   3. Section 32 14 00 - Cement Concrete Paving
   4. Section 32 16 00 — Curbs and Sidewalks

1.2 REFERENCES

A. Materials must conform to the following ASTM and CSA Standards:
   1. ASTM 150: CSA A5 - Specification for Portland Cement
   2. ASTM C33: CSA A23.1 - Specification for Normal Weight Aggregates
   3. ASTM C979: Specification for Pigments
   4. ASTM C140: CSA A231.1 - 98 Specification for Compressive Strength
   5. CSA A231.1 – 98: Specification for Flexural Strength
   7. CSA A231.1 – 98: Specification for Freeze/ Thaw
1.3 SUBMITTALS

A. Shop Drawings, Product Data and Samples: Submit per section 01 33 00 and the following:
   1. Shop drawings indicating required sizes, dimensions and layout include height relationships.
   2. Product samples:
      a. Two matched samples shall be used to determine the color and texture, one to be retained by Architect and the other by the manufacturer, to ensure the correct paver is provided to the project.
      b. One each of leveler examples incorporated in the work.
   3. Product data: Manufacturer's literature and specifications.

1.4 QUALITY ASSURANCE

A. Installer qualifications: To be "specialist" as defined per section 01 10 00
B. Regulatory requirements: See referenced Codes, ordinances, and the like per section 01 06 00.
C. The manufacturer is to be prequalified by the specifier, with the manufacturer having a minimum of 5 years experience in precast concrete pavers.

1.5 DELIVERY, STORAGE, AND HANDLING

A. In accordance with section 01 60 00 and the following:
   1. Delivery of materials: Complete and whole slab units unbroken and free of chips.
   2. Storage: Store in protected location from possible damage.
   3. Handling: Handle in manner avoiding chipping and breakage.

1.6 PROJECT SITE CONDITIONS

A. Fluid applied waterproofing complete with slopes to drains.

1.7 SEQUENCING/SCHEDULING

A. Phase in properly with Architect reviewed/accepted Progress Schedule per section 01 32 16.

1.8 WARRANTY

A. Provide a manufacturer's warranty ensuring material specification compliance.
PART 2 PRODUCTS

2.1 GENERAL QUALIFICATIONS

A. Comply with “Quality Assurance” provisions, “References”, specifications, and manufacturer’s data. Where these may be in conflict, the more stringent requirements govern.

2.2 ACCEPTABLE MANUFACTURERS

A. Paver products as manufactured by Mutual Materials - Langley, British Columbia, Canada: 800-477-7137

2.3 PRODUCTS

A. Precast Pavers: Precast paving units of uniform size and thickness unless indicated otherwise.
   2. Standard Size: 18" x 18" - others cut to required size as necessary
   4. Installation: over 1" leveling course of sand over 4" thick bedding compacted 5/8" minus crushed gravel over subgrade compacted to 95%.
   6. Location: mailboxes and along curb at carport.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify installation conditions as satisfactory to receive work of this section. Do not install until any unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory. Notify Architect for instructions if adverse conditions are encountered.

3.2 PREPARATION

A. Determine and verify starting point based on layout and finish elevation.
B. Establish support elevations and grid lines conforming to drawings

3.3 INSTALLATION

A. Detailed aspects of installation to conform to manufacturer’s recommendations.
B. Install paver installation completely to true and level surface except where slope required for adaptation to entrances or other predetermined levels.

3.4 CLEANING

A. Leave premises clean and free of residue of work of this section.

3.5 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. See section 01 50 05.
SECTION 32 16 00
CURBS AND SIDEWALKS

1.1 SECTION INCLUDES
A. Work includes but is not limited to the following:
   1. Provide cement concrete curbs and cement concrete sidewalks.
   2. Provide crushed surfacing top course under sidewalks.

1.2 RELATED SECTIONS
A. Coordinate related work specified in other parts of the Specifications, including but not limited to following:
   - Section 31 20 00 - Earthwork
   - Section 32 12 00 - Asphalt Paving
   - Section 32 14 00 – Concrete Paving

1.3 REFERENCES
WSDOT-APWA 2016 Standard Specifications for Road, Bridge, and Municipal Construction. All references to measurement and payment therein shall be deleted from consideration.


COS City of Seatac Standards

1.4 SUBMITTALS
A. Submit Certificates: Furnish certification in accordance with Section 00710 that all materials comply with Specification requirements; include laboratory test reports verifying compliance.
   1. Certified test results (no more than 6 months old at the time of submittal) that meet WSDOT-APWA.

B. Submit scoring and joint layout plan for new concrete sidewalks to Architect for review and approval. Drawing shall indicate direction for broom finish and type(s) of joints. Obtain approval prior to beginning construction of concrete curbs or sidewalks.

1.5 DIMENSIONS AND LAYOUT
A. All layout shall be provided by the Contractor. See Paragraph 311000 - 1.7.

B. The Contractor is responsible for preserving all benchmarks and stakes and the replacement of any that are displaced or missing.
C. The Contractor is responsible for review of all records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all utilities damaged as a result of the Contractor’s operations at its own expense.

D. The Contractor is to notify the Engineer immediately of underground utilities encountered, which are not shown on the plans.

PART 2 PRODUCTS

2.1 CEMENT CONCRETE

A. Cement concrete for curbs and walks shall be air entrained concrete Class 3000 conforming to the requirements of WSDOT-APWA Section 6-02. Portland cement, aggregates, joint filler and curing materials shall conform to Section 8-14.2 of WSDOT-APWA.

2.2 FIBRE JOINT MATERIAL

A. Fibre joint material shall be as manufactured by WR Meadows, or approved equivalent.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes your acceptance of conditions as satisfactory.

1. Verify proper compaction of subgrade per Section 31 20 00.

2. Verify existing dimensions and shapes. Conform to existing where applicable.

3.2 INSTALLATION

A. Install concrete curbs in accordance with plan drawings and WSDOT/APWA Sec. 8-04.3(1). Provide expansion joints at 10 foot spacing. Perform the work in a manner which results in a curb constructed to specified line and grade, uniform in appearance and structurally sound. Remove curbs found with unsightly bulges, ridges or other defects and replaced at Contractor’s expense if Owner’s representative considers them irreparable. When checked with a 10-foot straightedge, grade shall not deviate more than 1/8 inch, and alignment shall not vary more than 1/4 inch. Curb repairs shall match existing grades.

B. Install cement concrete sidewalks and walkways in accordance with the plan drawings and WSDOT-APWA Section 8-14. Provide joints as indicated on site. Install walkways flush with adjacent walks at connection points. Grade breaks in walks shall be constructed with smooth transitions, except at connections to specified landing areas. Smooth transitions shall be achieved via vertical curves.
C. Spread the concrete for walks uniformly between the forms and compact thoroughly with a steel shod strikeboard. In construction of expansion (through) joints, adequately support the premolded joint filler until the concrete is placed on both sides of the joint.

D. Whenever castings are located in the sidewalk area, install joints at the casting location to control cracking of the sidewalk. If spacing of joints or scoring is such that installation of joint materials would be unsuitable, install rebar to strengthen the sidewalk section.

E. After the concrete has been thoroughly compacted and leveled, float with wood floats and finish at the proper time with a metal float.

F. Finish and score walks as indicated. Refer to landscape drawings and specifications for concrete walkway finish and scoring.

3.3 CLEANING

A. Leave premises clean and free of residue of work of this Section.

END OF SECTION 321600
PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work includes but is not limited to following:
   1. Furnishing and installing required symbols and striping on asphalt surfaces.
   2. Providing, maintaining and removing temporary pavement markings and traffic controls and barricades.
   3. Providing parking control signs and other signage as indicated.

1.2 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Project Manual, including but not limited to following:
   Section 321200 - Asphalt Paving

1.3 REFERENCES

WSDOT-APWA 2016 Standard Specifications for Road, Bridge, and Municipal Construction. All references to measurement and payment therein shall be deleted from consideration.

COS City of Seatac Standards


Federal Specification TT-P-115, Traffic Paint

1.4 SAMPLING AND TESTING

A. Store materials proposed for use on the project site in sealed and labeled containers, or segregate at source of supply, sufficiently in advance of needs. Clearly identify materials by designated name, specification number, batch number, intended use and quantity formulation number, project contract number, intended use, and quantity involved. At the discretion of the Engineer, material may be approved for use based on the following data furnished by the Contractor.
   1. A test report showing that the proposed batch meets all specified requirements.
1.5 TEMPORARY TRAFFIC CONTROLS

A. Place suitable warning signs for alerting approaching traffic. Place traffic cones or markers along newly painted lines to control traffic and prevent damage to newly painted surfaces.

1.6 SUBMITTALS

A. Submit Certificates: Furnish certification in accordance with Section 00710 that all materials comply with Specification requirements; include laboratory test reports verifying compliance.

B. Submit dimensioned shop drawings of all signs.

PART 2 - PRODUCTS

2.1 TRAFFIC PAINT

A. Deliver and store paint in sealed containers that plainly show the designated name, formulation, or specification number, batch number, color, date of manufacture, manufacturer's name, formulation number and directions, all of which shall be printed legibly at time of use. The paint shall be homogeneous, easily stirred to a smooth consistency, and shall show no hard settlement or other objectionable characteristics.

B. Paint for permanent pavement marking shall conform to Federal Specification TT-P-1952B, color: as required.

2.2 SIGNS

A. Signs shall be manufactured of sheet aluminum meeting requirements of WSDOT/APWA Section 9-28.8. All signs shall have rounded corners.

B. Sign messages and colors shall be in accordance with WSDOT/APWA Section 9-28.6 and 9-28.7.

2.3 TEMPORARY PAVEMENT MARKINGS

A. Pavement markings for temporary delineations shall consist of reflective tape to establish required delineations, including, but not limited to, crosswalks, stop bars and turn arrows. Temporary pavement markings and temporary reflective tape shall be the same color as the lane line, centerline, or pavement marking the markers/tape replace.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes your acceptance of conditions as satisfactory.

3.2 PREPARATION

A. Allow new pavement surfaces to cure for a period of not less than 30 days before application of marking materials. Thoroughly clean all surfaces to be marked before application of the paint. Remove dust, dirt and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water or a combination of the methods as required. Completely remove rubber deposits, surface laitance, and other coating adhering to the pavement with scrapers, wire brushes, sandblasting, approved chemicals or mechanical abrasion as directed.

3.3 TEMPORARY DELINEATION

A. Whenever the work requires temporary reroutes of traffic, temporary or permanent pavement delineation shall be in place prior to opening the traveled way to public traffic. Lane line and centerline pavement delineation shall be provided at all times for traveled ways open to public traffic. In addition, crosswalks, stop bars, and pavement arrows shall be delineated prior to opening the area to traffic. The Contractor shall ensure that the appropriate striping and pavement markings are in place at all times to ensure safe traffic and pedestrian movement.

B. Temporary striping and pavement markings shall be installed to replace any existing striping and marking which have been removed, and to establish temporary routes of travel and parking stall markings.

C. Temporary pavement delineation shall be maintained until replaced with permanent pavement delineation. Temporary pavement delineation shall be removed as soon as the permanent pavement delineation is placed. When temporary pavement delineation is required to be removed, all lines and marks used to establish the alignment of the temporary pavement delineation shall be removed.

3.4 APPLICATION

A. **Two applications of paint will be required to complete all on site paint markings.** Apply paint evenly to the pavement surface to be coated at the rate of 105, plus or minus 5, square feet per gallon. Apply paint to clean, dry surfaces, and unless otherwise approved, only when air and pavement temperatures are above 50 degrees F and less than 95 degrees. Maintain paint temperature within these same limits. Apply paint pneumatically with approved equipment.

The Contractor shall provide guide lines and templates as necessary to control
paint application. Take special precautions in marking letters and symbols. Sharply outline edges of marking. The maximum drying time requirement of the paint specifications shall be strictly enforced, to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. Discontinue painting operations if there is a deficiency in drying of the marking, until cause of the slow drying is determined and corrected.

3.6 SIGN INSTALLATION

A. Install signs at locations as shown on plans. Coordinate with adjacent improvements.

3.8 CLEANING

A. Leave premises clean and free of residue of work of this Section.

END OF SECTION 321700
PART 1 – GENERAL

1.1 SUMMARY:

A. Furnish all labor, materials, and equipment required to construct Fencing and Gate(s) System(s) as indicated on the drawings or specified herein. Said work shall include any incidentals required to provide a finished job.

B. The Contractor/Installer shall examine the site to determine existing conditions, extent of work and clearing operations required.

C. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

D. It is a specific requirement of this Section that non-toxic and low-VOC products be used for this project, and that all interior paints, coatings, adhesives and sealants meet specified requirements. Refer to Section 01 81 15 & 01 81 19.

E. Design and performance criteria for this Section regarding health, safety and durability shall take precedence over sustainable design criteria. The Contractor shall inform the Owner and Architect of any conflicts that may result between the noted recycled content and the strength of the materials.

F. Related Sections:
   A. Section 03 30 00 - Cast in Place Concrete
   B. Section 31 00 00 - Earthwork

1.4 QUALITY ASSURANCE:

A. The Contractor/Installer must be experienced in chain link fencing installations. The Contractor shall provide three representative local fencing projects that have been completed by them within the last three years for the Owner's review.

B. The Contractor/Installer shall provide a warranty stating that the fencing is secure and stable, tight, corrosion-free, in proper alignment, complete in detail and finish, and free of hazardous conditions. Any defects that develop within one year from the date of Physical Completion shall be replaced at the expense of the Contractor/Installer.

C. Standard Specifications: All work shall conform to all applicable requirements of the following Specifications, whether specifically referred to or not, except as specifically modified herein.
   1. Comply with the requirements of the American Society for Testing and Materials (ASTM) especially the ASTM Committee F-14 Standards on Fences (latest edition).
2. Perform all shop and field welding in accordance with the pertinent recommendations of the American Welding Society.
4. ASTM A 392.
5. ASTM F 626-89a.
6. ASTM F 668-88

1.5 SUBMITTALS:
A. The Contractor shall make all product submittals and submit Shop Drawings, for approval, prior to manufacturing, describing and detailing typical line post, terminal post, gate, fabric, materials, hardware assemblies, and all proposed fence/gate alignment sections in accordance with Division 01 Specifications.
B. The Contractor shall provide certified letters from manufacturers indicating conformance with specifications, manufacturing date and lot number for all materials used on the site.

1.6 SUBSTITUTIONS AND PRODUCT OPTIONS:
A. During bidding, all bidders shall bid on the specified products.
B. Refer to Division 1 for information about substitutions.

1.7 PRODUCT HANDLING:
All materials shall be new and delivered to the site in an undamaged condition. Store materials off the ground and protect from damage. In the event of damage, immediately make repairs and/or replace as necessary to the approval of the Owner and at no additional cost to the Owner.

PART 2 - MATERIALS

2.1 GENERAL:
A. All piping for fence and gates shall be Schedule 40 steel, powder coated black, or approved equal, for size, finish, material composition, strength, appearance, performance and ease of maintainability.

2.2 CHAIN LINK FENCE FABRIC:
Chain link fabric shall be constructed of woven 9-guage for fencing & gates. All fabric shall be W & M steel wire in a continuous 2 inch mesh. Mesh shall be galvanized at Trash Enclosures & vinyl coated black to match existing at locations identified on Landscape drawings. Fabric shall not be hot-dipped galvanized after weaving, per ASTM A-392. Fabric shall be installed on playing side of posts and outside of enclosure gates. Lower edge of fabric shall be no greater than 1-1/2" above finished grade.

2.03 FENCING & GATES:
All system components shall be galvanized steel at Trash Enclosures and powder-coated black to match existing at locations identified on Landscape drawings. Sizes shall be as specified in the following table for perimeter fencing and backstop and wing fencing.

For Galvanized Site Fencing & Gates:

<table>
<thead>
<tr>
<th>Type</th>
<th>4' Ht.</th>
<th>6' - 8' Ht.</th>
<th>10' Ht.</th>
<th>&gt;10'Ht.</th>
<th>20' or Higher</th>
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<tr>
<td>Bottom Rails</td>
<td>N/A³</td>
<td>N/A³</td>
<td>1-5/8&quot; O.D.</td>
<td>1-5/8&quot; O.D.</td>
<td>1-5/8&quot; O.D.</td>
</tr>
<tr>
<td>Post Footing Size for</td>
<td>12” W</td>
<td>12” W</td>
<td>18” W</td>
<td>18” W</td>
<td>24” W</td>
</tr>
<tr>
<td>Terminal / Corner Posts</td>
<td>30” D</td>
<td>36” D</td>
<td>36” D</td>
<td>48” D</td>
<td>60” D</td>
</tr>
<tr>
<td>Post Footing Size for Line</td>
<td>12” W</td>
<td>12” W</td>
<td>18” W</td>
<td>18” W</td>
<td>24” W</td>
</tr>
<tr>
<td>Posts</td>
<td>24” D</td>
<td>36” D</td>
<td>36” D</td>
<td>48” D</td>
<td>48” D</td>
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<td>Fabric, Mesh Size</td>
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<td>9-gauge</td>
<td>9-gauge</td>
<td>9-gauge</td>
<td>9-gauge</td>
</tr>
</tbody>
</table>

¹ All >6' Chain Link Enclosure Gates shall have an intermediate rail.

2.04 GATES AND GATE POSTS:

A. General: Gateposts, frames, and hardware shall be galvanized, as noted, for framework. All fittings shall be powder coated black. Gate frames shall be powder coated after welding. Gate fabric shall match fencing fabric. Gates shall maintain a gap no greater than two (2) inches between gateposts and frames or ground.

B. Gates:

1. Gate Posts: Shall be 6” inches O.D. (min.) schedule 40 steel pipes filled with concrete (or larger, depending upon the size of the gate opening).

2. Gate Frames: Shall be 1-7/8 inch O.D. steel pipe with joints knotted and welded to form a rigid frame. Frames shall be filled with same fabric as fence and fastened in the frame by means of tension bars and tension bands at 1 foot O.C.
3. Diagonal Bracing: Shall be 3/8-inch O.D. adjustable truss rod to ensure frame rigidity without sag or twist.

4. Hinges: Shall be pressed steel to suit gate size, non-lift-off type, offset to permit 180-degree gate opening. Provide 2 hinges for each leaf. Drill, tap, and set screw or weld to frame and post to prevent rotation. Hinges shall be Bulldog Industrial hinge, or approved equal.

5. Chain Link Enclosure Gate Latches: For each set of two leaves, provide heavy-duty gate fork latch of correct size malleable iron to permit operation from either side of gate, with padlock eye as integral part of latch on right leaf. Provide heavy-duty cane bolt, minimum of 24” length with stainless steel receiver set into asphalt paving on left leaf.

2.5 FITTINGS:

Fittings shall be galvanized steel. All fittings shall be industrial quality.

2.6 ACCESSORIES:

A. Post tops shall be pressed steel and designed as a weather tight closure cap for tubular posts.

B. Tension bars shall be of one piece lengths equal to full height of fabric with a minimum cross section of 3/16” x 3/4”. Provide a tension bar for each gate, end post, corner and pull posts.

C. Tension bar bands (vinyl or powder coated), shall be pressed steel per ASTM F 626-89a spaced not over 12 inches O.C. to secure tension bars to end, corner, pull, and gate posts.

D. Tension Wire: Contractor shall provide a No. 7 W & M gauge vinyl coated black high carbon coiled tension wire (when bottom rail is not specified) stretched along the bottom of fabric and fastened to the fabric at intervals of not more than two feet (2’) using steel hog rings. Tension wire shall be attached with brace band, and nut and bolt. Tension wire shall be terminated around the bolt to itself with a minimum of three complete wraps.

E. Wire Ties: 9-guage aluminum wire ties, spaced at 12 inches O.C. (typ.). Tie fabric to tension wire with 9 gauge hog rings at 18 inches O.C. (typ.).

2.7 CONCRETE FOOTINGS:

Refer to Section 2.03 above for dimensions of all concrete post footings. Concrete for post footings shall conform to the City of Seattle Standard Specifications for Road, Bridge, and Municipal Construction (most recent edition), and shall be Class “C” concrete. Concrete footings shall be neatly and evenly crowned slightly above finished grades and all concrete shall be cleaned from all posts.

PART 3 - EXECUTION

3.1 SITE PREPARATION:
A. Pre-construction on-site conference: Do not work until a site meeting with the Owner and the Landscape Architect is held.

B. The Contractor is responsible for all temporary barricades, enclosures, and protection of adjacent property and existing work. These are to be in place before operations are started. Coordinate this work with other work and trades. Complete clearing and site preparation work is required prior to excavation.

3.2 FENCE CONSTRUCTION:

A. Posts:

1. Auger holes for post footings in firm, undisturbed or compacted soil. Holes for new line post footings shall be sized as shown on plans and standard details. Holes for terminal posts and gateposts shall be sized as shown on plans and standard details.

2. Over excavate hole depths to 6 inches deeper than post bottoms.

3. Place concrete around posts in a continuous placement, tamp for consolidation, checking each post for vertical and top alignment. Support posts plumb until concrete has cured. Set and secure keepers, stops, sleeves, and other accessories into concrete as required.

4. Tops of post footings shall be flush with finished grade, trowled and sloped outward to drain. Top of footing shall appear true and circular in shape with post at center of circle.

5. Post shall be 10 feet O.C. maximum.

B. Rails:

1. Top rail shall be securely fastened to terminal posts and pass through tops of line post fittings, forming a continuous rail for the full length of fence. Top rail shall be furnished in lengths approximately 21 feet long with standard hot dip galvanized steel expansion couplings not less than 6" in length. Lengths less than 10 feet shall not be used adjacent to terminal posts.

2. Intermediate and bottom (when specified) rails shall conform to the same specification as top rail and be joined at line posts with double-end socket clamps or brace bands and rail ends, with one inverted to maintain smooth line.

C. Brace Assemblies: All corner, terminal, and gate posts shall be furnished with complete brace assembly, including brace of same material and finish as top rail, and adjustable tightener for 3/8 inch truss rod. Corner and terminal posts shall have two brace assemblies, one in each direction. The diagonal 3/8 inch adjustable truss rod shall be attached to the first ensuing line post. Install braces so that posts are plumb and true when diagonal rod is under proper tension. No truss rod is required if the intermediate rail is continuous.
D. Fabric: Pull fabric taut and tie to posts and rails. Install fabric on interior or playing side of fences or outside of Chain Link Enclosure Gates and anchor to framework so that the fabric remains in tension after pulling force is released. Lower edge of fabric shall be set level with finished grades (1-1/2” above grade typ.) except as specified on plans and details.

F. Wire Ties: Tie fabric to line posts, rails, and braces with 9-guage aluminum wire ties, spaced at 12 inches O.C. (typ.). Tie fabric to tension wire with 7-gauge hog rings at 18 inches O.C. (typical). Attach all wire ties per accepted industry standards and as described as follows: Attach hooked end of tie to fabric above and close to the top or side of the rail or post and wrap the end of tie under so that the wire tie locks into place and will not come loose under normal use. Then wrap the wire tie around the rail snugly and affix to fabric below and close to the rail and twist the end of the wire tie at least one full revolution around the fabric so that the tie will not come loose under normal use.

G. Tension Bars: Fabric shall be attached to the terminal posts by means of single piece tension bars. Thread through fabric and secure to posts with metal bands spaced not over 12 inches O.C. (typ.).

H. Welding: All field welds shall be fully filled, ground flush and smooth, and finished with a complete Tnemec paint system to match black powder coat finish.

3.3 GATES:

A. Install gates as shown on the Drawings. Openings between frame or gate members shall not exceed two (2) inches. Gaps between bottom rail and finish grade shall not exceed one and one half (1-1/2) inches.

B. Install gates plumb, level, and secure for full opening without interference. Adjust hardware for smooth operation and lubricate where necessary. After the Owner's approval of operation, drill, tap, and setscrew or spot-weld all hinges and latch hardware to prevent rotation.

C. Set gatepost same as terminal posts.

3.4 CLEANUP:

Job site shall be cleared of all excess material (concrete, wire, rails, pipe, etc.). All areas impacted by construction shall be leveled with infield on field side or paving or topsoil on outside graded flush with concrete mow strip or dugout floors and free of all debris and rocks, and restored to as good as or better than original condition, as approved by the Owner.

END OF SECTION
PART 1 GENERAL

1.1 WORK INCLUDED

A. The contractor shall provide all labor, materials and appurtenances necessary for installation of the welded ornamental steel fence system defined herein.

1.2 RELATED WORK

A. Section 30 30 00 Concrete

1.3 SYSTEM DESCRIPTION

A. The manufacturer shall supply a total fence system of Montage Plus® standard picket space fusion-welded and rackable (ATF – All Terrain Flexibility) Ornamental Steel Majestic design and plated posts for bolted installation to top of concrete walls per plan. The system shall include all components (i.e., panels, posts, gates and hardware) required. Fence height as shown on plans.

1.4 QUALITY ASSURANCE

A. The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.05 REFERENCES

- ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
- ASTM D523 - Test Method for Specular Gloss
- ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.
1.6 SUBMITTAL

A. The manufacturer’s literature shall be submitted prior to installation.

1.07 PRODUCT HANDLING AND STORAGE

A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

1.08 PRODUCT WARRANTY

A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufactures warranty shall be guaranteed for five (5) years from date of original purchase.

PART 2 - MATERIALS

2.1 MANUFACTURER

A. The fence system shall conform to Montage Plus standard picket space Welded and Rackable (ATF – All Terrain Flexibility) Ornamental Steel, Majestic design, flush bottom rail treatment 2-Rail style and plated posts manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma.

2.2 MATERIAL

A. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 45,000 psi (310 MPa) and a minimum zinc (hot-dip galvanized) coating weight of 0.60 oz/ft² (184 g/m²), Coating Designation G-60.

B. Material for pickets shall be 3/4" square x 18 Ga. tubing. The rails shall be steel channel, 1.5" x 1.4375" x 14 Ga. Picket holes in the rail shall be spaced 4.675" o.c. for standard picket space. Fence posts and gate posts shall meet the minimum size requirements of Table 1.

2.3 FABRICATION

A. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.

B. Pickets shall be inserted into the pre-punched holes in the rails and shall be
aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by Ameristar’s proprietary fusion welding process, thus completing the rigid panel assembly (Note: The process produces a virtually seamless, spatter-free good-neighbor appearance, equally attractive from either side of the panel).

C. The manufactured panels and posts shall be subjected to an inline electrode position coating (E-Coat) process consisting of a multi-stage pretreatment/wash, followed by a duplex application of an epoxy primer and an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm). The color shall be (specify Black). The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2 (Note: The requirements in Table 2 meet or exceed the coating performance criteria of ASTM F2408).

D. The manufactured fence system shall be capable of meeting the vertical load, horizontal load, and infill performance requirements for Commercial weight fences under ASTM F2408.

E. Gates with an out to out leaf dimension less than and including 72 inches shall be fabricated using Montage Plus ornamental panel material and 1-3/4" sq. x 14ga. gate ends. Gate leafs greater than 72 inches shall be fabricated using ForeRunner rails, 17 gauge pickets, intermediate uprights, gussets and 1-3/4" sq. x 14ga. gate ends. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding.

2.3 ACCESSORIES

A. Pool exit hardware to be Von Duprin 99/9952 exit device, verify finish, handing, lever style, keypad and trim with Owner. Furnish with paddle-style exit device on pool side and keypad entry system on outside.

B. Perforated metal shield around exit device is to be McNichols expanded metal, flattened, stainless steel, Type 304, ½ #18 Flattened, 66% open area, custom cut and finished with stainless steel Type 304, 14 gauge U-edging, or approved equal.

C. Gate kickplate to be 18-gauge metal with finished and buffed edges.

PART 3 – EXECUTION

3.1 PREPARATION

A. All new installation shall be laid out by the contractor in accordance with the construction plans.

3.2 INSTALLATION

B. Fence post shall be spaced according to Table 3, plus or minus ¼". For installations that must be raked to follow sloping grades, the post spacing
dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete footers having a minimum depth of 36” (Note: In some cases, local restrictions of freezing weather conditions may require a greater depth). The “Earthwork” and “Concrete” sections of this specification shall govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

3.3 FENCE INSTALLATION MAINTENANCE

A. When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces; 1) Remove all metal shavings from cut area. 2) Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. 3) Apply 2 coats of custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufactures’ warranty.

3.4 GATE INSTALLATION

A. Gate posts shall be spaced according to the manufacturers’ gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers’ gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacture of the gate and shall be installed per manufacturer’s recommendations.

3.5 CLEANING

A. The contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

<table>
<thead>
<tr>
<th>Fence Posts</th>
<th>Panel Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1/2” x 16 Ga.</td>
<td>Up to &amp; Including 6’ Height</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gate Leaf</th>
<th>Gate Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 4’</td>
<td>Up to &amp; Including 4’</td>
</tr>
<tr>
<td>Over 4’</td>
<td>Over 4’ Up to &amp; Including 6’</td>
</tr>
<tr>
<td>2-1/2” x 14 Ga.</td>
<td>3” x 12 Ga.</td>
</tr>
<tr>
<td>3” x 12 Ga.</td>
<td>3” x 12 Ga.</td>
</tr>
<tr>
<td>3” x 12 Ga.</td>
<td>4” x 12 Ga.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quality Characteristics</th>
<th>ASTM Test Method</th>
<th>Performance Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1 – Minimum Sizes for Montage Plus Posts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Table 2 – Coating Performance Requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adhesion</td>
<td>D3359 – Method B</td>
<td>Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).</td>
</tr>
<tr>
<td>Corrosion Resistance</td>
<td>B117, D714 &amp; D1654</td>
<td>Corrosion Resistance over 1,500 hours (Scribed per D1654; failure mode is accumulation of 1/8” coating loss from scribe or medium #8 blisters).</td>
</tr>
<tr>
<td>Impact Resistance</td>
<td>D2794</td>
<td>Impact Resistance over 60 inch lb. (Forward impact using 0.625” ball).</td>
</tr>
<tr>
<td>Weathering Resistance</td>
<td>D822 D2244, D523 (60˚ Method)</td>
<td>Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).</td>
</tr>
</tbody>
</table>

**Table 3 – Montage Plus – Post Spacing By Bracket Type**

<table>
<thead>
<tr>
<th>Span</th>
<th>For CLASSIC, GENESIS, MAJESTIC, &amp; WARRIOR 8’ Nominal (91.95” Rail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Size</td>
<td>2-1/2”</td>
</tr>
<tr>
<td>Bracket Type</td>
<td>Montage Plus Universal (BB112)</td>
</tr>
<tr>
<td>Post Settings ± 1/4” O.C.</td>
<td>95”</td>
</tr>
</tbody>
</table>

*Note: When using BB113 swivel brackets on either or both ends of a panel installation, care must be taken to ensure the spacing between post and adjoining pickets meets applicable codes. This will require trimming one or both ends of the panel.*

END OF SECTION
SECTION 32 84 00

IRRIGATION DESIGN BUILD

PART 1 GENERAL

1.1 SCOPE

1.2 This Section specifies all work Contractor shall provide for construction of irrigation systems including furnishing all labor, materials, equipment and services necessary for a functional irrigation system as shown on the Drawings and specified herein. The irrigation system shall be a complete and operable, installed by the contractor, complying in all respects with these specifications, design plans, and design details. Furnish and install a completely automatic irrigation system to provide adequate irrigation of all new and restored planting shown on the plans and described in specifications, complete and ready for operation. The work shall consist of providing and installing all material necessary for a complete system, including pipe, valves, fittings, automatic central control equipment, and all appurtenances related thereto. Included shall be all labor for trenching, plumbing, backfill, electrical connections and adjustments, mechanical connections and other labor necessary for installation of satisfactorily operating systems. Whether mentioned or not, the intent is that the Contractor furnish a complete and operable system as indicated on the drawings.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. The irrigation system is to be a water-efficient, automatic drip irrigation system watering all trees, shrub and groundcover areas (lawns are excluded) as shown on the drawings throughout the project, supplemented by quick couplers (allow 26; quantity and locations to be verified by Owner).

B. Plan for and adjust trenching and excavation to minimize and avoid impacts to utilities, in tree protection areas, to vegetation and roots, and to other obstructions.

C. Full, complete and even irrigation coverage is required. Make adjustments to layout, irrigation zone pressure, or as needed, to achieve full coverage of irrigated areas without overspray onto roadways, sidewalks or buildings.

D. All material shall be new and of the highest quality.

1.4 ORDINANCES, CODES & REGULATIONS

A. General: All local, municipal and State laws, rules and regulations governing or relating to any of this work are hereby incorporated into and made part of these specifications and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with above mentioned rules, regulations or requirements. Where conflict may occur, rules, regulations or requirements of the governing code shall be adhered to. However, when these specifications and/or drawings call for or describe materials, workmanship or construction of a better quality, higher standard or larger size, these specifications and/or drawings shall take precedence over the requirements of said rules, regulations and codes.
1.5 SUBMITTALS

A. Submit design drawing for review and approval. Electronic submittal of a CAD file is strongly encouraged along with PDF file and hard copy.

B. Submit Product Data a minimum of 30 working days before beginning work for all proposed substitutions. Include material showing manufacturer’s name, catalog numbers, catalog cuts, technical data manufacturers’ installation, operation and maintenance instructions for each product.

C. Point of Connection Water Pressure Test: Test water pressure at the Irrigation System point of connection prior to beginning work. Submit results of test to Owner.

D. Site Inspection Report: Submit statement confirming a site inspection has been conducted, noting discrepancies between ground measures and plans, hazards or site conditions which will interfere with installation or operation of the system prior to beginning of work.

E. Record Drawings:
   1. Maintain a complete set of record drawings, corrected daily, to show design and specification changes, and location of system components. Submit copies as requested.
   2. At completion, submit electronic plans in AutoCAD format at the same scale as the construction plans, indicating the elevations of mainlines, valves, check valves, sleeves, backflow preventers, zone outlines and other system elements. Indicate locations with dimensions from building, curb lines or other fixed site features.

F. Submit to Owner one set of keys, hose swivels, quick coupler operating keys, and unique tools or devices needed to access, operate, adjust or maintain the system.

G. Operating and Maintenance Data.
   1. Zone Map: Submit an as-built irrigation plan for the site indicating, by varying colors, the area of coverage for each control valve. Indicate the number and location of the valve. The number is to correspond to that on the controller for that zone. Accurately indicate all sleeve locations.
   2. Submit controller timing schedule indicating on a weekly basis the day, time and duration of watering for each control valve.
   3. Provide the zone map and controller timing schedule, folded into a plastic envelope, of a size capable of being installed in the door of the controller.
   4. Submit manufacturers operating manuals for each piece of electronic equipment in the system.

1.6 QUALITY ASSURANCE

A. Comply with local jurisdiction requirements for prevention of backflow and back siphonage.

B. Installer Qualifications: Engage an experienced Installer who has completed irrigation systems similar in material, design, and extent to that indicated for projects that have resulted in construction with a record of successful in-service performance. Contractor must be a Washington State licensed landscape contractor with a minimum of three years experience in installing irrigation systems. Submit documentation that the installer is a licensed and bonded landscape or irrigation contracting firm that specializes in and has experience in
successfully installing similar irrigation systems. The sprinkler system must be installed by a journeyman lawn sprinkler mechanic or experienced journeyman plumber. All electrical work must be done by a licensed electrical contractor.

1.7 PROJECT CONDITIONS
A. Environmental Requirements: Perform work under environmental conditions suitable for the tasks being undertaken.

B. Existing Conditions:
1. Visit the site and note conditions which effect work under this Section.
2. Locate all utilities, lines and piping in the work area. Provide adequate protection during all phases of work.
3. Repair utilities, lines, and piping damaged by this work to the satisfaction of the Owner of the line, at no cost to Owner.
4. Notify Owner of unsatisfactory conditions. Proceed with work only after conditions have been corrected.
5. Field Measurements: Take field measurements of irrigated areas to determine if differences occur between plans and ground dimensions. Notify Owner of differences before proceeding with work.
6. Irrigation is not permitted during the following conditions:
   a. When the temperature is less than 35 degrees F or greater than 90 degrees.
   b. When the planting area's soil is saturated or frozen.
   c. When wind velocities are greater than 30 mph.

1.8 SEQUENCING AND SCHEDULING
A. Complete irrigation system installation and make fully operational before landscape seeding and sodding takes place.

1.9 WARRANTY
A. Refer to the General and Supplementary General Conditions.

B. Additional Requirements:
1. Repair settling of trenches. Include complete restoration of plantings, mulch, grades, pavements or other improvements.
2. Correct irrigation system problems or damage within five working days of notice until the final acceptance of the Irrigation System.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
A. As specified herein, and per the Equipment Legend.

2.2 Materials
A. Main Lines: Schedule 40 PVC. Lateral lines: Class 200 PVC, Type 1, Normal Impact, NSF61 approved, ASTM D2241, plain or bell end.

B. Poly Pipe and Fittings: Thick walled polyethylene pipe specifically designed for connection of irrigation sprinklers to lateral lines.

C. Sleeves: 6” Class 200 PVC.
D. Pipe Fittings:
   1. For plastic pipe solvent welded socket type fitting, ASTM D2466, PVC pipe fitting, Schedule 40.
   2. For plastic pipe threaded fitting, ASTM D2464, PVC pipe fitting, Schedule 80 PVC.

E. Jointing Materials:
   1. PVC solvent cement: Weld-On 721 for PVC through 4-inch, meeting requirements of ASTM D2564. No Wet & Dry (type 725) cement.
   2. PVC primer and cleaner: Weld on Primer P-70 PUC/CPUC purple primer.
   3. Teflon tape sealer, 1/2-inch wide, use at all threaded joints.

F. Valves:
   1. Master Valves to be Rain Bird EFB-CP sized to match larger of mainline or water meter.
   2. Electric Solenoid Drip Zone Control Valves:
      a. For 0.2 to 5 GPM: Rain Bird XCZ-LF-075.
      b. For 3.0 to 15.0 GPM: Rain Bird XCZ-100-B-COM.
      c. For 15 GPM to 40.0 GPM Rain Bird XCZ-150-COM.
   3. Gate Valves shall be Brass, line size, WATTS WGV X, Pegler 1068, or approved equivalent.
   4. Quick Coupler: Rain Bird Bronze model 33DLRC (locking rubber cover) on a 3/4" 3-way Lasco PVC Swing Joint. Provide one matching key and swivel hose ell for each 3 quick couplers.
   5. Swing Check Valve: Same size as lateral line. King Brothers (KBI) or approved equal.

G. Valves Boxes:
   1. For Control Valves: NDS Pro-Series ‘T’-top valve box as manufactured by Carson Industries, or approved equivalent, size per detail. NDS Standard Series or other residential grades will not be accepted.
   2. For backflow preventers: ¾” through 1-1/2” size: NDS 17 x 30 valve box. For 2” use approved Concrete vault with metal locking lid.
   3. For Quick Couplers: NDS Pro-Series 10” round with bolt down lid.

H. Backflow Preventer: Double Check Type, Wilkins 950XL.

I. Automatic Controller:
   1. Weathermatic Smartline model SL4800-Unlimited FLOW controller with expansion modules as required to accommodate all zones. Include controller bundle with SL48000 48 station smart controller, Smartlink Aircard, SLW5 weather sensor, flow sensor and unlimited data and warranty. Preliminary location of the controller is to be in the office, final location to be coordinated with and approved by Owner.

J. Flow Sensor: Weathermatic model SLFSI-TXX.

K. Low Voltage Control Wire and Connectors:
   1. Wire, solid copper, UL listed for direct burial in ground, minimum size #14 AWG. Increase size as needed for length of wire run.
   2. Connectors: 3-M DBY or DBR waterproof electrical connectors.

L. Drip Irrigation
   1. Netafim Techline CV Dripperline, 12” emitter spacing, 0.6 GPH per emitter (TLCV6-12xx).
2. **Accessories:** Netafim Line Flushing Valves, 6” staples, and Netafim proprietary pipe connectors and fittings.

**M. Other Materials**
1. **Drain Rock:** Washed, round river pea gravel, no fines.
2. **Trench Backfill:** Masons sand or excavated soil as specified.
3. **"Air Compressor" Valve:** Size to fit quick coupling valve keys.
4. **Quick Coupling Valve:** Bronze, two piece construction, size as noted on the Drawings.
5. **Valve Keys,** 3 feet long (minimum), with tee handle and key end to fit manual valves.
6. **Quick coupler keys and hose swivel ells,** brass, size and type to fit quick coupler shown on the Drawings.
7. **Water Meter:** Shall read in Cubic Feet, model and Manufacturer as approved. Flange connection not required. Size per paragraph 3.1 E. 5.

**N. Provide other materials, not specifically described but required for a complete and proper installation, as selected by Contractor subject to the approval of Owner.**

**PART 3 EXECUTION**

**3.1 DESIGN**

**A. General:** Contractor is responsible for designing the irrigation system in accordance with the design parameters, zoned and per other provisions on the plans and details, and to the highest standards of durability, distribution uniformity, efficiency of design, and ease of maintenance. It is recommended that the system be designed by a licensed landscape architect, or a designer certified by the American Society of Irrigation Consultants (A.S.I.C.) or the Irrigation Association (I.A.).

**B. Shop Drawings:** Electronic Shop drawings in AutoCAD format are preferred (paper or PDF plans increase response time to two weeks).

**C. Contractor to submit shop drawings for approval, at 1” = 20’ scale or larger, showing:**
1. Valve location, type, flow, and size.
2. Head location, type, and nozzle.
3. Pipe location and size.
4. Drip Line and flush valve locations.
5. Wire location.
7. Sleevng plan, showing size, location and quantity.
8. All necessary irrigation details.

**D. Other Requirements**
1. **Drawing shall contain the following notes:**
   a. "No valves, heads, or lateral lines shall be installed until the irrigation meter and backflow assembly are installed and functioning.
   b. "CALL BEFORE YOU DIG 1-800-424-5555".
2. **Submit cut sheets for approval of all proposed material substitutions.**

**E. Design Parameters:** The following shall be incorporated into the design:
1. No overspray onto buildings or paved areas. No low head drainage. Use in-line check valves if necessary.
2. Pipe flow rates not to exceed 5 F.P.S.
3. No 1/2" pipe permitted, other than dripline.
4. Zone size limited according to the water meter size as follows:
   a. 3/4" Meter: 20 G.P.M. or less.
   b. 1" Meter: 35 G.P.M. or less.
   c. 1-1/2" Meter: 60 G.P.M. or less.
   d. 2" Meter: 100 G.P.M. or less.
5. Valves sized per manufacturers recommendations to ensure operation of pressure regulating feature. Friction loss through valve not to exceed 10% of the available static water pressure, or 9 P.S.I., whichever is smaller.
6. System shall be designed to a minimum .625 DU (distribution uniformity).
7. Use dripline in all shrub areas as detailed. No irrigation required for turf areas.
8. Flow sensors to be sized as follows based on the size of the main line, as follows:
   a. 1/2" sensor: 3/4" main line 1.2 - 7 gpm
   b. 3/4" sensor: 1" main line 2.7 - 11 gpm
   c. 1" sensor: 1-1/4" 5 - 20 gpm
   d. 1" sensor: 1-1/2" main line 5 - 30 gpm
   e. 1-1/2" sensor: 2" main line 5 - 50 gpm
   f. 2" sensor: 2-1/2" main line 10 - 70 gpm
   g. 2" sensor: 3" main line 10 - 110 gpm
F. Install all materials and equipment in strict accordance with manufacturer's written instructions and recommendations, local and state codes, laws, ordinances, and regulations.
G. Turn-off and Turn-on: The Contractor shall turn off and winterize the entire system to prevent freezing damage at the end of watering season during the first year. System will be turned on by the Contractor in the spring and check-out will be made to ensure proper operation for the coming season in the first year.

3.2 EXAMINATION
A. Investigate and determine available water supply pressure and flow characteristics. Report results of pressure test at point of connection to Owner before beginning installation work.
B. In the event of conflicts between the specifications, plans and/or details, Contractor shall submit an RFI to the Landscape Architect prior to ordering or installing any items in question.
C. Plan for and adjust trenching and excavation to minimize and avoid impacts to utilities, in tree protection areas, to vegetation and roots, and to other obstructions. Within tree protection areas and tree driplines, tunnel to avoid major roots over 2" in diameter. See also section 01 56 39 Temporary Tree & Plant Protection.
3.3 PROTECTION
A. Provide protection for system components at all times. Keep rock, gravel, debris, and all other foreign materials from entering piping, valves and other equipment.
B. Provide barriers, crossings, markers and other devices necessary to protect materials and pedestrians at open trenches, holes, stockpiles, etc. Clean all publicly accessible areas daily. Refer to section GC 4-03.

3.4 LAYOUT
A. Prior to beginning work Contractor shall schedule an appointment with the Owner for approval of Layout. Contractor shall flag head, valve and quick coupler locations, subject to review and minor modifications by the Owner.

3.5 INSTALLATION
A. Point of Connection: Irrigation Water Meter shall be installed prior to beginning irrigation piping. No work shall occur unless it is able to be flushed.
B. Trenches:
   1. Plan for and adjust trenching and excavation to minimize and avoid impacts to utilities, in tree protection areas, to vegetation and roots, and to other obstructions.
   2. Excavate trench bottoms with uniform slopes 4” minimum width. Bottoms shall be smooth and free of rocks or other objects which might damage pipe.
   3. Make trenches wide enough to allow for tamping around pipe.
   4. Excavate trenches to a depth allowing for pipe slopes to drains, sand setting bed and the following minimum coverage depths:
      a. Non-Pressure Lateral Lines: 12 inch depth minimum, 18” maximum.
      b. Pressure Mainlines: 18 inch depth minimum, 24” maximum.
      c. Pressure Mainlines Under Paving: 18 inch depth minimum.
      d. Common and Control Wire: Install below mainlines or 18 inches where wire not in trench.
   5. Do not lay pipe on unstable materials in wet trench or when trench or other conditions are unsuitable.
C. Pipe:
   1. Lay pipe and make connections in accordance with irrigation industry standard practices and manufacturer’s recommendations.
   2. Solvent weld all non-threaded joints. Use Teflon tape to seal all threaded joints. Do not weld in temperatures below 40° F. Weld under cover in rainy conditions.
   3. Clean interior of pipe before installation. Keep pipe clean during and after laying by plugs or other means.
   4. No fittings are to be closer than 6” apart.
   5. Set lines in common trenches whenever possible, side by side, two lines maximum per trench, 2” minimum separation.
   6. Low head drainage not permitted. Install in-line spring check valves in lateral lines where elevation changes exceed 10 vertical feet.
   7. Remove rejected materials from site immediately.
D. Sleeves:
1. Install sleeves in all locations where piping and control wiring pass under paved areas and curbs or through walls. Extend sleeve 12 inches beyond edge of paving, curb, or wall. Cap and mark the location with temporary 2” x 4” Fir stake. Remove stake once pipe and wires has been routed through sleeves.

2. Set top of sleeve 18 inch minimum below top of sub-grade below paved, mulched, gravel or other surfaces (18” cover). Compact to density required for pavement subgrade. Sleeves with inadequate depth of cover will be rejected.

E. Backfill
1. Backfill trenches after inspection of pressure test as part of the work of this Section, observation of the results by Owner. Fill trench with clean excavated site soil. Thoroughly compact to give support to the pipe and prevent subsidence of backfill materials.

2. Backfill to finish grade, place backfill carefully around and over piping. Lay and compact in layers not over 6 inches thick.

3. Remove all excess excavated material from the project site.

F. Controller
1. Install controller as directed by the Owner, in accordance with manufacturer's directions. Coordinate location of control wire conduit with other trades. Provide all electrical hook-ups as required for safe operation of the system in accordance with all governing codes and regulations. A licensed electrician must perform hard wiring of controller, and the work must be inspected and approved by City Electrical Inspector and Owner's representative.

2. Connection shall be made to a common meter. Power may not be shared with a residential meter.

3. If an acceptable secure location is not available in a common maintenance or mechanical room, controller shall be pedestal mounted in a specified Strongbox enclosure.

G. Control Wire
1. Route red control and white & blue common wires from controller to control valves and make connections at each end.

2. Tape control wires together at 10 foot intervals. Provide 24” expansion loop every 100 feet of wire. Allow 24” of extra wire at controller and each valve.

3. Splice only at the valves, not between valves or between valve and controller.

4. Route wire below main line wherever possible. Where not routed below mainline, install 4-6 inch wide yellow plastic warning tape 6 inches above the control wire.

5. Spare Wire: Provide 3 spare wires for systems with 1 to 12 valves, 5 spare wires for systems from 13 to 24 valves, and 7 spare wires for systems of 25 valves and above.

H. Automatic Control Valves
1. Install as detailed complete with valve boxes as shown on drawings, no closer than 16” apart, (2) valves per valve box maximum.

2. Thoroughly flush supply lines before installing valves.

I. Drip Irrigation
1. Install as shown on drawings and as recommended by manufacturers.
2. No dripline shall be closer than 8” from walk, curb or wall.
3. Install dripline flush with or lower than top of topsoil. Cover with specified depth of soil and mulch. No dripline shall be visible at any point.
4. Flush valves to be an opposite end of zone from control valve. Flush lines before installing flush valves.

3.6 FIELD QUALITY CONTROL

A. Testing:
   1. Notify Owner in writing at least three work days prior to all tests and inspections. Do not request tests unless confident work will pass. Inspection and reports must be made for all tests.
   2. Thoroughly flush piping before testing and installation of sprinklers. Isolation valves to be open, valve flow control adjustment to be in normal operating position (open).
   3. Test Mainline at 100 psi for one hour prior to inspection by Owner. If pressure loss occurs, inspect the entire system, make watertight and retest until no pressure loss occurs for a one-hour testing period.
   4. Pressure test must show no pressure loss for the specified period and be approved by the Owner before backfill of trenches will be allowed.
   5. Provide satisfactory backflow assembly test certificate by an approved Washington State Backflow Assembly Tester.

B. Inspection: Upon completion of the installation and adjusting of the irrigation system notify the Owner for a system inspection. At that time present the following:
   1. Zone by zone system demonstration.
   2. Location of major system components.
   3. Winterization and maintenance procedures.
   4. Procedures for setting the controller.
   5. Location of Zone Map and Controller Schedule.

3.7 ADJUSTING AND TIMING

A. Adjust and balance irrigation system to provide uniform coverage and prevent overspray onto pavements and structures.

B. Set timing on irrigation controller before final inspection. Obtain recommendations of landscaping work installer before setting timing.

3.8 CLEAN UP

A. Area shall be kept free of debris during the course of this project.

B. Remove all debris, dirt, rock. Sweep and wash walls and roadways upon completion of work daily.

END OF SECTION
SECTION 32 91 13
SOIL PREPARATION

PART 1 GENERAL

1.1 DESCRIPTION
A. The work includes the furnishing and installation of soil and/or amendments for lawn restoration areas and landscape planting areas.

1.2 REFERENCE SECTIONS
A. Section 31 00 00 Site Preparation
B. Section 31 20 00 Earthwork
C. Section 32 92 19 Hydrosedding
D. Section 32 93 00 Landscape Planting

1.3 QUALITY ASSURANCE
A. All products supplied shall comply with applicable state and local codes.

1.4 SUBMITTALS
Submit the following sample and test report to the Owner for approval:
A. Planting Soil Mix (5lb bag) with current soil analysis test results and report
   Note: Soil analysis tests shall be current (no more than 30 days old), shall be performed by a local (Puget Sound Region) testing lab and shall be done for the final soil mix, not individual components. Soil mix samples shall meet or exceed the Specifications prior to delivery to the job site and shall not require on-site mixing or substantial chemical alteration after delivery unless otherwise approved by the Owner. Soil Mix test reports follow at the end of this section.

PART 2 PRODUCTS

2.1 MATERIALS
A. Compost (Organic Amendment) shall consist of 100% recycled yard waste materials or other organic waste materials that have been sorted, ground up, aerated and aged and shall be fully composted, stable and mature (non-aerobic). The composting process shall be for at least six months time and the organic amendment shall have a uniform dark, soil-like appearance. In addition, the compost shall have the following physical characteristics:
1. Shall have Carbon to Nitrogen ration of between 20:1 and 40:1. If C/N ratio is greater than 40:1, a lab recommended rate of Nitroform (38-0-0), be followed at the time of soil preparation.
2. Shall be certified by the Process to Further Reduce Pathogens (PFRP) guideline for hot composting as established by the United States Environmental Protection Agency.
3. Shall be fully mature and stable before usage.
4. Shall be screened using a sieve no finer than ¼-inch and no greater than ½-inch.  

   Based on dry weight of total organic amendment sample:
   Must comply with the following percent by weight passing:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent (%) Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot; (12.7mm)</td>
<td>100</td>
</tr>
<tr>
<td>1/4&quot; (6.35mm)</td>
<td>95-100</td>
</tr>
<tr>
<td>4.76mm</td>
<td>90-95</td>
</tr>
<tr>
<td>2.38mm</td>
<td>75-90</td>
</tr>
<tr>
<td>1.00mm</td>
<td>45-70</td>
</tr>
<tr>
<td>500micron</td>
<td>0-30</td>
</tr>
</tbody>
</table>

5. Shall have heavy metal concentrations below the WSDA limits as follows:

<table>
<thead>
<tr>
<th>Metal Type</th>
<th>WA State (Max. lb./ac.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARSENIC</td>
<td>0.297</td>
</tr>
<tr>
<td>CADMIUM</td>
<td>0.079</td>
</tr>
<tr>
<td>COBALT</td>
<td>0.594</td>
</tr>
<tr>
<td>LEAD</td>
<td>1.981</td>
</tr>
<tr>
<td>MERCURY</td>
<td>0.019</td>
</tr>
<tr>
<td>MOLYBDENUM</td>
<td>0.079</td>
</tr>
<tr>
<td>NICKEL</td>
<td>0.713</td>
</tr>
<tr>
<td>SELENIUM</td>
<td>0.055</td>
</tr>
<tr>
<td>ZINC</td>
<td>7.329</td>
</tr>
</tbody>
</table>

B. Planting Soil Mix (Imported - for Landscape Planting Areas): The Planting Soil Mix shall consist of 67% sandy loam and 33% composted organic material.

C. The Sandy Loam or Loamy Sand component shall consist largely of sand, but with enough silt and clay present to give it a small amount of stability and shall meet the following sieve analysis:

<table>
<thead>
<tr>
<th>Screen Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8&quot;</td>
<td>100</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>95-100</td>
</tr>
<tr>
<td>#10</td>
<td>85-95</td>
</tr>
<tr>
<td>#30</td>
<td>60-75</td>
</tr>
<tr>
<td>#60</td>
<td>50-60</td>
</tr>
<tr>
<td>#100</td>
<td>10-20</td>
</tr>
<tr>
<td>#200</td>
<td>0-10</td>
</tr>
</tbody>
</table>

D. Individual sand grains can be seen and felt readily. On squeezing in the hand when dry, it shall form a cast that will not only hold its shape when the pressure is released, but shall withstand careful handling without breaking. The mixed loam shall meet the following:

1. Shall have pH range of 5.5 - 7.5 with dolomite lime, sulfur or other amendments, added prior to delivery, as necessary to attain this range. The decomposed organic amendment component shall consist of composted organic material as described above.

E. Additional Fertilizers and Soil Amendments: Materials shall be as follows:

1. Fine ground Dolomite Lime.
   a. Shall be retained by Taylor Standard Sieves as follows:
      No. 20 sieve - retains 0%
      No. 100 sieve - retains 25%
2. **Lawn Starter Fertilizer**: Use (10-20-20) (or, approved equal) with the following characteristics:
   - Total Nitrogen* (N) 10.0%
     - (10.0% Ammoniacal Nitrogen)
   - Available Phosphate (P205) 20.0%
   - Soluble Potash (K20) 20.0%
   - Sulfur (S) 7.0%
   - *Nitrogen shall be derived from: Ammonium Sulfate, Potassium Chloride, and Monoammonium Phosphate and Urea.

3. **Lawn Maintenance Fertilizer**: Use (16-16-16) (or, approved equal) with the following characteristics:
   - Total Nitrogen* (N) 10.0%
     - (8.5% Ammoniacal Nitrogen)
     - (7.5% Urea Nitrogen)
   - Available Phosphate (P205) 16.0%
   - Soluble Potash (K20) 16.0%
   - Sulfur (S) 7.6%
   - *Nitrogen shall be derived from: Ammonium Sulfate, Potassium Chloride, Monoammonium Phosphate, and Urea.

4. **Landscape Planting Fertilizer**: Use (20-10-5+ minors) TURFGRO, "GROPACS" Fertilizer Packets (or, approved equal) with the following characteristics:
   - Total Nitrogen* (N) 20.0%
     - (18% Urea Nitrogen)
     - (2.0% Ammoniacal Nitrogen)
   - Available Phosphate (P205) 10.0%
   - Soluble Potash (K20) 5.0%
   - Calcium (Ca) 3.0%
   - Magnesium (Mg) 2.0%
   - Sulfur (S) 3.0%
   - Boron (B) 0.04%
   - Copper (Cu) 0.20%
   - Iron (Fe) 1.0%
   - Manganese (Mn) 0.10%
   - Zinc (Zn) 0.10%
   - *Nitrogen shall be derived from: Ammonium Sulfate, Potassium Chloride, Monoammonium Phosphate, and Urea.

**PART 3 EXECUTION**

3.1 **PREPARATION OF SUB-GRADE**

A. For all planting areas, finish grade is ½” below adjacent paving and as shown in the drawings.

B. Outside of tree protection areas, rip, disc, or scarify sub-grade soils to a minimum depth of 12 inches. Note, tree protection areas may extend into the limits of work from trees indicated for protection outside of the limits of work. Sub-grade elevations shall be as follows:
   1. For lawn restoration areas - Sub-grade elevation 1.75 inches below finished grade.
2. For new landscape planting areas (such as in new parking islands) - Sub-grade elevation 6 inches below finished grade.
3. For existing planting areas, the existing surface is the sub-grade elevation.

C. Within tree protection areas, scarify surface soils, using hand tools, to a depth of 2 inches or as directed by the Owner, depending on presence and depth of roots.

3.2 PLACING AMENDMENTS OUTSIDE OF TREE PROTECTION AREAS

A. For Seeding of Restored Lawns: Place 1.75 inches of planting soil and till thoroughly into top 8 inches of prepared sub-grade.

B. For restored lawns, incorporate specified Lime and Fertilizers by broadcasting over entire the seeded area at an even distribution and rate, then broom rake the fertilizer into the top inch of specified or amended soil at rates as follows.

1. **Dolomite Lime**: Recommended application Rate: Incorporate fifty (50) pounds of Dolomite Lime per 1,000 square feet in direct broadcast application.

2. **Starter Fertilizer**: Recommended Application Rates: For (10-20-20): (Bag size = 50lbs.)
   a. For Hydroseeding apply at 2lbs. of (N)/1000s.f. (20lbs./1000 s.f. of blended material).

3. **Maintenance Fertilizer**: Recommended Application Rates: For (16-16-16): (Bag size = 50lbs)
   a. For all seeded areas apply at 1lb. (N)/1000s.f. (5.3lbs./1000s.f. of blended material) in seeded areas.

C. For new landscape planting areas: Place **6 inches** of Planting Soil and thoroughly rototill soil into top **8 inches** of prepared sub-grade.

1. Broadcast Planting Fertilizer at a rate of one-half pound (1/2#) of nitrogen per 1,000 square feet after placement, but before rototilling in of planting soils.

2. Place Planting Fertilizer Packets at the rate of one packet per plant or as directed by the Owner.

D. For new planting in existing landscape planting areas: Add depth of new planting soil as needed to bring existing planting soils to finished grade. Thoroughly rototill into top 8 inches of subgrade.

1. Broadcast Planting Fertilizer at a rate of one-half pound (1/2#) of nitrogen per 1,000 square feet after placement, but before rototilling in of planting soils.

2. Place Planting Fertilizer Packets at the rate of one packet per plant or as directed by the Owner.

3.3 PLACING AMENDMENTS IN TREE PROTECTION AREAS

A. **For Seeding of Restored Lawns**: Place 1” inch of compost and till thoroughly into top 2” of prepared subgrade, or as directed by Owner.

B. For restored lawns, incorporate specified Lime and Fertilizers by broadcasting over entire the seeded area at an even distribution and rate, then broom rake the fertilizer into the top inch of specified or amended soil at rates as follows.
1. **Dolomite Lime**: Recommended application Rate: Incorporate fifty (50) pounds of Dolomite Lime per 1,000 square feet in direct broadcast application.

2. **Starter Fertilizer**: Recommended Application Rates: For (10-20-20): (Bag size = 50lbs.)
   a. For Hydroseeding apply at 2lbs. of (N)/1000s.f. (20lbs./1000 s.f. of blended material).

3. **Maintenance Fertilizer**: Recommended Application Rates: For (16-16-16): (Bag size = 50lbs.)
   a. For all seeded areas apply at 1lb. (N)/1000s.f. (5.3lbs./1000s.f. of blended material) in seeded areas.

C. For new planting in existing landscape planting areas: Add up to 3 inches of Planting Soil and thoroughly rototill soil into top 2 inches of prepared sub-grade. Depths may be adjusted as directed by the Owner, depending on presence and depth of roots.

1. **Broadcast Planting Fertilizer at a rate of one-half pound (1/2#) of nitrogen per 1,000 square feet after placement, but before rototilling in of planting soils.**

2. **Place Planting Fertilizer Packets at the rate of one packet per plant or as directed by the Owner.**

### 3.4 FINE GRADING

A. Perform fine grading to attain finish grades as shown on the Plans.

B. Rake out all rocks, roots, sticks and other debris larger than 1-inch diameter or sticks longer than 3 inches long. Leave surface even and readily able to accommodate lawn or planting installation. Compaction level shall be between 85 to 95 percent density.

**END OF SECTION**
PART 1 - GENERAL

1.1 DESCRIPTION:

A. Furnish all materials, equipment, and labor necessary for Hydroseeding of Lawn Areas and Restored Lawn Areas. Provide seeded areas impacted by construction activities and as noted on the contract drawings and as specified herein.

B. The work includes the following:

1. Preparation of the Sub-soil.
2. Soil Preparation; including the placing of specified topsoils and/or soil amendments.
3. Liming and Fertilizing.
4. Seed Mixes for Various Applications.
5. Maintenance and Establishment.

1.2 Related Sections:

Section 32 91 13 Soil Preparation

1.3 Quality Assurance: The seed shall be furnished in containers that show the following information: seed name, lot number, net weight, percentage of purity, germination, weed seed and inert material. Seed that has become wet, moldy, or otherwise damaged will not be accepted. Seed shall conform to the requirements of the Washington State seed law and when applicable the Federal Seed Act, and shall be "certified" grade or better.

1.4 Submittals: Submit seed vendor's certification for required grass seed mixture, indicating percentage by weight and percentages of purity, germination and weed seed for each grass species.

1.5 Delivery, Storage and Handling: Deliver seed and fertilizer materials in original unopened containers showing weight, analysis, and name of manufacturer. Store the seed in such a manner that will prevent the wetting and deterioration of the seed.

1.6 Field Quality Control:

A. Grading Inspection:

Finish grading, soil placement and preparation shall be inspected and approved by the Owner prior to hydroseed application.

B. Other Inspections: The Contractor shall request a provisional inspection by the Owner upon completion of the work. Upon Substantial Completion and completion of the punch list items, the Owner will make provisional acceptance in writing.

Abbey Ridge Apartments Renovations

Contract No. TC2002931
PART 2 - PRODUCTS

2.1 Soil Preparation shall be installed per the requirements of Section 32 91 13 - Soil Preparation and shall include the following:

A. Imported Planting Soil for all Restored Lawn Areas.
B. Dolomite Lime shall be applied to soil preparation for all seeded areas with mixes specified as follows.

2.2 Grass Seed Mix:

A. The Grass Seed Mix shall be composed of the following, by weight:
   50% Turf-type Perennial Ryegrasses
   25% Creeping Red Fescue
   25% Chewings Fescue

B. The Grass Seed Mix shall also meet or exceed the following:
   Minimum pure seed percent - 98%
   Minimum germination percent - 90%
   Maximum weed seed percent - 0.5%

C. All Seed shall be packed in clean, sound containers of uniform weight.

2.3 Fertilizers:

A. For Initial fertilization of all Hydroseeded areas use:
   1. **Lawn Starter Fertilizer**: (10-20-20), or, approved equal.
      Total Nitrogen* (N) 10.0%
      (10.0% Ammoniacal Nitrogen)
      Available Phosphate (P205) 20.0%
      Soluble Potash (K20) 20.0%
      Sulfur (S) 7.0%
      *Shall be derived from Ammonium Sulfate, Potassium Chloride, and Monoammonium Phosphate.

B. For Follow-up fertilization of all Hydroseeded areas use:
   1. **Lawn Maintenance Fertilizer**: (16-16-16), or approved equal.
      Total Nitrogen* (N) 16.0%
      (8.5% Ammoniacal Nitrogen)
      (7.5% Urea Nitrogen)
      Available Phosphate (P205) 16.0%
      Soluble Potash (K20) 16.0%
      Sulfur (S) 7.6%
      *Shall be derived from Ammonium Sulfate, Potassium Chloride, Monoammonium Phosphate, and Urea.

2.4 Hydromulch: Mulch shall be wood cellulose fiber from clean wood chips, containing no growth or germination inhibiting substances; a soil-binding agent (tackifier) is required. Hydromulch shall be dyed a suitable color to facilitate placement.
2.5 Soil Binding Agent: Soil binding agent shall consist of non-toxic, biodegradable materials that are environmentally safe such as MG 250F, Guar Gum Powder, or approved equal.

PART 3 - EXECUTION

3.1 Soil Preparation: All soil preparation operations, compaction and clean up of debris shall be done prior to seeding per Section 32 91 13 - Soil Preparation.

3.02 Cultivation: Cultivation shall be executed in conjunction with the requirements of Section 32 91 13. Cultivation may be done by farm disc, harrow or other suitable equipment approved by the Owner. Prior to cultivation apply dolomite limestone at the rate of 50 lbs. per 1,000 square feet and cultivate to a depth of 4 inches (if required by soil test or as directed by the Owner). Modify depth of cultivation as needed in tree protection areas to avoid damaging tree roots.

3.3 Soil Placement: Soil placement shall be executed in conjunction with the requirements of Section. 32 91 13. When specified, amendments or prepared soils shall be evenly spread in the locations and to the depths shown on the Plans. After soil has been spread, all large clods, rocks and debris greater than 1” in any dimension, shall be removed. Soil shall not be placed when the ground is frozen, wet or in a condition detrimental to the work.

3.4 Compaction:
   A. Compact with sheep’s foot roller, cleated crawler tractor, vibratory roller, or equipment approved by the Owner. Equipment must produce 150-300 pounds per square inch of ground pressure.
   B. Compaction shall produce a uniform rough textured surface free of tire ruts, depressions and low spots, and be ready for seeding and mulching. A minimum of four passes is required. After compaction, finish grade shall be flush with the top of curbs, catch basins and other structures.

3.5 Irrigation: If required by the Owner, water shall be provided to condition the soil for compaction or to provide dust control. Water shall be furnished and applied by contractor from on site supply or by watering truck if necessary.

3.6 Hydroseeding:
   A. Seed, Lawn Starter Fertilizer and Hydromulch shall be applied in slurry in one operation with approved hydraulic equipment. Apply materials at the following rates:
      1. Seed Mix: 8lbs. per 1,000 square feet for Irrigated/Mowed Lawn areas (Lawn Areas or Restored Lawn Areas).
      2. Lawn Starter Fertilizer: 1lb. of N per 1,000 square feet of blended materials.
      3. Hydromulch, at 50lbs. per 1,000 square feet.
      4. Soil Binding Agent, at 1lb. per 1,000 square feet.
   B. Seeding shall not be done during windy weather (above 25 mph) or when the ground is overly wet (saturated) or frozen. Contractor shall give the Owner 48 hours
notice of seeding operations. Seeding, fertilizing, and mulching of prepared areas shall be performed during the following time frames:

1. Hydrosedding shall be done from April 1 to May 31 or from September 1 to October 31.
2. No hydrosedding shall be done before or after these dates without the Owner’s written approval. Written permission to seed from June 1 to August 31 may be granted only if automatic irrigation is available and operational at the site. Permission to seed from November 1 to March 31 will only be given when completion of the Project is imminent and the environmental conditions are conducive to acceptable growth. No seeding shall be done on weekends or legal holidays without written approval of the Owner.
3. Application of pre-germinated seed, moisture retention agents and/or provision for supplemental watering may be required by the Owner should the Contractor schedule this portion of the Work outside the time frames listed in item 1 immediately above.
4. All areas that are partially completed to grade, shall be prepared and seeded during the first available planting period and shall not be allowed to sit idle for long periods of time without receiving the erosion control specified in the Contract.
5. When environmental conditions are not conducive to acceptable results from seeding operations, the Owner may order the Work suspended, and it shall be resumed only when the desired results are likely to be obtained.

C. Equipment shall use water as the carrying agent utilizing a continuous built-in agitation system. Equipment with a gear pump is not acceptable.

D. Pump a continuous, non-fluctuating supply of homogenous slurry to provide a uniform distribution of material over designated areas.

3.7 Maintenance and Establishment:

A. Maintain all Hydrosedded areas until seed mix is well established and exhibits a vigorous growing condition.

B. Maintenance shall include protection, watering, fertilizing, weeding and a minimum of two mowing cycles.

C. After the first mowing, turf shall be fertilized with specified Lawn Maintenance Fertilizer for lawns and athletic fields, at the rate of 1lb. of N per 1,000 square feet of blended materials.

D. All weeds and grass clippings shall be removed from the site if requested by the Owner.

3.8 Substantial/Physical Completion:

A. Inspection to determine Substantial Completion of seeded areas will be made by the Owner upon the Contractor’s request. Provide notification at least five (5) working days before requested inspection date.
1. Hydroteeded areas shall be accepted provided all requirements, including maintenance, have been complied with and grass is well established and exhibits a vigorous growing condition.
2. Areas failing to show a uniform stand of grass shall be reseeded at the Contractor’s expense.

B. Upon Physical Completion, the Owner will assume lawn maintenance.

3.9 Clean Up: Perform cleaning during installation of the work and upon completion of the work. Remove from the site all excess materials, soil, debris, and equipment. Repair the damage resulting from seeding operations.

3.10 Warranty and Replacement: All seeded areas must have a relatively uniform stand of turf grass or other seed mixes as specified with no bare spots over 6” square at the time of Substantial Completion. Reseed at the original rate and fertilize at the rates as for all blended materials. All areas failing to vigorously establish within 90 days after germination or one growing season (whichever is longest), shall be redone at the Contractor’s expense.

END OF SECTION
PART 1 GENERAL

1.1 DESCRIPTION

A. Description: Provide planted trees, shrubs and ground covers as shown and specified. The work includes but is not limited to:
   1. Soil Preparation.
   2. Plant Materials and Planting.
   3. Fertilizing and Mulching.
   5. Plant Warranties.

1.2 RELATED SECTIONS

A. All work of the Contract shall be performed in coordination with the requirements of the following sections:
   1. Section 31 20 00 Earthwork
   2. Section 32 91 13 Soil Preparation

1.3 QUALITY ASSURANCE

A. All plants shall be nursery grown or collected materials that has been held in a nursery for at least one year. Nursery climatic conditions must be similar to those in the locality of the project. All plants shall be weed free at the time of planting.

B. Stock furnished shall be at least the minimum size indicated. Comply with sizing and grading standards of the "American Standards for Nursery Stock" (most recent edition). Larger stock is acceptable at no additional cost, and providing that the larger plants will not be cut back to size indicated. Provide plants indicated by two (2) measurements so that only a maximum of twenty-five percent (25%) are of the minimum size indicated and seventy-five percent (75%) are of the maximum size indicated.

C. Pruning: Selective pruning only is allowed with prior approval of Owner. Any pruning should focus on removal of broken branches, thinning where needed for plant health, or removal of conflicts for instance with existing paving. No shearing, “tipping”, or topping of any plants is allowed. No “shaping” of any plants or cutting of tree leaders is allowed without prior approval of Owner. Any pruning shall be carried out by individuals experienced with selective pruning practices.

1.4 SUBMITTALS

A. Submit the following material samples:
   1. Topsoil submittals in accordance with Section 32 91 13.
   2. Fertilizers for planting submittal in accordance with Section.
   3. Mulch submittal in accordance with this Section.

B. Submit the following material certifications:
   1. Planting fertilizer.
   2. Plant material sources.
1.5 DELIVERY, STORAGE AND HANDLING
A. Deliver fertilizer materials in original, unopened, and undamaged containers showing weight, analysis, and name of manufacturer. The Contractor shall store fertilizer in such a manner as to prevent wetting and deterioration.
B. Dig, pack, transport, and handle plants with care to ensure protection against injury. Inspection certificates required by law shall accompany each shipment invoice or order to stock. On arrival, the certificate shall be filed with the Owner. Protect all plants from desiccation. “Wiltproof” or another antidesicant shall be applied only with approval of the Owner. If plants cannot be planted immediately upon delivery, properly protect them with soil, wet peat moss, or in a manner acceptable to the Owner. Water heeled-in plantings daily. No plant shall be bound with rope or wire in a manner that could damage or break the branches.
C. Provide dry, loose soils for planting. Frozen or muddy soil is not acceptable.

1.6 PROJECT CONDITIONS
A. Protect existing utilities, paving, and other facilities from damage caused by planting operations.
B. Do not install plant material when ambient temperatures may drop below 35°F or above 80°F.
C. Confine work to designated areas. Do not disturb existing vegetation outside project limits and protect all trees, shrubs and ground covers within project limits not designated to be removed. Do not permit vehicular traffic or materials storage under or around new or existing trees.

PART 2 PRODUCTS

2.1 PLANT MATERIALS
A. Plants: Provide plants typical of their species or variety; with normal, densely developed branches and vigorous, fibrous root systems. Provide only sound, healthy, vigorous plants free from weeds, defects, disfiguring knots, sunscald injuries, and abrasions of the bark, plant diseases, insect eggs, borers, and all forms of infestation. All plants shall have a fully developed form without voids, open spaces, broken branches, flush cuts or stubs.
1. Dig balled and burlapped plants with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and absorbing root system necessary for full recovery of the plant. Provide ball sizes complying with the latest edition of the "American Standard for Nursery Stock." Cracked or mushroomed balls are not acceptable.
2. Bare-root plants: Dug with adequate fibrous roots, covered with a uniformly thick coating of mud by being puddled immediately after they are dug, or packed in moist straw, sawdust or peat moss.
3. Container-grown stock: Grown in a container for sufficient length of time for the root system to have developed to hold its soil together, firm and whole.
   a. No plants shall be loose in the container.
   b. Container stock shall not be pot bound.
4. No pruning wounds shall be present with a diameter of more than one (1) inch and such wounds must show vigorous callous on all edges. Trees shall not be pruned within six (6) months prior to delivery.

2.2 SOILS

A. Where new planting is to take place in existing planting beds and the grade of existing soils is within 2" of proposed grades, bed may be prepared with specified Organic Amendment or with specified Planting Soil per Section 32 91 13.

B. Where new planting is to take place in new planting beds (such as in a new parking island) or if the grade of planting bed soils is lower than 2" from proposed grades, prepare bed with 100% specified Planting Soil per Section 32 91 13.

2.3 PLANTING FERTILIZERS

A. Fertilizers shall be according to the following:

1. Use (20-10-5+ minors) TURFGRO, “GROPACS” Fertilizer Packets (or, approved equal) with the following characteristics:

   - Total Nitrogen (N) 20.0%
   - (18% Urea Nitrogen)
   - (2.0% Ammoniacal Nitrogen)
   - Available Phosphate (P2O5) 10.0%
   - Soluble Potash (K2O) 5.0%
   - Calcium (Ca) 3.0%
   - Magnesium (Mg) 2.0%
   - Sulfur (S) 3.0%
   - Boron (B) 0.04%
   - Copper (Cu) 0.20%
   - Iron (Fe) 1.0%
   - Manganese (Mn) 0.10%
   - Zinc (Zn) 0.10%

   (Or)

B. Recommended Sources for Planting Fertilizers:

1. WILCO, 922 Valley Avenue East, Suite 103, Puyallup, WA 98371, Ph. (253) 841-3378, Fax. (253) 841-8549.
2. HORIZON DISTRIBUTION, Bellevue, WA, Ph. 425-828-4554, Fax 425-822-0419.
3. WILBUR-ELLIS, 16300 Christensen Road, Tukwila, WA 98188-3418, Ph. (206) 439-9950.
4. Or, approved equal. (Provide manufacturer’s written analysis by way of substitution request, for approval by the Owner, prior to delivery).

C. Mulch shall be Arborist Wood Chip Mulch consisting of coarse ground wood chips (approximately 1/2" to 4" along the longest dimension) derived from the mechanical grinding or shredding of whole trees or portions of trees. It may contain wood, wood fiber, roots, bark, branches, and leaves, but may not contain visible amounts of soil. It shall be free of weeds and weed seeds, and may not contain more than 1% by weight of manufactured inert material (plastic, concrete, ceramics, metal, etc.). Arborist wood chip mulch, when tested, shall meet the following loose volume gradation:
### PART 3 EXECUTION

#### 3.1 INSPECTIONS

A. Finish grading shall be inspected and approved by the Owner prior to any planting.

B. Plant material shall be inspected and approved by the Owner at the nursery or site prior to installation. The Contractor shall remove all unsatisfactory material from the site immediately and his/her own expense.

#### 3.2 PREPARATION

A. Contractor shall locate plants by staking with stakes and flags or setting out plants in their containers as indicated on the drawings or as approved in the field. If obstructions are encountered that are not shown on the drawings, do not proceed until the Owner has approved the locations or selected alternate plant locations.

#### 3.3 INSTALLATION PROCEDURES

A. Excavate circular plant pits with scarified vertical sides, except for plants specifically indicated to be planted in beds. Provide planting pits at least twice the diameter of the root system or container. Depth of pit shall accommodate the entire root system. Scarify the bottom and sides of the pit to a depth of four inches then foot tamp or water to assure firm bottom of pit to prevent settling. If groundwater is encountered upon excavation of planting holes, the Contractor shall promptly notify the Owner. In tree protection areas, avoid damaging tree roots; it may be necessary to adjust plant spacing and pit sizes.

B. Set plant material in the planting pit to proper grade and alignment. Set plants upright, plumb, and faced to give the best appearance or relationship to each other or adjacent structure. Set crown of plant material at the finish grade. Backfill the planting pits with specified soil or amendment. Do not fill around trunks or stems. Water in or foot tamp soil to prevent settling. Do not use frozen or muddy mixtures for backfilling. Form a ring of soil around the edge of each planting pit to retain water.

C. After balled and burlapped plants are set, water in soil mixture around bases of balls and fill all voids.

1. Remove at all plastic wrapping materials and at least the top 2/3 of the burlap, twine, and wires, and wire baskets from root balls.
2. If burlap has been chemically treated (green color), remove from the planting pit.
D. Space ground cover plants using triangular spacing in accordance with indicated dimensions. Adjust spacing as necessary to evenly fill planting bed with indicated quantity of plants.

E. Spread and arrange roots of bare-rooted plants in their natural position. Work in specified planting soil. Do not mat roots together. Cut all broken and frayed roots before backfilling with remaining specified planting soil.

F. Fertilizer Application Rates:
   1. TURFGRO, "GROPACS" Fertilizer Packets - Place fertilizer packets in the planting pits at the rate of one packet per gallon sized plant container.

G. Mulching
   1. Mulch tree and shrub planting pits, shrub beds, and groundcover beds with required mulching material 2"-4" deep (settled) immediately after planting.
   2. Taper mulch to soil level a few inches away from stems and tree trunks so that mulch is not in direct contact with them. Place mulch so leaves, stems, and branches are above the mulch.
   3. Where the finished surface of the mulch is above adjacent paving, taper mulch level at edge of bed to be flush with paving.
   4. Thoroughly water mulched areas. After watering, rake mulch to provide a uniform finished surface.

H. Staking
   1. Stake all deciduous and coniferous trees immediately after planting as shown in the plans and details.

3.4 MAINTENANCE AND ESTABLISHMENT
A. Maintain plantings for a period of at least 30 days after substantial completion of planting operations or until all plants are sufficiently recovered from transplanting and in a healthy growing condition acceptable to the Owner.

B. Maintenance shall include regular (at least twice weekly) cultivating, weeding, watering, pruning (only as directed), and application of appropriate insecticides and fungicides necessary to maintain plants free of insects and disease.
   1. Re-set settled plants to proper grade and position. Restore planting saucer and adjacent material and remove dead material.
   2. Straighten, repair and adjust guy wires and stakes as required.
   3. Correct defective work, as soon as possible, after deficiencies become apparent and weather and season permit.
   4. Water trees, plants, and ground cover beds within the first 24 hours of initial planting, and not less than twice per week (including rain) until Physical Completion.

3.5 SUBSTANTIAL/PHYSICAL COMPLETION
A. Inspection to determine Substantial Completion of planted areas will be made by the Owner, upon the Contractor’s request. Provide notification at least 5 working days before requested inspection date.
   1. Planted areas will be accepted provided all requirements, including the maintenance period have been complied with and plant materials are alive and in a healthy, vigorous condition.

B. Upon Physical Completion, the Owner shall assume all plant maintenance.
3.6 CLEAN UP
   A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris, and equipment. Repair damage resulting from planting operation.

3.7 WARRANTY AND REPLACEMENT
   A. Warranty plant material to remain alive and be in healthy, vigorous condition for a period of 1 year after the date of Substantial Completion. Inspection of plants will be made by the Owner at the completion of planting.
   B. Replace, in accordance with the drawings and specifications, all plants that are dead or, as determined by the Owner, are in an unhealthy or unsightly condition, and have lost their natural shape due to dead branches, or other causes due to the Contractor's negligence. The cost of such replacement(s) is at the Contractor's expense. Warrant all replacement plants for 1 year after Physical Completion, unless otherwise specified.
   C. Warranty shall not include damage or loss of trees, plants, or ground covers caused by fires, floods, freezing rains, lightning storms, or winds over 75 MPH, winter kill caused by extreme cold and severe winter conditions not typical of planting area; acts of vandalism or negligence on the part of the Owner.
   D. Remove and immediately replace all plants, as determined by the Owner, to be unsatisfactory during the initial planting installation.
   E. This warranty also applies to existing trees, shrubs and ground covers that are to be removed and heeled-in for later replanting on-site.

END OF SECTION
SECTION 33 10 00
WATER DISTRIBUTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work includes but is not limited to the following:
   1. Providing water primary distribution lines and service lines.
   2. Providing permanent connections to existing water mains, fittings and valves.
   3. Providing temporary and permanent connections to existing water system.
   4. Maintaining project field plans and providing as-built plans and materials per HWD as built requirements.

1.2 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Specifications, including but not limited to following:

   Section 31 20 00   Earthwork

1.3 REFERENCES

   WSDOT-APWA   2016 Standard Specifications for Road, Bridge, and Municipal Construction. All references to measurement and payment therein shall be deleted from consideration.

   COS   City of Seatac Standards

   HWD   Highline Water District Standards


   The International Association of Plumbing and Mechanical Officials (IAPMO) Standards.

   American Water Works Association (AWWA) Standards.

1.4 SUBMITTALS

A. Prepare and make all required submittals to HWD.

B. Submittal format for water service materials downstream of meters shall be coordinated with format directions provided in Division 01.
1.5 DIMENSIONS AND LAYOUT

A. All layout shall be provided by the Contractor. See Paragraph 311000 - 1.7.

B. The Contractor is responsible for preserving all benchmarks and stakes and the replacement of any that are displaced or missing.

C. The Contractor is responsible for review of all records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all utilities damaged as a result of the Contractor’s operations at its own expense.

D. The Contractor is to notify the Engineer immediately of underground utilities encountered, which are not shown on the plans.

1.6 CONTRACTOR REQUIREMENTS

A. Contractor is responsible for coordinating all water system work with HWD and KCHA. Provide minimum 2 weeks advance notice to KCHA of any planned water work affecting water system. Schedule and attend Preconstruction Meeting with HWD, and provide all materials required at same.

B. All Contractors installing, inspecting, servicing or maintaining fire protection systems shall be licensed by the State Director of Fire Protection Services in accordance with Chapter 18.106 RCW.

1.7 GENERAL STANDARDS

A. All work and materials shall be in conformance with HWD requirements, except as modified herein.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. Domestic Water Service Pipe and Fittings
   1. Upstream of Meter: Copper Tubing ASTM B88, Type K for buried piping.
      a. Tubing less than 2.5” in diameter shall be joined with brass compression fittings conforming to AWWA C800, minimum 150 PSI working pressure, with external gripping feature to prevent pull out. Fittings shall be Mueller Model 110 or approved equal.
      b. Tubing 2.5” in diameter and larger shall be joined by wrought copper fittings with soldered joints per ASTM B828 for potable water.
   2. Water Service Lines Downstream of Meter: High density polyethylene (PE) pipe with a standard thermoplastic material designation code of PE4710. Pipe shall meet the requirements of NSF 14/61 and AWWA C901-08. Pipe shall be permanently marked in accordance with all applicable standards per this specification. Marking shall be heat stamped indent print and shall remain legible under normal handling and installation practices. Pipe shall be IPS, DR9 meeting ASTM D3035. Pipe
and fittings shall be joined by thermal fusion per the Manufacturer’s recommended procedures.

B. Water Primary Distribution Lines Downstream of Meter:
   1. Ductile iron manufactured in accordance with the requirements of AWWA C151 and cement-mortar lining conforming to AWWA C104. Pipe thickness shall be Standard Thickness Class 52, unless otherwise noted. Fittings shall be ductile iron conforming to AWWA C110 and C111. Fittings shall be cement mortar lined conforming to AWWA C104. Fittings may be ductile iron compact body class 350 conforming to AWWA C-153. Flange-type fittings shall meet the requirements of AWWA C-115 and shall be ductile iron. Flanges shall be faced and drilled to 125 pound ANSI template. Bolts shall be steel as specified in the appendix of AWWA C-115.
   2. Pipeline joints shall be flanged, restrained push on, or restrained mechanical. Fitting joints shall be flanged or restrained mechanical. All gaskets, including MJ shall be lubricated to effect the seal. Pipe with mechanical joints shall be furnished with a mechanical joint of the stuffing box type, including rubber gasket, restrained mechanical joint adapter, and tee-head bolts and nuts to effect the seal. All joints shall conform to ANSI Standard A21.11 (AWWA C-111). Flanged joints shall conform to ANSI Standard A21.15 (AWWA C115).
   3. Restraint for mechanical joint adapter shall consist of a plurality of individual actuated gripping wedges to maximize restraint capability. Torque limiting actuating screws shall be used to insure proper initial set of gripping wedges. Restrained gland follower for mechanical joints shall be Mega Lug 1100 produced by EBAA Iron, Inc. Restraining gasket for push on joints shall be US Pipe Field-Lok 350.
   4. Flanged by restrained joint adapters shall be made of ductile iron conforming to ASTM A536 and have flange bolt circles that are compatible with ANSI/AWWA C110/A21.10 (125#/Class 150 Bolt Pattern). The flange adapter shall be the Series 2100 MEGAFLANGE Restrained Flange Adapter as produced by EBAA Iron, Inc.
   5. All nuts, washers and fasteners used to join pipe and fittings shall be hot dipped galvanized. Nuts shall be per ASTM A563 Grade A.

2.2 OTHER MATERIALS
   A. Concrete for Thrust Blocks: Class 3000.
   B. Plastic Foam for pipe protection and separation between pipes shall meet the Federal spec. PPP-C-1752B Type 1, Class 2.
   C. Detection tape with a metallic foil core shall be buried with all non-metallic irrigation pipe, in accordance with WSDOT/APWA Section 9-15.18.

2.3 BEDDING AND BACKFILL MATERIAL
   A. Bedding material shall be per Section 31 20 00.
   B. Backfill material shall be per Section 31 20 00.
PART 3  EXECUTION

3.1  EXAMINATION

A.  Prior to beginning any water line construction or ordering materials, Contractor shall excavate and expose existing mains at proposed points of connection and verify required materials for connection and depth of connection points. Notify Engineer of any discrepancies.

B.  Beginning of installation means acceptance of existing conditions.

3.2  TRENCHING

A.  Excavation and preparation of the trench shall be in accordance with Section 31 20 00.

B.  The trench shall be kept free from water. Surface water shall be diverted so as not to enter trench.

C.  Boulders, rocks, and other obstructions shall be removed or cut out to the width of the trench and to a depth of 6 inches below the elevation of bottom of pipe.

3.3  WATER PRIMARY DISTRIBUTION LINE INSTALLATION

A.  Pipe shall be installed in accordance with HWD requirements, except bedding and backfill material shall be as specified herein.

B.  Installation, moving and adjusting of hydrants shall be completed by HWD; contractor to coordinate.

C.  Contractor shall provide design of any deadman and temporary blocking required for connections to existing systems.

D.  Survey line and grade control hubs shall be provided by a survey crew working under the direction of a licensed land surveyor and shall be provided by the Contractor.

E.  Elevation and location of installed pipe and appurtenances shall be recorded by the Contractor at the time of installation and prior to backfill in accordance with HWD as built requirements.

3.4  WATER SERVICE INSTALLATION AND ADJUSTMENT

A.  Private water service lines downstream of a meter:
   1. Pipe shall be installed and joined in accordance with manufacturer’s recommendations.
   2. Domestic service pipe terminations shall be coordinated with mechanical installer. Provide temporary plug and blocking as required.
3.5  BEDDING AND BACKFILLING

A. Bedding shall be installed in accordance with Section 31 20 00, and the details in the plans.

B. Backfilling of trenches shall be in accordance with Section 31 20 00, and the details in the plans.

C. Install detectable warning tape with a metallic foil core for non-metallic pipe for full length of each pipe run. Tape shall be installed eighteen inches above the pipe crown.

3.6  TESTING, CLEANING AND FLUSHING

A. All pipe shall be pressure tested, disinfected and approved for use prior to connection to existing mains, per HWD requirements. Cleaning, testing, and flushing shall be in conformance with HWD.

B. Contractor shall provide for proper collection, discharge and disposal of flushing water in accordance with requirements of affected AHJs and HWD.

3.7  AS BUILT PLANS

A. Record as built locations of new facilities. Maintain field plans which accurately and legibly record all as built information and revisions.

B. Provide As Built Mylars and CAD files of water mains, meters, and associated appurtenances to HWD per HWD requirements. The contractor will be provided the CAD files for the construction plans as a basis for their production of As Built materials.

END OF SECTION 331000
SECTION 33 30 00
SANITARY SEWER

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work includes but is not limited to following:
   1. Furnishing and installing sanitary sewer lines, fittings, cleanouts, and castings, in accordance with the plans and Specifications.
   2. Connections to existing sanitary sewer piping.
   3. Connections to building waste piping.

1.2 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Specifications, including but not limited to following:

   Section 312000 Earthwork

1.3 REFERENCES

   WSDOT-APWA 2016 Standard Specifications for Road, Bridge, and Municipal Construction. All references to measurement and payment therein shall be deleted from consideration.

   COS City of Seatac Standards

   Midway Midway Sewer District Standards and Specifications


   The International Association of Plumbing and Mechanical Officials (IAPMO) Standards.

1.4 DIMENSIONS AND LAYOUTS

A. All layout shall be provided by the Contractor. See Paragraph 311000 - 1.7.

B. The Contractor is responsible for preserving all benchmarks and stakes and the replacement of any that are displaced or missing.

C. The Contractor is responsible for review of all records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all utilities damaged as a result of the Contractor’s operations at its own expense.

D. The Contractor is to notify the Engineer immediately of underground utilities encountered, which are not shown on the plans.
1.5 SUBMITTALS
   A. Submit manufacturer's data on sanitary sewer materials and equipment as required by Midway.

1.6 CONTRACTOR REQUIREMENTS
   A. Contractor is responsible for coordinating all sanitary sewer work with City of Seatac, Midway and KCHA.

1.7 GENERAL STANDARDS
   A. All work and materials shall be in conformance with Midway requirements, except as modified herein.

PART 2 PRODUCTS

2.1 PIPE
   A. Pipe shall be PVC conforming to Section 9-05.12 of WSDOT-APWA. Pipe shall be ASTM 3034, SDR 35 with rubber gasket joints.

2.2 BEDDING AND BACKFILL MATERIAL
   A. Bedding material shall be per Section 312000.
   B. Backfill material shall be per Section 312000.

PART 3 EXECUTION

3.1 TEMPORARY BYPASSING
   A. Existing sanitary sewer systems shall remain operational during construction. Contractor shall provide bypass systems as required by his operations and sequencing of installation of new improvements in order to ensure existing sewer system maintains its functionality with no blockages, surcharges, flooding, or any other detrimental impacts.
   B. All temporary bypasses shall be coordinated with the KCHA, Midway, and City of Seatac prior to implementation, and shall meet all Midway requirements.
   C. Bypass systems shall be sized to accommodate all potential flows and prevent any detrimental effects to existing facilities and improvements, including but not limited to surcharging of existing systems, surface ponding, flooding, or erosion
   D. Provide monitoring as required to ensure functioning of system as required by operations.
   E. Provide all pumps, piping, plugs, power supplies, and any other appurtenances, materials, equipment and labor required for installation, maintenance, monitoring, and removal of bypass systems.
3.2 TRENCHING

A. Excavation and preparation of the trench shall be in accordance with Section 312000.

B. The trench shall be kept free from water. Surface water shall be diverted so as not to enter trench.

C. Boulders, rocks, and other obstructions shall be removed or cut out to the width of the trench and to a depth of 6 inches below the elevation of bottom of pipe.

3.3 PIPE INSTALLATION

A. Pipe is to be installed in accordance with Section 7-08.3(2) of WSDOT-APWA, except that survey line and grade control hubs shall be provided by a survey crew working under the direction of a licensed land surveyor or licensed Engineer and shall be provided by the Contractor.

B. Connections to building plumbing shall include necessary fittings to make vertical and horizontal transition. Clean outs shall be installed per plans.

3.4 BEDDING AND BACKFILLING

A. Bedding shall be installed in accordance with Midway and Section 312000.

B. Backfilling of trenches shall be in accordance with Midway and Section 312000.

C. Install detectable warning tape with a metallic foil core for non-metallic pipe for full length of each pipe run. Tape shall be installed eighteen inches above the pipe crown.

3.5 MANHOLE ADJUSTMENT

A. Sanitary sewer structures shall be adjusted in accordance with Section 7-05.3 of WSDOT-APWA

B. All existing sanitary sewer structures to remain shall be adjusted to final finish grade. Provide additional structure sections as required to achieve a total access riser height of no more than 18”.

C. Relocate existing handholds and ladder and provide additional handholds and ladder sections as required.

3.6 MANHOLE INSTALLATION

A. Install precast manholes in accordance with Midway and the details in the drawings. Manhole channels to be constructed in the field.
3.7 CLEANING AND TESTING

A. Cleaning and testing shall be in conformance with Section 7-04.3(1) of WSDOT-APWA. All new lines shall be subjected to testing after installation. Tests shall be air pressure test unless otherwise required by AHJ. Tests shall be conducted in the presence of the Engineer.

3.9 PROJECT FIELD PLANS

A. Record surveyed as built locations and invert elevations of new facilities, and maintain field plans which accurately and legibly record all as built information and revisions.

B. Provide as built plans and documents to Midway per Midway requirements.

END OF SECTION 333000
SECTION 33 40 00
STORM DRAINAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work includes but is not limited to following:
   1. Furnishing and installing stormwater collection, conveyance systems, structures and storm drain piping of the type and sizes designated in the plans and specifications.
   2. Providing connections to existing facilities.
   3. Providing storm drainage bypass piping.

1.2 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Specifications, including but not limited to following:

   Section 31 20 00 - Earthwork

1.3 REFERENCES

WSDOT-APWA 2016 Standard Specifications for Road, Bridge, and Municipal Construction. All references to measurement and payment therein shall be deleted from consideration.


KCSWDM King County Surface Water Design Manual

COS City of Seatac Standards

1.4 DIMENSIONS AND LAYOUT

A. All layout shall be provided by the Contractor. See Paragraph 311000 - 1.7.

B. The Contractor is responsible for preserving all benchmarks and stakes and the replacement of any that are displaced or missing.

C. The Contractor is responsible for review of all records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all utilities damaged as a result of the Contractor’s operations at its own expense.

D. The Contractor is to notify the Engineer immediately of underground utilities encountered, which are not shown on the plans.
1.5 SUBMITTALS
   A. Submit manufacturer's data on storm drain materials and equipment.
   B. Submit shop drawings for Filterra bioretention planters and trench drains.

1.6 TEMPORARY BYPASSING
   A. Existing storm drainage systems shall remain operational during construction, unless indicated otherwise. Contractor shall provide bypass systems as required by his operations and sequencing of installation of new improvements in order to ensure existing storm drainage system maintains its functionality with no ponding, erosion, flooding, or any other detrimental impacts.
   B. All temporary bypasses shall be coordinated with the Owner and all affected AHJs prior to implementation.
   C. Contractor shall provide all pumps, piping, plugs, power supplies, and any other appurtenances, materials, equipment and labor required for installation, maintenance, monitoring, and removal of bypass systems.

PART 2 PRODUCTS

2.1 STORM DRAINS, CULVERTS, OUTFALLS
   A. Pipe material for on site storm drains shall be PVC unless indicated otherwise.

2.2 POLYVINYL CHLORIDE (PVC) PIPE
   A. Unless indicated otherwise PVC pipe shall be rubber gasketed and shall conform to Section 9-05.12(1) of WSDOT-APWA.
   B. Connections to structures shall be by GPK manhole adaptor.

2.3 DUCTILE IRON PIPE
   A. Ductile iron pipe shall be per ANSI A21.51 Class 50 with push-on joints.

2.4 CATCH BASINS AND GRATES
   A. Catch basins shall be as indicated on the plans.
   B. Grates for catch basins shall be as indicated on the plans, and shall be bolt locking.

2.5 AREA DRAINS
   A. Area drains shall be Nyloplast 12-inch drain basins (Part #2812AG) with locking Pedestrian grate (Part # 1299CGPL), or locking domed grate per plan.
2.6 PATIO DRAINS  
A. Provide patio drains as indicated on the plans.

2.7 BEDDING AND BACKFILL MATERIAL  
A. Bedding material shall be per Section 31 20 00.  
B. Backfill material shall be per Section 31 20 00.

2.8 COUPLINGS AND JOINTS  
A. All joints and couplings shall provide a watertight connection testable with the storm drain lines upon which they are installed.  
B. Tees on existing pipe shall be connected by core drilling and flexible connections.  
C. Pipe to pipe connections between pipes of differing materials shall be made with a flexible gasketed coupling, adaptor or coupling-adaptor to make a watertight joint. Couplings shall be those manufactured by Romac or approved equivalent.

2.9 TRENCH DRAINS  
A. Provide trench drains as specified in the drawings.

2.10 FILTERRA BIORETENTION PLANTERS  
A. Provide Filterra Bioretention Planters as specified in the drawings.

PART 3 EXECUTION

3.1 TRENCHING  
A. Excavation and preparation of the trench shall be in accordance with KCSWDM and Section 31 20 00.  
B. The trench shall be kept free from water. Surface water shall be diverted so as not to enter trench.  
C. Boulders, rocks, and other obstructions shall be removed or cut out to the width of the trench and to a depth of 6 inches below the elevation of bottom of pipe.

3.2 PIPE INSTALLATION  
A. Pipe is to be installed in accordance with Section 7-08.3(2) of WSDOT-APWA, except that survey line and grade control hubs shall be provided by a survey crew working under the direction of a licensed land surveyor or licensed Engineer and shall be provided by the Contractor.
3.3 BEDDING AND BACKFILLING

A. Bedding shall be installed in accordance with Section 31 20 00, and the details in the plans.

B. Backfilling of trenches shall be in accordance with Section 31 20 00, and the details in the plans.

C. Install detectable warning tape with a metallic foil core for non-metallic pipe for full length of each pipe run. Tape shall be installed eighteen inches above the pipe crown.

3.4 STRUCTURE INSTALLATION AND ADJUSTMENT

A. Storm drain structures shall be installed and adjusted in accordance with Section 7-05.3 of WSDOT-APWA, except backfilling shall be per Section 31 20 00.

B. All existing storm drain structures to remain shall be adjusted to final finish grade. Provide additional structure sections as required to achieve a total access riser height of no more than 18”. Relocate existing handholds and ladder and provide additional handholds and ladder sections as required.

C. Verify orientation with proposed improvements including curbs and pavement edges.

D. Grout all adjustment sections and penetrations with non-shrink grout.

3.5 TEMPORARY BYPASSING

A. Coordinate all bypassing with Owner and utility provider. Obtain all required approvals prior to implementation.

B. Bypass systems shall be sized to accommodate all potential flows and prevent any detrimental effects to existing facilities and improvements, including but not limited to surcharging of existing systems, surface ponding, flooding, or erosion

C. Provide monitoring as required to ensure functioning of system as required by operations.

3.6 PERMANENT CONNECTIONS TO EXISTING SYSTEMS

A. Where indicated on the plans, make permanent connections to existing storm drain systems.

B. Where new pipe is to be connected to an existing structure, connection shall be made by core drilling and sand collar. Rebuild structure as necessary to provide an approved connection per the plans. Relocate ladders and other appurtenances as required to allow for new connection and provide minimum 1’ clearance from edge of pipe to edge of appurtenance.
3.7 CLEANING AND TESTING

A. Cleaning and testing shall be in conformance with Section 7-04.3(1) of WSDOT-APWA and KCSWDM. All new lines shall be subjected to testing after installation. Tests shall be air pressure test unless otherwise required by KCSWDM. Tests shall be conducted in the presence of the Engineer.

B. Contractor shall clean all new piping and structures prior to final acceptance. Existing storm pipelines and structures to be retained for use shall be cleaned for their full length.

C. Cleaning equipment shall be hi velocity hydro cleaning equipment, hydraulically propelled equipment, and/or mechanically powered equipment and shall be capable of removing dirt, grease, rocks, sand, roots and obstructions.

D. Cleaning shall proceed from upstream end of system to downstream end of system. Cleaning shall restore existing pipelines to their original carrying capacity. Provide CCTV inspection of pipelines documenting results of cleaning operations.

E. Material resulting from cleaning operations shall be removed from the system and disposed of off site in accordance with all applicable local, State and Federal requirements. Plug lowest outlet and remove all flushing water and debris prior to discharge to downstream system, and dispose of off site.

3.8 AS BUILT PLANS

A. Record as built locations and elevations of new facilities. All pipes shall be surveyed for line and invert prior to backfill. Maintain field plans which accurately and legibly record all as built information and revisions, including but not limited to locations of all piping and structures/drains, rim elevations, invert elevations, and surface finish grading.

B. Provide As Built drawings and CAD files of new facilities, and associated appurtenances to City of Seatac per City of Seatac requirements. The contractor will be provided the CAD files for the construction plans as a basis for their production of As Built materials.

END OF SECTION 334000