CITY OF KIRKLAND
EVEREST PARK
RESTROOM REPLACEMENT
PROJECT

CIP NO. PKC-1560200
PROJECT JOB NO. 10-25-PW

500 8th Street South, Kirkland WA 98033

PROJECT MANUAL
Volume 2 (Divisions 09-33)

June 24, 2025

SECTION 09 91 13
EXTERIOR AND INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Doors and door frames of Restroom and Storage Buildings.
   3. Exposed surfaces of steel lintels and ledge angles.
   4. Weather barrier behind the perforated metal panels.
   5. Mechanical and Electrical:
      a. On the roof and outdoors, paint equipment exposed to weather or to view, including factory-finished materials.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically indicated. See Section 07 18 00 Traffic Coatings.
   6. Glazing.
   7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 04 29 00 - Engineered Unit Masonry.

B. Section 05 12 13 - Architecturally-Exposed Sttructural Steel Framing.

C. Section 05 50 00 - Metal Fabrications: Shop-primed items.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2005 (Reapproved 2017).

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

D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

E. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.04 SUBMITTALS

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

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).

3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. 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.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
2. Tnemec Company, Inc.: www.tnemec.com/.

C. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Supply each paint material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.

b. Architectural coatings VOC limits of Washington State.

2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

2.03 PAINT SYSTEMS - EXTERIOR AND INTERIOR

A. Paint E-OP - Exterior and Interior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete and concrete masonry units.
1. Two top coats and one coat primer.
2. Top Coat(s): Exterior High Build Latex; MPI #40.
3. Top Coat Sheen:
a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
4. Primer: 2200-0400 Deep Tint Base, or as recommended by manufacturer.

B. Concrete/Masonry, Opaque, Alkyd, 3 Coat:
1. One coat of block filler.
2. Flat: Two coats of alkyd enamel.

C. Medium Duty Door & Frame, including the adjacent metal art panels:
1. Medium duty applications include doors and door frames.
2. Two top coats and one coat primer.
3. Top Coat(s): Interior Light Industrial Coating; Tnemec Series 73 EnduraShield, two component polyurethane.
4. Top Coat Sheen:
a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
5. Primer: As recommended by top coat manufacturer for specific substrate.

D. Exterior Factory Primed Metal: For the exterior exposed framing metal including, but not limited to the steel "V" columns.
1. Two top coats over pre-primed metal. Confirm compatibility with manufacturer’s provided primer system. Assumed to be PPG Industrial Coatings Water-Reducible Structural Steel Gray Primer)
2. Top Coat(s): Light Industrial Coating; Tnemec Series 73 EnduraShield, two component polyurethane.
3. Top Coat Sheen:
a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.

E. Weather Resistant Barrier (exposed behind the perforated metal panels): Acrylic pigment paint compatible with manufacturer's product.
1. Two coats of Flat Black MPI gloss level 1.

F. Exterior and Interior Wood - Any exposed nominal wood members:
1. Two coats of stain; Solid Stain for Wood, Water Based; MPI #16.
2. Exterior Clear Water Based Sealer with UV Inhibitor; matte finish
3. Color: To be selected by architect from manufacture standard colors.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

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

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

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

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

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
   2. Clean concrete according to ASTM D4258. Allow to dry.

G. Masonry:
   1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
   2. Prepare surface as recommended by top coat manufacturer.

H. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed 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. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.

I. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

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

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

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

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.06 COLOR SCHEDULE

A. Concrete Masonry Units, interior of all rooms, and other locations indicated as "white": 36301 Ironclad Latex Low Luster, "White"

B. Metal, Steel, and Hollow Metal Door Frames indicated as "blue": 1034 B Moorgard Low Luster, "Baseball Blue"

C. Hollow Metal Doors and Metal Art Panels indicated a "gray": HC-167 Amherst Gray

END OF SECTION

SECTION 10 14 23
PANEL SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Panel signage.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.

C. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
   2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
      a. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
      b. Submit for approval by Owner through Architect prior to fabrication.

D. Selection Samples: Where colors, materials, and finishes are not specified, submit two sets of color selection charts or chips.

E. Manufacturer's qualification statement.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.02 PANEL SIGNAGE

A. Panel Signage:
   1. Application: Room signs.
   2. Description: Flat signs with engraved panel media, tactile characters.
   3. Sign Size: 4 inches by 6 inches to be verified to fit all graphics, text, and braille.

4. Total Thickness: 1/8 inch.
5. Sign Edges: Squared.
6. Color and Font, unless otherwise indicated:
   a. Character Font: Helvetica, Arial, or other sans serif font.
   b. Character Case: Upper case only. 5/8" high letters.
   c. Background Color: As selected by Architect.
   d. Character Color: Contrasting color.
7. Material: Laminated colored plastic engraved through face to expose core as background color.
8. Profile: Flat panel without frame.
9. Tactile Letters: Raised 1/32 inch minimum.
10. Braille: Grade II, ADA-compliant.
11. One-Sided Wall Mounting: Tape adhesive.

2.03 SIGNAGE APPLICATIONS

A. Room Signs: Refer to locations on plans as indicated by room numbers and door locations. Locate signs on the wall adjacent to the latch side of the doors unless otherwise indicated.
   1. Women's Restroom 101: "WOMEN" with female figure, baby changing, and wheelchair accessibility symbols and braille.
   2. All-Gender Restrooms 102 and 103: "RESTROOM" with male figure, female figure, all-gender figure, baby changing, and wheelchair accessibility symbols and braille.
   3. Men's Restroom 104: "MEN" with male figure, baby changing, and whellchair accessibility symbols and braille.
   4. Maintenance and Storage 105, Door 105A: "MAINTENANCE" with braille.
   5. Maintenance and Storage 105, Door 105B: "MAINTENANCE AND STORAGE" with braille. Locate on primary operable door.

2.04 ACCESSORIES

A. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 21 13.19
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic toilet compartments.

B. Solid high density polyethyleme (HDPE solid plastic) toilet and screen compartments.

1.02 RELATED REQUIREMENTS

A. Section 10 28 00 - Toilet and Bath Accessories.

1.03 REFERENCE STANDARDS

A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

1.04 SUBMITTALS

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

B. Product Data: Provide data on panel construction, hardware, and accessories.

C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall and floor supports, door swings.

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid Plastic Toilet Compartments:
   1. AMPCO Products, Inc; HDPE : www.ampco.com, 11400 NW 36th Avenue Miami, FL 33167 (L0CAL AUBURN, WA) Tel: (305) 821.5700. Fax: (305) 507.1414..
   2. Substitutions: Section 01 60 00 - Product Requirements.

2.02 PLASTIC TOILET COMPARTMENTS

A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted headrail-braced.
   1. Color: Single color as selected.
   2. Doors:
      a. Thickness: 1 inch.
      b. Width: 24 inch.
      c. Width for Handicapped Use: 36 inch, out-swinging.
      d. Height: 55 inch.
   3. Panels:
      a. Thickness: 1 inch.
      b. Height: 55 inch.
   4. Pilasters:
      a. Thickness: 1 inch.
      b. Width: As required to fit space; minimum 3 inch.

2.03 ACCESSORIES

A. Pilaster Shoes: Stainless steel, satin finish, 4 inches high; concealing floor fastenings.

B. Head Rails: Extruded aluminum, anti-grip profile.

C. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.

D. Hinges: Stainless steel; satin finish.

1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.

E. Door Hardware: Stainless steel; satin finish.
   1. Door Latch: Slide type.

F. Coat Hook: One per compartment, mounted on door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

END OF SECTION

SECTION 10 28 00
TOILET AND BATH ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Under-lavatory pipe supply covers.

C. Electric hand/hair dryers.

D. Diaper changing stations.

E. Maintenance room accessories.

1.02 RELATED REQUIREMENTS

A. Section 10 28 13.13 - Metal Toilet Compartments

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2022.

1.04 SUBMITTALS

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

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet and Bath Accessories:
   1. Bradley Corporation: www.bradleycorp.com/#sle.
   2. Bobrick Washroom Equipment, Inc.: www.bobrick.com.

2.02 MATERIALS

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.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Four roll, surface mounted bracket type, stainless steelwith restrictor.
   1. Products:
      a. Stainless Solutions: Covered CTP Series, with Restrictor, 4 rolls; provide lock & clips. https://www.stainlesssolutions.net/.

B. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with plastic cover; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
   1. Products:
      a. Health Guard Soft & Silky Manual Dispenser; PN# 9951ZPL.

C. Mirrors: Stainless steel framed, 1/4 inch thick Stainless Steel.
   1. Frame: One-piece, roll-formed, stainless steel, annealed.
   2. Back: Galvanized Steel
   3. Mirror: Highly polished No. 8 architectural finish, 20 gauge stainless steel

D. Grab Bars: Stainless steel, smooth surface.
   1. Heavy Duty Grab Bars: Floor supports are not acceptable.
      a. Push/Pull Point Load: Minimum 1000 pound-force, minimum.
      b. Dimensions: 1-1/2 inch outside diameter, minimum 0.125 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
      c. Length and Configuration: As indicated on drawings.

E. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
   1. Products:
      a. Bobrick B-270 Commercial Restroom Sanitary Napkin/Tampon Disposal, Surface Mounted, Stainless Steel.

2.05 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
   1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
   2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
   3. Color: White.
   4. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.

2.06 ELECTRIC HAND/HAIR DRYERS

A. Electric Hand and Hair Dryers: Traditional fan-in-case type, with downward fixed nozzle.
   1. Operation: Automatic, sensor-operated on and off.
   2. Mounting: Wall-mounted - semi-recessed.
   3. Cover: Stainless steel with brushed finish.
      a. Tamper-resistant screw attachment of cover to mounting plate.
   4. Air Velocity: 13,000 - 20,000 linear feet per minute, minimum.
   5. Fan Control: Field adjustable down to approximately half-speed.
   6. Total Wattage: 530, maximum; no heater.
   7. Runtime as Hair Dryer: 80 seconds, nominal.
   8. Supply Voltage: 120 V, single phase, 60 Hz, nominal.
   9. Warranty: 3 years.
   10. Electric Hand Dryer Products:
      a. Excel Dryer Inc; XLERATOReco: www.exceldryer.com/#sle.

2.07 DIAPER CHANGING STATIONS

A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
   1. Material: Polyethylene.
   2. Mounting: Surface.
   3. Minimum Rated Load: 250 pounds.
   4. Products:
      a. Koala Kare: KB300 Horizontal Surface-Mounted.

2.08 MAINTENANCE ROOM ACCESSORIES

A. Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, hat-shaped channel.
   1. Holders: Three spring-loaded rubber cam holders.
   2. Length: 36 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.03 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Common work results for Division 22 (plumbing).

1.02 SUMMARY

A. Section includes general requirements that apply to the entirety of Division 22 - Plumbing, both interior and exterior to the building, as indicated on the plans and specified herein.

B. All specification sections with Division 22 - Plumbing are complementary. All specification sections within Division 22 shall be considered to reference each other.

C. Provide all plumbing work as indicated in the drawings and specified herein.

1.03 REFERENCE STANDARDS

A. American Institute Of Steel Construction (AISC)
   1. AISC 325 - Steel Construction Manual

B. American Society Of Heating, Refrigerating And Air-Conditioning Engineers (ASHRAE)
   1. ASHRAE - HVAC Applications Handbook, I-P Edition

C. American Society of Mechanical Engineers (ASME)
   1. ASME A13.1 - Scheme for the Identification of Piping Systems
   2. ASME B31.1 - Power Piping
   3. ASME B31.9 - Building Services Piping

D. American Society for Testing and Materials (ASTM)
   1. ASTM D 1557m - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)

E. International Code Council (ICC)
   1. IMC - International Mechanical Code
   2. IBC - International Building Code
   3. IFC - International Fire Code

F. International Association of Plumbing and Mechanical Officials (IAPMO)
   1. UPC - Uniform Plumbing Code

G. Manufacturers Standardization Society Of The Valve And Fittings Industry (MSS)
   1. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation
   2. MSS SP-69 - Pipe Hangers and Supports - Selection and Application

H. National Electrical Manufacturers Association (NEMA)
   1. NEMA MG 1 - Motors and Generators

I. National Fire Protection Association (NFPA)
   1. NFPA 70 - International Electrical Code

J. Revised Code of Washington (RCW)
   1. 18-106 - Plumbers

K. Sheet Metal And Air Conditioning Contractors' National Association (SMACNA)
   1. SMACNA 1650 - Seismic Restraint Manual Guidelines for Mechanical Systems, 2nd Edition

L. Underwriters Laboratories (UL)
   1. Fire Resistance Directory
   2. Building Materials Directory

M. Washington Administrative Code (WAC)
   1. 51-11C - Washington State Energy Code - Commercial Edition

1.04 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data: Provide product data for all components and equipment provided under this Division.
   1. Product sheets with more than one item or option shown shall have the product(s) and options to be used on the project clearly identified.
   2. Any equipment or materials installed or furnished without prior approval of the Owner's Representative shall be rejected and such materials will be required to be removed and replaced with approved materials at the expense of the Contractor.

C. Shop Drawings:
   1. Shop drawings shall be submitted for review and approval prior to beginning work.
   2. Shop drawings shall indicate routing of piping and location of all equipment to be provided, and shall reflect coordination with other disciplines and existing conditions.
   3. Shop drawings shall be provided for the following systems:
      a. Plumbing
   4. Provide coordination shop drawings showing all project scope(s) including architectural, structural, mechanical, electrical, and specialty contractors.

D. Manufacturer's Installation Instructions: Indicate installation instructions and recommendations.

E. Field Quality Control Submittals: Indicate test reports, inspection reports, and commissioning reports.

F. Project Record Documents:
   1. Record actual routing of installed piping, including elevation (or depth for buried piping).
   2. Record actual equipment and components installed, as well as locations.
   3. RFI's, change orders, and the like shall be noted on the Record Documents where these affect the layout or other aspect of project shown on the documents. References to these shall include the RFI/change order number as well as written description(s), sketch(es), etc., indicating the change or clarification.
   4. Record actual location of installed valves and control components.
      a. Include riser diagram(s) and schedule of valve tags and locations.
   5. Final record documents:
      a. Transfer plan notes and revisions to CAD, indicate the area of change with a bubble around that area. Provide CAD file to Architect for approval. Employ AutoCAD (by AutoDesk) DWG format, version no older than one year prior to date of bid.

G. Operation and Maintenance (O&M) Data:
   1. Include manufacturer's descriptive literature, operating instructions of equipment and controls, maintenance and repair data, and parts listings.
   2. Include manufacturer's warranty information, including any extended warranties, or certifications of warranties required for specific products, systems, or installations.
   3. Include certification of inspection(s) from the Authority Having Jurisdiction for the applicable work scope(s).
   4. Include certification of training.
   5. Include certification of Contractor's one-year warranty of materials and workmanship, including effective date(s) of warranty period.
   6. Include SDS sheets for all chemicals, adhesives, etc., utilized in the construction process as well as those utilized by or in the constructed system(s).

H. Seismic support calculations and any related required certification(s).

I. Warranty Information:
   1. Certificate of installing contractor's one-year warranty.
      a. Warranty certificate shall specifically list project information, owner information, start and end dates of warranty period, and specific description of coverage (materials, labor, other costs, etc.).
   2. Certificate of product manufacturer's warranty.

a. Warranty certificate shall specifically list project information, owner information, start and end dates of warranty period, and specific description of coverage (materials, labor, other costs, etc.).

3. Certificate of extended warranty.
   a. Warranty certificate shall specifically list project information, owner information, start and end dates of warranty period, and specific description of coverage (materials, labor, other costs, etc.).
   b. Provide extend warranty for:
      1)

1.05 QUALITY ASSURANCE

A. Manufacturer: A company specializing in manufacturing products specified in Division 22 with a minimum of three years documented experience.

B. Contractor: The contractor shall be a Washington State licensed plumber.

C. Backflow Testing: All testing of backflow prevention equipment shall be done by a Washington State Certified Backflow Assembly Tester (BAT) certified to work in buildings.

D. Electrical Work:
   1. Contractor: Electrical work required under this Division shall be performed by a Washington State Licensed Electrician.
   2. Electrical work required under this Division shall require an electrical permit.
      a. Electrical permit shall be procured by the Division 22 contractor or their electrical subcontractor.
   3. Electrical Equipment
      a. Any piece of equipment used in this project and hereinafter specified which, by its nature, requires electrical connection(s), such as fans, pumps, hot water tanks, boosters, air handling equipment, etc., shall be provided with an approved label from either Underwriters Laboratories (UL), the American Gas Association (AGA) or the Canadian Standards Association (CSA).
      b. Approval of agency must be for the total package (approval of individual components not acceptable) and all labels must be located outside of equipment and shall be visible to inspector.
      c. It shall be the responsibility of the Contractor to meet the Agency Approval requirements of this section. Any allowance for agency costs to provide appropriate label for a piece of equipment must be included in this Bid and Contract. Failure by the Contractor or supplier to obtain labels associated with agency approval prior to bid shall be sufficient cause for the Contractor to obtain all such labels and approvals at no additional cost to Owner.

E. Performance Certification: All equipment performance (water flow, heating capacity, etc.) shall be certified by a recognized national agency such as the Air Conditioning and Refrigeration Institute (ARI), Air Movement and Control Association (AMCA) and the American Society of Mechanical Engineers (ASME).

1.06 DELIVERY, STORAGE AND HANDLING

A. Refer to Division 1 for product storage and handling requirements.

B. Lift only with lugs provided. Handle carefully to avoid damage to components, enclosure and finish.

C. Protect products from weather and moisture. Provide coverings of plastic or canvas. Cover openings into pipe and duct. Isolate components from contact with the soil. Provide a means of heating for those components that may become damaged by high or low temperatures.

D. For extended outdoor storage, remove motors and other electrical equipment from enclosures not designed for outdoor use and store separately.

1.07 DEFINITIONS

A. The term "approved equal" means final approval by the Architect of a material or piece of equipment substituted for that which is shown in the Specifications or Plans.

B. The term "provide" means the furnishing and installing of equipment (including connections and appurtenances) complete and ready for use.

C. The term "Mechanical Contractor (MC)" and "Electrical Contractor (EC)" as used in these Specifications or on the Contract Drawings, refer to those subcontractors working under the direction of the General Contractor (GC).

1.08 MISCELLANEOUS REQUIREMENTS

A. Intent of Drawings
   1. The drawings are intended to depict the general scope of arrangement. The drawings are diagrammatic and do not show the exact details and locations, nor all offsets in piping. Provide additional fittings, offsets and extensions in piping systems and related items to provide full systems functionality and to assure access for equipment maintenance and as detailed elsewhere in the contract. Relocate or shift piping where conflict exists with other plumbing or mechanical systems, structural elements, architectural elements, or electrical systems, or other project work scope(s). Report conflicts before proceeding with work. Provide reasonable planning and layout in advance of installation in order to avoid conflicts and delays. The Contractor will be directed to adjust systems due to conflicts that could have been reasonably foreseen at the Contractor’s own expense.
   2. Examine the Architectural, Civil, Landscape Architectural, Structural, Electrical, and other project drawings before work is started. Consult with each of the other Contractors regarding locations and spaces required for the work and lay out work to avoid interference. Failure to provide reasonable coordination shall result in the Contractor, at his own expense, moving his work to provide the necessary space for the other Contractors.

B. Permits and Fees: Obtain and pay for all permits and construction fees. Furnish Final Certificate to Owner showing compliance with code requirements.

C. Scheduling: Comply with requirements of Division 1.

D. As-Specified Equipment: These specifications and drawings; generally list only one make and model number for each item of equipment or material required for the project. This is not intended to be restrictive but is intended to indicate the standard of quality, design and features required. In addition the listed product is the basis of the design regarding physical size, capacity, electrical power requirements and performance. The product so identified is designated "as specified."

E. Prior Approvals:
   1. Specifications have been written around equipment and materials selected for this project based on quality, size, capacity, and performance required to meet building design criteria. All equipment and materials used in this project that have been specified around a specific product or products shall have prior approval for product substitutions.
   2. Request for Approval must be submitted in accordance with Division 1 requirements.
   3. Supplier and/or Contractor shall be responsible to ensure that substituted material or equipment is of same size, quality, capacity, weight and electrical characteristics as that specified or shown on the drawings. Any changes and cost increases required during construction due to substituted equipment; shall be paid by the Contractor/Supplier. Prior approval to bid does not mean final approval of material or equipment. Final approval will be given after final submitted data has been presented, complete with full information regarding weights, capacities, size, electrical requirements and quality.

F. Contractor’s Cost Breakdown: Submit a cost breakdown (schedule of values) of the major portions of the work. Provide this submittal along with the equipment submittals. Organize the costs generally by specification section. For example, if one Section (such as copper piping) applies to both plumbing and hydronics, apportion the appropriate amount to each area of work.

1.09 CLOSEOUT REQUIREMENTS

A. Refer to Division 1 for execution and closeout requirements.

B. Refer to Division 1 for closeout submittal procedures.

C. Refer to Division 1 for general demonstration and training requirements.

1.10 REQUESTS FOR INFORMATION

A. Refer to Division 1 for Request for Information (RFI) requirements and procedures.

PART 2 PRODUCTS

2.01 GENERAL

A. See technical specifications for detailed product specifications.

2.02 DAMAGED OR REJECTED MATERIALS

A. Damaged or rejected materials shall be removed from the site immediately upon discovery.

2.03 FIRE INTEGRITY

A. All mechanical system penetrations of fire rated assemblies shall be protected in accordance with the building code in force in the Authority Having Jurisdiction for this project. This includes piping, supports, conduit, and any other system and appurtenance provided by Division 22. In addition, all through-penetration sealing methodologies shall be listed in the Underwriter's Laboratories (UL) Fire Resistance Directory, issue current at time of bid.

2.04 MOTORS

A. Motors shall comply with the current edition of the Washington State Energy Code. Service factor for poly-phase motors shall be 1.15. Service factor for single phase motors shall be 1.35.

B. In addition to the requirements in Paragraph "A" above, motors for variable frequency drives shall be of premium efficiency and are suitable for VFD operation ("Inverter Ready") in accordance with NEMA MG-1, Part 31.4.4.2. Additionally, motors shall be acceptable to the manufacturer of the drive for inverter use. "Inverter Duty" motors are not necessarily required.

PART 3 EXECUTION

3.01 CODE COMPLIANCE

A. The Contractor shall comply with all applicable codes and requirements including but not limited to:
   1. Washington State Department of Health requirements.
   2. International Building Code, including local amendments.
   3. International Fuel Gas Code, including local amendments.
   4. International Mechanical Code, including local amendments.
   5. International Fire Code, including local amendments.
   6. Uniform Plumbing Code, including local amendments.
   7. National Electrical Code (NFPA 70), including local amendments.
   8. Washington State Energy Code.
   9. Requirements of the local Authority Having Jurisdiction (AHJ).
      a. Authority Having Jurisdiction: Kirkland.

3.02 LAYING OUT WORK

A. Locate all general reference points as established by the General Contractor and take such action as is necessary to prevent their destruction; lay out work and be responsible for all lines, elevations, grading for utilities and other work required under the Contract. Exercise proper precaution to verify figures shown on drawings before laying out work and be responsible for any error resulting from failure to exercise such precaution. Coordinate the utility installation with the final site grading and elevations. Locate existing utility lines that will be affected by the building location before any footing work begins. Report conflicts with the Plans before proceeding with the work. Failure to follow reasonable precautions with regards to this instruction will require Contractor to alter the work at the Contractor's expense.

3.03 ELECTRICAL WORK

A. All electrical work performed under this Section of the Specifications shall conform to all applicable portions of the Electrical Section of the Specifications, and shall conform to the NEC (NFPA 70) and all applicable codes.

B. All electrical work performed under this Section of the Specifications shall require a permit. Contractor shall obtain & pay for all required permits & fees.

C. All electrical work performed under this Section of the Specifications shall be performed by a electrician licensed in the jurisdiction where the work is performed.

3.04 WORKMANSHIP

A. Furnish and install all equipment in a neat and finished appearance. If any portion of the work has not been installed in a workmanlike manner, or has been left in a rough, unfinished manner, the Contractor shall remove the equipment, reinstall and patch and paint surrounding surfaces without any increase in cost.

3.05 EXCAVATION - GENERAL

A. Provide all necessary excavation and shoring required for the proper installation plumbing systems.

B. Slope sides of excavation to comply with local codes and ordinances having jurisdiction.

C. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.

D. Sewer trenches shall be excavated to the grade with the bottom rounded to the outside of sewer pipes.

E. Bell holes shall be hand excavated to ensure the pipes resting for their entire length upon the bottom of the trench.

F. In case of sewer lines in rock excavation, the excavation shall be made at least 4 inches deeper than required and backfilled with sand to outside invert grades to provide cushion.

G. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

H. Secure approval to excavate for all trenches near or under footings and for backfilling of such trenches.

I. No underground lines shall be covered until the installation has been approved by both Owner's technical representatives and the Local AHJ.

3.06 EXCAVATION DEWATERING

A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

B. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

C. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collection or run off areas. Do not use trench excavations as temporary drainage ditches.

3.07 EXCESS EXCAVATION MATERIAL

A. Legally dispose of dirt and debris from excavation at an off-site location.

3.08 PIPE BEDDING

A. Provide sand or pipe zone bedding mix for pipe bedding.
   1. Native soil shall not be used as pipe bedding material.
   2. Remove all rocks or other objects from bedding material that may damage piping.

B. Pipe bedding material shall be provided all around the piping, to the following minimum amounts:
   1. Below bottom of pipe: 4 inches
   2. Above top of pipe: 4 inches
   3. From each side of pipe: 4 inches
   4. Pipe bedding shall be compacted to ensure even support for all buried piping systems.

3.09 SUB-BASE

A. Sub-base shall be compacted structural fill or gravel.
   1. Native soil shall not be utilized as sub-base material.

B. Minimum thickness for sub-base material, unless stated otherwise in these documents or required by component manufacturer, shall be 6 inches.

C. Compact sub-base material by the use of mechanical tampers to at least 95% of the maximum density of the soil foundations as determined by the compaction control test in accordance with the "Method of Test for Moisture Density Relations of Soils, ASTM D1557." The moisture control at the time of compaction shall be uniform throughout the area and shall not vary more than 5% above or below the optimum moisture content as determined by the above described "Compaction Control Test."

D. Provide sub-base material for the following items:
   1. Concrete mounting bases.
   2. Other concrete work or precast concrete components provided under this contract.

3.10 BACKFILL

A. All backfill shall be thoroughly mechanically compacted.

B. Excavation shall be backfilled with gravel or pea gravel and mechanically compacted to give full support to the equipment, piping, or other items installed in the excavated area.

C. Excavated areas more than 12" laterally and 12" above or below equipment, piping, or other items installed in the excavated area may be backfilled with native soil. Native soil used as backfill shall be mechanically compacted.
   1. Native soil shall not be utilized as a backfill material in areas below concrete slabs, such as spray pads, concrete paving, or similar areas.

D. No cinders shall be used for backfilling where steel, iron or copper pipe is used.

E. All soil foundation areas which will in any manner support any load bearing building components shall be compacted, by the use of mechanical tampers, to at least 95% of the maximum density of the soil foundations as determined by the compaction control test in accordance with the "Method of Test for Moisture Density Relations of Soils, ASTM D1557." The moisture control at the time of compaction shall be uniform throughout the area and shall not vary more than 5% above or below the optimum moisture content as determined by the above described "Compaction Control Test." Place fill in 8 inch loose layers, each layer compacted.

3.11 PIPE INSTALLATION

A. Lay pipe in straight lines with uniform slope, leaving no pockets. Care shall be taken to keep all foreign materials out of the pipes during installation. Where ground water is present, provide suction pumps to keep trenches free of water, and cap end of piping exposed to ground water when work is interrupted.

B. All underground piping used for the distribution of domestic water or waste drainage systems, which are located outside the building perimeter, shall be buried a minimum of 24 inches from finish grade to top of pipe.

C. All piping and ductwork run above the floor shall not be located over electrical panels or switchboards except where located above the structural ceiling. This shall include, but not be limited to, sanitary waste and vent, storm drain and rainleaders, domestic water, and condensate drain piping.

1. Where routing above electrical distribution equipment cannot be avoided, stainless steel drip pans shall be provided. Drain piping from drip pans shall be routed to nearest indirect drain location (such as standpipes, floor/funnel drains, floor sinks, air gap fittings, etc.).

D. Isolation valves shall be provided on inlets and outlets of all major pieces of equipment to facilitate serving and removal of such equipment without the necessity of draining the associated system.

E. Provide detectable metallic underground tape for all buried piping. Install between 6”-12” above piping. Color scheme and text shall be appropriate to the associated system, and can be the manufacturer’s standard color and description.

3.12 OPENINGS IN PIPES

A. Keep closed during the work.

3.13 WALL AND FLOOR PLATES AND ESCUTCHEONS

A. Where pipes pass through finished walls, floors or ceilings, provide chromium plates, with suitable set screws or other approved holding devices. Where extended sleeves are necessary, the plates shall be of sufficient depth to cover the sleeves.

3.14 INSERTS

A. Inserts in concrete for the suspension of piping and equipment; shall be provided by this Contractor unless otherwise noted on the Plans. Provide as necessary for support of systems installed.

B. Inserts in "poured in place" concrete shall be Grinnell, Kinsdorf, Elcen, or approved equal.

3.15 CUTTING AND PATCHING

A. General:
1. Provide all saw cutting, core drilling, and other work (including patching) necessary for installation of plumbing systems.
2. Prior to cutting, saw cutting, or core drilling any concrete, Contractor shall locate any reinforcing steel (rebar) and the like located in the concrete where the cutting is to be performed. Obtain specific approval prior to cutting any concrete reinforcement. Approval must be obtained for each specific instance of cutting reinforcement.
3. Unless directed otherwise by Structural Documents, maintain the following minimum clearances from any concrete reinforcement:
   a. Reinforcing steel: 2”

B. New Work: Furnish dimensions and locations of openings to other Contractors doing the work. Provide ample time to avoid delays and unnecessary labor. The expense for cutting and patching made necessary to admit work, repair defective material or workmanship, or by neglect to anticipate proper requirements shall be borne by this Contractor.

C. Existing Structure:
1. All necessary cutting and patching of existing structures necessary for the installation of mechanical work shall be as part of this Contract. Unless cutting and patching locations are specifically shown on the drawings, obtain approval prior to proceeding.
2. All surfaces must be patched upon completion of work. Final finish of all patched surfaces (walls, ceilings, floors etc.) shall be done patched to match the adjacent surface.
3. Contractor shall locate all steel in existing structure using x-ray or similar scanning equipment prior to cutting into existing structure.

3.16 MAINTENANCE AND OPERATION ACCESS

A. Provide suitable access to all mechanical equipment requiring servicing, maintenance, replacement, or repair.
1. In concealed spaces where access has not been provided by means of doors, hatchways, walkways or other means, provide wall or ceiling access doors of a type suitable to the service intended, sized to provide easy access to all equipment. Location of such doors shall be coordinated with the work of the other trades to avoid conflicts.

2. Access door locations shall be approved by the Architect prior to installation.

B. Access Panels
1. Provide access panels for all concealed equipment, valves, and the like that requires adjustment or service access, as well as for all wall cleanouts. Panel locations shall be carefully selected on the job so as not to be located behind cabinets, lights, etc.
a. Coordinate with the work of other Contractors before installing panels.
b. Panels shall be prime coated and painted to match surrounding surface.
c. In finished areas, including ceilings, all access panels shall have the same type of finished surface as that of the surrounding area.
d. Panels shall be size appropriate for the service intended.
e. Provide UL labeled fire rated access doors for one or two-hour rated walls and ceilings.
f. Install before surrounding surfaces have been painted.
g. Access panel doors shall have cylinder lock latch, all keyed alike.
h. Provide access doors in ceiling or wall adjacent to all fire damper locations.
i. Verify with Architect the location and finish of all access panels.
j. Panels shall be J.R. Smith or equal.

3.17 ZONE ISOLATION

A. At a minimum, provide isolation valves at plumbing connections to all spaces with plumbing in the building including the following:
1. Each restroom.
2. Each utility space.

B. Plumbing systems to be provided with isolation valves:
1. Domestic CW systems.
2. Domestic HW systems.
3. Tempered water systems.
4. Domestic HW recirculation systems.

3.18 SEISMIC SUPPORT

A. Piping: Support piping per the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) Seismic Restraint Manual Guidelines for Mechanical Systems. Use Seismic Hazard Level-A unless otherwise indicated.

3.19 FIRE INTEGRITY

A. Maintain the fire rating of all assemblies (wall, ceiling, floor, etc.) penetrated by mechanical systems. Provide approved firestopping materials as previously specified, and install in accordance with the conditions of the material UL listing.

3.20 PRESSURE TESTS AND IN-SERVICE TEST

A. All work under this Contract shall be thoroughly and systematically tested, both during construction and after completion. Pipe testing shall be either as specified in the appropriate specification section, or as specified in the applicable plumbing or mechanical code. Tests shall be maintained until approved.

B. Notifications shall be sent to the following parties 48 hours in advance of all tests:
1. Architect.
2. Owner.
3. Authority Having Jurisdiction over the specific work to be inspected.
a. Notifications to AHJ shall be provided in accordance with requirements of each specific AHJ, including amount of advance notice allowed.

C. No systems, whether prescribed for testing or not, shall be covered or concealed below ground, in walls, in ceiling spaces, or generally from ease of viewing without first notifying all of the above-listed parties for inspection. Failure to provide such notification of concealed systems shall be cause to require this Contractor to uncover and re-cover such systems at no additional cost.

D. A log of all tests shall be kept. The log shall note date, time of day test started, system or portion of system tested, length of test and test results.

E. The Contractor shall test the completed installation as in regular service. The systems provided under this Contract shall be operated in normal service for a period of at least a week prior to requesting substantial completion inspection, and any resulting defects repaired.

F. The Contractor shall guarantee the entire system and all parts thereof for a period of one year from the date of final acceptance, and shall repair or replace any part which may show signs of failure in that time if such failure is due to imperfections in material or to improper workmanship.

3.21 STARTUP, BALANCING AND COMMISSIONING

A. Equipment Startup
   1. Refer to Section 23 08 10 for startup requirements.

B. Testing and Balancing
   1. Refer to Section 23 05 93 for testing and balancing requirements.

C. Commissioning
   1. Provide system adjustment to demonstrate compliance with design documents. Provide documentation to meet basic commissioning requirements of Washington State Energy Code section C408.

3.22 CLEANING UP

A. Comply with requirements of Division 1.

B. Pipes shall be maintained as clean as possible during construction, and shall be blown clean before the building field painting operations are started. Piping shall shall be thoroughly cleaned before systems are operational. Strainers shall be cleaned prior to turning the system(s) over to the owner.

C. All equipment and material installed by this Contractor shall be properly protected from damage during the course of construction.

D. Enamelware or china fixtures around which plaster is installed or paint is applied shall be covered with heavy wrapping paper thoroughly secured.

E. Fixtures and equipment shall be thoroughly cleaned before final inspection. Remove all labels from plumbing fixtures.

F. In utility rooms and other spaces where piping such as domestic water, condensate drains, stormwater, rainleader, sanitary sewer, or vent have been installed at floor level and interfere with foot traffic, the Mechanical Contractor shall provide covers to protect these pipes. Wood or other such material is acceptable. Where duct plenums or duct runs interfere with normal traffic pattern of maintenance personnel, the Mechanical Contractor shall provide a wooden bridge over the ducts to prevent damage. Provide handrails for bridge(s) where required by code.

3.23 SPECIAL PROTECTION

A. Exercise maximum precaution to provide positive protection for the building and equipment from damage of any kind, and in particular, prevent water and dust seepage into new equipment.

B. Any damage to the building, systems, or property, caused by the Contractor shall result in the Contractor repairing or replacing the damaged item(s) at no additional cost to the Owner. This provision shall include any preventable damage caused by lack of due diligence in planning and investigation, and shall not be applied to field conditions which could not reasonably be ascertained prior to the activity causing damage.

C. In attic or other spaces where piping has been installed at floor level and interferes with foot traffic, the Contractor shall provide permanent covers to protect these items. Wood or other such material is acceptable. Provide handrails where required by code.

3.24 CAULKING

A. Caulk all openings and flash around all piping, equipment, and ducts passing through roof, floor, and walls.

B. All caulking shall be waterproof, low-VOC, and zero mold growth type.

C. Refer to paragraph "Fire Integrity" for all rated wall, ceiling, floor, and other penetrations.

3.25 FINAL INSPECTION

A. This Contractor shall thoroughly review and inspect the project to determine when final inspection is required, and shall provide notification. It shall be understood that the work shall be essentially complete, and the open items list provided at that time. The warranty period will not start until the punchlist and back-check are complete. Additional inspections required because of lack of diligence by the Contractor will be conducted on a schedule convenient to the inspectors.

3.26 INSTRUCTION PERIODS

A. Refer to Division 1 for additional demonstration and training requirements.

B. Scope: Following installation of mechanical work, have representatives of installation tradesmen conduct demonstrations and instruction periods to point out locations of servicing points and required points of maintenance to Owner’s staff.

C. General Description Of Instruction Period: Each period shall include preliminary discussion and presentation of information from maintenance manuals with appropriate references to drawings; followed by tours of building areas explaining maintenance requirements, access methods, servicing and maintenance procedures, and equipment cleaning procedures, temperature control settings and available adjustments.

D. Scheduling Of Instruction Period: Notice of Contractor's readiness to conduct such instruction and demonstration shall be given at least two weeks prior to the instruction period, and agreement finalized as to the date at which the instruction period is to be performed. Notify two weeks prior to date when ready to conduct instruction and demonstrations; receive approvals of proposed date prior to making final arrangements.

3.27 ON SITE OBSERVATIONS AND SAFETY MEASURES

A. The Contractor is solely responsible to provide design and construction review services relating to the Contractor's safety precautions or to means, methods, techniques, sequences or procedures required for the Contractor to perform his work. The duty of any other individual or organization to conduct construction observations of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the construction site. The contractor shall be responsible for providing all safety measures and shall consult with the State and/or Federal Safety Agency or Inspector for interpretation whenever in doubt as to compliance with State and/or Federal regulations. Furthermore, the Contractor distinctly assumes all risk or damages or injury to any persons or property wherever located resulting from any action or operation under this Contract or in connection with the work.

3.28 CONTINUITY OF BUILDING AND UTILITY AND SHUTDOWNS

A. General: Continuity of utilities services in the building shall be maintained at all times as required to provide heat, water, lighting, and power to all portions of the building. Utility systems shutdowns required for extensions, alterations or connections of new services; shall be accomplished in accordance with the following requirements.

B. Shutdowns:
   1. While building is in operation, utilities shutdowns shall be scheduled for weekends, holidays, or at night, if the shutdown affects the use of the building or surrounding buildings.
   2. Shutdowns longer than 2 hours shall be coordinated with and approved by the Owner at least 1 week in advance.
   3. Shutdowns less than 2 hours shall be coordinated with and approved by the Owner at least 48 hours in advance.

C. Costs: The Contractor shall include in their bid proposal all costs associated with utilities shutdowns. No extra payment will be made for overtime work, schedule changes or failure to complete utilities connections within authorized shutdown periods.

D. Liability: Failure to coordinate with the serving utility or to sufficiently pursue the work in time to return utilities to service shall not constitute a basis for avoiding any contractual penalties.

END OF SECTION

SECTION 22 05 17
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

B. Pipe sleeve-seals.

1.02 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2022a.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

C. FM (AG) - FM Approval Guide; Current Edition.

D. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product data.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified this section.
   1. Minimum three years experience.
   2. Approved by manufacturer.

C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.06 WARRANTY

A. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch above finished floor.
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
   4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

B. Pipe Passing Through Below Grade Exterior Walls:
   1. Zinc coated or cast iron pipe.
   2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

C. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, Partitions, and Beam Flanges: 1 inch greater than external pipe diameter.

2.02 PIPE-SLEEVE SEALS

A. Modular Mechanical Sleeve-Seal:
   1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
   2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
   3. Size and select seal component materials in accordance with service requirements.
   4. Glass-reinforced plastic pressure end plates.

B. Sealing Compounds:
   1. Provide packing and sealing compound to fill pipe to sleeve thickness.
   2. Combined packing and sealing compounding to match partition fire-resistance hourly rating.

C. Pipe Sleeve Material:
   1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.
   2. Masonry Structures: Sheet metal or fiber.

D. Wall Sleeve: PVC material with waterstop collar, and nailer end-caps.

E. Sleeve-Forming Disk: Non-conductive plastic-based material, 3 inch thick.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

E. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
   1. Aboveground Piping:
      a. Pack solid using mineral fiber complying with ASTM C592.
      b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
   2. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

F. Manufactured Sleeve-Seal Systems:
   1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
   2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
   3. Locate piping in center of sleeve or penetration.

4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
5. Tighten bolting for a water-tight seal.
6. Install in accordance with manufacturer's recommendations.

G. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 22 05 19
METERS AND GAGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Indicating thermometers
B. Pressure gauges
C. Thermowells
D. Water meters

1.02 REFERENCE STANDARDS

A. American Society of Mechanical Engineers (ASME)
   1. ASME B40.100 - Pressure Gauges and Gauge Attachments
   2. ASME B40.200 - Thermometers, Direct Reading and Remote Reading
B. American National Standards Institute (ANSI)
   1. ANSI/IEC 60529 - Degrees of Protection Provided by Enclosures
C. American Society for Testing and Materials (ASTM International)
   1. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers
   2. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers
D. American Water Works Association (AWWA)
   1. AWWA M6 - Water Meters -- Selection, Installation, Testing, and Maintenance

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.
B. Required Submittals:
   1. Product data.
   2. Test and Inspection Reports:
      a. Completed manufacturer's startup checklist and report.
      b. Commissioning report.
   3. Project record documents.
   4. Operation and maintenance data.
   5. Warranty information:
      a. Manufacturer's warranty.
      b. Manufacturer's extended warranty.
   6. Training certificates.
C. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.
B. Manufacturers: A company specializing in manufacturing products specified in this section with a minimum of three years documented experience.
C. Installers: The installer shall have a minimum of five continuous years’ experience installing systems specified in this section and at least ten projects of similar size and scope.

1.05 DELIVERY, STORAGE AND HANDLING

A. Refer to Division 1 for product storage and handling requirements.

1.06 CLOSEOUT REQUIREMENTS

A. Refer to Division 1 for closeout submittal procedures.
B. Refer to Division 1 for demonstration and training requirements.

PART 2 PRODUCTS

2.01 INDICATING THERMOMETERS

A. Mercury type thermometers are not acceptable.

B. Dial type: ANSI B40.200, Provide thermowell sized for each thermometer. Thermometer shall be 5” dial size with stainless steel case & stem. Case shall be hermetically sealed. Accuracy shall be +/- 1% or better. Coil shall be bimetallic type (silicone dampened on ranges up to 300°F, above 300°F not dampened). Window shall be double-strength glass. Thermometer shall be adjustable for viewing angle.

C. Standard type: ANSI B40.200, Provide thermowell sized for each thermometer. Thermometer shall have a nominal scale length of 5”. Construction shall be stainless-steel case with molded glass cover, stainless-steel stem and bulb. Stem shall be straight, length as required to fit well.

2.02 PRESSURE GAUGES

A. Gauges, Pressure and Compound
   1. Stainless steel liquid filled gauges. 4” diameter. IP65 protection as rated under ANSI/IEC 60529 standards.
   2. Provide normal working range of 50 % full scale.
   3. Ambient Temperature Range: -40 degrees F to 140 degrees F.
   4. 316 stainless steel element.
   5. Laminated safety glass window.
   6. White aluminum dial with black lettering.
   7. Pressure Connection: 1/2”.
   8. Case, Bezel Ring And Movement: 304 stainless steel.
   9. Provide piston snubber and isolation cock valve. Snubber shall be brass body with minimum pressure of 5000 PSI. Snubber shall include a piston that moves within a chamber. The action of the piston in the chamber provides damping for the gauge and protects the gauge from debris in the working fluid.

2.03 THERMOWELLS

A. Pressure/temperature thermowells (“Pete’s Plug” or equal) shall be installed on inlet and discharge of all pumps and coils unless other different instrumentation that performs the same function is shown on the drawings. Provide a gauge kit that includes a pressure gauge and thermometer compatible with the thermowells.

2.04 WATER METERS

A. Single-Jet Type with Digital Encoder/Register
   1. Meter shall be single element measuring type, with 1/8 gpm accuracy and no upstream or downstream straight pipe length requirements for installation. Meter shall meet NSF-61 and AWWA C712-15 standards.
   2. Construction
      a. Meter body: ASTM C875 low-lead bronze.
      b. Impeller: Polypropylene
      c. Impeller Bearings: Tungsten carbide
      d. Impeller Shaft: AISI 303 with tungsten carbide tip
   3. Encoder/Register
      a. Provide digital encoder/register for each water meter. Encoder/register shall have integral cellular modem with external external antenna. External antenna shall be 12' long. Encoder/register shall be battery powered. Encoder/register shall be remote-mount type, with interconnecting cable between meter body and encoder unit.

B. Single-Jet Type with Digital Encoder/Register
   1. Meter shall be single element measuring type, with 1/4 gpm accuracy and no upstream or downstream straight pipe length requirements for installation. Meter shall meet NSF-61 and AWWA C712-15 standards.
   2. Construction

a. Meter body: ASTM C875 low-lead bronze.
b. Impeller: Polypropylene
c. Impeller Bearings: Tungsten carbide
d. Impeller Shaft: AISI 303 with tungsten carbide tip

3. Encoder/Register
   a. Provide digital encoder/register for each water meter. Encoder/register shall have integral cellular modem with external external antenna. External antenna shall be 12' long. Encoder/register shall be battery powered. Encoder/register shall be remote-mount type, with interconnecting cable between meter body and encoder unit.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install positive displacement meters with isolating valves on inlet and outlet to AWWA M6. Provide full line size valved bypass with globe valve for liquid service meters.

C. Provide one pressure gage per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gage. Not required for fractional horsepower pumps.

D. Install pressure gages with pulsation dampers. Provide gage cock to isolate each gage. Provide siphon on gages in steam systems. Extend nipples and siphons to allow clearance from insulation.

E. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch (60 mm) for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

F. Install thermometers in air duct systems on flanges.

G. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets. Refer to Section 23 09 23 - Direct Digital Controls for HVAC. Where thermometers are provided on local panels, duct or pipe mounted thermometers are provided on local panels, duct or pipe mounted thermometers are not required.

H. Coil and conceal excess capillary on remote element instruments.

I. Provide instruments with scale ranges selected according to service with largest appropriate scale.

J. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

K. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

L. Locate test plugs adjacent thermometers and thermometer sockets

3.02 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

3.03 WATER METERS

A. Remote read encoders shall be located at building exterior.

END OF SECTION

SECTION 22 05 23
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ball valves.

B. Butterfly valves.

C. Check valves.

1.02 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).

B. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.

C. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022, with Errata (2023).

D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

E. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2020.

F. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2023).

G. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).

H. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.

I. AWWA C606 - Grooved and Shouldered Joints; 2022.

J. MSS SP-67 - Butterfly Valves; 2022.

K. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

L. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

M. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

N. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

1.04 QUALITY ASSURANCE

A. Manufacturer:
   1. Obtain valves for each valve type from single manufacturer.
   2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
   2. Protect valve parts exposed to piped medium against rust and corrosion.
   3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
   4. Secure check valves in either the closed position or open position.
   5. Adjust butterfly valves to closed or partially closed position.

B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.

2. Store valves in shipping containers and maintain in place until installation.
    a. Store valves indoors in dry environment.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

B. Provide the following valves for the applications if not indicated on drawings:
1. Shutoff: Ball or butterfly.
2. Throttling: Provide ball or butterfly.
3. Swing Check (Pump Outlet):
    a. 2 inch and Smaller: Bronze swing check valves with bronze or nonmetallic disc.

C. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.

D. Domestic, Hot and Cold Water Valves:
1. 2 inch and Smaller:
    a. Bronze and Brass: Provide with solder-joint, threaded, or press-fit ends.
2. 2-1/2 inch and Larger:
    a. Iron, 2-1/2 inch to 4 inch: Provide with threaded, flanged, or grooved ends.
    b. Iron Single-Flange Butterfly: 200 CWP, EPDM seat, aluminum-bronze disc.
    c. Iron Grooved-End Butterfly: 175 CWP.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
1. Hand Lever: Quarter-turn valves 6 inch and smaller.

D. Insulated Piping Valves: With 2 inch stem extensions and the following features:
1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
2. Butterfly Valves: Extended neck.
3. Memory Stops: Fully adjustable after insulation is installed.

E. Valve-End Connections:
1. Threaded End Valves: ASME B1.20.1.
2. Pipe Flanges and Flanged Fittings 1/2 inch through 24 inch: ASME B16.5.
3. Solder Joint Connections: ASME B16.18.
4. Grooved End Connections: AWWA C606.

F. General ASME Compliance:
1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
2. Solder-joint Connections: ASME B16.18.

G. Potable Water Use:
1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

H. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRONZE, BALL VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Two Piece, Full Port with Bronze Trim:

1. Comply with MSS SP-110.
2. WSP Rating: 150 psi.
3. WOG Rating: 600 psi.
4. Body: Forged bronze or dezincified-brass alloy.
5. Ends Connections: Pipe thread or solder.
6. Seats: PTFE.
7. Stem: Bronze, blowout proof.
8. Ball: Chrome plated brass.

C. Three Piece, Full Port with Stainless Steel Trim:
1. Comply with MSS SP-110.
2. WSP Rating: 150 psi.
3. CWP Rating: 600 psi.
4. Body: Bronze.
5. End Connections: Pipe thread or press.
6. Seats: PTFE.
7. Stem: Stainless steel.
8. Ball: Stainless steel, vented.

2.04 IRON, SINGLE FLANGE BUTTERFLY VALVES

A. Wafer Style:
1. Class 125, or Class 150 flanges.
2. Comply with MSS SP-67, Type I.
3. Wafer Style, Service Pressure Ratings:
   a. 200 psi for sizes 2 to 12 inch.
4. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
5. Stem: One or two-piece stainless steel.
6. Seat: EPDM.
7. Disc: Aluminum-bronze.
8. Finish: Epoxy coated.
9. Operator: Gear operator with handwheel over direct-mount actuator base.

2.05 IRON, GROOVED-END BUTTERFLY VALVES

A. CWP Rating: 175 psi.
1. Comply with MSS SP-67, Type I.
2. Body: Coated ductile iron.
3. Stem: Two-piece stainless steel.
4. Disc: Coated ductile iron.
5. Disc Seal: EPDM.

2.06 BRONZE, SWING CHECK VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125:
1. Pressure and Temperature Rating: MSS SP-80, Type 3.
2. Design: Y-pattern, horizontal or vertical flow.
3. WOG Rating: 200 psi.
4. Body: Bronze, ASTM B62.
5. End Connections: Threaded.
6. Disc: Bronze.

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

END OF SECTION

SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prefabricated trapeze-framed systems.

B. Strut systems for pipe or equipment support.

C. Beam clamps.

D. Pipe hangers.

E. Pipe supports, guides, shields, and saddles.

F. Anchors and fasteners.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

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

O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems and other pipe support components.

1.06 QUALITY ASSURANCE

A. Comply with applicable building code.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.

B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.

C. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.
   1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
   2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.

D. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.
   1. Outdoor, Damp, or Wet-Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

2.02 PREFABRICATED TRAPEZE-FRAMED SYSTEMS

A. Prefabricated Trapeze-Framed Metal Strut Systems:
   1. Strut Channel or Bracket Material:
      a. Indoor Dry Locations: Use zinc-plated steel or galvanized steel.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
   2. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
   3. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

2.03 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

A. Strut Channels:
   1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
   2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.

B. Hanger Rods:
   1. Threaded zinc-plated steel unless otherwise indicated.
   2. Minimum Size, Unless Otherwise Indicated or Required:

a. Piping up to 1 inch: 1/4 inch diameter.
b. Piping larger than 1 inch: 3/8 inch diameter.

2.04 BEAM CLAMPS

A. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.

B. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

C. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2.05 PIPE HANGERS

A. Band Hangers, Adjustable:
1. MSS SP-58 type 7 or 9, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

2.06 PIPE CLAMPS

A. Riser Clamps:
1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
3. UL (DIR) listed: Pipe sizes 1/2 to 8 inch.

B. Extension Split Pipe Clamp:
1. MSS SP-58 type 12, hinged split ring and yoke roller hanger with epoxy copper or plain finish.
2. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
3. Provide hanger rod and nuts of the same type and material for a given pipe run.
4. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

C. Strut Clamps:
1. Cushioned Pipe or Tubing Strut Clamp: Provide strut clamp with thermoplastic elastomer cushion having dielectric strength of 670 V/mil.

2.07 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

B. Pipe Shields for Insulated Piping:
1. MSS SP-58 type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
2. General Construction and Requirements:
a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
b. Shields Material: UV-resistant polypropylene with glass fill.
c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.
d. Service Temperature: Minus 40 to 178 degrees F.
e. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

C. Pipe Supports:
1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
2. Liquid Temperatures Up to 122 degrees F:
a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
b. Support From Below: MSS SP-58 types 35 through 38.

D. Pipe Supports, Thermal Insulated:
1. General Requirements:

a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
c. Provide pipe supports for 1/2 to 30 inch iron pipes.
d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.

2. PVC Jacket:
a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.
b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
c. Minimum Thickness: 60 mil, 0.06 inch.

2.08 ANCHORS AND FASTENERS

A. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

B. Concrete: Use expansion anchors or screw anchors.

C. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

D. Hollow Masonry: Use toggle bolts.

E. Hollow Stud Walls: Use toggle bolts.

F. Steel: Use beam ceiling clamps, beam clamps, or machine bolts.

G. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, plain, stainless steel, or zinc finish.

H. Powder-actuated fasteners are not permitted.

I. Hammer-driven anchors and fasteners are not permitted.

J. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

K. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
1. Channel Material: Use galvanized steel.
2. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.
3. Manufacturer: Same as manufacturer of metal strut channel framing system.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

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

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

H. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

J. Secure fasteners according to manufacturer's recommended torque settings.

K. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 22 05 33
HEAT TRACING FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Self-regulating parallel resistance electric heating cable.

B. Cable outer jacket markings.

C. Connection kits.

D. Accessories.

E. Controls.

1.02 REFERENCE STANDARDS

A. IEEE 515.1 - IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications; 2022.

B. ITS (DIR) - Directory of Listed Products; Current Edition.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

B. Coordinate the work with other trades to provide ground fault protection for electric heat tracing circuits as required by NFPA 70.

C. Coordinate the work with other trades to provide circuit breaker ratings suitable for installed circuit lengths.

1.04 SUBMITTALS

A. Refer to Division 1 for submittal requirements.

B. Product Data: Provide data for electric heat tracing.

C. Field Quality Control Submittals: Indicate test reports and inspection reports.

D. Project Record Documents: Record actual locations of electric heat tracing lines and thermostats.

E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions of equipment and controls, maintenance and repair data, and parts listings.

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

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

PART 2 PRODUCTS

2.01 SELF-REGULATING PARALLEL RESISTANCE ELECTRIC HEATING CABLE

A. Provide products listed, classified, and labeled by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction (AHJ).

B. Factory Rating and Testing: Comply with IEEE 515.1.

C. Heating Element:

1. Provide pair of parallel No.16 tinned or nickel coated stranded copper bus wires embedded in cross linked conductive polymer core with varying heat output in response to temperature along its length.
2. Terminations: Waterproof, factory assembled, non-heating leads with connector at one end and water-tight seal at opposite end.
3. Capable of crossing over itself without overheating.

D. Insulated Jacket: Flame retardant polyolefin.

E. Cable Cover: Provide tinned copper and polyolefin outer jacket with UV inhibitor.

F. Maximum Power-On Operating Temperature: 150 degrees F.

G. Maximum Power-Off Exposure Temperature: 185 degrees F.

H. Electrical Characteristics:

2.02 CABLE OUTER JACKET MARKINGS

A. Name of manufacturer, trademark, or other recognized symbol of identification.

B. Catalog number, reference number, or model.

C. Month and year of manufacture, date coding, applicable serial number, or equivalent.

D. Agency listing or approval.

2.03 CONNECTION KITS

A. Provide power connection, splice/tee, and end seal kits compatible with the heating cable and without requiring cutting of the cable core to expose bus wires.

B. Provide with NEMA 4X rating for prevention of corrosion and water ingress.

2.04 ACCESSORIES

A. Provide Accessories As Indicated or As Required for Complete Installation, Including but Not Limited To:
1. High temperature, glass filament tape for attachment of heating cable to metal piping.
2. Aluminum self-adhesive tape for attachment of heating cable to plastic piping.
3. Heat-conductive putty.
4. Cable ties.
5. Silicone end seals and splice kits.
6. Installation clips.
7. Warning labels for attachment to exterior of piping insulation.

2.05 CONTROLS

A. Pipe Mounted Thermostats:
1. Remote bulb on capillary, resistance temperature device (RTD) or thermistor for direct sensing of pipe wall temperature.
2. Control Enclosure: Corrosion resistant and waterproof.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping and equipment are ready to receive work.

B. Verify field measurements are as indicated on shop drawings.

C. Verify required power is available, in proper location, and ready for use.

3.02 PREPARATION

A. Clean exposed surfaces prior to installation.

B. Prepare surfaces using approved methods as recommended by manufacturer.

3.03 INSTALLATION

A. Install in accordance with manufacturer's written installation instructions.

B. Comply with installation requirements of IEEE 515.1 and NFPA 70, Article 427.

C. Apply heating cable linearly on pipe with fiberglass tape only after piping has successfully completed any required pressure testing.

D. Comply with applicable local building codes and requirements of authorities having jurisdiction.

E. Grounding: Refer to Division 26.

F. Identification:
   1. After thermal insulation installation, apply external pipeline decals to indicate presence of the thermal insulation cladding at intervals not to exceed 20 ft including cladding over each valve or other equipment that may require maintenance.

G. Wiring: Refer to Division 26.

3.04 FIELD QUALITY CONTROL

A. Perform start-up by factory technician or factory representative as per Owner's requirements.

B. Field Testing and Inspections:
   1. Commission system in accordance with installation and operation manual.
   2. Inspect for sources of water entry and proper sealing.
   3. Inspect weather barrier to confirm that no sharp edges are contacting the trace heating.
   4. Insulation Resistance: Greater than 20 megohms at a test voltage of 2500 VDC for polymer insulated trace heaters.
   5. Test heating cable integrity with megohmmeter at the following intervals:
      a. Before installing the cable.
      b. Prior to initial start-up (commissioning).
   6. Measure voltage and current at each unit.
   7. Controls:
      a. Verify control parameters are set to the application requirements.
   8. Submit written test report showing values measured on each test for each cable.

3.05 CLOSEOUT ACTIVITIES

A. Demonstrate operation of controls.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

D. Underground warning tape.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.04 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Schedules:
   1. Submit plumbing component identification schedule listing equipment, piping, and valves.
   2. Detail proposed component identification data in terms of of wording, symbols, letter size, and color coding to be applied to corresponding product.
   3. Valve Data Format: Include id-number, location, function, and model number.

C. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Nameplates:
   1. Heat exchangers, water heaters, and other heat transfer products.
   2. Control panels, transducers, and other related control equipment products.
   3. Pumps, tanks, filters, water treatment devices, and other plumbing equipment products.

B. Tags:
   1. Manual operated and automated control valves.

C. Pipe Markers: 3/4 inch diameter and higher.

2.02 NAMEPLATES

A. Description: Laminated or engraved piece with up to three lines of text.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch.

2.03 TAGS

A. Metal: Brass, 19 gauge 1-1/2 inch in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.

B. Valve Tag Chart: Typewritten 12-point letter size list in anodized aluminum frame.

2.04 PIPE MARKERS

A. Comply with ASME A13.1.

B. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

C. Underground Flexible Marker: Bright-colored continuously printed ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

D. Identification Scheme, ASME A13.1:
   1. Primary: External Pipe Diameter, Uninsulated or Insulated.
   2. Secondary: Color scheme per fluid service.
      a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.
   3. Tertiary: Other Details.
      a. Directional flow arrow.

2.05 UNDERGROUND WARNING TAPE

A. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, 0.005 inch, unless otherwise required for proper detection.

C. Legend: Type of service, continuously repeated over full length of tape.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive identification products.

3.02 INSTALLATION

A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags in clear view and align with axis of piping

C. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

D. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

E. Apply ASME A13.1 Pipe Marking Rules:
   1. Place pipe marker adjacent to changes in direction.
   2. Place pipe marker adjacent each valve port and flange end.
   3. Place pipe marker at both sides of floor and wall penetrations.
   4. Place pipe marker every 25 to 50 feet interval of straight run.

END OF SECTION

SECTION 22 07 19
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass fiber insulation.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

C. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2019).

D. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2019).

E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 QUALITY ASSURANCE

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

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER INSULATION

A. Insulation: 1; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
   1. Maximum Service Temperature: 220 degrees F.
   2. Maximum Moisture Absorption: 0.2 percent by volume.

B. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D. Vapor Barrier Lap Adhesive: Compatible with insulation.

E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

F. Indoor Vapor Barrier Finish:
   1. Vinyl emulsion type acrylic, compatible with insulation, black color.

G. Insulating Cement: ASTM C449.

2.03 JACKETING AND ACCESSORIES

A. PVC Plastic Jacket:
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil, 0.010 inch.
      e. Connections: Brush on welding adhesive.

B. Aluminum Jacket:
   1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
   2. Thickness: 0.016 inch sheet.
   3. Finish: Smooth.
   4. Joining: Longitudinal slip joints and 2 inch laps.
   5. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
   6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

E. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

F. Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert Location: Between support shield and piping and under the finish jacket.
4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

G. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 84 00.

H. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

END OF SECTION

SECTION 22 11 13
FACILITY WATER DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Copper pipe and fittings.

1.02 REFERENCE STANDARDS

A. ASTM D2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping; 2012.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

C. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction Materials; 2018.

D. ASTM F645 - Standard Guide for Selection, Design, and Installation of Thermoplastic Water-Pressure Piping Systems; 2015.

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturer's catalog information. Indicate valve data and ratings.

C. Project Record Documents:
   1. Record actual installed locations of piping, valves, and equipment.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of undocumented utilities.

D. Operation and Maintenance Data: Provide product information and manufacturer's operation and maintenance information for all products used.

E. Purging and Disinfecting Reports

1.04 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Manufacturers: A company specializing in manufacturing products specified in this section with a minimum of three years documented experience.

C. Installers: The installer shall have a minimum of five continuous years' experience installing systems specified in this section and at least ten projects of similar size and scope.
   1. Installers for PEX piping systems shall be factory trained by the PEX piping and fitting manufacturer.

D. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.06 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

B. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located. Pothole and locate existing utilities prior to connection to existing utility. Locations shown on the plans have not been verified, and Contractor shall anticipate the actual location may differ from that shown. Service line serving the picnic area has not been field located.

C. Verify that water-service piping may be installed to comply with original design and referenced standards.

D. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
   1. Refer to Section 22 05 00 - Common Work Results for Plumbing for notification requirements for service interruptions.
   2. Do not proceed with interruption of water-distribution service without Owner's written permission.
   3. Coordinate with utility provider for any interruption of existing water service.

1.07 COORDINATION

A. Coordinate connection to water service with utility provider.

PART 2 PRODUCTS

2.01 COPPER PIPE AND FITTINGS

A. Pipe: ASTM B88, Type-L.

B. Fittings and flanges:
   1. Cast Bronze Fittings: ASME B16.15.
   2. Cast Copper Alloy Solder Joint Pressure Fittings: ASME B16.18.
   3. Wrought Copper and Copper Alloy Solder Joint Pressure Fittings: ASME B16.22.
   4. Cast Copper Alloy Solder Joint Drainage Fittings (DWV): ASME B16.23.
   5. Cast Copper Alloy Fittings for Flared Copper Tubes: ASME B16.26.
   6. Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings: ASME B16.29.

C. Alternate Fittings and Flanges:
   1. Rolled/grooved fittings.
      a. Couplings: 200 PSI minimum joint working pressure, cast ductile iron housing conforming to ASTM A536. Gaskets for heating water or chilled water service, elastomer in accordance with ASTM D2000. Gaskets for domestic water service, EPDM per ASTM D2000. All grooved couplings shall be designed with angle bolt pads to provide rigid joint.
      b. Flanges: 200 PSI minimum joint working pressure, cast ductile iron housing, suitable for bolting to ANSI Class-125 cast iron and 150 steel flanged components. Gasket material similar to coupling gasket material.
   2. Press fitting, Viega Rigid or Nibco Press System, conforming to the material and sizing requirements of ASME B16.18 or ASME B16.22. O-ring for copper press fittings shall be EPDM.

D. Solder: ASTM B32, lead free.

PART 3 EXECUTION

3.01 GENERAL PIPING INSTALLATION

A. General: Install per the Uniform Plumbing Code (UPC). Any UPC installation instructions located in Appendix “I” (“Installation Standards”) for a specific piping material specified in this section applies to the work of this section.

B. Preparation:
   1. Clean off scale and dirt inside and outside before assembly. Cut pipes and tubes square and ream to remove all burrs.
   2. Cut pipe accurately to field measurements so work can be placed without springing or forcing.

C. Installation:
   1. Install so piping is free to expand, provide for all expansion with offsets or loops where necessary. Branch connections shall have three elbow spring pieces to allow for expansion.
   2. All changes in direction shall be made with fittings. All radius; shall be long radius.

3. Arrange piping so as not to interfere with access or removal of other equipment or devices, block access to doors, windows, manholes or other access openings.
4. Arrange piping to facilitate the removal of tube bundles, coils, etc. Provide unions ahead of screwed valves, traps or strainers on each side of each piece of equipment and wherever needed to dismantle piping.
5. All piping shall be properly pitched and graded to drain moisture and/or vent air.
6. Each low point shall have an accessible blind flange or screwed plug or cap.
7. Route pipe to avoid liquid or air pockets throughout the work. Provide at high points of closed systems, collecting chambers and automatic air vents.
8. Make reductions in pipe size using eccentric reducing fittings installed to provide drainage and venting.
9. Nipples shall be of the same material as pipe. Close nipples shall not be used.
10. Install pipe in neat and workmanlike manner, in accordance with best trade practice. Install to conserve headroom and interfere as little as possible with use of space. Run exposed piping parallel to walls unless otherwise shown. Where possible, group runs and rises.
11. Install concealed pipes in walls with clearance around piping to prevent contact with structure.
12. Pipes passing through concrete or masonry construction shall be fitted with sleeves. The inside diameter of pipe sleeves shall be at least 1/2 inch larger than the outside diameter of the pipe or pipe covering.
    a. Refer to Section 22 05 17 - Sleeves and Sleeve Seals for Plumbing Piping for sleeve fabrication and installation instructions.
13. At all connections between ferrous and non-ferrous pipe:
    a. Small Bore Pipe: Provide dielectric waterway fittings that maintain external electrical continuity while maintaining internal isolation.
    b. Large Bore Pipe: Provide dielectric flanges.
14. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

D. Installation, Building Service Connection
1. Install piping, connecting to existing building service line. Ensure that minimum vertical clearances, as required by utility provider, are provided where crossing other utilities.
2. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.
3. Piping Connections: Conforming to utility provider requirements.

3.02 APPLICATIONS

A. Within Building Footprint:
1. Above-grade, exposed areas, domestic water CW, HW, TW, and HWC: Copper
2. Above grade, concealed areas, domestic water CW, HW, TW, and HWC: Copper
3. Below grade, domestic water CW: Copper

B. Outside Building Footprint:
1. Below grade, domestic water CW: Copper

3.03 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 22 05 00 - Common Work Results for Plumbing.

3.04 COPPER PIPING INSTALLATION

A. Copper Tube
1. Solder joints shall be made in accordance with the methods of ASTM B828. All cut tube ends shall be reamed to the full inside diameter of the tube end. All joint surfaces shall be cleaned. A flux conforming to ASTM B812 shall be applied. The joint shall be soldered with a solder conforming to ASTM B32. The joining of water supply piping shall be made with lead free solders and fluxes. “Lead free” shall mean a chemical composition equal to or less than 0.2 % lead.

B. Press Connections: Copper press fittings shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

C. Rolled/Grooved Connections: Install in accordance with manufacturer's instructions.

D. Flared Joints: Flared joints for water pipe; shall be made by a tool designed for that operation.

3.05 FIELD QUALITY CONTROL

A. Inspect water distribution piping:
   1. Do not enclose, cover, or put into operation water distribution piping system until it has been inspected and approved by the appropriate authority having jurisdiction.
   2. During progress of the installation, notify the plumbing official having jurisdiction at least two (2) working days prior to the time inspection must be made. Perform tests specified below in the presence of the Plumbing Inspector.
      a. Ground work Inspection: Arrange for inspection of all plumbing systems located beneath any poured concrete slabs or foundations.
      b. Roughing-In Inspection: Arrange for inspection of piping system before concealed or closed-in after system roughing-in and prior to setting fixtures.
      c. Final Inspection: Arrange for final inspection by plumbing official to observe tests specified below and to ensure compliance with requirements of plumbing code.
   3. Re-inspections: When a Plumbing Inspector finds that piping system will not pass test or inspection, make required corrections and arrange for re-inspection by the Plumbing Inspector.
   4. Reports: Prepare and submit inspection reports signed by the Plumbing Inspector.

B. Testing water distribution system:
   1. Test for leaks and defects in new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of system tested.
   2. Leave uncovered and unconcealed in new, altered, extended, or replaced water distribution piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved for testing.
   3. Cap and subject the piping system to a static water pressure of 50 psi above the operating pressure without exceeding pressure rating of piping system materials. Isolate test-source and allow it to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
   4. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.

3.06 CLEANING:

A. Clean and disinfect water distribution piping:
   1. Purge new potable water distribution piping systems and parts of existing potable water systems that have been altered, extended, or repaired prior to use.
   2. Use purging and disinfecting procedure prescribed by authority having jurisdiction or, if a method is not prescribed by that authority, the procedure described in either AWWA C651 or AQQA C652 or as described below:
      a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
      b. Fill system or part thereof with water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) and allow it to stand for 24 hours.
      c. Drain system or part thereof of previous solution and refill with water/chlorine solution containing at least 200 parts per million of chlorine. Isolate and allow it to stand for 3 hours.

d. Flush system with clean, potable water until chlorine does not remain in water coming from system following allowed standing time.
e. Submit water samples in sterile bottles to authority having jurisdiction. Repeat procedure if biological examination made by authority shows evidence of contamination.

B. Prepare and submit reports for purging and disinfecting activities.

C. Clean interior of piping system. Remove dirt and debris as work progresses.

3.07 COMMISSIONING

A. Fill water systems.

B. Before operating systems, perform these steps:
1. Close drain valves, hydrants, and hose bibs.
2. Open shutoff valves to full open position.
3. Remove plugs used during testing of piping systems and plugs used for temporary sealing of piping during installation.
4. Check plumbing equipment and verify proper settings, adjustments, and operation.
5. Do not operate water heaters before filling with water.
6. Check plumbing specialties and verify proper settings, adjustments, and operation.
7. Energize pumps and verify proper operation.

END OF SECTION

SECTION 22 11 19
DOMESTIC WATER PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Strainers
B. Trap Primers
C. Dielectric Connections
D. Automatic Air Vents
E. Water Hammer Arrestors
F. Pressure Reducing Valves
G. Backflow Preventers
H. Thermostatic Mixing Valve Assemblies
I. Wall Hydrants

1.02 REFERENCE STANDARDS

A. American National Standards Institute (ANSI)
   1. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment
B. American Society of Sanitary Engineers (ASSE)
   1. ASSE 1001 - Pipe Applied Atmospheric Type Vacuum Breakers
   2. ASSE 1013 - Reduced Pressure Principle Backflow Preventers
   3. ASSE 1015 - Double Check Backflow Prevention Assembly
   4. ASSE 1017 - Temperature Actuated Mixing Valves for Hot Water Distribution Systems
   5. ASSE 1020 - Vacuum Breakers, Anti-Siphon, Pressure Type
C. International Association of Plumbing and Mechanical Officials (IAPMO)
   1. Uniform Plumbing Code (UPC)
D. National Safety Foundation (NSF)
   1. NSF 61 - Drinking Water System Components

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.
B. Required Submittals:
   1. Product data.
   2. Test and Inspection Reports:
      a. Completed manufacturer's startup checklist and report.
      b. Commissioning report.
   3. Project record documents.
   4. Operation and maintenance data.
   5. Warranty information:
      a. Manufacturer's warranty.
      b. Manufacturer's extended warranty.
   6. Training certificates.

1.04 DELIVERY, STORAGE AND HANDLING

A. Refer to Division 1 for product storage and handling requirements.

1.05 CLOSEOUT REQUIREMENTS

A. Refer to Division 1 for closeout submittal procedures.
B. Refer to Division 1 for demonstration and training requirements.

PART 2 PRODUCTS

2.01 TRAP PRIMERS

A. J.R. Smith, PPP Inc., or equal.

2.02 DIELECTRIC CONNECTIONS

A. Union Type

B. Flange Type

2.03 AUTOMATIC AIR VENTS:

A. Float type with isolating valves, brass or semi-steel body, copper float, stainless steel valve and valve seat. Suitable for system operating temperature and pressure, but not less than 80 PSIG.

2.04 WATER HAMMER ARRESTORS

A. Stainless steel shell and bellows, nitrogen pressurized compression chamber, Jay R. Smith Hydrotrol or approved equal.

2.05 PRESSURE REDUCING VALVES

A. Single-seated, for dead end service for 30lb to 125lb range on low-pressure side. Composition diaphragm and stainless steel springs, bronze body with threaded connections for sizes 1/2 - 2 NPS, cast iron or semi-steel body with brass or bronze trimmings and flanged connections for sizes 2-1/2 - 4 NPS.

B. Operation: Diaphragm and spring to act directly on valve stem. Delivered pressure shall vary not more than 1lb for each 10lb variation on inlet pressure.

C. Setting: Entering water pressure, discharge pressure, capacity, size, and related measurements shall be as shown on the drawings.

D. Connections at Valves And Strainers: Install shut off valve on each side of reducing valve and full sized bypass with shut off valve. Install strainer on inlet side of, and same size as pressure reducing valve. Install pressure gauge on low pressure side of line.

2.06 BACKFLOW PREVENTERS

A. Install backflow preventers per the requirements of the Uniform Plumbing Code; Article 603 "Cross Connection Control". All backflow preventers shall be listed by the State of Washington, Department of Health, as an approved cross-connection control device.

B. Pressure Type: ASSE 1020

C. Atmospheric Vacuum Breaker: ASSE 1001

D. Double Check Detector Backflow Prevention Assembly, Fire service: ASSE 1015.

E. Double Check Valve Assemblies, Reduced Pressure, 3/4 - 2 NPS
   1. Bronze body construction.
   2. The assembly shall consist of an internal pressure differential relief valve located in a zone between two positive seating check modules with captured springs and silicone seat discs.
   3. Seats and seat discs shall be replaceable in both check modules and the relief valve.
   4. There shall be no threads or screws in the waterway exposed to line fluids.
   5. Service of all internal components shall be through a single access bronze cover secured with stainless steel bolts.
   6. The assembly shall meet the requirements of: USC; ASSE Std. 1013; AWWA Std. C511-92; CSA B64.4.
   7. Provide with the following accessories:
      a. Four resilient seated test cocks.
      b. Two resilient seated quarter turn ball valves for isolation.
      c. Bronze strainer at inlet.
      d. Airgap fitting for relief discharge.

F. Double Check Valve Assemblies, Reduced Pressure, 1 - 3 NPS
   1. Bronze body construction.

2. The assembly shall consist of an internal pressure differential relief valve located in a zone between two positive seating check modules with captured springs and silicone seat discs.
3. Seats and seat discs shall be replaceable in both check modules and the relief valve.
4. There shall be no threads or screws in the waterway exposed to line fluids.
5. Service of all internal components shall be through a single access bronze cover secured with stainless steel bolts.
6. The assembly shall meet the requirements of: USC; ASSE Std. 1013; AWWA Std. C511-92; CSA B64.4.
7. Provide with the following accessories:
   a. Four resilient seated test cocks.
   b. Two resilient seated quarter turn ball valves for isolation.
   c. Bronze strainer at inlet.
   d. Airgap fitting for relief discharge.

G. Double Check Valve Assemblies, Reduced Pressure, 2-1/2 - 10 NPS
1. Steel or cast iron construction with epoxy coated and lined check valves.
2. The assembly shall consist of a pressure differential relief valve located in a zone between two positive seating check valves and captured springs. Backsiphonage protection shall include provision to admit air directly into the reduced pressure zone via a separate channel from the water discharge channel.
3. The Lead Free* Reduced Pressure Zone Assembly shall comply with state codes and standards, where applicable, requiring reduced lead content.
4. The assembly shall meet the requirements of ASSE Std. 1013; AWWA Std. C511-92; CSA B64.5; and UL Classified File No. EX3185. Listed by IAPMO (UPC). Approved by the Foundation for CrossConnection Control and Hydraulic Research at the University of Southern California.
5. Provide with the following accessories:
   a. Four resilient seated test cocks.
   b. Two resilient seated non-risting stem gate valves for isolation.
   c. Two resilient seated, UL/FM approved outside stem and yoke valves for isolation.
   d. Cast iron strainer at inlet.
   e. Airgap fitting for relief discharge.

2.07 THERMOSTATIC MIXING VALVE ASSEMBLIES

A. Point Of Use Mixing Valves
1. Provide a complete tempering valve assembly for recessed installation including valve, piping, fittings, and accessories.
2. Valve
   a. Lead-free brass body with lead-free and corrosion-resistant internal components.
   b. Paraffin actuator assembly.
   c. Temperature adjustment via allen wrench, with locknut on bonnet to prevent accidental or unauthorized adjustment.
   d. Integral cartridge style checks with screens to prevent backflow and to filter debris from entering the valve assembly.
   e. 125 PSIG maximum operating pressure.
   f. Adjustable for 90-115°F temperature output.
   g. Certifications: ASSE 1069, ASSE 1070, CSAB125.3
3. Provide valve assembly with the following accessories:
   a. Brass ball valves at supply inlets and outlet.
   b. Temperature gauges at each inlet and outlet pipe.
   c. Access panel for recessed installation in wall.

2.08 WALL HYDRANTS

A. Freezeproof
1. Box type with integral vacuum breaker.

B. Mild Climate

1. Box type with integral vacuum breaker.

PART 3 EXECUTION

3.01 STRAINERS

A. Provide blowdown valves with 3/4 inch hose connections at all strainer locations.

3.02 DIELECTRIC CONNECTIONS

A. Provide dielectric connections at all connections between ferrous and non-ferrous pipe:
   1. Small Bore Pipe: Provide dielectric waterway fittings that maintain external electrical continuity while maintaining internal isolation.
   2. Large Bore Pipe: Provide dielectric flanges.

3.03 AUTOMATIC AIR VENTS

A. Locate automatic air vents at high points in piping system.

B. Where air vents are located in inaccessible locations, covered locations, or in locations where leakage could potentially damage the building in any way, provide drain piping from the air vent to the nearest approved indirect drain receptor.
   1. Drain piping shall not be run to drain locations in public areas.

3.04 WATER HAMMER ARRESTORS

A. Provide water hammer arrestors at all of the following location(s):
   1. All restroom piping groups.
   2. Water header assembly.

B. Size and provide in accordance with the Manufacturer’s Instructions.

3.05 PRESSURE REDUCING VALVES

A. Set discharge pressure of pressure reducing valves as follows:
   1. General use: 60-80 psig

3.06 BACKFLOW PREVENTERS

A. Provide isolation valves and strainers for all backflow preventer assemblies.

B. Route discharge pipe from pressure-reducing type backflow preventer assemblies from air gap fitting at assembly to the nearest floor drain, floor sink, or other approved drain location.
   1. Pipe shall not be routed across floor or in other manner that creates a tripping hazard or otherwise obstructs the area.

3.07 THERMOSTATIC MIXING VALVE ASSEMBLIES

A. General
   1. Install temperature-actuated water mixing valves with check stops and shutoff valves on inlets and with shutoff valve on outlet.

B. Labelling
   1. Provide explanatory text on signs. Identify units. Distinguish among units, inform operator of operating requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Setup, Testing and Adjusting
   1. Startup of mixing valve assemblies shall be performed by factory-trained technicians. Perform startup of valve system in accordance with manufacturer's instructions.
   2. Set field-adjustable temperature set points of temperature-actuated water mixing valves. Adjust set point within allowable temperature range.
   3. Remove and replace malfunctioning thermostatic mixing valves and retest.

3.08 TRAP PRIMERS

A. Provide trap primers and primer connections for all of the following:
   1. Floor drains.

2. Trench drains.

END OF SECTION

SECTION 22 13 16
SANITARY WASTE AND VENT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cast iron piping.

1.02 REFERENCE STANDARDS

A. General: References used throughout Division 22 are generally accepted industry standards. The edition of the criteria cited shall be that in force at the time of bid. The Contractor shall provide all work in accordance with codes and standards in force in the Authority Having Jurisdiction for the project, to include all local amendments.

B. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.

C. ASTM A888 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

D. ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.

E. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

F. CISPI 301 – Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

G. CISPI 310 – Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

H. CSA CAN/CSA B602M - Mechanical Couplings for Drain, Waste and Vent Pipe and Sewer Pipe.

I. IAPMO IS 1 – Non-Metallic Building Sewers.

J. IAPMO IS 9 – PVC Building Drain, Waste and Vent Pipe and Fittings.

K. IAPMO IS 11 – ABS Sewer Pipe and Fittings.

L. UPC - Uniform Plumbing Code

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Required submittals:
   1. Product data.
   2. Project record documents.
   3. Warranty information:
      a. Manufacturer's warranty.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Buried piping shall comply with requirements of utility provider.

C. Manufacturers: A company specializing in manufacturing products specified in this section with a minimum of three years documented experience.

D. Installers: The installer shall have a minimum of five continuous years’ experience installing systems specified in this section and at least ten projects of similar size and scope.

1.05 DELIVERY, STORAGE AND HANDLING

A. Refer to Division 1 for product storage and handling requirements.

1.06 CLOSEOUT REQUIREMENTS

A. Refer to Division 1 for execution and closeout requirements.

B. Refer to Division 1 for closeout submittal procedures.

C. Refer to Division 1 for demonstration and training requirements.

PART 2 PRODUCTS

2.01 CAST IRON PIPE AND FITTINGS

A. Soil, Drain, Waste, & Vent Piping: Standard weight bell and spigot cast iron (ASTM A74) or hubless cast iron (ASTM A888/CISPI 301)

B. Hubless Fittings: ASTM A888 or CISPI 301
   1. Couplings: CISPI 301, ASTM C1277, or ASTM C1540
   2. Elastomeric Sealing Sleeve: ASTM C564, CISPI HSN 85, or CSA CAN/CSA B602M, with center stop

PART 3 EXECUTION

3.01 GENERAL

A. All main vertical soil and waste stacks shall be installed with provision for expansion and shall be extended full-size to and above roof lines as vents, except where otherwise specifically indicated.

B. All vent pipe openings on the roof shall terminate not less than 10'-0" horizontally and 1'-0" vertically above any opening to the building or outside air intake opening.

C. Where practical, two or more vent pipes shall be connected together and extended as one pipe through roof. Vent pipes in roof spaces shall be run as close as possible to underside of roof, with horizontal piping pitched down to stacks without forming traps in pipes, using fittings as required.

D. Vertical vent pipes may be connected into one main riser above vented fixture. Where an end or circuit vent pipe from fixture or line of fixtures is connected to a vent line serving other fixtures, connections shall be located to prevent use of any vent line as a waste.

3.02 APPLICATIONS

A. Within Building Footprint:
   1. Below grade, sanitary sewer, general use: Cast iron
   2. Below grade, vent, general use: Cast iron
   3. Above grade, sanitary sewer, general use: Cast iron
   4. Above grade, vent, general use: Cast iron

B. Outside Building Footprint:
   1. Below grade, sanitary sewer, general use: Cast iron

3.03 CAST IRON PIPE INSTALLATION

A. Mechanical Joints for Hubless Cast Iron: Install in accordance with manufacturer’s instructions and CISPI standards.

B. Where cast iron piping is used in above-grade applications in combination with plastic piping below grade, the cast iron piping shall extend a minimum of 18" below grade or to the first fitting below grade, whichever is deeper.

3.04 PIPE SLOPE

A. Horizontal drain piping shall be installed with the following minimum pipe slope(s):
   1. 3" and smaller: 1/4" per foot (2%).
   2. 4" and larger: 1/8" per foot (1%).

3.05 ROOF PENETRATIONS

A. Provide manufactured neoprene, santoprene, or similar vent flashing assemblies for all roof penetrations.

B. Vent flashing assemblies shall be compatible with the roof construction where the penetration is located.

3.06 CLEANOUTS

A. Provide cleanouts at all locations required to permit cleaning of all sewer piping. Cleanouts shall be full-sized of pipe, but not larger than 4". This shall include cleanouts at base of all vertical lines, ends of all horizontal main runs, and elsewhere as shown on Drawings. Cleanout openings shall be closed with brass screw plugs. Where cleanouts occur in floor, furnish and install a brass ferrule, complete with screwed brass cover, flush with floor.

3.07 TESTS

A. Sanitary and waste lines shall be tested with water at a pressure of not less than 5 PSI. Duration of test shall be not less than 24-hours, and shall be witnessed by Architect.

B. If any piping is found to leak, all defects shall be remedied and test repeated.

END OF SECTION

SECTION 22 13 19
SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flexible pipe joints

B. Drains

C. Cleanouts

1.02 REFERENCE STANDARDS

A. American Society of Sanitary Engineers (ASSE)
   1. ASSE 1051 - Individual and Branch Type Air Admittance Valves for Sanitary Drainage Systems

B. American Society of Testing and Materials (ASTM)
   1. ASTM D4101 - Standard Specification for Polypropylene Injection and Extrusion Materials

C. International Association of Plumbing and Mechanical Officials
   1. UPC - Uniform Plumbing Code

D. National Sanitation Foundation International (NSF)
   1. NSF 14 - Plastics Piping System Components and Related Materials

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data: Valves, pipe joints, drains and all other specialty components specified herein.

C. Installation instructions.

1.04 DELIVERY, STORAGE AND HANDLING

A. Refer to Division 1 for product storage and handling requirements.

1.05 CLOSEOUT REQUIREMENTS

A. Refer to Division 1 for execution and closeout requirements.

B. Refer to Division 1 for closeout submittal procedures.

C. Refer to Division 1 for demonstration and training requirements.

PART 2 PRODUCTS

2.01 FLEXIBLE PIPE JOINTS

A. Expansion Joints: Waste/Vent Stacks: JR Smith Model 1710 or approved equal.

B. Flexible Pipe Joints: Waste/Vent: Metraflex Model 201 or approved equal.

2.02 DRAINS

A. Drains shall be Josam, Jay R. Smith, Sioux Chief, Wade, Zurn, or approved equal.

B. Floor Drains
   1. Floor Drains: duco cast iron body with flashing collar, square polished nickel bronze adjustable strainer head and grate, trap primer connection and vandal proof screws. Size as per Plans.
   2. Floor And Funnel Drains: Duco cast iron two piece body with flashing collar, seepage openings, round polished nickel bronze adjustable strainer head and grate complete with 4 inch diameter polished nickel bronze funnel, trap primer connection and vandal proof screws.

C. Trench Drains
   1. Manufactured trench drain system including polyester polymer concrete or polypropylene body, cast iron or coated cast iron grating, and vandal-resistant grate fastening system.

Grating shall be ADA compliant. Grating shall meet DIN load rating E. Grating shall be heelproof type.

2.03 CLEANOUTS

A. Cleanouts shall be Josam, Jay R. Smith, Sioux Chief, Wade, Zurn, or approved equal.

B. Floor: Duco cast iron body with round adjustable scoriated secured nickel bronze top, gasket seal-ABS countersunk closure plug, complete with flashing flange and clamp.

C. Wall: Duco cast iron caulk ferrule with cast iron countersunk closure plug. Provide with stainless steel cover and screw.

PART 3 EXECUTION

3.01 GENERAL

A. Install specialties in accordance with Uniform Plumbing Code, Manufacturer's installation instructions, and local jurisdiction requirements.

3.02 DRAINS

A. Provide the drainage equipment and all piping for a complete drainage system as shown and detailed on Plans.

B. Provide water pipe connections to trap primers and run the primer lines to the drains. Verify location of trap primers with Architect before installing.

C. See Section 22 11 19, Domestic Water Piping Specialties, for trap primers.

3.03 CLEANOUTS

A. Provide cleanouts as indicated on the plans, and as required by the Uniform Plumbing Code.

B. Provide cleanouts at the locations specified below, regardless of whether or not indicated on the drawings:
   1. Drains Within Buildings: Not more than 100’ apart.
   2. Drains Outside Of Buildings: Not more than 100’ apart.
   3. Changes of Direction Inside Buildings: At each fitting of greater than 45 degrees. Where more than one change of direction occurs in a run of piping, only one cleanout shall be required for each 40’ of developed length of the drainage piping.
   4. Building Sewer Junction: Provide a cleanout at the junction between the building drain and building exterior sewer. Provide a 2-way cleanout at this junction.

C. Install in accordance with Manufacturer’s instructions.

END OF SECTION

SECTION 22 30 00
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial electric water heaters.

B. Diaphragm-type compression tanks.

C. In-line circulator pumps.

1.02 REFERENCE STANDARDS

A. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); Current Edition.

B. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2023.

C. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Provide electrical characteristics and connection requirements.

C. Project Record Documents: Record actual locations of components.

D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

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

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 WATER HEATERS

A. Commercial Electric Water Heaters
   1. Heater(s) shall be listed by Underwriters' Laboratories. Models shall meet the standby loss requirements of the U.S. Department of energy and current edition of ASHRAE/IES 90.1.
   2. Heater(s) shall have 150 psi working pressure and be equipped with extruded high density anode rod.
   3. All internal surfaces of the heater(s) exposed to water shall be glass lined with an alkaline borosilicate composition that has been fused-to-steel by firing at a temperature range of 1400°F to 1600°F.
   4. Electric heating elements shall be medium watt density with zinc plated copper sheath. Each element shall be controlled by an individually mounted thermostat and high temperature cutoff switch.
   5. The outer jacket shall be of backed enamel finish and shall enclose the tank with foam insulation.
   6. Electrical junction box with heavy duty terminal block shall be provided.
   7. The drain valve shall be located in the front for ease of servicing.

8. The tank shall be provided with a CSA certified and ASME rated temperature & pressure relief valve.
9. Heater tank shall have a three year limited warranty as outlined in the written warranty.

2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

B. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psig.

2.03 IN-LINE CIRCULATOR PUMPS

A. Pump Type: Bronze circulator pump

B. Connections: 3/4" Sweat or 1/2" Sweat

C. Housing Material: Bronze

D. Impeller Material: Composite, PES

E. Liquid Temperature: 35.6 - 230°F or 35.6 - 150.8°F

F. Integral digital controller with three control modes:
1. Basic Control Mode: The pump runs at 100% mode constantly.
2. Temperature Control Mode: Keeps the water temperature within an optimal temperature range that is calculated every 12 hours.
3. Auto Control Mode: Learns the hot water consumption patterns of the user and adapts operation time accordingly.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions required for applicable certifications.

B. Electrical Work: Provide automatic control and protective devices with associated wiring to interconnect related interfaced devices required for specified operation.

C. Coordinate system, equipment, and piping work with applicable electrical, drain, and waste support interconnections as included or provided by other trades.

END OF SECTION

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush valve water closets.

B. Wall hung urinals.

C. Lavatories.

D. Under-lavatory pipe supply covers.

E. Outdoor drinking fountains.

F. Mop sinks.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).

C. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2022).

D. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

E. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

F. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

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

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on-site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 REGULATORY REQUIREMENTS

A. Comply with applicable codes for installation of plumbing systems.

B. Perform work in accordance with local health department regulations.

2.03 FLUSH VALVE WATER CLOSETS

A. Water Closets:

1. Fixture shall be fabricated from 16 gage, type 304 stainless steel. Construction shall be seamless welded and exposed surfaces shall have a satin finish with hinged, elongated, open-front seat.
2. Toilet shall be concealed Siphon Jet type with an elongated bowl and a self-draining flushing rim.
3. Toilet shall be configured as wall-mount type for concealed flush valves.
4. Toilet shall be ASME A112.19.3-2008 and CSA B45.4-2008 compliant. Toilet requires a minimum of 25 PSI flow pressure and uses a minimum water consumption of 1.28 GPF. Toilet trap shall have a minimum 3-1/2" seal that shall pass a 2-1/8" diameter ball and be fully enclosed. Toilet waste outlet shall be a gasketed waste.
5. Fixture shall be ADA compliant.

B. Flush Valves:
1. Rear spud fixture connection, single flush, concealed manual flushometer.
2. Activation shall be by wall-mounted push button.
3. Valve Body, Cover, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classi?cation for Semi- Red Brass.
4. Valve shall be in compliance with the applicable sections of ASSE 1037 and ANSI/ASME 112.19.2.
5. Flushometer shall be ADA compliant.

C. Water Closet Carriers:
1. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.04 WALL HUNG URINALS

A. Urinal
1. Fixture bowl is fabricated of 16 gage type 304 stainless steel and the housing fabricated of 18 gage type 304 stainless steel with exterior surfaces polished to a satin finish.
2. Urinal is a high efficiency type designed for a 1/8 GPF flush valve and supplied with 3/4" NPT flushing inlet connection and 1-1/2" O.D. plain end P-Trap.
3. Fixture shall be ADA compliant.

B. Flush Valve
1. 0.125 gpf, Rough Brass Finish, Fixture Connection Rear Spud, Single Flush, concealed manual specialty urinal hydraulic flushometer.
2. Valve Body, Cover, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classi?cation for Semi- Red Brass. Valve shall be in compliance with the applicable sections of ASSE 1037 and ANSI/ASME 112.19.2.
3. Activation shall be by wall-mounted pushbutton.
4. Flush valve shall be ADA compliant.

C. Urinal Carriers:
1. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.05 LAVATORIES

A. Wall-Hung Lavatory:
1. Fixture shall be wall-mount type, fabricated from heavy gage, type 304 stainless steel. Construction shall be seamless welded with #4 a satin finish exterior. Lavatory deck shall have an integral air-circulating, self-draining soap dish. Lavatory angle braces and fasteners shall be furnished by manufacturer.
2. Fixture shall be ADA compliant.
3. Wall carrier shall be ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

B. Metered Faucet:
1. Metering type, single-supply, single-hole deck mount, chrome plated. Integral, cast brass spout, 4-1/8" center-to-center. 2.2 GPM (8.3 L/min) pressure compensating Softflo aerator.

1-3/4" metal, vandal-proof, push handle with blue or red index button. MVP self-closing, auto-timed metering cartridge, adjustable run time from 2 to 25 seconds, opens with push, 0.20 max gallon/cycle. 1/2" NPSM supply inlet with coupling nut for 3/8" or 1/2" flexible riser. Mounting hardware included. ECAST construction with less than 0.25% lead content by weighted average. This product meets ADA ANSI/ICC A117.1 requirements and is tested and certified to industry standards: ASME A112.18.1/CSA B125.1, and Certified to NSF/ANSI 61, Section 9.

2.06 UNDER-LAVATORY PIPE SUPPLY COVERS

A. General:
   1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
   2. Construction: 1/8 inch PVC with antimicrobial, antifungal and UV resistant properties.
      a. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
      b. Comply with ICC A117.1.

2.07 OUTDOOR DRINKING FOUNTAINS

A. Drinking fountain shall be furnished by owner for installation by contractor.

2.08 MOP SINKS

A. Mop Sink shall be made of precast terrazzo to produce a compressive strength of not less than 3,000 PSI seven days after casting. All exposed surfaces shall be ground smooth and sealed. No air holes or pits shall be allowed on the finished surface.

B. Sink shall have coved corners and be pitched to the outlet for positive drainage.

C. Integral drain shall have a stainless steel strainer and provide for an inside caulked connection to a 3" pipe.

D. Provide with beehive dome strainer, rubber drain gasket, 36” long hose, stainless steel mop hanger with 3 grips, and 2 wall guard panels.

E. Faucet: Service Sink Faucet for hot and cold water, exposed wall-mount, chrome plated. Top-mounted supplies with 6" fixed centers. Rigid spout with vacuum breaker, pail hook, and wall brace, 5-3/4" center-to-center. 2-3/8" metal, vandal-proof, lever handles with sixteen-point, tapered broach and secured blue and red index buttons. Quarter turn rebuildable compression cartridge, opens and closes 90°, closes with water pressure, features square, tapered stem. 1/2" NPT female thread, top-mounted supply inlets. 3/4" male hose thread outlet.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome-plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall carriers and bolts.

3.04 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.05 CLEANING

A. Clean plumbing fixtures and equipment.

3.06 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General requirements for Division 23 (HVAC).

1.02 SUMMARY

A. Section includes all general requirements that apply to the entirety of Division 23 - HVAC, both interior and exterior to the building, as indicated on the plans and specified herein.

B. All specification sections with Division 23 - HVAC are complementary. All specification sections within Division 23 shall be considered to reference each other.

C. Provide all HVAC work as indicated in the drawings and specified herein.

1.03 REFERENCE STANDARDS

A. American Institute Of Steel Construction (AISC)

B. American Society Of Heating, Refrigerating And Air-Conditioning Engineers (ASHRAE)
   1. ASHRAE - HVAC Applications Handbook, I-P Edition

C. International Code Council (ICC)
   1. IMC - International Mechanical Code
   2. IBC - International Building Code
   3. IFC - International Fire Code

D. National Electrical Manufacturers Association (NEMA)
   1. NEMA MG 1 - Motors and Generators

E. National Fire Protection Association (NFPA)
   1. NFPA 70 - International Electrical Code
   2. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems

F. Sheet Metal And Air Conditioning Contractors' National Association (SMACNA)
   1. SMACNA 1650 - Seismic Restraint Manual Guidelines for Mechanical Systems, 2nd Edition
   2. SMACNA 1966 - HVAC Duct Construction Standards Metal and Flexible, 3rd Edition

G. Underwriters Laboratories (UL)
   1. Fire Resistance Directory
   2. Building Materials Directory

H. Washington Administrative Code (WAC)
   1. 51-11C - Washington State Energy Code - Commercial Edition

1.04 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data: Provide product data for all components and equipment provided under this Division.
   1. Product sheets with more than one item or option shown shall have the product(s) and options to be used on the project clearly identified.
   2. Any equipment or materials installed or furnished without prior approval of the Owner's Representative shall be rejected and such materials will be required to be removed and replaced with approved materials at the expense of the Contractor.

C. Shop Drawings:
   1. Shop drawings shall be submitted for review and approval prior to beginning work.
   2. Shop drawings shall indicate routing of piping and location of all equipment to be provided, and shall reflect coordination with other disciplines and existing conditions.

D. Manufacturer's Installation Instructions: Indicate installation instructions and recommendations.

E. Field Quality Control Submittals: Indicate test reports, inspection reports, and commissioning reports.

F. Project Record Documents:
   1. Record actual routing of installed piping and ductwork, including elevation (or depth for buried items).
   2. Record actual equipment and components installed, as well as locations.
   3. RFI's, change orders, and the like shall be noted on the Record Documents where these affect the layout or other aspect of project shown on the documents. References to these shall include the RFI/change order number as well as written description(s), sketch(es), etc., indicating the change or clarification.
   4. Record actual location of installed valves, sensors, dampers, and other control components.
      a. Include riser diagram(s) and schedule of valve tags and locations.
   5. Record actual location and type of vibration isolation devices.
   6. Final record documents:
      a. Transfer plan notes and revisions to CAD, indicate the area of change with a bubble around that area. Provide CAD file to Architect for approval. Employ AutoCAD (by AutoDesk) DWG format, version no older than one year prior to date of bid.

G. Operation and Maintenance (O&M) Data:
   1. Include manufacturer's descriptive literature, operating instructions of equipment and controls, maintenance and repair data, and parts listings.
   2. Include manufacturer's warranty information, including any extended warranties, or certifications of warranties required for specific products, systems, or installations.
   3. Include certification of inspection(s) from the Authority Having Jurisdiction for the applicable work scope(s).
   4. Include certification of training.
   5. Include certification of Contractor's one-year warranty of materials and workmanship, including effective date(s) of warranty period.

H. Seismic support calculations and any related required certification(s).

I. Warranty Information:
   1. Certificate of installing contractor's one-year warranty.
      a. Warranty certificate shall specifically list project information, owner information, start and end dates of warranty period, and specific description of coverage (materials, labor, other costs, etc.).
   2. Certificate of product manufacturer's warranty.
      a. Warranty certificate shall specifically list project information, owner information, start and end dates of warranty period, and specific description of coverage (materials, labor, other costs, etc.).
   3. Certificate of extended warranty.
      a. Warranty certificate shall specifically list project information, owner information, start and end dates of warranty period, and specific description of coverage (materials, labor, other costs, etc.).
      b. Provide extended warranty for:
         1)

1.05 QUALITY ASSURANCE

A. Manufacturer: A company specializing in manufacturing products specified in Division 23 with a minimum of three years documented experience.

B. Contractor: Mechanical work required under this Division shall be performed by a Washington State Licensed Mechanical Contractor.

C. Electrical work required under this Division shall require an Electrical Permit.
   1. Electrical permit shall be procured by the Division 23 contractor or their electrical subcontractor.

D. Electrical Equipment
   1. Any piece of equipment used in this project and hereinafter specified which, by its nature, requires electrical connection(s), such as fans, pumps, hot water tanks, boosters, air handling equipment, etc., shall be provided with an approved label from either Underwriters Laboratories (UL), the American Gas Association (AGA) or the Canadian Standards Association (CSA).
   2. Approval of agency must be for the total package (approval of individual components not acceptable) and all labels must be located outside of equipment and shall be visible to inspector.

E. Performance Certification: All equipment performance (airflow, heating capacity, cooling capacity, etc.) shall be certified by a recognized national agency such as the Air Conditioning and Refrigeration Institute (ARI), Air Movement and Control Association (AMCA) and the American Society of Mechanical Engineers (ASME).

1.06 DELIVERY, STORAGE AND HANDLING

A. Refer to Division 1 for product storage and handling requirements.

B. Lift only with lugs provided. Handle carefully to avoid damage to components, enclosure and finish.

C. Protect products from weather and moisture. Provide coverings of plastic or canvas. Cover openings into pipe and duct. Isolate components from contact with the soil. Provide a means of heating for those components that may become damaged by high or low temperatures.

D. For extended outdoor storage, remove motors and other electrical equipment from enclosures not designed for outdoor use and store separately.

1.07 DEFINITIONS

A. The term "approved equal" means final approval by the Architect of a material or piece of equipment substituted for that which is shown in the Specifications or Plans.

B. The term "provide" means the furnishing and installing of equipment (including connections and appurtenances) complete and ready for use.

C. The term "Mechanical Contractor (MC)" and "Electrical Contractor (EC)" as used in these Specifications or on the Contract Drawings, refer to those subcontractors working under the direction of the General Contractor (GC).

1.08 MISCELLANEOUS REQUIREMENTS

A. Intent of Drawings
   1. The drawings are intended to depict the general scope of arrangement. The drawings are diagrammatic and do not show the exact details and locations, nor all offsets in ductwork and piping. Provide additional fittings, offsets and extensions in piping, ductwork and related items to provide full systems functionality and to assure access for equipment maintenance and as detailed elsewhere in the contract. Relocate or shift piping and ductwork where conflict exists with other plumbing or mechanical systems, structural elements, architectural elements, or electrical systems, or other project work scope(s). Report conflicts before proceeding with work. Provide reasonable planning and layout in advance of installation in order to avoid conflicts and delays. The Contractor will be directed to adjust systems due to conflicts that could have been reasonably foreseen at the Contractor’s own expense.
   2. Examine the Architectural, Civil, Landscape Architectural, Structural, Electrical, and other project drawings before work is started. Consult with each of the other Contractors regarding locations and spaces required for the work and lay out work to avoid interference. Failure to provide reasonable coordination shall result in the Contractor, at his own expense, moving his work to provide the necessary space for the other Contractors.

B. Permits and Fees: Obtain and pay for all permits and construction fees. Furnish Final Certificate to Owner showing compliance with code requirements.

C. Scheduling: Comply with requirements of Division 1.

D. As-Specified Equipment: These specifications and drawings generally list only one make and model number for each item of equipment or material required for the project. This is not intended to be restrictive but is intended to indicate the standard of quality, design and features required. In addition the listed product is the basis of the design regarding physical size, capacity, electrical power requirements and performance. The product so identified is designated "as specified."

E. Prior Approvals:
   1. Specifications have been written around equipment and materials selected for this project based on quality, size, capacity, and performance required to meet building design criteria. All equipment and materials used in this project that have been specified around a specific product or products shall have prior approval for product substitutions.
   2. Request for Approval must be submitted in accordance to Division 1 requirements,
   3. Supplier and/or Mechanical Contractor shall be responsible to ensure that substituted material or equipment is of same size, quality, capacity, weight and electrical characteristics as that specified or shown on the drawings. Any changes and cost increases required during construction due to substituted equipment shall be paid by the Contractor/Supplier. Prior approval to bid does not mean final approval of material or equipment. Final approval will be given after final submitted data has been presented, complete with full information regarding weights, capacities, size, electrical requirements and quality.

F. Contractor’s Cost Breakdown: Submit a cost breakdown (schedule of values) of the major portions of the work. Provide this submittal along with the equipment submittals. Organize the costs generally by specification section. For example, if one Section (such as copper piping) applies to both plumbing and hydronics, apportion the appropriate amount to each area of work.

1.09 CLOSEOUT REQUIREMENTS

A. Refer to Division 1 for execution and closeout requirements.

B. Refer to Division 1 for closeout submittal procedures.

C. Refer to Division 1 for general demonstration and training requirements.

1.10 REQUESTS FOR INFORMATION

A. Refer to Division 1 for Request for Information (RFI) requirements and procedures.

PART 2 PRODUCTS

2.01 DAMAGED OR REJECTED MATERIALS

A. Damaged or rejected materials shall be removed from the site immediately upon discovery.

2.02 FIRE INTEGRITY

A. All mechanical system penetrations of fire rated assemblies shall be protected in accordance with the building code in force in the Authority Having Jurisdiction for this project. This includes piping, ductwork, supports, conduit, and any other system and appurtenance provided by Division 23. In addition, all through-penetration sealing methodologies shall be listed in the Underwriter’s Laboratories (UL) Fire Resistance Directory, issue current at time of bid.

2.03 MOTORS

A. Motors shall comply with the current edition of the Washington State Energy Code. Service factor for poly-phase motors shall be 1.15. Service factor for single phase motors shall be 1.35.

B. In addition to the requirements in Paragraph “A” above, motors for variable frequency drives shall be of premium efficiency and are suitable for VFD operation (“Inverter Ready”) in accordance with NEMA MG-1, Part 31.4.4.2. Additionally, motors shall be acceptable to the manufacturer of the drive for inverter use. “Inverter Duty” motors are not necessarily required.

PART 3 EXECUTION

3.01 CODE COMPLIANCE

A. The Contractor shall comply with all applicable codes and requirements including but not limited to:
   1. International Building Code, including local amendments.
   2. International Fuel Gas Code, including local amendments.
   3. International Mechanical Code, including local amendments.
   4. International Fire Code, including local amendments.
   5. Uniform Plumbing Code, including local amendments.
   6. National Electrical Code (NFPA 70), including local amendments.
   7. Washington State Energy Code
   8. Requirements of the local Authority Having Jurisdiction (AHJ).
      a. Authority Having Jurisdiction: City of Kirkland.

3.02 LAYING OUT WORK

A. Locate all general reference points and take such action as is necessary to prevent their destruction lay out work and be responsible for all lines, elevations, grading for utilities and other work required under the Contract. Exercise proper precaution to verify figures shown on drawings before laying out work and be responsible for any error resulting from failure to exercise such precaution. Coordinate the utility installation with the final site grading and elevations. Locate existing utility lines that will be affected by the building location before any footing work begins. Report conflicts with the Plans before proceeding with the work. Failure to follow reasonable precautions with regards to this instruction will require Contractor to alter the work at the Contractor’s expense.

3.03 ELECTRICAL WORK

A. All electrical work performed under this Section of the Specifications shall conform to all applicable portions of the Electrical Section of the Specifications, and shall conform to the NEC and other all applicable codes.

B. All electrical work performed under this Section of the Specifications shall require a permit. Contractor shall obtain and pay for all required permits and fees.

C. All electrical work performed under this Section of the Specifications shall be performed by a electrician licensed in the jurisdiction where the work is performed.

3.04 WORKMANSHIP

A. Furnish and install all equipment in a neat and finished appearance. If any portion of the work has not been installed in a workmanlike manner, or has been left in a rough, unfinished manner, the Contractor shall remove the equipment, reinstall and patch and paint surrounding surfaces without any increase in cost.

3.05 DUCT INSTALLATION

A. Ductwork shall not be located over electrical panels or switchboards except where located above the structural ceiling.

B. Lay below-grade duct and piping in straight lines with uniform slope. Care shall be taken to keep all foreign materials out of the duct and pipes during installation.

3.06 OPENINGS IN PIPES AND DUCTS

A. Keep closed during the work.

3.07 INSERTS

A. Inserts in concrete for the suspension of piping and equipment shall be provided by this Contractor unless otherwise noted on the Plans. Inserts in "poured in place" concrete shall be Grinnell, Kinsdorf, Elcen, or approved equal. Provide as necessary for support of systems installed.

3.08 CUTTING AND PATCHING

A. General:
   1. Provide all saw cutting, core drilling, and other work (including patching) necessary for installation of mechanical systems.
   2. Prior to cutting, saw cutting, or core drilling any concrete, Contractor shall locate any reinforcing steel (rebar) and the like located in the concrete where the cutting is to be performed. Obtain specific approval from the Architect prior to cutting any concrete reinforcement. Approval must be obtained for each specific instance of cutting reinforcement.
   3. Unless directed otherwise by Structural Documents, maintain the following minimum clearances from any concrete reinforcement:
      a. Reinforcing steel: 2”

B. New Work: Provide openings in walls, floors, foundations, etc. for pipe, duct and associated items required for installation under Division 23 are provided.Furnish dimensions and locations of openings to other Contractors doing the work. Provide ample coordination time to avoid delays and unnecessary labor. The expense for cutting and patching made necessary to admit work, repair defective material or workmanship, or by neglect to anticipate proper requirements shall be borne by this Contractor.

C. Existing Structure:
   1. All necessary cutting and patching of existing structures necessary for the installation of mechanical work shall be as part of this Contract. Unless cutting and patching locations are specifically shown on the drawings, obtain approval prior to proceeding.
   2. All surfaces must be patched upon completion of work. Final finish of all patched surfaces (walls, ceilings, floors etc.) shall be done per finish schedules shown on the Architectural Drawings or patched to match the adjacent surface.
   3. Contractor shall locate all steel in existing structure using x-ray or similar scanning equipment prior to cutting into existing structure.

3.09 COORDINATION WITH CONTROLS INSTALLATION

A. Review the controls section of Division 23 and the drawings. Provide installation of any components specified in that section.

3.10 MAINTENANCE AND OPERATION ACCESS

A. Provide suitable access to all mechanical equipment requiring servicing, maintenance, replacement, or repair.
   1. In concealed spaces where access has not been provided by means of doors, hatchways, walkways or other means, provide wall or ceiling access doors of a type suitable to the service intended, sized to provide easy access to all equipment. Location of such doors shall be coordinated with the work of the other trades to avoid conflicts.
   2. Access door locations; shall be approved by the Architect prior to installation.

B. Access Panels
   1. Provide access panels for all concealed equipment, dampers, and the like that requires adjustment or service access. Panel locations shall be carefully selected on the job so as not to be located behind cabinets, lights, etc.
      a. Coordinate with the work of other Contractors before installing panels.
      b. Panels shall be prime coated and painted to match surrounding surface.
      c. In finished areas, including ceilings, all access panels shall have the same type of finished surface as that of the surrounding area.
      d. Panels shall be size appropriate for the service intended.
      e. Provide UL labeled fire rated access doors for one or two-hour rated walls and ceilings.
      f. Install before surrounding surfaces have been painted.
      g. Access panel doors shall have cylinder lock latch, all keyed alike.
      h. Provide access doors in ceiling or wall adjacent to all fire damper locations.

i. Verify with Architect the location and finish of all access panels.
j. Panels shall be J.R. Smith, or equal.

C. Provide suitable access to all mechanical equipment requiring servicing, maintenance, replacement, or repair.
1. In concealed spaces where access has not been provided by means of doors, hatchways, walkways or other means, provide wall or ceiling access doors of a type suitable to the service intended, sized to provide easy access to all equipment. Location of such doors shall be coordinated with the work of the other trades to avoid conflicts.
2. Access door locations; shall be approved by the Architect prior to installation.

D. In addition to building access openings, provide access panels on ducts where required to service fire dampers, damper operators, and other equipment requiring adjustment or maintenance.
1. Duct access openings shall be constructed in accordance with SMACNA Duct Construction Standards, Metal and Flexible.
2. All access doors to mechanically furnished panels, control boxes and filter compartments shall be provided with fully hinged, easily opened access doors.

3.11 TEMPORARY HEATING

A. The Contractor shall be responsible for providing temporary heating for all spaces affected by work under this contract.

B. The Contractor shall coordinate any temporary utility (such as gas, electric, etc.) required to provide temporary heating.
1. The building electrical system may be used.
a. The Contractor shall be responsible for providing temporary electrical connection(s) to the electrical system.
b. The Owner will pay for electrical energy used as part of their normal utility payment.

C. Maintain the following space conditions:
1. General spaces: 60°F
a. During concrete work and curing: Refer to concrete specifications for condition requirements.
b. During painting work and curing: Refer to painting specifications for condition requirements.

D. Air handling units, unit heaters, and other equipment installed as permanent units under this contract may not be used as temporary conditioning units during construction.

E. Where specifically allowed in writing by the Owner, equipment installed as permanent units under this contract or existing equipment may be used for temporary space conditioning during construction, subject to the following conditions:
1. The building must be clean of all dust before starting units.
2. Temporary filter media (80 % to 85 % efficient) for all return air, fresh air, exhaust and relief air systems shall be provided.
3. All windows, doors or other openings in the building must be closed off.
4. Upon completion of the job, provide new filters for all units, size and type as specified for normal operation of the equipment in Division 23.

3.12 VIBRATION ISOLATORS

A. General: Provide vibration isolation per the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Applications Manual, Chapter “Sound and Vibration Control”. Vibration isolation shall be provided for both isolation from the building structure (devices such as spring hangers, rubber in shear isolators, etc.) and isolation from the mechanical system (devices such as pipe and duct flexible connections). This ASHRAE reference details specifically the method, type of device, and device selection required. Refer to Table 47, “Selection Guide for Vibration Isolation”.

B. Vibration isolation may be combined with the seismic support system, if certified by the isolation equipment manufacturer.

3.13 SEISMIC SUPPORT

A. Ductwork: Support ductwork per the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) Seismic Restraint Manual Guidelines for Mechanical Systems. Use Seismic Hazard Level-A unless otherwise indicated.

3.14 EQUIPMENT LUBRICATION

A. All air handling equipment including DOAS units, etc., shall have all lubrication fittings on the equipment exterior.

3.15 FIRE INTEGRITY

A. Maintain the fire rating of all assemblies (wall, ceiling, floor, etc) penetrated by mechanical systems. Provide approved firestopping materials as previously specified, and install in accordance with the conditions of the material UL listing.

3.16 PRESSURE TESTS AND IN-SERVICE TESTS

A. All work under this Contract shall be thoroughly and systematically tested, both during construction and after completion. Testing of systems and/or components shall be either as specified in the appropriate specification section, or as specified in the applicable code. Tests shall be maintained until approved.

B. Notifications shall be sent to the following parties 48 hours in advance of all tests:
   1. Architect.
   2. Owner.
   3. Authority Having Jurisdiction over the specific work to be inspected.
      a. Notifications to AHJ shall be provided in accordance with requirements of each specific AHJ, including amount of advance notice allowed.

C. No systems, whether prescribed for testing or not, shall be covered or concealed below ground, in walls, in ceiling spaces, or generally from ease of viewing without first notifying all of the above-listed parties for inspection. Failure to provide such notification of concealed systems shall be cause to require this Contractor to uncover and re-cover such systems at no additional cost.

D. A log of all tests shall be kept. The log shall note date, time of day test started, system or portion of system tested, length of test and test results.

E. The Contractor shall test the completed installation as in regular service. The systems provided under this Contract shall be operated in normal service for a period of at least a week prior to requesting substantial completion inspection, and any resulting defects repaired.

F. The Contractor shall guarantee the entire system and all parts thereof for a period of one year from the date of final acceptance, and shall repair or replace any part which may show signs of failure in that time if such failure is due to imperfections in material or to improper workmanship.

3.17 STARTUP, BALANCING AND COMMISSIONING

A. Equipment Startup
   1. Refer to Section 23 08 10 for startup requirements.
   2. Refer to individual technical sections for specific startup requirements.
   3. Equipment startup shall be performed by factory-trained and certified technicians.

B. Testing and Balancing
   1. Refer to Section 23 05 93 for test and balance requirements.
   2. Provide any necessary impeller trimming or other modifications to mechanical equipment required for specified performance.

C. Commissioning
   1. Provide system startup, adjustment, functional testing, and documentation to demonstrate compliance with design documents. Provide documentation to meet basic commissioning requirements of Washington State Energy Code section C408.

3.18 CLEANING UP

A. Comply with requirements of General Specifications (Division 1, General Conditions, Etc.).

B. Ducts shall be maintained as clean as possible during construction, and shall be blown clean before the building field painting operations are started. Ducts and apparatus casings shall be thoroughly cleaned before fans and filters are operated. After equipment has been used for any purposes, such as adjusting, testing, or temporary ventilation, filters shall be cleaned or renewed and exhaust/return ducts shall be cleaned. Use temporary filters with 80% to 85% filter efficiency during construction.

3.19 SPECIAL PROTECTION

A. Exercise maximum precaution to provide positive protection for the building and equipment from damage of any kind, and in particular, prevent water and dust seepage into new equipment.

B. Repair all damage to the building, systems, or property, caused by the Contractor at no additional cost to the Owner. This provision shall include any preventable damage caused by lack of due diligence in planning and investigation, and shall not be applied to field conditions which could not reasonably be ascertained prior to the activity causing damage.

C. All equipment and material installed shall be properly protected from damage during the course of construction.

D. In utility rooms and other spaces where piping such as condensate drains, heating water, chilled water, or refrigeration lines have been installed at floor level and interfere with foot traffic, the Mechanical Contractor shall provide covers to protect these pipes. Wood or other such material is acceptable. Where duct plenums or duct runs interfere with normal traffic pattern of maintenance personnel, the Mechanical Contractor shall provide a wooden bridge over the ducts to prevent damage. Provide handrails for bridge(s) where required by code.

E. In attic or other spaces where ductwork has been installed at floor level and interferes with foot traffic, the Contractor shall provide permanent covers to protect these items. Wood or other such material is acceptable. Provide handrails where required by code.

3.20 CAULKING

A. Caulk all openings and flash around all ductwork passing through roof, floor, and walls.

B. All caulking shall be water resistant, zero-VOC, zero mold growth, and water based type.

C. Refer to paragraph "Fire Integrity" for all rated wall, ceiling, roof, floor, and other penetrations.

3.21 FINAL INSPECTION

A. This Contractor shall thoroughly review and inspect the project to determine when final inspection is required, and shall provide notification. It shall be understood that the work shall be essentially complete, and the open items list provided at that time. The warranty period will not start until the punchlist and back-check are complete. Additional inspections required because of lack of diligence by the Contractor will be conducted on a schedule convenient to the inspectors.

3.22 INSTRUCTION PERIODS

A. Refer to Division 1 for additional demonstration and training requirements.

B. Scope: Following installation of mechanical work, have representatives of installation tradesmen conduct demonstrations and instruction periods to point out locations of servicing points and required points of maintenance to Owner’s staff.

C. General Description Of Instruction Period: Each period shall include preliminary discussion and presentation of information from maintenance manuals with appropriate references to drawings followed by tours of building areas explaining maintenance requirements, access methods, servicing and maintenance procedures, and equipment cleaning procedures, temperature control settings and available adjustments.

D. Scheduling Of Instruction Period: Notice of Contractor's readiness to conduct such instruction and demonstration shall be given at least two weeks prior to the instruction period, and

agreement finalized as to the date at which the instruction period is to be performed. Notify two weeks prior to date when ready to conduct instruction and demonstrations receive approvals of proposed date prior to making final arrangements.

E. Comply with training and training reporting requirements enumerated in Chapter 14 of the Washington State Energy Code, WAC 51-11.

3.23 ON SITE OBSERVATIONS AND SAFETY MEASURES

A. The Contractor is solely responsible to provide design and construction review services relating to the Contractor's safety precautions or to means, methods, techniques, sequences or procedures required for the Contractor to perform his work. The duty of any other individual or organization to conduct construction observations of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the construction site. The contractor shall be responsible for providing all safety measures and shall consult with the State and/or Federal Safety Agency or Inspector for interpretation whenever in doubt as to compliance with State and/or Federal regulations. Furthermore, the Contractor distinctly assumes all risk or damages or injury to any persons or property wherever located resulting from any action or operation under this Contract or in connection with the work.

3.24 CONTINUITY OF BUILDING AND UTILITY AND SHUTDOWNS

A. General: Continuity of utilities services in the building shall be maintained at all times as required to provide heat, water, lighting, and power to all portions of the building. Utility systems shutdowns required for extensions, alterations or connections of new services shall be accomplished in accordance with the following requirements.

B. Shutdowns:
   1. While building is in operation, utilities shutdowns shall be scheduled for weekends, holidays, or at night, if the shutdown affects the use of the building or surrounding buildings.
   2. Shutdowns longer than 2 hours shall be coordinated with and approved by the Owner at least 1 week in advance.
   3. Shutdowns less than 2 hours shall be coordinated with and approved by the Owner at least 48 hours in advance.

C. Costs: The Contractor shall include in their bid proposal all costs associated with utilities shutdowns. No extra payment will be made for overtime work, schedule changes or failure to complete utilities connections within authorized shutdown periods.

D. Coordinate with the serving utility and pursue the work in timely manor to return utilities to service.

E. Liability: Failure to coordinate with the serving utility or to sufficiently pursue the work in time to return utilities to service shall not constitute a basis for avoiding any contractual penalties.

END OF SECTION

SECTION 23 05 48
VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Seismic control requirements.

C. Vibration isolators.

D. Seismic restraint systems.

1.02 DEFINITIONS

A. HVAC Component: Where referenced in this section in regards to seismic controls, applies to any portion of the HVAC system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., ductwork, piping).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.03 REFERENCE STANDARDS

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

B. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.

C. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Seismic Controls:
      a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
      b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
   2. Seismic Controls: Include seismic load capacities.

C. Shop Drawings - Seismic Controls:

1. Include dimensioned plan views and sections indicating proposed HVAC component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
2. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
3. Indicate proposed arrangement of distributed system trapeze support groupings.
4. Indicate proposed locations for distributed system flexible fittings and/or connections.
5. Indicate locations of seismic separations where applicable.

D. Seismic Design Data:
1. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.

E. Evidence of qualifications for seismic controls designer.

1.06 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five years experience designing seismic restraints for nonstructural components.
1. Designer may be employed by the manufacturer of the seismic restraint products.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
1. Select vibration isolators to provide required static deflection.
2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.

2.02 SEISMIC CONTROL REQUIREMENTS

A. Design and provide HVAC component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor HVAC components.

B. Seismic Restraints:
1. Provide seismic restraints for HVAC components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
2. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
a. ASHRAE (HVACA).
b. SMACNA (SRM).
3. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.

4. External Seismic Snubber Assemblies:
    a. Provide quantity and arrangement of external seismic snubber assemblies as required to restrain equipment in all directions (both lateral and vertical).
    b. Do not use external seismic snubber assemblies that restrain equipment only in one or more lateral directions (but not vertical) except where uplift forces are zero or are addressed by other restraints.
5. Seismic Restraint Systems:
    a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
    b. Use only cable restraints to restrain vibration-isolated HVAC components, including distributed systems.
    c. Use only one restraint system type for a given HVAC component or distributed system (e.g., ductwork, piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
    d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain HVAC component in all lateral directions; consider bracket geometry in anchor load calculations.
    e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported HVAC component weight.
    f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported HVAC component weight.
    g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
    h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
    i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.
    j. Manufacturer's certified seismic restraint design may be submitted as an alternative to project-specific design and documentation, subject to approval of authorities having jurisdiction.
6. Ductwork Applications:
    a. Provide independent support and seismic restraint for in-line components (e.g., fans, heat exchangers, humidifiers) having an operating weight greater than 75 pounds.
    b. Positively attach appurtenances (e.g., dampers, louvers, diffusers) with mechanical fasteners.

C. Seismic Attachments:
1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
3. Do not use power-actuated fasteners.
4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
6. Concrete Housekeeping Pads:
    a. Increase size of pad as required to comply with anchor requirements.

b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

D. Seismic Interactions:
1. Include provisions to prevent seismic impact between HVAC components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
3. Comply with minimum clearance requirements between HVAC equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.

E. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections to accommodate:
a. Relative displacements at connections between components, including distributed systems (e.g., ductwork, piping); do not exceed load limits for equipment utility connections.
b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
c. Design displacements at seismic separations.
d. Anticipated drifts between floors.

2.03 VIBRATION ISOLATORS

A. General Requirements:
1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.

2.04 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Cable Restraints:
1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

C. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

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

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:
1. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.

2. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
3. Adjust isolators to be free of isolation short circuits during normal operation.
4. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

F. Seismic Controls:
1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
4. Equipment with Sheet Metal Housings:
   a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
   b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
   c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Concrete Housekeeping Pads:
   a. Size in accordance with seismic design to meet anchor requirements.
   b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
6. Seismic Restraint Systems:
   a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
   b. Install restraints within permissible angles in accordance with seismic design.
   c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
   d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
   e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

3.03 FIELD QUALITY CONTROL

A. Inspect vibration isolation and/or seismic control components for damage and defects.

B. Vibration Isolation Systems:
1. Verify isolator static deflections.
2. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

C. Seismic Controls:
1. Verify snubbing element air gaps.

D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION

SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Automatic Controls: Tags. Key to control schematic.

B. Instrumentation: Tags.

C. Major Control Components: Nameplates.

D. Small-sized Equipment: nameplates.

2.02 NAMEPLATES

A. Letter Color: White.

B. Letter Height: 1/4 inch.

C. Background Color: Black.

D. Plastic: Comply with ASTM D709.

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 110 - Methods of Testing Performance of Laboratory Fume Hoods; 2016, with Errata.

C. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).

D. NEBB (TAB) - Procedural Standard for Testing Adjusting and Balancing of Environmental Systems; 2019.

E. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2023.

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Confirmation of understanding of the outside air ventilation criteria under all conditions.
      f. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
      g. Method of checking building static and exhaust fan and/or relief damper capacity.
      h. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Revise TAB plan to reflect actual procedures and submit as part of final report.
   2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
   3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

D. Project Record Documents: Record actual locations of balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC (NSTSB), AABC National Standards for Total System Balance.
   2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
   3. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a 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. If required, install temporary media in addition to final filters.
   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.

B. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
   1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

3.04 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.06 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

3.07 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

3.08 SCOPE

A. Test, adjust, and balance the following:
   1. Air Inlets and Outlets.

2. Packaged heat recovery units.
3. Domestic hot water recirculation balancing valves.

END OF SECTION

SECTION 23 07 13
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

E. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

H. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

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

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 1,200 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure-sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

E. Indoor Vapor Barrier Mastic:
   1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.03 GLASS FIBER, RIGID

A. Insulation: ASTM C612; rigid, noncombustible blanket.

B. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

C. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

2.04 DUCT LINER

A. Elastomeric Foam Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
   1. Minimum Service Temperature: Minus 40 degrees F.
   2. Maximum Service Temperature: 180 degrees F.
   3. Connection: Waterproof vapor barrier adhesive.

B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation. Comply with ASTM C916.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Duct and Plenum Liner Application:
   1. Adhere insulation with adhesive for 90 percent coverage.
   2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
   3. Seal and smooth joints. Seal and coat transverse joints.
   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.

END OF SECTION

SECTION 23 08 10
REQUIREMENTS FOR STARTUP

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provide startup and checkout procedures for all Plumbing and HVAC equipment in Divisions 22 and 23.

B. Provide all commissioning documentation in order to comply with the “Systems Commissioning” requirements of the Washington State Energy Code, Commercial (Chapter 51-11C WAC, paragraph C408.2).

1.02 REFERENCE STANDARDS

A. Washington Administrative Code (WAC):
   1. WAC 51-11C - Washington State Energy Code, Commercial (WSEC-C)

B. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
   1. SMACNA 1429 - HVAC Systems Commissioning Manual

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Startup Data
   1. Incomplete items list.
   2. Preliminary systems documentation
   3. Pre-start and startup checklists
   4. Functional performance checklists
   5. WSEC-C Commissioning checklist upon completion, along with the completed pre-start, startup and functional performance checklists.

1.04 DELIVERY, STORAGE AND HANDLING

A. Refer to Division 1 for product storage and handling requirements.

1.05 CLOSEOUT REQUIREMENTS

A. Refer to Division 1 for execution and closeout requirements.

B. Refer to Division 1 for closeout submittal procedures.

C. Refer to Division 1 for demonstration and training requirements.

PART 2 PRODUCTS

2.01 NOT USED

PART 3 EXECUTION

3.01 GENERAL

A. The Contractor shall prepare a complete list of all items that are not complete prior to notification of readiness for punchlist. This list shall include estimated date of Contractor completion for each item.

B. The Contractor shall coordinate with the Owner for Owner’s system operators & maintenance personnel to observe startup procedures.

C. The following procedures shall be performed by the Contractor and their equipment supplier. Also, complete the “Commissioning Compliance Checklist” per the WSEC-C, and provide any information stipulated on that checklist.

3.02 PREPARATIONS

A. Assemble four copies of the preliminary system documentation described below, and submit to the Architect along with the startup and checkout plan. Three copies will be returned to the Contractor.
   1. Startup Schedule, to be integrated with the Construction Schedule.

2. List of equipment and systems for formal startup.
3. List of sub-trades, suppliers and other Contractors who will be involved in the startup process.
4. All submittal data and controls sequence descriptions needed to prepare startup and checkout checklists.

3.03 SYSTEM CHECKLISTS

A. Prepare Pre-Start and Startup Checklists. These checklists shall be based on lists provided in Appendix B of the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) “HVAC Systems Commissioning Manual”. Level-1, “Basic Commissioning”, which is the standard for this Contract. If applicable to the equipment and systems on this project, the SMACNA checklists may be used without modification. If not directly applicable, either modify a similar SMACNA checklist to suit the equipment or system under consideration, or create a new checklist. Any new or modified checklist must have the same level of checkout as the base SMACNA checklist. Pre-start and startup checklists shall include all manufacturer’s recommended startup instructions. The manufacturer’s instructions shall have priority over SMACNA checklist examples.

B. Prepare functional performance checklists. These checklists shall be based lists provided in Appendix D of the SMACNA “HVAC Systems Commissioning Manual”. Again, Level-1, “Basic Commissioning”, is the Standard for this Contract. If applicable to the equipment and systems on this project, the SMACNA checklists may be used without modification. If not directly applicable, either modify a similar SMACNA checklist to suit the equipment or system under consideration, or create a new checklist. Any new or modified checklist must have the same level of checkout as the base SMACNA checklist. Functional performance checklists shall include all manufacturer’s recommended instructions for performance checkout. The manufacturer’s instructions shall have priority over SMACNA checklist examples.

3.04 STARTUP AND CHECKOUT PLAN

A. The startup and checkout plan is composed of the pre-start checklists, startup checklists and functional performance test checklists. The plan also includes the startup schedule, checkout schedule, list of sub-trades, suppliers and other contractors who will be involved in the startup and checkout process and all submittal data and controls sequence descriptions needed to prepare startup and checkout checklists.

B. The startup and checkout plan shall be submitted to the Architect as soon as possible along with the preliminary system information. This will normally occur after the initial Controls Design Submittal (Shop Drawings) has been returned to the Contractor (all equipment has been normally submitted and approved by that time), and no later than 3-months prior to substantial completion.

3.05 STARTUP AND CHECKOUT PROCEDURES

A. Perform startup and checkout in accordance with the startup and checkout plan.

B. The completed package shall be submitted for approval prior to acceptance of substantial completion. This package shall include:
   1. Two copies of the preliminary system information.
   2. Completed startup and checkout checklists.

C. Provide an operations instruction and demonstration to the Owner’s maintenance personnel in accordance with Chapter 6 of the SMACNA HVAC Systems Commissioning Manual.

3.06 BALANCING

A. Balancing occurs after initial startup, and prior to functional testing. Deficiencies are identified and corrected, controls are calibrated, controls programming is initially set up and verified, and other startup and balancing tasks completed.

B. Refer to Section 23 05 93 – Testing, Adjusting and Balancing, for balancing description.

3.07 DOCUMENTATION

A. Provide all documentation described in paragraph C408 of the Washington State Energy Code, Commercial.

B. Provide completed startup and checkout checklists.

END OF SECTION

SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ducts.

B. Flexible ducts.

C. Air plenums and casings.

1.02 REFERENCE STANDARDS

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

B. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

E. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

G. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

H. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

I. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

J. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

K. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data: Provide data for duct materials.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

1.05 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.

B. Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.

C. Duct Shape and Material in accordance with Allowed Static Pressure Range:
   1. Round: Plus or minus 2 in-wc of galvanized steel.
   2. Rectangular: Plus or minus 1/2 in-wc of galvanized steel.

D. Duct Sealing and Leakage in accordance with Static Pressure Class:
   1. Low Pressure Service: Up to 2 in-wc:
      a. Seal: Class C, apply to seal off transverse joints.
      b. Leakage:
         1) Rectangular: Class 24 or 24 cfm/100 sq ft.
         2) Round: Class 12 or 12 cfm/100 sq ft.
   2. Low Pressure Service: From 2 in-wc to 3 in-wc:
      a. Seal: Class B, apply sealing of transverse joints and longitudinal seams.
      b. Leakage:
         1) Rectangular: Class 12 or 12 cfm/100 sq ft.
         2) Round: Class 6 or 6 cfm/100 sq ft.

E. Duct Fabrication Requirements:
   1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
   2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
   3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
   4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
   5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
   6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
   7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.02 METAL DUCTS

A. Material Requirements:
   1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
   2. Aluminum: ASTM B209/B209M, aluminum sheet, alloy 3003-H14.
   3. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.

B. Round Metal Ducts:
   1. Round Single Wall Duct: Round lock seam duct with galvanized steel outer wall.
   2. Round Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).

C. Round Spiral Duct:
   1. Round spiral lock seam duct with galvanized steel outer wall.

D. Connectors, Fittings, Sealants, and Miscellaneous:
   1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
   2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
   3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
b. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

4. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
5. Hanger Fasteners: Attach hangers to structure using appropriate fasteners as follows:

2.03 FLEXIBLE DUCTS

A. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form spiral helix.
1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
2. Pressure Rating: 10 in-wc positive and 5 in-wc negative.
3. Maximum Velocity: 5500 fpm.
4. Temperature Range: Minus 20 degrees F to 250 degrees F.

2.04 AIR PLENUMS AND CASINGS

A. Fabricate in accordance with SMACNA (DCS) for indicated operating pressures indicated.

B. Minimum Fabrication Requirements:
1. Fabricate acoustic plenum or casing with reinforcing turned inward.
2. Provide 16-gauge, 0.059-inch sheet steel back facing and 22-gauge, 0.029-inch perforated sheet steel front facing with 3/32 inch diameter holes on 5/32 inch centers.
3. Construct panels 3 inches thick, packed with 4.5 pcf minimum glass fiber insulation media, on inverted channel of 16-gauge, 0.059-inch sheet steel.
4. Mount floor-mounted plenum or casings on 4-inch high concrete curbs. At floor, rivet panels on 8-inch centers to angles. Where floors are acoustically insulated, provide liner of galvanized 18-gauge, 0.052-inch expanded metal mesh supported at 12-inch centers, turned up 12 inches at sides with sheet metal shields.

C. Access Doors:
1. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
2. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles.
3. Provide clear wire glass observation ports, minimum 6 by 6 inch size.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install products following the manufacturer's instructions.

C. Comply with safety standards NFPA 90A and NFPA 90B.

D. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

F. Flexible Ducts: Connect to metal ducts with adhesive plus sheet metal screws.

G. Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.

H. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

I. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with a crimp in the direction of airflow.

J. Use double nuts and lock washers on threaded rod supports.

K. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

L. Louver Fit-out:
   1. Provide blank-out panels sealing available area of wall-mounted exterior-faced louver when connected ductwork is smaller than actual louver free area, and duct outlet is smaller than the louver frame.
   2. Use the same duct material painted black on the exterior side, then seal louver frame and duct.

3.02 CLEANING

A. Clean duct system by forcing air at high velocity through duct to remove accumulated dust. Clean half the system at a time to obtain sufficient air. Protect equipment that could be harmed by excessive dirt with temporary filters or bypass during cleaning.

END OF SECTION

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct access doors.

B. Duct test holes.

C. Flexible duct connectors.

D. Volume control dampers.

E. Low leakage (Class 1A) control dampers.

F. Miscellaneous Products:
   1. Damper operators.
   2. Duct opening closure film.

1.02 RELATED REQUIREMENTS

A. Section 23 31 00 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.04 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data: Provide for shop-fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers and duct access doors.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Access doors with sheet metal screw fasteners are not acceptable.

2.02 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.03 FLEXIBLE DUCT CONNECTORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.

2.04 VOLUME CONTROL DAMPERS

A. Splitter Dampers:

1. Material: Same gauge as duct to 24 inches size in either direction, and two gauges heavier for sizes over 24 inches.
2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.

B. Single Blade Dampers:
1. Fabricate for duct sizes up to 6 by 30 inch.
2. Blade: 24 gauge, 0.0239 inch, minimum.

C. Multi-Blade Damper: Fabricate consisting of opposed blades with maximum blade sizes 8 by 72 inches. Assemble center- and edge-crimped blades in prime-coated or galvanized-channel frame with suitable hardware.
1. Blade: 18 gauge, 0.0478 inch, minimum.

D. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

E. Quadrants:
1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

2.05 LOW LEAKAGE (CLASS 1A) CONTROL DAMPERS

A. Maximum Leakage Allowed: 3 cfm/sq ft at 1 in-wc.

2.06 MISCELLANEOUS PRODUCTS

A. Damper Operators: Provide electric operators.

B. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.
1. Thickness: 2 mils.
2. High tack water based adhesive.
3. UV stable light blue color.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 31 00 for duct construction and pressure class.

B. Provide duct test holes where indicated and required for testing and balancing purposes.

C. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

D. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

E. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum two duct widths from duct take-off.

F. Use splitter dampers only where indicated.

G. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers:

B. Rectangular ceiling diffusers.

C. Registers/grilles:
   1. Ceiling-mounted, exhaust and return register/grilles.
   2. Wall-mounted, supply register/grilles.
   3. Wall-mounted, exhaust and return register/grilles.
   4. Wall-mounted, linear register/grilles.

D. Duct-mounted supply and return registers/louvers.

E. Louvers:

1.02 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.

B. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.04 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Test and rate louver performance in accordance with AMCA 500-L.

C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 RECTANGULAR CEILING DIFFUSERS

A. Type: Provide rectangular and square formed adjustable, core removable, and multi-louvered ceiling diffusers constructed to maintain four way discharge air pattern.

B. Frame: Provide surface mount, snap-in, inverted T-bar, and spline type.

C. Fabrication: Aluminum with baked enamel or powder coat finish.

D. Accessories: Provide radial opposed blade, butterfly, and combination splitter volume control damper; removable core and gaskets for surface mounted diffusers with damper adjustable from diffuser face.

2.02 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

A. Type: Egg crate style face consisting of 1/2 by 1/2 by 1/2 inch grid core.

B. Fabrication: Grid core consists of aluminum with powder coat or baked enamel finish.

C. Accessories: Provide integral gang and face operated opposed blade damper.

2.03 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, single deflection.

B. Fabrication: Aluminum extrusions with factory anodized aluminum finish.

C. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.04 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, vertical face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Aluminum extrusions, with factory anodized aluminum finish.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.05 LOUVERS

A. Type: 4 inch deep frame with blades on 45 degree slope with center baffle and return bend, heavy channel frame, 1/2 inch square mesh screen over intake or exhaust end.

B. Fabrication: 12 gauge, 0.1046 inch (2.66 mm) thick extruded aluminum thick galvanized steel welded assembly, with factory baked enamel finish.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.

3.02 PROTECTION

A. Protect installed products until completion of project.

B. Replace, repair, or touch-up damaged products before Substantial Completion.

END OF SECTION

SECTION 23 72 23
PACKAGED AIR-TO-AIR ENERGY RECOVERY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Energy recovery units.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 84 - Method of Testing Air-to-Air Heat/Energy Exchangers; 2024.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data: Manufacturer's installation instruction, product data, and engineering calculations.

C. Closeout Submittals: Submit manufacturer's operation and maintenance instructions.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Spare Parts: One of each kind of filter.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Firm regularly engaged in manufacturing energy recovery units.
   2. Products in satisfactory use in similar service for not less than five years.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store in manufacturer's unopened packaging.

B. Store products to be installed indoors in dry, heated area.

1.06 WARRANTY

A. Refer to Division 1 for additional warranty requirements.

B. The ERV units shall have a manufacturer’s parts and defects warranty for a period one (1) year from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.

C. The ERV Energy Transfer Core shall have an additional nine (9) year warranty against defects in material or workmanship. The total warranty period shall be ten (10) years from date of installation.

PART 2 PRODUCTS

2.01 SMALL PACKAGED ENERGY RECOVERY VENTILATOR (ERV) UNITS

A. General
   1. The ERV unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, control circuit board and blowers with motors, filters, and insulated foam air guides. Each unit will have an automatic by-pass damper system for economic operation under certain conditions. The unit shall have factory installed control board with functions for local, remote, and optional control modes.

B. Cabinet
   1. The cabinet shall be fabricated of galvanized steel, and covered with polyurethane foam insulation as necessary with steel mounting points securely attached.

C.

1. The unit shall be furnished with two direct drive centrifugal blowers running simultaneously supplying and extracting air at the same rate for balanced ventilation air flow.
2. The blower motors shall be a directly connected to the blower wheels and have permanently lubricated bearings.
3. The blowers and motors shall be mounted for quiet operation.

D. Heat Exchanger
1. The heat exchanger element shall be constructed of specially treated cellulous 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.
2. The heat exchanger element shall have protective filters installed at both the supply and exhaust sides with an access cover to allow easy maintenance.

E. Bypass Damper
1. The ERV shall have an automatic supply side by-pass damper to allow inbound ventilation air to by-pass the heat recovery core when outside weather conditions warrant.
2. The mechanism for opening and closing the bypass damper shall be a 208V-230V synchronous electric motor through an actuator. The motor will drive a steel cable connected to an mechanical damper flap to allow fresh air to bypass the heat recovery core.
3. Supply and return air thermistor shall control the damper.

F. Filters
1. The ERV shall be equipped with factory installed air filters located at each intake face (both supply and exhaust sides) of the heat recovery core to clean the air and prevent clogging.

G. Controls
1. Independent control by contact closure from other sensor driven controllers, switch, or timers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that structure is ready for installation of unit, that openings in deck for ductwork, if required, are correctly sized and located, and that mechanical and electrical utilities supplying unit are of correct capacities and are accessible.

3.02 INSTALLATION

A. Provide openings for suitable ductwork connection.

B. Ductwork:
1. The installer shall supply, install, test and commission all interconnecting ductwork for the ERV units.
2. Ductwork sizing, layout, fittings, etc shall be in strict accordance with the design requirements.
3. The two outdoor ducts must be covered with heat insulating material in order to prevent condensation from forming.
4. The two outdoor ducts must be tilted at a gradient (1/30 or more) down toward the outdoor area from ERV unit.

3.03 SYSTEM STARTUP

A. Provide services of manufacturer's authorized representative to provide start up of unit.

3.04 CLEANING

A. Clean filters, air plenums, interior and exposed-to-view surfaces prior to Substantial Completion.

END OF SECTION

SECTION 23 82 16
AIR COILS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electric coils.

1.02 RELATED REQUIREMENTS

A. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils; 2001, with Addenda (2011).

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.04 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data: Provide coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

C. Certificates: Certify that coil capacities, pressure drops, and selection procedures meet or exceed specified requirements.

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

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors.

B. Protect coils from entry of dirt and debris with pipe caps or plugs.

PART 2 PRODUCTS

2.01 ELECTRIC COILS

A. Assembly: UL listed and labelled, with terminal control box and hinged cover, splice box, coil, casing, and controls.

B. Coil: Enclosed copper tube, aluminum finned element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material.

C. Casing: Die formed channel frame of 16 gauge, 0.0598 inch galvanized steel with 3/8 inch mounting holes on 3 inch centers. Provide tube supports for coils longer than 36 inches.

D. Controls: Automatic reset thermal cut-out, built-in magnetic contactors, control circuit transformer and fuse, manual reset thermal cut-out, air flow proving device, fused disconnect, load fuses.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Install in ducts and casings in accordance with SMACNA (DCS).
   1. Arrange supports to avoid piercing drain pans.

2. Provide airtight seal between coil and duct or casing.

C. Protect coils to prevent damage to fins and flanges. Comb out bent fins.

D. Install coils level. Install cleanable tube coils with 1:50 pitch.

E. Electric Duct Coils: Wire in accordance with NFPA 70. Refer to Section 26 05 83.

END OF SECTION

SECTION 23 83 33
ELECTRIC & RADIANT HEATERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wall-mounted fan heaters.

1.02 REFERENCE STANDARDS

A. General: References used throughout Division 23 are generally accepted industry standards. The edition of the criteria cited shall be that in force at the time of bid. The Contractor shall provide all work in accordance with codes and standards in force in the Authority Having Jurisdiction for the project, to include all local amendments.

B. National Fire Protection Agency (NFPA)
   1. NFPA 70 - National Electrical Code (NEC)

C. Underwriters Laboratories (UL)
   1. Fire Resistance Directory
   2. Building Materials Directory

1.03 SUBMITTALS

A. Refer to Division 1 for submittal procedures.

B. Product Data, to include capacity and utility requirements.

C. Installation instructions.

1.04 DELIVERY, STORAGE AND HANDLING

A. Refer to Division 1 for product storage and handling requirements.

1.05 CLOSEOUT REQUIREMENTS

A. Refer to Division 1 for execution and closeout requirements.

B. Refer to Division 1 for closeout submittal requirements and procedures.

C. Refer to Division 1 for demonstration and training requirements.

PART 2- PRODUCTS

2.01 GENERAL

A. All heaters shall be fabricated in accordance with the National Electrical Code, and shall bear an Underwriter’s Laboratories (UL) label.

2.02 WALL MOUNTED UNIT HEATER

A. General: Electric heat, fan driven, thermostatic control, UL listed.

B. Enclosure:
   1. Wall Box: Not less than 1.3mm (l8-gauge) steel, recessed type.
   2. Ribbed 1.6mm (l6-gauge) steel front cover.
   3. Closely spaced downflow discharge louvers.
   4. Concealed screws for locking trim frame to front cover.
   5. Finished in neutral gray baked enamel with satin finish anodized aluminum trim frame.

C. Heating Elements: Steel sheath enclosed finned tube type.

D. Integral Controls:
   1. Two-pole terminal block.
   2. Built-in fan delay switch.
   3. Automatic reset line voltage internal thermal overheats protection.
   4. Built-in thermostat comfort control with adjustment range between -1 to 32 degree C (30 to 90 degrees F), and manually set "No Heat" position; tamper resistant adjustment by inserting screwdriver through front cover louvers.

PART 3 - EXECUTION

3.01 GENERAL

A. Units will be installed per manufacturer's published installation instructions.

B. Electrical installation work shall be in accordance with the National Electrical Code and Division 26 Requirements.

END OF SECTION

SECTION 26 01 26
MAINTENANCE TESTING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 0 and 1 Specification Sections, apply to this Section.

1.02 WORK INCLUDED

A. Perform tests of the electrical system to assure code compliance and proper system operation according to the intent of the contract documents.

B. Applicable Codes, Standards & References for Tests:

References used in this Section are generally accepted industry standards. The edition of the criteria cited shall be the most recent, published edition, including amendments at the time of Bid.

All inspections and tests shall be in accordance with the following applicable codes and standards except as provided otherwise herein.

1. National Electrical Code - NEC
2. National Electrical Manufacturer's Association - NEMA
3. American Society for Testing and Materials - ASTM
4. Institute of Electrical and Electronic Engineers - IEEE
5. National Electrical Testing Association - NETA
6. American National Standards Institute – ANSI
7. Washington State Administrative (WAC)
8. Local Codes and Ordinances
9. Insulated Cable Engineers Associate - ICEA
10. Association of Edison Illuminating Companies - AEIC

1.03 CIRCUIT TESTS

A. The Contractor shall perform routine insulation resistance, continuity and grounding tests for all distribution and utilization equipment prior to their connection and energization. A standard megger-type instrument shall be used to demonstrate that insulation values are acceptable, ground system is continuous and the neutral system is isolated from the grounding system except at the systems' single ground point.

B. System defects, indicated by the circuit tests, shall be corrected. Tests shall be repeated until satisfactory results are obtained.

1.04 GROUNDING TEST

A. Measure the ohmic value of the Electrical Service Entrance "System Ground" with reference to "Earth Ground" using multiple terminal, fall of potential methods and suitable test instruments.

B. Maximum resistance to ground shall be less than 10 ohms unless lower values are specified in the contract documents. Notify the Owner’s Representative if this resistance value is not obtained for the initially installed system; and then provide corrective measures required to reduce ground resistance to less than 10 ohms.

1.05 MOTOR AND EQUIPMENT TESTS

A. Verify proper rotation of all motors before placing into service.

B. Measure and record electrical data for each motor installed under this contract. Data shall include these items:

1. Motor description
2. Controller description
3. Motor nameplate amperes
4. Actual measured motor running amperes
5. Overload heater manufacturer and catalog numbers
6. Overload heater ampere range
7. Voltage (measured) and phase

C. Motor controller overload heaters shall be sized to the actual motor nameplate full load current; do not oversize overload heaters.

1.06 PHASE BALANCE TESTS

A. Verify the balance of the electrical system's phase currents. Reassign load connections necessary to obtain a balance acceptable to the Owner's Representative.

1.07 ARC FLASH AND PERSONNEL PROTECTIVE EQUIPMENT (NEC 110-16)

A. Contractor shall prepare an Arc Flash and Personnel Protective Equipment study. Contractor shall provide labeling of all new and existing electrical equipment including Fields 7 and 8. All labels shall have a permanent marked date of the label installation. The existing recreational building electrical is not part of this scope.

PART 2 PRODUCTS

2.01 MATERIALS AND INSTRUMENTATION

A. Contractor and/or testing agency shall supply all apparatus and materials required for indicated tests.

B. Contractor shall include all costs associated with testing in bid proposal.

2.02 TEST REPORT(S)

A. Furnish electronic PDF copy of test reports, as specified herein, for inclusion into the project operation and maintenance manuals. Each test report shall include the following items:
1. Name, address and telephone number of the testing agency.
2. Name(s) of personnel conducting the tests
3. Type of test
4. Description of test procedure
5. List of items tested
6. List of actual test equipment including make, model(s), serial number(s) and calibration date(s) as applicable.
7. Test results
8. Conclusion and recommendations
9. Appendix, including appropriate test forms

PART 3 EXECUTION

3.01 TESTING PROCEDURE

A. Submit a copy of test procedure(s) to the Owner's Representative prior to testing.

B. All tests shall be conducted according to applicable industry standards.

3.02 SCHEDULING

A. Notify Owner's Representative at least five (5) working days prior to performance of any test.

END OF SECTION

SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

B. References used in this Section are generally accepted industry standards. The edition of the criteria cited shall be the most recent, published edition, including amendments at the time of Bid.

1.02 DEFINITIONS

A. The term "provide" shall mean furnish, install and connect equipment and materials complete in operating condition.

B. The term "approved" as used herein shall mean the written approval of the Owner's Representative.

C. The term "Contractor" as used herein shall mean the organization responsible for accomplishing all work within the contract documents. The plural term "contractors" as used herein shall include all of the trade organizations that comprise the project workforce.

D. The term "drawings" as used herein shall mean all contract drawings for all divisions of work.

E. NEC means National Electrical Code.

F. The term "code" as used herein shall mean all applicable National, State and local codes.

1.03 SCOPE OF WORK

A. The electrical work includes de-energizing and removal of existing 200AV, 240V electrical equipment and legally disposing of same off site.

B. The Electrical work consists of furnishing, installing, testing and placing in satisfactory operation new equipment, materials, devices and appurtenances, necessary to provide complete systems according to the intent of the Drawings and Specifications. In general this includes all labor, materials, equipment, tools, etc. to complete the electrical work.

C. Electrical requirements are not limited to electrical drawings and specifications. There is additional electrical work required to be included in the bid, indicated on the architectural, structural, landscape, civil, mechanical and plumbing drawings and specifications. Contractor shall review all architectural, structural, landscape, civil, mechanical and plumbing drawings and specifications for additional electrical requirements and information prior to bid.

1.04 INTENT OF DRAWINGS

A. The Electrical drawings are intended to serve as working drawings for general layout. Equipment, receptacles, tele/data, switches, panels, lights, disconnects and raceways are partially diagrammatic and do not necessarily indicate actual routings or all appurtenances required for a complete installation. This includes coordination prior to rough-in for any Elmhurst utility trenching and equipment.

B. The drawings and specifications are complementary. What is called for in either is binding as if called for in both. In case of conflict within the drawings, specifications or between drawings and specifications the Owner's Representative will select the method to be taken.

C. Take all working dimensions, device heights, door swings and the like from architectural drawings and check them against those shown or scaled on the electrical drawings. In the event of conflict, report discrepancies to the Owner's Representative for resolution before proceeding with the work.

D. Minor changes in the locations of raceways, devices and the like, from those shown on the

plans, shall be made without extra charge if so directed by the Owner's Representative before installation.

E. Motor horsepower and apparatus wattages indicated on the plans are estimated requirements of equipment furnished under other Divisions of this contract. Advise the Owner's Representative in writing of any deviations in actual equipment supplied that affect the electrical installation.

1.05 MANUFACTURERS' RECOMMENDATIONS

A. Make all installations in strict accordance with manufacturers' published recommendations and details. All equipment and materials recommended by them shall be considered as part of this contract.

1.06 WORK RELATED TO OTHER DIVISIONS –

A. Reference Division 01 Specifications for additional requirements.

B. TEMPORARY CONSTRUCTION POWER AND LIGHTING
   1. Contractor is responsible for all costs associated with set up and removal of the temporary construction service meter.
   2. Provide, maintain and remove, when no longer required, temporary electrical construction wiring from the construction service meter to and within the building for the number of lights and receptacles required. Wiring to construction sheds, outdoor construction machinery, and temporary exterior work areas shall be the responsibility of individual contractors.
   3. Provide and maintain construction lighting with portable wiring and temporary energization of the permanent building wiring, complete with lamps. Suitable construction lighting shall be provided in each room where lighting is required for any of the contractors on the job. See NEC ARTICLE 305. Temporary wiring.
   4. General Contractor is responsible for re-lamping construction lighting after the initial lamping.
   5. Provide adequate feeders, circuit breakers and duplex 15-ampere 120-volt receptacles at locations as required. Note: 120 volt construction receptacles shall provide Ground Fault circuit protection in accordance with applicable WISHA safety standards.
   6. Portable power cords from the outlets specified herein shall be the responsibility of individual contractors using the cords.
   7. Responsibilities outlined in the Paragraph Temporary Construction Power and Lighting are delineated herein to avoid conflicts between the various contractors. Assume all responsibility for safety, Electrical and Safety Code compliance, performance and adequacy of the construction power and lighting installation. The Owner's Representative assumes no responsibility for the performance or safety and will not inspect nor design this temporary installation as it is not part of the completed structure.

C. MECHANICAL CONTROL WIRING
   1. See Division 23.

D. EQUIPMENT FURNISHED BY OTHERS
   1. All electrical equipment furnished for this project shall be coordinated with the drawings to insure correctness of Voltage, Phase and Ampacity. Equipment served by single circuit or feeder shall be provided with appropriate internal wiring including fusing of multiple circuits as required by code.
   2. Contractors supplying equipment incompatible with the designed electrical service shall be responsible for arranging and providing necessary changes in their supply wiring to suit the equipment.
   3. Verify dimensions of equipment to be furnished by others to insure correct clearances and connections.
   4. Control Voltages shall not exceed 120 volts. Provide control transformers for higher line

voltages. Control transformers shall be connected from phase to neutral.

5. IT equipment and wiring will be furnished by the Owner for installation by the Owner vender.

1.07 SUPERVISION AND COORDINATION

A. Contact Electrical Inspection and obtain permit before starting work.

B. Maintain adequate supervision of the Division 26 work and have a responsible person in charge at the site any time work is in progress or when necessary for coordination with other trades.

C. Schedule work to best serve the interests of the Owner. Lay out work by referring to the Drawings and other Contractors to anticipate their movements. Cooperate with the other contractors on the job and coordinate work to avoid interference with them.

D. Determine a satisfactory space allocation arrangement prior to rough-in where electrical material is installed in proximity to work of other trades. No extra payments will be allowed to relocate work that interferes with that of other trades.

1.08 CODES AND REGULATIONS

A. All work shall conform to current applicable National, State and local Codes; these shall be regarded as the minimum standard of quality for material and workmanship. Contractor shall provide all Labor and Material that may be required for compliance with Code Requirements or Code Interpretations, although not specifically detailed on the Drawings or in the Specifications. Contractor shall become familiar with all the following codes prior to bidding.

ASTM	American Society for Testing and Materials
NBFU	National Board of Fire Underwriters
NEC	National Electrical Code
WAC	Washington State Administrative Code
NESC	National Electrical Safety Code
NEMA	National Electric Manufacturers Association
NFPA	National Fire Protection Association
UL	Underwriters Laboratories, Inc.
ICEA	Insulated Cable Engineers Associations
CBM	Certified Ballast Manufacturers
ETL	Electrical Testing Laboratories
IFC	International Fire Code
IBC	International Building Code

B. Nothing in these Drawings and Specifications shall be construed as permitting work not conforming with governing codes.

C. The Contractor shall not be relieved from complying with any requirements of these contract documents which may exceed, but not conflict with, requirements of the governing codes.

D. Contractor shall include in bid all costs to have a Department of Labor & Industries approved firm to evaluate the installation safety, and compliance with code as required per WAC 296-40-100 for any equipment specified or furnished that is not UL labeled.

E. For equipment furnished by others and not UL labeled the contractor shall not connect the equipment to the electrical system until receiving written approval by the electrical authority having jurisdiction.

1.09 PERMITS & FEES

A. Obtain and pay all fees for licenses, permits and inspections required by laws, ordinances and rules governing work specified herein. Arrange for inspection of work and provide inspectors with all necessary assistance.

1.10 WORKMANSHIP

A. All work shall be done by competent craftsmen skilled in the specific work to be done. Equipment shall be installed in a neat and workmanlike manner following the best practice of the trade.

1.11 ITEMIZED COST BREAKDOWN

A. Furnish the Owner's Representative with an itemized contract cost breakdown to allow evaluation of partial payment requests. The cost breakdown shall categorize major items of the contract such as: Job organization and setup, conduit system, primary switchgear, transformers, secondary panel gear, service and feeder wiring, branch circuit wiring, lighting fixtures, wiring devices, trim, fire alarm and special systems.

1.12 OPERATING INSTRUCTIONS

A. Fully instruct the Owner's designated representatives in the operation and maintenance of all components of the electrical system upon completion of the work and after all tests and final inspection(s) by the Authority(s) Having Jurisdiction.

B. All costs for contractor's instruction are to be included in the bid proposal. These costs are in addition to contractors costs for commissioning.

C. Instructors shall be contractor's superintendents or foremen knowledgeable in each system and equipment suppliers representatives for special systems.

D. For each timeclock provide a written copy of final settings in a clear plastic sealed enclosure attached to the timeclock.

1.13 AS-BUILT RECORD DRAWINGS

A. Continuously maintain a set of AS-Built Drawings to indicate all significant deviations from the original design and the actual placement of equipment and underground conduits. Location of equipment, trenches and conduit stubouts shall be dimensioned from fixed building, curb or fence reference lines. Changes shall be shown with red colored pencil while work is in progress. This "As-Built" set shall be clearly marked: "AS-BUILT RECORD DRAWINGS - Do Not Remove From Office."

B. Contractor shall transfer "As-Built Record Drawings" to "Corrected to As-Built" drawings in AutoCAD. Provide a electronic PDF disk to the Owner's Representative for review and transmittal to the Owner. Reference Specification Section 00 70 00 – General Conditions, for additional information.

1.14 GUARANTEE

A. The Division 26 Contractor shall provide written guarantee to repair or replace, without additional expense to the Owner any defective materials or workmanship which become evident within a period of one (1) year after final acceptance or for such longer period as elsewhere specified. All warranty work shall be to the satisfaction of the Owner.

B. Any material guaranteed by a specific manufacturer for a period in excess of two (2) years shall be specifically noted on the Owner's written guarantee.

C. The Division 26 Contractor will not be expected to perform normal maintenance, such as replacement of incandescent lamps, etc., beyond date of Substantial Completion. Reference Specification Section 00 70 00, 5.10 – General Conditions, for additional information.

PART 2 PRODUCTS

2.01 GENERAL

A. All materials shall be new, free from defects, of the quality specified herein and on the drawings. Materials shall be designed to ensure satisfactory operation and rated life in the prevailing environmental conditions where they are being installed. They shall be listed by Underwriter's Laboratories or a recognized testing laboratory for use under these conditions.

B. Each type of material shall be of the same make and quality throughout the job. The materials

furnished shall be the latest standard design products of manufacturers regularly engaged in their production.

2.02 TECHNICAL DATA

A. Technical information contained herein relies entirely on tests and ratings provided by manufacturers who are solely responsible for their accuracy. The Owner's Representative, by use of this information in no way implies the results of published manufacturer's information has been verified.

2.03 AS SPECIFIED EQUIPMENT

A. This specification generally lists only one make and model number for each item of equipment or material required for the project. This is not intended to be restrictive but is intended to indicate the standard of quality, design and features required. In addition, the listed product is the basis of the design regarding physical size, electrical power requirements and performance. The product so identified is designated "as specified", "match existing", or "no substitute".

2.04 SUBSTITUTION OF MATERIALS

A. Listing of approved materials is not intended to prevent acceptance of other materials provided the substitute products are submitted for approval and have been approved in accordance with the Substitution of Materials requirements.

B. Approval Prior to Bid Opening

1. Substitute materials will not be considered or reviewed prior to bid.

C. Approval After Contract Award: Substitute products will be considered after contract award only under these conditions:
   1. Non-Availability of Specified Materials: The Contractor shall have placed orders for specified materials within ten days after notice to proceed and received written confirmation of non-availability from the supplier(s). The reason of non-availability shall be beyond the contractor's control such as: discontinuation of manufacture, strikes and acts of God.
   2. Contract Price Adjustments: The Contractor may submit substitution requests for Owner cost savings. All substitute request forms submitted after award of contract shall clearly indicate the proposed contract price change or the request will not be considered.

D. Approval Prior to Installation
   1. All substitution requests shall be made on the substitution request form.
   2. The Contractor shall be responsible for a substitute item suiting the space limitations shown and for any additional installation costs incurred by the substitution.
   3. Approval of substitute materials shall not be construed as authorizing any deviation from the contract drawings and specifications except where such deviation is clearly described in writing on the substitution request form and is approved in writing by the Owner's Representative.
   4. Requests shall clearly define and describe the proposed substitute product. Such requests shall be accompanied by samples, record of performance, certified test reports and such additional information as the Owner's Representative may require to satisfactorily evaluate the substitute product(s).

E. No Substitute:
   1. It is the intent of this specification to require specific materials to be compatible with the existing installation. Certain materials and systems, consequently, are indicated "match existing", "no substitute" and shall be provided as specified.

2.05 COMPLETE SYSTEMS

A. All systems specified herein and shown on the drawings shall be provided by the contractor complete and operational in every detail. Mention of certain materials in bidding documents

shall not be construed as releasing the Contractor from furnishing such additional materials and performing all labor required to provide a complete and operable system.

2.06 SUBMITTALS

A. Purpose of Submittals
   1. Submittals processed by the Owner's Representative are not change orders. The Contractor, by the submittal process, demonstrates an understanding of the design concept by indicating equipment and materials intended to be provided and fabrication/installation methods intended to be utilized to meet all requirements of the contract documents.
   2. The Owner's Representative's review is for general conformance with the design concept and the contract documents. Markings or comments shall not be construed as relieving the Contractor from compliance with the contract documents.

B. Submittal items: Submittals shall include, but not be limited to the following items:
   Raceways
   Wiring Devices
   Disconnects
   Lighting Controls including scaled floor plan wiring schematic drawings.
   Lighting Fixtures
   Nameplates
   Wires and Cables
   Fused
   Fused Disconnects
   Arc Flash PPE Study/Labels
   Programmable Time Switches
   Switchboard and Panels with included Coordination, Arc Flash, PPE and Short circuit studies
   Electric Heating Equipment
   Splicing Kits
   Labels
   Items Requested by Owner's Representative

C. Submittal Format
   1. A transmittal letter with reference identification (i.e., Electrical Submittal No. 1, material lists and catalog data, etc.) shall accompany all submittals.
   2. Submittal brochures shall be separately bound in ACCO fastened or 3-ring type binders appropriate for the quantity of submittal items. Provide typewritten adhesive identification labels on each cover that include Project Name, Electrical Submittal Reference and Contractor's Name.
   3. All information contained in the brochures shall be grouped by specification sections. Provide a typewritten index and identifying divider tabs for all project submittal items to facilitate future reference.

D. Submittal Completeness
   1. The Contractor shall make every effort to ensure the completeness of the initial submittal. Availability of certain shop drawings and catalog materials, however, may prevent this. Submittal shall not be delayed past specified time periods to await delivery of the missing items. The Contractor, instead, shall identify missing items on the transmittal letter and provide index listings and divider tabs for later insertion of these materials into the completed submittal brochure.

E. The Owner's Representative's Selection of Materials for Installation: The Owner's Representative may select specified items that the Contractor shall provide, without change in contract price or time of completeness, under these circumstances:
   1. Late and/or Unqualified Partial Submittals: Submittals must be made within the specified

time periods; all partial submittals shall indicate manufacturer(s) catalog numbers, pertinent technical information and status of missing items.

2. Failure to follow Re-submittal Procedures: Contractor, within 14 days after the Owner's Representative rejects any items, shall re-submit new materials for approval.
3. Materials have been submitted and rejected twice by the Owner's Representative.

F. Contractor's Responsibilities: The Contractor is responsible for all submittal details, accuracy of quantities and dimensions, selection of fabrication processes and techniques of assembly.
1. The Contractor shall furnish equipment/material suppliers with all Drawings and Specifications pertinent to their work.
2. The General Contractor and Electrical Contractor shall review, stamp and sign all submittals and shop drawings, prior to submitting shop drawings to the Owner's Representative for review. Contractor shall correct them to ensure compliance with the specifications and drawings. Obtain Owner's Representative's written approval before manufacture is started on any special equipment.
3. Deviation from Shop Drawings in fabrication and/or installation of equipment is not permitted unless proposed changes are clearly noted in writing by the Contractor and approved in writing by the Owner's Representative at the time of submittal.
4. Maintain at least one complete approved submittal brochure on the jobsite for reference during construction.

2.07 ELECTRICAL EQUIPMENT IDENTIFICATION

A. General: These items shall be provided with nameplates:
1. All motors, motor starters, pushbutton stations, control panels and time switches.
2. Disconnect switches, switchboards, panelboards, time clocks, low voltage control panels and circuit breakers, contactors, and relays in separate enclosures.
3. Wall switches controlling receptacles, lighting fixtures or equipment where the receptacles are not located within sight of the controlling switch.
4. Special systems shall be properly identified at outlets, junction and pull boxes, terminal cabinets and equipment racks.
5. PSE meter shall be provided with phenolic nameplate with building address (500 8th St. S.).

B. Nameplate Inscription
1. All nameplates shall adequately describe the function or operation of the identified equipment as required.
2. Panelboard and Switchgear nameplates shall include equipment designation, voltage and phase of supply, i.e., Panel A, 208/120V, 3 phase, 4 wire.
3. Nameplate designations shall be consistent for all components of a particular piece of equipment, such as starter, disconnect switch, Push Button control station(s) and the like.
4. Contractor shall submit a complete list of nameplates for approval.

C. Nameplate Construction
1. Nameplates shall be laminated phenolic plastic with minimum 3/16" high black engraved characters on white background.
2. Nameplates shall be securely fastened to the equipment with No. 4 round-head phillips, cadmium plated steel, self-tapping screws. Contact cement adhesive only is not acceptable.
3. Motor nameplates may be non-ferrous die-stamped metal, minimum 0.03 inch thick, in lieu of separate phenolic nameplate. Device plates may be identified by engraving directly on the plate. All engraved or stamped lettering shall be filled with contrasting enamel.

PART 3 - EXECUTION

3.01 PROTECTION OF WORK

A. Protect all work, wire, cable, materials and equipment installed under this division against damage by other trades, weather conditions or any other causes. Equipment found damaged

or in other than new condition will be rejected as defective.

B. Switchgear, panels, light fixtures and electrical equipment shall be kept covered or enclosed to exclude moisture, dust, dirt, plaster, cement, or paint and shall be free of all such contamination before acceptance. Enclosures and trims shall be in new condition, free of rust, scratches or other finish defects. Properly refinish in a manner acceptable to the Owner's Representative if damaged.

C. Keep conduit and raceways closed with suitable plugs or caps during construction to prevent entrance of dirt, moisture, concrete or foreign objects. Raceways shall be clean and dry before installation of wire and at the time of acceptance.

D. Make up and insulate wiring promptly after installation of conductors. Wire shall not be pulled-in until raceways are complete, all bushings are installed, and raceway terminations are completed. Wire shall not be pulled into conduit embedded in concrete until after the concrete is placed and forms are removed.

3.02 CUTTING AND PATCHING

A. See Specification Section 01 73 29 –Cutting and Patching for additional requirements.

B. Obtain permission from the Owner's Representative prior to cutting. Locate cuttings so they will not weaken structural components. Cut carefully and only the minimum amount necessary. Cut concrete with diamond core drills or saws except where space limitations prevent the use of such equipment.

C. Penetrations of fire rated elements shall be carefully made to maintain that rating after the installation is complete.

D. All construction materials damaged or cut into during the installation of Division 26 work must be repaired or replaced with materials of like kind and quality as original materials by skilled labor experienced in that particular building trade.

3.03 EXCAVATIONS

A. See Specification Section 01 73 00 – Excavation for additional requirements.

B. The contractor shall be fully responsible for the location and protection of all existing utilities. The contractor shall verify all utility locations prior to construction by calling the underground locate line at 1-800-424-5555 a minimum of 48 hours prior to any excavation. The contractor will also be responsible for maintaining all locate marks once the utilities have been located.

C. All excavations are to be so conducted that no walls or footings shall be disturbed or injured in any way.

D. Remove all surplus earth not needed for backfilling and dispose of same as appropriate at a licensed disposal facility.

3.04 PAINTING

A. Painting in general will be covered under another Division of this specification. Items furnished under this Division scratched or marred in shipment or installation are to be refinished by the Contractor to the satisfaction of the Owner's Representative.

B. Junction boxes in interior building spaces for telecom shall be painted blue. Fire alarm junction boxes in interior building spaces shall be painted red.

3.05 CLEAN UP

A. Contractor shall continually remove debris, cuttings, crates, cartons, etc., created by his work. Such clean up shall be done at sufficient frequency to minimum hazard to the public, other workmen, the building and the Owner's employees. Before acceptance of the installation, Contractor shall carefully clean cabinets, panels, wiring devices, coverplates, etc., to remove dirt, cuttings, paint, plaster, mortar, concrete, etc. Blemishes to finished surfaces or apparatus shall be removed and new finish equal to the original applies.

3.06 LABELING

A. Clearly and properly label the complete electrical system, as specified herein, to indicate the loads served or the function of each item of equipment connected under this contract.

B. Control circuits shall utilize combinations of colors with each conductor identified throughout using wrap around numbers or letters. Identification shall be consistent with the contract drawing requirements and operation and maintenance shop drawings.

C. Labels shall be provided on all disconnects, combination motor starter, and junction boxes indicating the specific panel and branch circuit utilized. Do not provide circuiting labels on light switch and receptacle cover plates.

3.07 MECHANICAL AND SPRAY PARK EQUIPMENT CONNECTIONS

A. Provide complete electrical connections for all items of equipment, including incidental wiring, materials, devices, grounding, and labor necessary for a finished working installation.

B. Mechanical/Electrical equipment connection coordination shall be as follows:

ITEM	FURNISHED BY	INSTALLED BY	POWER WIRING BY	CONTROL WIRING BY
Mechanical Equipment Motors	MC	MC	EC	MC
Fused & Unfused Disconnect Switches, Thermal Overload & Heaters	EC	EC	EC	--
Motor Starter & Overload Heaters	EC	EC	EC	MC
Manual Operating & Speed Switches	MC	EC	EC	MC
Control Relays & Control Transformers	MC	MC	EC**	MC
Low Voltage Thermostats	MC	MC	EC**	MC
Temperature Control Panels	MC	MC	EC**	MC
DDC Panels	MC	MC	EC**	MC
Motor & Solenoid Valves, Damper Motors, PE & EP Switches	MC	MC	--	MC
Fire/Smoke Dampers (Actuators)	MC	MC	EC***	MC/EC*
Duct-Mounted Smoke Detectors	EC	MC	--	MC/EC*

MC = Division 23
EC = Division 26

* Motor interlock by MC, Fire Alarm System Interconnection by EC.
** EC shall provide conduit and wire from nearest un-switched 120V circuit location. Label on "as built" drawings.

*** EC shall provide conduit and wire from nearest 120V panel. Connect to spare circuit breaker and label on “as-built” drawings.

3.08 SUPPORT AND ALIGNMENT

A. Each fastening device and support for electrical equipment, fixtures, panels, outlets and cabinets shall be capable of supporting not less than four times the ultimate weight of the objects fastened to or suspended from the building structure.

B. Install panels, cabinets and equipment level, plumb, and parallel with structural building lines. Switchgear, panels and all electrical enclosures shall fit neatly without gaps, openings or distortion. Properly and neatly close all unused openings with approved devices.

C. Fit surface panels, devices and receptacles with neat, appropriate trims, plates or covers, (without over-hanging edges, protruding corners or raw edges) to leave a finished appearance.

D. All junction boxes, pull boxes or other conduit terminating housings located above a suspended ceiling shall be securely suspended from structure or ceiling grid system to prevent sagging or swaying.

3.09 NOISE CONTROL

A. Back-to-back or straight-through installation of wall or partition boxes is not permitted to minimize noise transmission between occupied spaces.

B. Contactors, transformers, starters and similar noise producing devices shall not be placed on walls which are common to occupied spaces. Where such devices must be mounted on walls common to occupied spaces, they shall be shock mounted or isolated in such a manner as to effectively prevent the transmission of their inherent noise to the occupied space.

C. Ballasts, contactors, starters, transformers and like equipment which are found to be noticeably noisier than other similar equipment on the project will be deemed defective and shall be replaced.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

1.02 WORK INCLUDED

A. Provide all wire, cable and terminations for a complete installation.

PART 2 PRODUCTS

2.01 PACKAGING

A. Conductors shall be delivered to the job site in approved original cartons, or on reels as recommended by the manufacturer and shall bear the Underwriter's Label. Reels shall be provided with suitable protection to prevent fork-lift damage to conductors during shipment or storage prior to use.

2.02 SPECIALIZED CONDUCTORS

A. Conductors for specialized systems shall be as recommended by the equipment manufacturer.

2.03 CONDUCTORS - 600 VOLTS

A. Stranded copper, insulated for 600 volts.

B. Insulation types THW, THHN, THWN, XHHW, RHH, RHW, or as required to suit installation conditions.

C. Thru wiring in fluorescent fixtures shall be rated for 90 degree C minimum.

D. Aluminum: Stranded electrical grade, insulated for 600 volts. See execution section for permitted use.

2.04 CONNECTORS - 600 Volts

A. Branch circuit conductor splices: Pre-insulated "twist-on" type or "crimped-on" type as approved (Scotch-lok, Ideal or equal).

B. Cable Splices: Split-bolt or tool applied sleeves with pre-formed insulated cover, heat shrinkable tubing or approved plastic insulating tape.

C. Terminator lugs of No. 12 wire and smaller: Spade, insulated type to be tool applied.

D. Terminator lugs for No. 10 wire or larger: Two bolt (or approved positive restraint), tool applied compression type (Burndy or equal).

2.05 INSULATING MATERIALS

A. Insulating tape or heat shrink tubing shall have the equivalent rating of the applicable conductor insulation (Scotch 3M, RAYCHEM or equal).

2.06 PLASTIC CABLE TIE

A. Nylon, or equivalent, locking type (T&B or equal).

2.07 METAL CLAD CABLE

A. Metal clad cable is an acceptable wiring method instead of EMT conduit and wire for lighting and receptacle branch circuits. Metal clad cable is not acceptable from the homerun junction box back to the panel for lighting and receptacle circuits.

PART 3 EXECUTION

3.01 GENERAL

A. Install all wiring in raceway.

3.02 MINIMUM WIRE SIZE

Lighting and Power System ..... No. 12 AWG
Fixture Wire ..... No. 14 AWG
Wiring in Fluorescent Fixture Troughs ... No. 12 AWG
Control Circuits for Motors, etc. ..... No. 14 AWG
Fire Alarm Line Voltage Wiring ..... No. 14 AWG
Low Voltage Wiring ..... As recommended by Mfgr

3.03 CONDUCTOR TYPES, REFERENCED ON PLAN

A. Conductors #3 AWG and below shall be copper.

B. Aluminum may be substituted for copper conductors size #2 AWG and larger unless specifically noted as copper only on the drawings. Contractor shall identify conduit size and conductors (Cu or AL) on ‘As- Built” record drawings.

3.04 ALUMINUM CONDUCTORS

A. Aluminum conductors where utilized by Contractor in lieu of copper are subject to the following requirements:

B. Increase wire size for equal or greater current capacity as copper. Increased conduit size as necessary for code compliance.

C. Minimum size of aluminum conductors is #1/0 AWG.

D. Insulation requirements are the same as for copper conductor wires and cables.

3.05 CONDUCTOR COLORING CODE

Conductor color coding shall be as follows:

A. 208/120 volt system
A Phase - Black
B Phase - Red
C Phase - Blue
Neutral – White
Grounding – Green
Switched wires – Other colors

B. Conductors shall have colored insulation except wires larger than #8 may be black with colored tape identification at all terminations and splices.

C. Additional colors may be used where such colors will help in identifying wires and different systems.

3.06 CONDUCTOR INSTALLATION

A. Raceways shall be complete, clean and free of burrs before pulling conductors.

B. U.L. approved pulling compounds may be used with the residue cleaned from the conductors and raceway entrances after the pull is made.

C. Contractor shall obtain the manufacturer's published recommendations for the handling, pulling and terminating of the cable. Contractor shall perform work in accord with manufacturer's recommendations and accept all responsibility for work not in accord with manufacturer's recommendations.

D. Pulleys or blocks shall be used for alignment of the conductors when pulling. Pulling shall be in accordance with manufacturer's specifications regarding pulling tensions, bending radius of the cable and compounds. No mechanical pulling means shall be used for wires No. 8 AWG and smaller. Cables shall be pulled by the conductor, not by the insulation or shielding.

3.07 MOISTURE PROTECTION

A. Cable ends shall be protected at all times from moisture. Provide approved heat-shrink end caps or

equivalent for all unterminated cable ends.

3.08 CONDUCTORS IN PANELS AND SWITCHBOARDS

A. Conductors in panels, switchboards and terminal cabinets shall be neatly grouped and formed in a manner to "fan" into terminals with regular spacing.

3.09 CABLE SUPPORTS

A. Provide conductor support devices as required by code in vertical cable runs.

3.10 INSULATION REMOVAL

A. Insulation shall be removed with approved wire stripping tools. Conductors that are nicked or ringed are unacceptable and shall be cut off and re-stripped

3.11 INSULATION OF ENERGIZED TERMINATIONS

A. Insulate all exposed energized connections and splices with approved tape or heat shrink tubing. Tape, if used, shall be half-lapped in two directions.

3.12 TERMINATIONS - COPPER CONDUCTORS 600 VOLT

A. Control and special systems wires shall be terminated with a crimped on lug when terminating at a screw connection.

B. All screw and bolt type connectors shall be made up tight and retightened after an eight hour period. Tighten all bolted connections with a ratcheting type torque wrench per manufacturer's standards.

C. All tool applied crimped connectors shall be applied per manufacturer's recommendations and physically checked for tightness.

D. Where oversized wire is used to compensate for voltage drop, a short length of copper conductor crimped to a copper “finger” manufactured for this purpose may be utilized.

3.13 TERMINATION - ALUMINUM CONDUCTORS 600 VOLTS

A. Aluminum conductors shall be terminated or spliced using hydraulic crimped aluminum lugs filled with a contact aid compound (Penetrox A or equal). They shall not be terminated or spliced with bolted pressure fittings. Where a device is available with bolted lugs only, a short length of copper conductor may be spliced to the aluminum conductor and the copper connected to the bolted pressure lug. As an alternate, a special type crimped aluminum lug with aluminum or copper "finger" manufactured for this purpose may be used.

B. Hydraulic crimped fittings shall be sized for the conductor used and shall be made with a tool which assures a preset deformation before release.

C. Aluminum lugs shall be plated.

D. Provide Belleville washer system where bolting to aluminum lugs or bus unless specifically permitted otherwise. (Belleville washer bearing on a chrome plated or stainless steel washer.)

E. Because aluminum oxidizes rapidly, and aluminum oxide is an insulator, contractor shall prepare aluminum wire for terminations by cleaning it with a wire brush immediately before inserting it into aluminum lugs.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

B. References used in this Section are generally accepted industry standards. The edition of the criteria cited shall be the most recent, published edition, including amendments at the time of Bid.

1.02 WORK INCLUDED

A. Provide a complete grounding system that complies with the current edition of the National Electrical Code (NEC), and all applicable regulatory codes.

PART 2 - PRODUCTS

2.01 GROUND RODS

A. Minimum size: 3/4" diameter by 10'-0" long, copper clad steel rods.

2.02 GROUND CONDUCTORS

A. Grounding conductors shall be soft drawn, bare, stranded copper unless otherwise noted. Size as shown on the plans and per the National Electrical Code (NEC) Article 250.

1. GROUNDING ELECTRODE CONDUCTORS FOR A.C. SYSTEMS: See NEC table 250.66
2. EQUIPMENT GROUNDING CONDUCTORS:
   See NEC table 250.122
   Equipment grounding conductors may be insulated; provide green insulation and/or approved permanent identification for conductors larger than No. 6 AWG. Equipment grounding conductors shall be provided in all feeder and branch circuit conduits.

2.03 GROUND ELECTRODE CONNECTORS

A. Connectors for grounding electrode conductor to ground rod shall be of the thermal fusion type; conductor-to- conductor connections may be either thermal fusion or approved hydraulically applied compression type.

2.04 GROUNDING BUSHINGS

A. Grounding bushings shall be matched to the ampacity of the grounding conductor and shall have approved set-screw type grounding lug connectors.

2.05 GROUNDING CONNECTORS

A. Shall meet the requirements of ground bushings, cast, set-screw or bolted type.

2.06 GROUNDING CLAMPS

A. Clamps shall be matched to the ampacity of the grounding conductor. Provide approved raceway hub where grounding conductor is shown protected by conduit or armored cable. Clamps shall be U-bolt type for connection to waterpipes.

PART 3 - EXECUTION

3.01 GROUND CONTINUITY

A. Maintain ground continuity throughout the entire electrical system.

B. Permanently connect the electrical system neutral to the water service. The system shall be grounded only at transformer secondaries and at the main distribution board. Branch panel neutrals must be isolated from additional points of grounding.

C. Provide approved grounding bushings or locknuts on all conduits terminating in panelboards, pullboxes or other enclosures to insure continuity of conduit grounding connections.

D. Securely ground lighting fixtures.

E. Provide a separate grounding conductor in all metal or non-metallic conduits and in all flexible metallic conduit runs. Connect to the grounding system in an approved manner.

F. All plug-in receptacles shall be bonded to the box and raceway ground system.

3.02 GROUNDING CONNECTIONS

A. All grounding connections shall be carefully made to insure low system impedance. Locate grounding connections to allow future servicing and expansion.

B. Prior to making mechanical or thermal connections, all conductors shall be clean, dry and bright with the bonding surface thoroughly cleaned of any oxides, mill, scale or other foreign matter.

C. Ground conductors shall be protected from mechanical injury during construction. Provide protective coverings or rigid non-ferrous conduit.

3.03 GROUND RODS

A. Ground rods shall be driven into undisturbed soil to full depth. Provide additional rods, ionic salt solutions and the like where special low-resistant grounds are specified.

3.04 CONCEALED GROUND ELECTRODE SYSTEM

A. Concealed ground electrode systems, shall be installed, inspected, tested and certified for low resistance connections and low resistance to earth ground prior to being covered.

3.05 THROUGH-SLAB GROUND PENETRATIONS

A. Ground conductors extending through the slab shall be protected by a rigid conduit sleeve; the void portion of the sleeve shall be packed with a non-hardening type duct seal.

3.06 TESTING

A. Shall conform to Section 26 01 26.

END OF SECTION

SECTION 26 05 33
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

B. References used in this Section are generally accepted industry standards. The edition of the criteria cited shall be the most recent, published edition, including amendments at the time of Bid.

1.02 WORK INCLUDED

A. Provide raceways for a complete electrical system. Include all fittings, hangers and appurtenances required for a complete installation.

B. Provide outlet and pull boxes required to enclose devices, permit pulling conductors, for wire splices and branching.

C. Provide grommeted end bushings and long sweep elbows for all fiber and data cabling.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide boxes suitable for the location. Boxes shall meet NEMA Standards for various types.

2.02 CONDUITS

A. Galvanized Rigid Steel, thick wall (GRS)

B. Intermediate Metal Conduit (IMC)

C. Electrical Metallic Tubing (EMT)

D. Flexible Metal Conduit with and without polyvinyl chloride jacket

E. Non-metallic, polyvinyl chloride (PVC), schedule 40

2.03 FITTINGS

A. GRS and IMC couplings and connectors shall have threaded connections. Galvanized malleable iron or non-corrosive alloy compatible with galvanized conduit. Running thread or set screw type fittings are not permitted.

B. EMT - Couplings and connectors shall be rain tight, steel or malleable iron, utilizing a split corrugated compression ring and tightening nut or stainless steel locking disk. Set screw fittings are permitted in dry locations. Set screw fittings are not permitted in wet locations or in concrete. Zinc, pot metal, die cast fittings and indenter fittings are not acceptable.

C. Flexible Metal Conduit
   1. Dry Locations: malleable iron or steel, Thomas & Betts "Squeeze" type or equal.
   2. Damp or Wet Locations: Thomas & Betts "Super Liquid-Tight" with external ground lug.

D. PVC Fittings shall be solvent welded types.

2.04 INTERIOR WIRING, NEMA 1

A. Flush and concealed outlet boxes shall be galvanized stamped steel with screw ears, knock-out plugs, mounting holes, and fixture stud.

B. Surface outlet boxes shall be galvanized stamped steel same as above for use on ceilings and in accessible locations. Contractor shall provide cast iron galvanized for use on walls below 8 feet.

C. Boxes exceeding 4-11/16 inches square shall be welded steel construction with screw cover and factory painted.

D. Surface Metal Raceway boxes shall be of same manufacture to match raceway. Boxes shall accommodate standard devices and device plates.

E. Boxes for casting in concrete or mounting in masonry walls shall be galvanized steel (not aluminum or zinc die castings), specifically designed and listed for that purpose.

2.05 SPECIAL LOCATIONS

A. For indoor damp or dusty locations provide NEMA 4 boxes

B. For corrosive locations provide NEMA 4X boxes

C. For outdoor equipment where a drain is appropriate provide NEMA 3R boxes.

2.06 BELOW GRADE

A. Where exposed to earth vaults shall be constructed of precast concrete with size, configuration, hinged and locking cover. Provide welded ground lugs on all frames and covers. Structural loading shall be minimum H30 traffic rating, stencil painted on wall tight to lid.

B. Where exposed to earth. Security handholes and lid combo, H30 traffic rating shall be Cobalt Utility Products, Inc (425-443-2830) or equal with a total of five (5) T-handle security keys provided to Owner at completion of project or equal.

PART 3 EXECUTION

3.01 GENERAL

A. Install raceways concealed in construction of finished spaces.

B. Cut conduit ends square, ream smooth and extend maximum distance into all couplings and connectors.

C. Provide and install manufactured end caps on all conduit ends during construction to prevent the entrance of water or dirt. Tape, as a cover, is not acceptable.

D. Pull a properly sized mandrel through each conduit prior to installation of conductors or pull-lines to remove any materials trapped within the conduit run.

E. All PVC elbows shall be factory made.

F. Field made elbows are acceptable for steel conduits when made with approved bending tools. Bends that show conduit flattened or deformation are unacceptable and shall be replaced.

G. Conduits shall maintain a minimum 12" clearance from any high temperature surface. Power and communication conduits shall have minimum 12” separation below grade.

H. The conduit layout shall be carefully planned by the contractor to ensure neat and workmanlike installation.

I. Any work showing inadequate planning may be ordered removed by the Owner’s Representative and shall be replaced in a neat and proper manner at no additional cost to the owner.

3.02 CONDUIT SIZING

A. Conduits shall be sized per code for conductors with type THW insulation, although thinner insulation types are permitted in some cases. Conduit size shall not be reduced if large size is specified on the drawing. Minimum conduit size shall be ¾” trade diameter. Conduit ½” trade diameter may be used for dead end receptacles and switch runs.

3.03 GRS AND IMC

A. Install GRS or IMC for all conduits in wet locations, concrete, underground, exposed to weather, where subject to physical damage and as noted on drawings.

B. Connections shall be watertight in damp locations.

3.04 EMT

A. EMT may be installed for wiring in masonry block, frame construction, furred ceilings, above

suspended ceilings and in dry location concrete, exposed dry location unfinished spaces not subject to physical damage. EMT shall not be installed underground, under concrete slabs-on-grade, in concrete slabs-on-grade, exposed to weather, on exterior of buildings or on roofs.

B. Contractor shall coordinate assembly and installation of EMT in masonry block construction to avoid construction delays. Avoid surface cut masonry units wherever such masonry units are to remain unplastered or exposed.

3.05 FLEXIBLE CONDUIT

A. Provide flexible conduit connection to motors and equipment subject to vibration with at least a 60 degree loop to allow for isolation and flexibility. Use liquid-tight for pumps, equipment which is regularly washed down, and for equipment in damp locations. Provide bonding jumper as required by N.E.C.

3.06 PVC CONDUIT

A. PVC conduit may be used underground when permitted by code and where designated as an acceptable substitute for GRS or IMC on the drawings. Field bends, less than 45 degrees, when necessary, shall be formed with factory recommended heater. PVC bends 45 degrees or greater shall be factory made.

3.07 UNDERGROUND RACEWAYS

A. Burial depth of underground raceways shall be not less than NEC minimums and shall be deeper where so noted herein or required to avoid conflicts with other utilities. Route dry utilities below wet utilities when there is a conflict.

B. Arrange and slope conduits entering buildings to drain away from the point of entry.

C. Conduits passing through the exterior walls below grade and/or bridging areas of naturally unstable soil conditions or previously filled areas shall be placed in a manner to avoid crushing from ground settlement. Backfill under conduit shall be thoroughly compacted. Provide approved deflection fittings on conduits.

3.08 CONDUITS IN FOUNDATION AREA

A. Conduits in foundation areas shall be installed so as not to undermine the footings. Check structural drawings for any specific instructions. Backfill over conduits under footings and concrete slabs shall conform to the requirements of the Architect/Structural Engineer.

3.09 STUBUPS THROUGH CONCRETE SLABS OR FINISH GRADE

A. Conduits through concrete slabs shall be steel. Install at such depth that the exposed conduit is vertical and curved section of the elbow is not visible.

B. All steel conduit below grade to 6” above grade shall be wrapped with Scotch 50 Anti Corrosion Protective tape or equal.

3.10 INSERTS AND SLEEVES

A. Furnish and install all inserts and sleeves necessary for Division 26 installation prior to pouring of concrete slabs and walls.

B. In existing concrete slabs and walls utilize drilled-in threaded inserts, installed as recommended by the manufacturer, where additional supports are required. Neatly core drill openings where additional sleeves are required.

3.11 SEALING RACEWAY PENETRATIONS

A. Exterior Wall Surface Above Grade

For concrete construction above grade, cast raceway or sleeve in wall or core drill wall and hard pack with a mixture of equal parts of sand and cement. Seal around all penetrations, with caulking approved by the Owner’s Representative.

B. Exterior Surface Below Grade

Cast raceway into wall/floor or use manufactured seal assembly cast in place. OZ type "FSK" or equal. Change from PVC to steel conduit (couplings or bushings) where necessary to obtain a watertight seal in poured concrete wall or floors.

C. Roof

Conduits passing through building roof shall be flashed using a 4 lb. per square foot lead plumbing vent flashing extending not less than 10" from the conduit under the roofing, and not less than 10" above the roof around the conduit. Flashing shall be attached by an approved galvanized or stainless steel clamping band.

D. Fire Rated Construction
1. All seals must meet with the approval of the local Fire Marshal.
2. Concrete or Masonry
   a. Seal around raceway with an approved firestop compound that passes UL test 1479 (ASTM E814) DOW CORNING 3-6548, T & B FLAME SAFE, 3M Fire Barrier Caulk, 3M #Fire Barrier Putty, or equal.
3. Plaster or Gypsum Wallboard
   a. Seal around raceway penetration with plaster and approved fire tape.

E. Acoustical Sealing

1. Provide Acoustical Sealing of all wiring and raceway openings in ceilings, walls and floors which are critical barriers for noise transfer. Acoustical sealing shall consist of resilient caulking to seal all openings around wiring and electrical raceways.

F. Below grade vaults, switchboards, and event pedestals.
1. Seal all conduits entering and leaving with removable foam seal to prevent rodent access.

3.12 SEALING CONDUITS

A. Seal interior of all conduits which enter the building through floor, roof or outside walls and may carry water into the building. Seal on the end inside the building, using duct sealing mastic, non-hardening compound type, specifically designed for such service. Pack around wires in the conduit.

B. For exterior wall penetrations below grade, install OZ type "CSB" sealing bushing at interior end of penetrating conduit. Threaded fittings-only are permitted in entering conduits ahead of the sealing bushing.

C. Provide for water drainage so no electrical problems will result if seals leak.

3.13 CONDUIT HANGERS

A. General
1. Provide for supporting all conduits from the building structure. Space supports per NEC. Contractor shall provide supports adequate for the loads and resistant to earthquake forces.
2. Contractor is responsible to calculate lbs/sq ft of proposed main conduit runs and verify with project structural engineer if acceptable or additional structural bracing is required. Contractor shall alter conduit route or provide additional bracing acceptable to the structural engineer.

B. With Suspended Ceiling Areas
1. Contractor may attach 1/2" and 3/4" EMT conduits to ceiling suspension systems provided such systems are structurally suitable. Attachment to suspension systems shall be made with clips specifically manufactured for this purpose. (CADDY or equal)

C. Conduits not attached to the ceiling suspension system shall be fastened with approved pipe straps or separate suspension hangers to ceiling metal inserts and/or structural members.

D. Hangers for Direct Mounted Conduits
1. Hangers attached directly to building surface shall be two hole sheet steel or one hole malleable iron, all galvanized, pipe clamps. (Thomas & Betts or approved equal).
2. Hangers for ground cable and PVC conduit supporting ground cable shall not encircle the cable or conduit in metal, but shall be 2-hole plastic or 1-hole metal clamps.

E. Hangers for Single Suspended Conduit
   1. Hangers suspended below ceilings shall utilize steel rods and malleable iron pipe rings sized for the application (Grinnell No. 97 or approved equal). Provide concrete hanger inserts as required.

F. Trapeze Type Suspended Supports
   1. Trapeze type supports shall be used where two or more conduits use the same routing. Such hangers shall utilize steel rods, structural steel channels, and clamps of Kindorf, Unistrut or approved equal, sized for the application.

G. Support of Conduit in Steel Stud Walls
   1. Attach conduits to studs with approved straps or 18 gauge steel wire secured to steel bars.

3.14 CONTINUITY OF CONDUIT SYSTEM

A. Conduits shall be assembled continuous and secured to boxes, panels, etc., with appropriate fittings to maintain electric continuity.

3.15 PULL-LINES

A. Provide 150 pound plastic pull-lines in all conduit systems and spare/empty conduits to facilitate future conductor installation. Provide plastic, weather resistant labels with source and end point at both ends.

3.16 ANCHORING

A. All interior boxes shall be firmly anchored directly or with concealed bracing to building studs or joints. Boxes must be so attached that they will not "rock" or "shift" when devices are operated.

B. Exterior boxes shall be fastened to approved hot dipped galvanized mounting supports and racking appropriate for size of enclosure.

3.17 FLUSH MOUNTING

A. All boxes shall have front edge (box or plaster ring) even with the finished surface of the wall or ceiling. Use of long screws with spacers or shims will not be acceptable.

3.18 RECEPTACLES AND SWITCHES

A. Coordinate the work of this Section with the work of other Sections and trades. Study all drawings that form a part of this contract and confer with the various trades involved to eliminate conflicts between the work of this Section and the work of other trades. Check and verify locations with respect to door swings, installation details, cabinet work, and suspended ceilings indicated on contract drawings. Review and coordinate locations of all plumbing, heating, and ventilating equipment and other equipment indicated on the contract drawings of all trades.

B. Centered on Built-In Work: In the case of doors and cabinets, where devices are centered between two such features, rough-in these device locations exact. Relocate any devices which are located off center at no additional cost to the owner.

C. Where more than one device is shown or specified to be at the same elevation or one above the other, align them exactly on centerlines horizontally or vertically. Relocate as directed all such devices including light switches, receptacles, voice/data, signal and thermostat devices which are not so installed, at no additional cost to Owner.

D. Device Outlet Height: Measure from the finished floor to the centerline, unless otherwise noted on electrical or architectural drawings, or required to serve specific equipment.

Switches	42 inches, set vertically
Receptacles	18 inches set vertically
Other	As shown on the plans or as directed by the Owner’s Representative

3.19 LIGHTING FIXTURES

A. Locate in accordance with approved architectural ceiling layout plans so light fixtures replace full size lay-in ceiling tiles wherever possible. Notify the Owner’s Representative of any conflicts between plans prior to rough-in. Contractor shall relocate light fixtures at no additional charge if

field coordination is not done prior to installation.

3.20 ELECTRICAL WORK IN COUNTERBACKS, MILLWORK AND CASEWORK

A. Provide templates, where required, to other trades for drilling and cutting to insure accurate location of electrical devices as field verified prior to rough-in with the Architect.

3.21 CONNECTION TO EQUIPMENT

A. Provide device back boxes of size and at locations necessary to serve equipment furnished under this or other Divisions of the specifications or by others. A device box is required if equipment has pigtail wires for external connection, does not have space to accommodate circuit wiring or requires wire different from circuit wiring used. Study equipment details to assure proper coordination.

3.22 BLANK COVERS

A. Provide blank cover or plate over all boxes.

3.23 JUNCTION BOXES OR PULL BOXES IN SUSPENDED CEILINGS

A. Shall be supported from structure independently from ceiling suspension system.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

B. References used in this Section are generally accepted industry standards. The edition of the criteria cited shall be the most recent, published edition, including amendments at the time of Bid.

1.02 WORK INCLUDED

A. Provide all panelboard equipment complete. All equipment shall be dead front type construction and shall bear the U.L. label. Load centers will not be acceptable.

B. All panels provided for service entrance locations as defined by the NEC shall be provided with a UL label as Suitable for Use as Service Entrance Equipment (SUSE).

1.03 SHOP DRAWINGS

A. Prepare and submit for review prior to manufacture. Include front view, dimensions, device sizes and layout, list of nameplates and all other information required to demonstrate conformance with contract documents.

B. Dimensions of panelboards shall not exceed those noted on or scaled from the contract documents. Conform to 26 24 13, Switchboard Dimensions, when dimensions exceed those allowed by contract documents.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Siemens

B. General Electric

C. Square D

D. Cutler Hammer

2.02 PANELBOARD DESCRIPTION

A. Voltage, arrangement, and capacity of bus and overcurrent protective devices shall be as shown on the drawings. Bus shall extend behind all spaces ready for future overcurrent protective devices.

B. Buss bars shall be plated aluminum or copper with ampere density not-to-exceed 1200/1000 amperes per square inch. Bussing will generally be 3 phase, 4 wire, 100 percent neutral, 200 percent for lighting and computer equipment panels, braced to match the interrupting rating of the breakers.

C. Provide multiple lugs where parallel or "feed-through" connections are shown on drawings.

D. Provide separate neutral and ground buses at the bottom of each panelboard.

2.03 OVERCURRENT PROTECTIVE DEVICES

A. Provide thermal-magnetic type circuit breakers.

B. The AIC rating of the circuit breaker shall match the panel as specified on the drawings. Do not series rate/.

C. Mount breakers in all panelboards so breaker handles operate in a horizontal plane. Provide common trip on all multiple pole breakers.

D. All circuit breakers shall be the bolt-on type.

E. Circuit Breakers rated 15A through 30A shall be U.L. rated for 60/75 degree centigrade wire. Breakers 35A and larger shall be rated for 75 degree centigrade.

F. Circuit breakers intended for switching 120 volt loads shall be switching duty rated (SWD).

G. Provide "Spare" overcurrent devices, where noted on the drawings, complete and ready for future circuit connections.

H. Provide "Space" for future overcurrent devices, where noted on the drawings. Space shall include all bussing and device mounting hardware. Provide approved coverplates or overcurrent devices in all spaces. Open spaces in the panel are not permitted.

2.04 ENCLOSURE GENERAL CONSTRUCTION

A. Provide cabinets of sufficient dimensions to allow future expansion and addition of overcurrent devices within the panelboards. All panelboards shall be provided with door-in-door construction. Provide increased enclosure width required for installation of conduits.

B. Provide factory primer coat for cabinets located in finished areas. Where cabinets are located in unfinished areas, standard lacquer or enamel finish, gray or blue-gray color, shall be substituted for factory primer coat.

C. All electrical distribution equipment locks shall be keyed identically.

D. Fasten panelboard front with machine screws with oval counter-sunk heads, finish hardware quality, with escutcheons or approved trim clamps. Clamps accessible only when dead front door is open are acceptable.

E. Surface mounted panelboards with fronts greater than 48 inches vertical dimension shall be hinged at right side in addition to hinged door over dead front. Provide three point latching mechanism with one T-handle operator.

F. Provide matching trim of same height for adjacent panels or control devices in finished areas.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION

A. Secure panelboards in place with top of cabinet at 6'-0", above finished grade unless otherwise noted. Top of cabinet and trim shall be level; trim and door shall fit neatly without gaps, openings or distortion.

B. Top edges of adjacent panels shall be even.

C. Securely anchor panelboards to structural framing or walls with approved fasteners and concealed bracing as required. Provide steel channel support framing where panelboard is free standing. Submit support rack shop drawings for approval prior to fabrication.

D. Install panelboard interiors only after building structure is completely enclosed.

3.02 CIRCUIT INDEX

A. Each panelboard shall be provided with a typewritten index listing each circuit in the panel by number, with its proper designation. Listing shall match circuit breaker arrangements, typically with odd numbers on the left and even numbers on the right. Room numbers shall be the final room numbers used in the building as verified with the Owner. Mount index with a transparent protective cover inside the cabinet door.

3.03 PANELBOARD NAMEPLATE

A. Provide phenolic engraved nameplate for each panelboard. See Section 26 05 00

3.04 LABELING

A. Panelboards shall be provided with required Arc Flash and Personal Protective Equipment (PPE) labels

3.05 SPACE

A. Verify space available with equipment sizes and code required working clearances prior to submittal of shop drawings.

3.06 ARC FLASH LABELING

A. Provide per Section 26 01 26.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

B. References used in this Section are generally accepted industry standards. The edition of the criteria cited shall be the most recent, published edition, including amendments at the time of Bid.

1.02 WORK INCLUDED

A. Provide all wiring devices and plates for a complete installation.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Hubbell

B. Arrow Hart

C. Leviton

D. Pass & Seymour

2.02 MATERIALS

A. Wiring devices shall be specification grade, and the product of a nationally recognized manufacturer regularly engaged in their production.

B. All wiring devices specified in this section shall be the product of one manufacturer. Each type shall have identical appearance and characteristics.

C. Switched receptacles provided in offices for energy code compliance shall be separately identified from non-switched receptacles.

2.03 DEVICE COLOR

A. Switch handles and receptacles: White

B. Paint or other surface finish treatments are not acceptable. Verify actual colors with project Owner's Representative for special installation conditions.

2.04 SWITCHES

A. Switches shall be 20 ampere, 277 volt, quiet type with plastic handle. Single pole, double pole, 3-way, 4-way or locking type as required. Provide matching styles and color in other devices as required for the conditions of installation.

B. Momentary Contact line voltage switch: Single pole, double throw, 3 wire, normally open. Rating same as above.

2.05 RECEPTACLES

A. Duplex NEMA 5-20R configuration (20 amp, 125V)

B. GFCI Receptacles
   1. Interior: 20A-125V duplex receptacle with trip indicator light.
   2. Exterior: 20A-125V duplex, weather resistant, GFCI receptacle with trip indicator light and single NEMA 3R "In Use" metal cover, mounted horizontally.

2.06 DEVICE PLATES

A. Non-metallic with color to match device. Provide pressed steel plates for surface devices in equipment and storage areas.

B. Identification: Provide engraved device plates with amperage and voltage for all receptacles above 125V, 20 ampere rating.

PART 3 EXECUTION

3.01 MOUNTING

A. Rigidly fasten each device to the box at proper position with the wall to bring device flush with plate or switch handle the proper distance through the plate.

3.02 ORIENTATION

A. Set switches vertical with handle operating vertically, up position "ON" and +42" above finished floor.

B. Set interior receptacles vertical with ground slot up; +18" above finished floor.

C. Set interior receptacles above counters, horizontal, centered in backsplash or as directed by Owner’s Representative. Verify prior to rough-in.

D. Set exterior receptacles horizontal at +24" above finished grade.

E. Devices and finish plates shall be installed plumb with building lines.

3.03 RECEPTACLE GROUNDING

A. Provide bare bonding wire between receptacle grounding terminal and box. Plaster ear screws connecting the receptacle frame to the box will not be acceptable for grounding.

3.04 HANDICAPPED ACCESS

A. Comply with requirements of Washington State handicapped access code.

3.05 TRIM OUT

A. Provide device plate for each wiring device. Trim plates and devices shall not be installed until final painting is completed. Scratched or splattered plates and devices will not be acceptable.

3.06 RECEPTACLE TESTS

A. Receptacles shall be checked to ensure proper line to neutral, line to ground and neutral to ground voltages.

END OF SECTION

SECTION 26 28 13
FUSES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

B. References used in this Section are generally accepted industry standards. The edition of the criteria cited shall be the most recent, published edition, including amendments at the time of Bid.

1.02 WORK INCLUDED

A. Provide fusing and appurtenances for all fusible equipment provided under this contract.

PART 2 PRODUCTS

2.01 LOW VOLTAGE FUSES

A. The low voltage fuse range is considered to extend over the range 600 volts or less. Fuses in this category shall be current limiting types, UL Class R, unless specified otherwise. Provide rejection style fuse clips for all current limiting applications.

B. Fuses shall be as follows or equal:

APPLICATION	AMPERE RANGE	UL CLASS	GOULD - SHAWMUT	BUSS
Motor & Branch Circuit	1-100	RK 5 Time Delay	Tri-onic	Fusetron
Feeder	60-100	RK 5 Fast	Falt-Trap	Fusetron
All	125-200	RK 1 Time Delay	Amp-Trap 2	Low Peak

2.02 SPARE FUSES

A. Provide 10 % of each rating with a minimum of 3 per rating. Turn over to Owner with O & M requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install fuses in all fusible devices provided under this contract.

END OF SECTION

SECTION 26 28 16
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

1.02 WORK INCLUDED

A. Provide all disconnect switches and enclosed circuit breakers required by NEC for equipment furnished under this and other divisions of these specifications and by the Owner.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Siemens

B. General Electric

C. Square D

D. Cutler Hammer

2.02 DISCONNECT SWITCHES

A. Switches shall be NEMA type HD (heavy duty), quick make, quick break, dual rated with electrical characteristics as required by the system voltage and the load served. Switches shall be single throw and have blades to open all ungrounded conductors.

B. Enclosure shall have interlocking cover to prevent opening door when switch is closed. Interlock shall include a defeating scheme for authorized service work.

C. Operator handle shall be lockable in the "off" position.

D. Disconnect enclosures shall be suitable for mounting locations. Provide NEMA 1 for dry locations, NEMA 3R for damp or exterior locations. Provide other NEMA ratings to suit area requirements.

E. All disconnect switches shall be the product of one manufacturer to facilitate future maintenance.

2.03 FUSIBLE DISCONNECTS

A. Fusible disconnect switches provided shall be per 2.2 above with the addition of fuse space and clips to accept only Class R fuses.

2.04 TOGGLE SWITCHES

A. Motor rated toggle type disconnect switches are acceptable for fractional horsepower equipment. Switches shall be suitable for the intended load and provided with handle guard/lock-off feature (similar to Square D Class 2510FG2P).

2.05 NAMEPLATES

A. Provide nameplates on all disconnects and fused switches. Nameplates shall be engraved laminated phenolic mounted with screws. Adhesive only will not be acceptable. Each nameplate shall include this information: Load served, voltage, phase, panel, circuit number, fuse size and type.

PART 3 EXECUTION

3.01 DISCONNECT LOCATIONS

A. Install disconnects and enclosed circuit breakers in the same relative location as the equipment being served unless that location is difficult to access or is in an unsuitable environment. Discrete disconnect switches of similar size may be grouped in a central location.

3.02 SUPPORT

A. Secure disconnect switches and enclosed circuit breakers to building structure, equipment unit or approved mounting frame. Support by conduit system only is not acceptable.

3.03 SPLICES

A. Wiring space within disconnect switches and enclosed circuit breakers shall not be used for splicing; provide suitable wire gutters or junction boxes for this purpose.

END OF SECTION

SECTION 26 43 13
TRANSIENT VOLTAGE SURGE SUPPRESSION SYSTEM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

1.02 SUMMARY

A. This Section describes the materials and installation requirements for Surge Protective Devices (SPD). SPD's are used for the protection of all AC electrical circuits from the effects of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and/or capacitive load switching.

B. This specification also describes the mechanical and the electrical requirements for the SPD. The SPD shall be suitable for application in both category B and C environments as described in ANSI/IEEE C62.41- 2002.

C. The Manufacturer/Vendor shall furnish all of the necessary SPD products and related hardware (i.e. flush mounting kits, mounting brackets, etc.) as required for the installation of

1.03 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

B. VPR: Voltage Protection Rating.

C. SPD: Surge Protective Device, replacement acronym for TVSS: Transient Voltage Surge Suppressor

D. CLF: Component Level Fusing

E. LIC: Low Impedance Cable

F. SCCR: Short Circuit Current Rating

1.04 REFERENCE STANDARDS

A. All manufacturers must comply with the standards listed below and any additions current revisions of industry standards. All products that do not comply with current industry standards will not be accepted.
   1. Underwriters Laboratories 1449 – (UL 1449) 3rd Edition
   2. NEC article 285. National Electrical Code 2008
   3. NFPA 780 Standard for the installation of lightning protection systems
   4. UL96A – Lightning Protection System Master Label
   5. IEEE (Institute of Electrical and Electronic Engineering Inc.) Latest Revision C62.41.1, C62.41.2, C62.45, C62.33 & C62.35
   6. Previous NEMA LS-1 testing standards
   7. ISO 9001 (International Organization for Standardization) Quality Systems – Quality Management System

1.05 SUBMITTALS

A. Submittals shall include written specification response referencing each specification section and sub-section indicating compliance or non-compliance. If manufacturer cannot fully comply with specification section, this must be stated in the response along with a full description of the variance. Submittal responses shall be signed by manufacturer's VP of Engineering or Product Line Manager.

B. Submit the following information, indexed by response and test results.
   1. Specification compliance response sheet referencing each specification section.
   2. Proof of UL1449 Third Edition compliance from Nationally Recognized Test Lab (NRTL)

accepted by local authority having jurisdiction. UL1449 Third Edition Nominal Discharge Current Rating and Voltage Protection Ratings shall be provided.

3. Published specifications, cut sheets & product data with appropriate IEEE C62.41 & UL1449 Third Edition performance ratings for intended installation locations.
4. Electrical and mechanical shop drawings.
5. Installation requirements/instructions.
6. Operations & maintenance manuals.
7. Performance / warranty information.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Manuals

B. Warranty Documentation

1.07 DELIVERY, STORAGE AND HANDLING

A. Inspect for damage and replace any damaged device.

B. Store in a clean, dry space suitable for equipment and protect against damage.

C. Clean equipment and touch up minor scratches using suitable materials.

1.08 QUALIFICATIONS

A. Manufacturer shall have local representation and distribution within 400 miles of the project location to provide technical, warranty claim, and installation support for the project.

B. Manufacturer/vendor must be capable of supplying SPD for project within 30 days of receipt of order for orders of 25 units and less for models submitted in response to this specification.

C. Manufacturers shall be certified to latest ISO 9001 standard and shall be registered for the design and manufacturing of SPD devices.

D. Manufacturer shall provide access to a readily available factory engineer for answering questions about this product.

E. Manufacturer qualifications shall be provided as part of the submittal.

F. The successful manufacturer/vendor shall assign a technical contact person for SPD application, installation and warranty questions. This contact shall be available to provide a response to a technical question within a maximum of two business days.

G. All SPDs for this project must be supplied by the same manufacture.

PART 2 PROCUCTS

2.01 ACCEPTABLE "PRE-APPROVED" MANUFACTURES/MODELS

A. Total Protection Solutions – Contact Power Solutions NW (206) 930-1980

Total Protection Solutions (TPS) ServiceTrack & LowProfile Series					
Voltage / Application	480Y277v 3 Phase Wye	480v 3 Phase Delta	208Y120v 3 Phase Wye	208v 3 Phase Delta	120/240v Single / Split Phase
Main Services	ST240-3Y480-FL	ST240-480NN-FL	ST240-3Y208-FL	ST240-240NN-FL	ST240-1S240-FL
Distribution, MCC & Branch Panels	LP120-3Y480-FL	ST120-480NN-FL	LP120-3Y208-FL	ST120-240NN-FL	LP120-1S240-FL

Use Delta units for all unbonded/ungrounded & high resistance ground Wye applications.

B. Low Impedance Cable: Required for all installations with lead lengths over 36”
   1. Total Protection Solutions (TPS)
      a. Main Services – LIC-6X-xx
      b. All other applications – LIC-10X-xx
      c. (Where xx denotes length in feet; 5’, 10’, 15’)

C. Approved Alternate Manufacturer’s:
   1. Siemens Industry, LLC – UL Listed with Electrical Switchboards and Panelboards.

2.02 SURGE CURRENT RATINGS

A. Minimum Single Impulse Ratings with Independent testing per previous NEMA LS1.

Main Services	240kA per Phase, 120kA per Mode
Distribution, MCC & Branch Panels	120kA per Phase, 60kA per Mode

2.03 TYPE

A. External, non-modular SPD/TVSS required for all applications (not integrated with gear/panels) connected in parallel to switchgear via dedicated circuit breaker.

2.04 LISTINGS: UL1449 3RD EDITION, UL96A & NFPA 780 (OR CURRENT REVISION)

A. Type 1 & 2: Suitable for applications including direct buss connection with no additional overcurrent protection requirements.

B. Nominal Discharge Current (In): 20kA for Main Service and 10kA for all other applications (for compliance to NFPA 780, NEC 280 and UL96A Lightning Protection Master Label).

C. SCCR: 200KA Short Circuit Current Rating with no additional/external overcurrent protection.

2.05 MODES OF PROTECTION - ALL MODES FOR ALL CONFIGURATIONS AND

A. WYE: Discrete MOV Line to Neutral, Line to Ground, Neutral to Ground

B. Delta: Discrete MOV Line to Line & Line to Ground

C. Sinewave tracking transient filter protection for all modes on Wye & L-L for Delta.

2.06 LOW IMPEDANCE CABLE (LIC):

A. An LIC must be available from the SPD manufacture that reduces effective lead impedance by 75% and be used for all SPD installations with lead lengths exceeding 36”.

2.07 DURABILITY TESTING

A. TVSS/SPD devices shall withstand a minimum of 5,000 hits delivered at a rate of one pulse per minute. Unit shall not fail or suffer let through voltage degradation of more than 7%. Lead length for testing and let through measurements shall be 6”.

2.08 COMPONENT LEVEL FUSING

A. Balanced array MOV based SPD/TVSS with individual Component Level Fusing (Oxygen Free High Conductivity [OFHC] elements in silica sand) are required for all components.

2.09 SPD MUST NOT HAVE, USE OR REQUIRE ANY OF THE FOLLOWING

A. Board trace fuses, crowbar type gas tube arrestors or SAD devices are not allowed.

B. Integrated primary overcurrent protection Fuses or Circuit Breakers are not allowed.

C. SPDs with external over-current protection requirements (UL Type-2 listing only) are not allowed.

2.10 SAFETY

A. SPD must not fail catastrophically when a continuous over-voltage is applied to 6 modes simultaneously (Line-Neutral & Line-Ground * 3 Phases). UL1449 only requires one mode be tested at a time.

2.11 MONITORING

A. Green “Phase Status” LEDs, Red “Service Required” LED, Dry Contacts & Audible Alarm w/silence button are required. SPD must not rely solely on primary overcurrent protection (no CLF), as this will likely open up on SPD failure, thus disabling the alarm (no power, no alarm).

2.12 SERVICE CONDITIONS

A. SPDs shall be rated for continuous operation under the following conditions, unless otherwise indicated:
   1. Maximum Continuous Operating Voltage (MCOV) above nominal – Minimum 115%.
   2. Enclosures: Heavy duty, powder coated steel with appropriate NEMA rating for application.
   3. Operating Temperature: 30 to 120 deg F (0 to 50 deg C).
   4. Humidity: 0 to 85 percent, non-condensing.
   5. Altitude: Up to 13,000 feet (4,000 m) above sea level.
   6. Noise Level: SPD shall not emit any audible noise unless “in alarm” indicating a “service required” condition.

2.13 WARRANTY

A. Warranty:
   1. SPD Manufacturer’s Warranty: shall provide a product warranty for a period of not less than thirty (30) years from date of installation. Warranty shall cover unlimited, complete replacement of TVSS devices during the warranty period with no exceptions for lightning, utility accidents etc.
   2. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents. Those firms responding to this specification shall provide proof that they have been regularly engaged in the design, manufacturing and testing of TVSS for not less than five (5) years.

PART 3 EXECUTION

3.01 PRE-INSTALLATION

A. Training: Onsite installation training for the contractor must be provided by the SPD supplier.

B. Review all installation information in manufacturer’s installation manual prior to installing SPD’s

3.02 INSTALLATION

A. GENERAL
   1. Verify all voltages before connecting to avoid injury and damage to equipment.
   2. The SPD’s shall be installed external to switchboard, distribution and panelboard.
   3. Internally mounted SPD’s will not be accepted.
   4. Ground resistance shall be 25 ohms or less per NEC Article 250.56
   5. Suppressors shall be installed per the manufacturer's installation instructions and the requirements of: the NEC, the local authority having jurisdiction and the project engineer.
   6. Project Engineer or their appointed representative may perform inspection of the installed suppressors and reserves the right to require corrections to the installation to comply with

manufacturer's installation requirements and project specifications.

7. The SPD/TVSS supplier must provide on-site installation training for the electrical contractor.
8. All circuit breakers feeding SPDs much have locking safety clips installed to prevent the circuit breaker from inadvertently being turned off.

B. SERVICE ENTRANCE
   1. Suppressor shall be installed on the load side of the service entrance disconnecting means unless noted otherwise by the project engineer.
   2. Provide a 100 Amp circuit breaker (with a safety clip to ensure the circuit breaker cannot be inadvertently turned off) in the switchboard as over-current protection for the wire and as a disconnecting means for the SPD.
      a. Only UL1449 Type-1 devices are allowed, so by definition of Type-1, the manufacture cannot have any external overcurrent protection requirements. If the SPD manufacture does have external overcurrent protection requirements, that SPD equipment will not be accepted.
   3. Use minimum #4 AWG wire for connecting the SPD.
   4. Conductors between suppressor and point of attachment shall be kept as short and straight as possible. Lead length of connecting conductor shall not exceed two (2) feet without written permission of the specifying Engineer.
   5. Whenever possible, SPD leads must be twisted together and securely tie-wrapped together every 6" to reduce impedance of the leads.
   6. Over-length SPD leads (greater than 36") must use Low Impedance Cable (see "Pre-Approved" section 2.1-A for ordering information)
   7. SPD leads must not be spliced.
   8. Suppressor's ground shall be bonded to enclosure frame and the service entrance ground bus, and conduit between the TVSS/SPD and the switchboard must provide secure electrical/mechanical connections.

C. SECONDARY SPDs FOR BRANCH PANELS
   1. Install one secondary suppressor at each Branch Panel & Sub-Panel location as indicated on the drawings.
   2. Provide a 30 Amp circuit breaker (with a safety clip to ensure the circuit breaker cannot be inadvertently turned off) in the panel being protected as over-current protection for the wire and as a disconnecting means for the SPD.
      a. Only UL1449 Type-1 devices are allowed, so by definition of Type-1, the manufacture cannot have any external overcurrent protection requirements. If the SPD manufacture does have external overcurrent protection requirements, that SPD equipment will not be accepted.
   3. Conductors between suppressor and point of attachment to the panelboard shall be kept as short and straight as possible. Mount the TVSS directly adjacent to the circuit breaker closest to the neutral bus, such that the maximum length of all connecting wiring is kept as short as possible, not exceed 18 inches.
   4. Over-length SPD leads (greater than 18") must be twisted together (2 twists/foot) and securely tie-wrapped once per foot to reduce impedance of the leads. Quality compression butt-splice connections are required when extending SPD leads (wire nuts are not acceptable).
   5. Grounding: Suppressor's ground lead shall be bonded to the panel enclosure with a small ground lug as close as possible to the TVSS mounting point. Conduit between the TVSS/SPD and the switchboard must provide secure electrical/mechanical connections.
      a. Isolated Ground (IG) Applications: The ground lead is bonded to the SPDs metal enclosure, so a non-metallic conduit must be used to isolate the SPD from the panel enclosure. The ground lead must then be connected to the IG buss.
   6. Multiple "Feed-Through" Panels with shared SPD/TVSS units must be immediately

adjacent to each other (side by side) with short tie cables not to exceed 36". Sub-panels must be feed from a primary panel with a "lug-out', lug-in" tie connection, and the tie connection lugs must be at the same end of the primary and sub-fed panel. i.e. bottom to bottom or top to top to ensure short tie "sub-feed" cables.

3.03 FIELD QUALITY CONTROL

A. A factory authorized representative shall inspect and photograph all SPD installations and report findings in writing to the project engineer.

3.04 STARTUP SERVICE

A. Do not energize or connect service entrance equipment or panelboards to their sources until SPD's are installed and connected.

B. Do not perform insulation resistance "Hipot" tests of the distribution wiring with the SPDs installed/connected. Disconnect before conducting insulation resistance tests and reconnect immediately after the testing is over.

END OF SECTION

SECTION 26 50 00
LIGHTING

PART 1 GENERAL

1.01 SUMMARY

A. The provisions and intent of the Contract, the General and Supplementary Conditions, Division 1 Specification Sections, and published addenda apply to the work as if specified in this Section.

B. This Section includes interior lighting fixtures, lighting fixtures mounted on exterior building surfaces, LED module, drivers, emergency lighting units, and accessories.

C. Provide the lighting system complete and operational. All light fixtures shall be provided complete with LED module, mounting hardware and accessories required for operation.

D. Provide lighting fixtures of types, sizes and finish as listed on the drawings. Light Fixtures shall be complete assemblies constructed to ensure full life of components and minimize amplification and transmission of component generated noise.

E. Contractor shall include in the bid all costs and documentation for lighting control commissioning. Contractor shall provide the owner a complete report of test procedures and results indicating all lighting controls have been tested, adjusted and operate in accordance with approved plans and specifications per the authority having jurisdiction.

F. Light fixture schedule series numbers are a design series reference and do not necessarily represent the exact catalog number, size, voltage, wattage, type of LED, driver, finish trim, ceiling type, mounting hardware, ceiling trim or special requirements as specified hereinafter or as required by the particular installation(s). Provide complete light fixtures and drivers to correspond with the number of LED's, wattage, switching and/or size specified. Refer to light fixture schedule, Architectural drawings, and schedules for additional requirements.

G. Light fixture voltage shall match voltage of circuit serving the light fixture. Contractor as part of the bidding and submittal process shall verify each light fixture and notify engineer in writing of any conflicts.

1.02 REFERENCES

A. Shall be as follows:
National Electrical Manufacturer's Association (NEMA):
LE 5-1993 Procedure for determining luminaire efficiency ratings.

1.03 QUALITY ASSURANCE

A. Listing and Labeling: Provide light fixtures, emergency lighting units, and accessories Listed and Labeled as defined in NFPA 70, Article 100 and marked for intended use for the location and environment in which installed.

B. Comply with NFPA 70, as adopted and administered by the Authority Having Jurisdiction.

C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.04 SUBMITTALS

A. Submittals shall be neatly and clearly marked to indicate the light fixture(s), LED module and drivers fully comply with contract documents. When substitute light fixtures are submitted (if permitted) the data shall clearly cross reference (written and highlighted) the substitute light fixture complies with every detail of the specified light fixture. Light fixtures not fully complying with contract documents are not permitted.

B. Submittals shall have light fixture types and project name clearly indicated and shall be prepared by the authorized manufacturer's representative serving the project area. A list of manufacturer representatives (including address, telephone and fax numbers) identifying which light fixture types they represent shall be included with submittals. Submittals or requests for

prior approval not meeting these requirements will be rejected.

C. Product Data: For each type of lighting fixture indicated on the drawing E0, lighting fixture schedule, arranged in order of light fixture designation. Include data on features, accessories, and the following:
   1. Dimensions of light fixtures.
   2. Certified results of independent laboratory tests for light fixtures and LED module for electrical ratings and photometric data.
   3. Emergency lighting unit battery and charger.
   4. Types of LED's, color temperatures and (LPW) lumens per watt.

D. Wiring Diagrams: Detail wiring for light fixtures that clearly differentiates between manufacturer-installed and field-installed wiring.

E. Product Certificates: Signed by manufacturer(s) or their designated representatives stating lighting fixtures certifying that products comply with drawing and specification requirements.

F. Dimming Driver Compatibility Certificates: Signed by manufacturer of driver certifying drivers are compatible with dimming systems and equipment with which dimming drivers are to be used.

1.05 WARRANTY

A. General Warranty: Warranty specified in this section shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with other warranties under requirements of the Contract Documents.

B. Special Warranty Period for Batteries: Manufacturer's standard, but not less than 10 years from date of Substantial Completion. Full warranty shall apply for first year and prorated warranty for last nine years.

C. Special Warranties for LED Drivers: Written warranty, executed by manufacturer agreeing to replace LED drivers, including labor for driver failure in materials or workmanship within specified warranty period. Five years from date of manufacture, but not less than four years from date of Substantial Completion.

E. Light Fixtures Utilizing LED Lamp Technology: Provide manufacturer's warranty for a period of not less than 5 years including parts and labor for full replacement of defective product.

PART 2 PRODUCTS

2.01 LIGHTING FIXTURES AND LIGHTING FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit re-lamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during re-lamping and when secured in operating position.

D. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:
   1. White Surfaces: 85 percent.
   2. Specular Surfaces: 83 percent.
   3. Diffusing Specular Surfaces: 75 percent.
   4. Laminated Silver Metallized Film: 90 percent.

E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or annealed crystal glass, unless otherwise indicated.
   1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.

2. Lens Thickness: 0.125 inch (3 mm) minimum, unless greater thickness is indicated.

2.02 LED MODULES AND LED DRIVERS

A. General:
1. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.
2. LED light fixtures shall be Reduction of Hazardous Substances (RoHS)-compliant.
3. LED drivers shall include the following features unless otherwise indicated:
   a. Minimum efficiency: 85% at full load.
   b. Minimum Operating Ambient Temperature: -20˚ C. (-4˚ F.)
   c. Input Voltage: 120 - 277V (±10%) at 60 Hz.
   d. Integral short circuit, open circuit, and overload protection.
   e. Power Factor: ≥ 0.95.
   f. Total Harmonic Distortion: ≤ 20%.
   g. Comply with FCC 47 CFR Part 15.
4. LED modules shall include the following features unless otherwise indicated:
   a. Comply with IES LM-79 and LM-80 requirements.
   b. Minimum CRI 80 and color temperature 3500˚ K unless otherwise specified in LIGHTING FIXTURE SCHEDULE.
   c. Minimum Rated Life: 50,000 hours per IES L70.
   d. Light output lumens as indicated in specified fixture literature.

B. LED Fixtures:
1. Housing, LED driver, and LED module shall be products of the same manufacturer.
2. LED drivers, modules, and reflector shall be accessible, serviceable, and replaceable from below the ceiling.

2.03 EXIT SIGNS

A. General Requirements: Comply with UL 924 and the following:
1. Sign Colors and Lettering Size: Comply with Authorities Having Jurisdiction.

B. Internally Lighted Signs: As follows:
1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.

C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically energizes lamp from unit when circuit voltage drops to 80 percent of nominal or below. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.
4. Self-diagnostic type with test switches and indicator lights.

2.04 EMERGENCY LIGHTING UNITS

A. General Requirements: Self-contained units. Comply with UL 924. Units include the following features:
1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life and special warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. LED module automatically disconnects from battery when voltage approaches deep-discharge level.
   When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.
4. Integral Time-Delay Relay: Arranged to hold unit on for fixed interval after restoring power

after an outage. Provides adequate time delay to permit high-intensity-discharge lamps to restrike and develop adequate output.

5. Self-diagnostic type with test switches and indicator lights.

2.05 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Contractor shall provide “Seismic Controls for Electrical Work” such as channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as light fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy arranged to mount a single light fixture. Finish same as light fixture.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to light fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

F. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by light fixture manufacturer.

2.06 FINISHES

A. Fixtures: Manufacturer’s standard, unless therwise indicated.
   1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
   2. Metallic Finish: Corrosion resistant.

PART 3 EXECUTION

3.01 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer’s written instructions and approved submittal materials. Install lamps in each light fixture.

B. Verify mounting provisions prior to the ordering of fixtures. Fixtures shall be UL listed for the location, and application in which they are installed.

C. Install lighting fixture diffusers only after construction work, painting and clean up are completed. Prior to final acceptance, remove all, reflectors and diffusers, wash, rinse and reinstall.

3.02 SUPPORT OF LED FIXTURES

A. Recessed Downlight Type: Mount in frames suitable for the ceiling, with the recessed portion of the light fixture securely supported from the ceiling framing. For light fixtures supported by a ceiling suspension system, provide as a minimum or as required by AHJ, two safety chains secured to structural members above suspended ceiling.

B. Surface and Pendant Mounted Type:
   1. Where mounted on accessible ceilings, hang from structural members by means of hanger rods through ceiling or as approved.
   2. Continuous Runs of Light Fixtures: Straight when sighting from end to end, regardless of irregularities in the ceiling. Where light fixtures are so installed, omit ornamental ends between sections. For surface pendant mounted fixtures of three or more provide a unistrut channel for mounting fixtures. Provide 3/8-inch thread rod secured to structural members for support of unistrut channel.
   3. Provide surface mounted fluorescent light fixtures with UL approval for direct mounting on the various ceilings used. Spacers will not be approved where mounted on lay-in ceilings, support light fixtures by at least two positive devices which surround the ceiling runner, and which are supported from the structure above by a No. 12 gauge wire. Spring clips or clamps that connect only to the runner are not acceptable.

3.03 CONNECTIONS

A. Ground equipment
   1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.04 FIELD QUALITY CONTROL

A. Inspect each installed light fixture for damage. Replace damaged light fixtures and components.

B. Advance Notice: Give dates and times for field tests.

C. Provide instruments to make and record test results.

D. Test as follows:
   1. Verify proper operation, switching and phasing of each light fixture after installation.
   2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation. Verify normal transfer to battery source and retransfer to normal.
   3. Report results in writing.

E. Malfunctioning Light Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

3.05 CLEANING AND ADJUSTING

A. Clean light fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

3.06 CEILING TYPES

A. The Contractor prior to submitting shop drawings to the Engineer for review shall review the Architectural drawings to verify and coordinate the ceiling systems and lighting fixture frame requirements as well as proper ballast voltage. Contractor shall provide a written statement with the shop drawing submittal stating this has been completed.

END OF SECTION

SECTION 31 10 00
SITE CLEARING AND SITE DEMOLITION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Protecting existing trees and vegetation to remain.
2. Removing existing trees and vegetation within clearing limits.
3. Clearing and grubbing within project limits.
4. Removing surface features including, but not limited to concrete, asphalt, concrete retaining walls, fences, etc.
5. Disconnecting, demolition, and capping existing utilities.
6. Protect existing utilities to remain.

B. Related Sections:

1. Division 01 Sections 01 40 00 “Quality Requirements,” 01 73 29 “Cutting and Patching,” and 01 50 00 “Temporary Facilities & Controls” for temporary utility services, construction and support facilities, and security and protection facilities.
2. Division 31 Section 31 25 13 “Erosion Control” for temporary erosion control measures and requirements of the National Pollutant Discharge Elimination System (NPDES) under the Washington State Department of Ecology’s (DOE) General Permit for Stormwater Discharges from Construction Activities.
3. Division 31 Section 31 20 00 “Earth Moving” for soil materials, excavation, backfilling, and site grading.

1.03 REFERENCE STANDARDS

A. WSDOT Specification: Standard Specifications for Road, Bridge and Municipal Construction, prepared jointly by the Washington State Department of Transportation, and the American Public Works Association, Washington State Chapter, 2025 edition. All references to measurement and payment shall be deleted from consideration; and the terms agreed to in the contract substituted therefor.

B. WSDOT Standard Plan: Standard Plans for Road and Bridge Construction prepared by the Washington State Department of Transportation, current issue in effect at the bid date.

1.04 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Utilities: Underground pipes, vaults, conduits, ducts, and cables, as well as underground services within buildings.

D. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and as indicated on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other manmade stationary features constructed above or below ground surface.

1.05 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.06 SUBMITTALS

A. See Division 01 – General Requirements.

B. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

C. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions. Dimension locations and depths of underground items using triangulation to two or more permanent improvements.

1.07 QUALITY ASSURANCE

A. Maintain at least one copy of the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction, 2025 edition, and project plans and specifications onsite.

B. Field inspection and testing will be performed under provisions of Division 01 Section 01 40 00 "Quality Requirements."

C. Field inspection of Erosion Sediment Control measures will be performed by the Contractor as required by City of Kirkland. A fee will be assessed for additional review or inspection of a modified design for re-inspections when the applicant is not prepared for the required inspection.

D. Field conditions may warrant revisions: Field conditions during construction may warrant required revisions or modifications to the site plan, utility plan, or street improvement plan.

E. Tests and analysis of aggregate material will be performed in accordance with ANSI/ASTM D1557, ASTM D2922, ASTM D3017, ASTM D4318, and ASTM C136, as applicable.

F. If tests indicate materials do not meet specified requirements, change material and retest or obtain written approval of the Engineer. Costs associated with the retesting of materials will be the responsibility of the Contractor.

G. The owner/contractor is responsible for the implementation of any "redline" plan revised comments found in the plans submitted to and reviewed by the Public Works Department.

1.08 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises.

C. Utility Locator Service: Contractor shall utilize a utility locate service and shall notify affected utility companies before starting work. Contractor shall comply with all of said utility companies' requirements.

D. The locations of existing underground utilities are approximate only and have not been independently verified by the Owner. The Contractor shall determine the exact locations of all existing utilities before commencing work. All damages that happen due to the Contractor's failure to locate exactly and preserve all underground utilities that are designated to remain shall be repaired at Contractor's own expense.

E. Onsite soils are susceptible to erosion and therefore cause colloidal suspension in stormwater. See Division 31 Section 31 25 13 "Erosion Control" for additional information.

1.09 REGULATORY REQUIREMENTS

A. Conform to applicable agency code for dust control, runoff control, and disposal of the demolished material.

B. Obtain, post, and pay for required permits from authorities according to provisions of the Contract, including General and Supplemental Conditions and Division 01 Specification Sections.

C. Notify affected utility companies before starting work and comply with their requirements.

D. Do not close or obstruct roadways, sidewalks, or hydrants without appropriate permits or written authorization. Maintain emergency access as required by the local jurisdiction.

E. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials, or when uncovering buried tanks.

F. Pay all related disposal fees and charges and conform to all regulations for materials disposed offsite, including asbestos-lined cement water main, asbestos-containing building materials, storage tanks, tires, appliances, and any environmentally hazardous substances.

G. Conform to all requirements of NPDES under the DOE General Permit for Stormwater Discharges from Construction Activities. See Division 31 Section 31 25 13 "Erosion Control" for additional information.

H. Conform to OSHA (Occupational Safety and Health Administration) requirements.

I. Conform to WISHA (Washington Industrial Safety and Health Act) requirements.

J. Per Kirkland Zoning Code 115.25, Limit Construction activity to Monday through Friday, from 7:00 a.m. to 8:00 p.m. and Saturday 9:00 am to 6:00pm. No development work shall occur on Sundays or Holidays unless note otherwise.

1.10 COORDINATION

A. Coordinate work under provisions of Division 01 Section 01 40 00 "Quality Requirements."

1.11 INTENT

A. It is the intent of this Specification that the Contractor provide the Work defined herein complete in every respect, and in accordance with good practices involved in the clearing and demolition of site improvements above and below surface grade, and the requirements of this Specification, regardless of whether or not full details of such completeness, workmanship, or practices are contained herein.

B. It is the intent of the Work under this contract to conduct all clearing and demolition necessary to complete all of the Work of this project.

PART 2 PRODUCTS

N/A

PART 3 EXECUTION

3.01 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that clearing limits are identified and consistent with proposed improvements.

C. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated.

D. Schedule and conduct pre-work conference with Owner, Engineer, Architect, City of Kirkland, and Utility Company representatives.

E. Protect existing site improvements to remain from damage during construction.

F. Restore damaged improvements to their original condition, as acceptable to Owner.

G. Provide, erect, relocate, and maintain temporary barriers and security devices as required by Division 01 Section 01 50 00 “Temporary Facilities & Controls.” Facilities shall conform to Manual of Uniform Traffic Control Devices (MUTCD) and WSDOT.

H. Restrict site access to the designated construction entrance and as authorized by Owner.

I. Conform to construction sequence as indicated on the plans.

J. Provide neat sawcut at meet line with adjacent concrete or asphalt pavement to remain.

K. Pothole and locate utilities at all locations where a proposed utility will cross or connect to an existing utility. Existing utility type, size, and elevations shall be determined. Verify clearances and tie-in elevations prior to commencing work. Notify Civil Engineer immediately where conflicts occur. Backfill potholes with aggregate for gravel base. Provide all pothole information to the Engineer for review.

3.02 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures according to requirements in Division 31 Section 31 25 13 “Erosion Control.”

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion and sedimentation control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.03 EXISTING UTILITIES

A. Contractor shall arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
2. Coordinate and pay for any utility provider fees associated with disconnecting services.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place. Demolished materials shall be removed and disposed of offsite by the Contractor at an approved disposal area.

C. The utility removal trenches, and any depressions below planned final grades caused by demolition activities shall be backfilled with structural fill as required under Division 31 Section 31 20 00 “Earth Moving.”

D. Locate, identify, and disconnect utilities indicated to be abandoned in place.

E. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than 2 days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect’s written permission.

F. Contractor shall provide coordination with all serving utility agencies and well decommissioning contractor.

G. Contractor shall not damage existing utilities to remain and shall include in the Base Bid all costs to clean and repair any disturbed utility to remain.

H. If workers enter any trench or other excavation 4 feet or more in depth that does not meet the open pit requirements of WSDOT Specification 2-09.3(3)b, it shall be shored and cribbed. All trench safety systems shall meet the requirements of the Washington Industrial Safety and Health Act, Chapter 49.17 RCW.

I. Excavate for and remove underground utilities indicated to be removed.

3.04 CLEARING AND GRUBBING

A. Remove obstructions, shrubs, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions, and grubbing roots.

1. Do not remove shrubs and other vegetation indicated to remain or to be relocated.
2. Completely remove stumps, roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Use only hand methods for grubbing within drip line of remaining trees.

B. Fill depressions caused by clearing and grubbing operations with appropriate fill material unless further excavation or earthwork is indicated.

C. Remove debris, rock, and extracted plant life from site and haul to an approved offsite disposal location. Do not burn or bury materials onsite.

3.05 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil, and dispose of sod, grass, and roots offsite at an approved location.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying non-organic subsoil.

1. Strip surface soil of unsuitable topsoil including trash, debris, weeds, roots, and other waste materials and remove from project site.
2. Stockpile topsoil and reuse where indicated on the drawings and approved for reuse by the Architect.
3. Dispose excess topsoil offsite at approved location.

3.06 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Concrete walks shall be removed to nearest construction joint as approved by engineer.
3. Replace materials designated to remain that are damaged due to Contractor’s operations at no additional cost to owner.

C. Contractor shall review topographical survey construction documents, geotechnical reports, and environmental reports, and shall visit the site in order to make own determination of the site improvements to be demolished and removed, and shall include all associated costs for removal of above- and below-grade improvements in the bid.

D. Excavations created from demolition or removal of existing below-grade structures (concrete foundations, manholes, water main, catch basins, etc.) that are below planned final grades shall be backfilled with structural fill and compacted, as required under Section 31 20 00 “Earth Moving.”

3.07 DEMOLITION REQUIREMENTS

A. Conduct demolition to minimize interference with adjacent improvements.

B. Conduct operations with minimum interference to public or private accesses. Maintain protected egress and access at all times.

C. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon, or limit access to their property.

D. Sprinkle work with water to minimize dust. Provide hoses, hydrant meters, backflow prevention, and water connections for this purpose per requirements of the jurisdiction.

E. Remove and dispose of existing asphalt pavement as indicated. Asphalt materials shall be removed from the site and shall be disposed of at an agency-approved location for acceptance of asphalt materials.

F. Remove demolished plant materials and miscellaneous demolition debris from site and haul to an approved disposal location.

G. Burial or burning of material to be removed is not permitted onsite. Maintain site in clean condition.

H. Blasting is not allowed.

I. Pay all related disposal fees and charges for materials disposed of offsite, including asbestos-containing materials if applicable, appliances, and misc. debris.

J. Remove pavement markings by grinding or wire brush.

3.08 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner’s property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION

SECTION 31 20 00
EARTH MOVING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade, foundations, walks, pavements, turf and grasses, and plants.
2. Excavating and backfilling for structures.
3. Subbase course and base course for asphalt pavements and concrete walks.
4. Excavating and backfilling trenches for utilities and buried utility structures.
5. Wet weather earthwork.
6. Rough and final grading the site.

B. Related Sections:

1. Division 01 Sections 01 40 00 “Quality Requirements,” 01 73 29 “Cutting and Patching,” and 01 50 00 “Temporary Facilities & Controls” for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
2. Division 31 Section 31 10 00 “Site Clearing and Site Demolition” for site stripping, grubbing, stripping topsoil, and removal of above- and below-grade improvements and utilities.
3. Division 31 Section 31 25 13 “Erosion Control” for temporary erosion control.

1.03 REFERENCE STANDARDS

A. WSDOT Specification: Standard Specifications for Road, Bridge and Municipal Construction, prepared jointly by the Washington State Department of Transportation, and the American Public Works Association, Washington State Chapter, 2025 edition. All references to measurement and payment shall be deleted from consideration; and the terms agreed to in the contract substituted therefor.

B. WSDOT Standard Plan: Standard Plans for Road and Bridge Construction prepared by the Washington State Department of Transportation, current issue in effect at the bid date.

C. City of Kirkland Standards and details.

1.04 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow Soil: Satisfactory soil imported from offsite for use as fill or backfill. Onsite excavated material may be reused onsite if requirements of Article 2.01.D are met.

D. Boulder: A rock fragment with a dimension of 18 inches or greater in the largest dimension.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect.
   2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

F. Fill: Soil materials used to raise existing grades.

G. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D 1586.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

J. Utilities: Onsite underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

K. Wet Weather Earthwork: Earthwork performed between October 1 and April 30 requires structural fill as fill material. Wet weather earthwork shall be minimized and accomplished in small sections. Refer to Article 3.22 for further requirements.

1.05 SUBMITTALS

A. See Division 01 – General Requirements.

B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
   1. Classification according to ASTM D 2487 of each onsite or borrow soil material proposed for fill and backfill.
   2. Laboratory compaction curve according to ASTM D1557 for each onsite or borrow soil material proposed for fill and backfill.

C. Certification:
   1. Provide a letter, signed by the supplier and reviewed and also signed by an officer of the general contractor’s company, certifying that the following products to be incorporated into the work to meet the requirements specified.
   2. Products:
      a. Imported Structural Fill
      b. General Site Fill
      c. Gravel for Pipe Bedding
      d. Gravel Backfill for Trench Backfill
      e. Crushed Surfacing Top and Base Course
      f. Capillary Break for Slabs-on-Grade
      g. Vapor Barrier
   3. All certifications shall include a statement certifying that material is free of contamination.

D. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.06 QUALITY ASSURANCE

A. Field inspection and testing will be performed under Division 01 Section 01 40 00 “Quality Requirements.”

B. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

C. Pre-excavation Conference: Conduct conference at Project site.

1.07 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

C. Do not commence earth-moving operations until temporary erosion- and sedimentation-control measures, specified in Division 01 Section 01 50 00 “Temporary Facilities & Controls,” and Division 31 Section 31 25 13 “Erosion Control,” are in place.

D. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

E. Streets and sidewalks shall not be used for stockpiling building materials, debris, or equipment.

1.08 REGULATORY REQUIREMENTS

A. Secure site development and right-of-way use permits and conform to permit requirements.

B. Conform to agency codes for dust control, runoff control, and disposal of demolished and cleared materials.

C. Notify affected utility companies before starting work and comply with their requirements.

D. If any materials that appear to be hazardous are encountered during excavation, discontinue work and immediately notify both Owner and Architect.

E. Contractor shall pay all applicable fees for permits not already acquired by Owner.

F. Any public improvements damaged during construction shall be replaced prior to final inspection.

G. Per Kirkland Zoning Code 115.25, Limit Construction activity to Monday through Friday, from 7:00 a.m. to 8:00 p.m. and Saturday 9:00 am to 6:00pm. No development work shall occur on Sundays or Holidays unless note otherwise.

1.09 INTENT

A. It is the intent of this Specification that the Contractor provide the Work defined herein, complete in every respect, and in accordance with the good practices of the trades involved in the excavation, transport, placement, grading, backfilling and compaction of earthen materials and the requirements of this Specification, regardless of whether or not full details of such completeness, workmanship, or practices are contained herein.

B. It is the intent of this Specification that all Work comply with all applicable federal, state, and local codes, ordinances, and regulations. Nothing in the Specifications or Drawings is to be construed to allow Work not conforming to such codes. Contractor shall be responsible for complying with the regulations and code requirements.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

1. All imported materials shall be free of contaminants that exceed Method A and Method B cleanup standards specified in Chapter 173-340 of the Washington Administrative Code (WAC).

B. Satisfactory Soils: Soil Classification Groups GW, GP, SW, and SP according to ASTM D 2487 or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, GP, SC, SP, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. General Site Fill: Imported Fill meeting the requirements of WSDOT Specification 9-03.14(3), Common Borrow, or onsite material free of sod, organic, vegetative, and other deleterious materials containing less than 5 percent passing a US No. 200 sieve based on the fraction passing the US No. 4 sieve. Onsite material may be used for non-structural fill beneath landscaping, provided it can be properly worked and compacted. Boulders and cobbles larger than 6 inches in diameter should be removed from the site. Onsite material shall not be used for fill during the wet weather months (October 1 to April 30) or during periods of wet weather, regardless of the time of year.

E. Gravel Backfill: WSDOT Specification 9-03.9(3), Crushed Surfacing Top Course. Backfill for trenches on slopes steeper than 5:1 shall be Imported Structural Fill. Meet requirements of the City of Kirkland.

F. Gravel for Pipe Bedding: Conform to WSDOT Specification 9-03.9(3), Crushed Surfacing Top Course, for less than 6-feet depth from surface and pea gravel for greater than 6-feet depth. Meet requirements of the City of Kirkland.

G. Structural Fill: The onsite soils may be suitable for structural fill (except below structure foundations), provided certain requirements are met.

H. Imported Structural Fill:

1. Clean, well-graded mixture of sand and crushed gravel, containing less than 5 percent fines by dry weight passing the No. 200 sieve, based on wet sieving the fraction passing the No. 4 mesh sieve. Meet WSDOT Specification 9-03.14.

I. Crushed Surfacing Top and Base Course: WSDOT Specification 9-03.9(3).

J. Geotextile Fabric: Mirafi 160 N or approved equal.

K. Capillary Break: Provide capillary break material under concrete slabs.

L. Vapor Barrier: 10-mil minimum thickness plastic sheeting.

2.02 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.

4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 EXECUTION

3.01 PREPARATION

A. Protect utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

D. Verify survey control elevations and protect survey controls and benchmarks.

E. Provide temporary construction access throughout the site per the plans. The contractor shall relocate the temporary roads as construction schedules dictate.

3.02 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

C. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

D. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

E. Zones of seepage may be encountered. Contractor shall construct a dewatering system to drain perched groundwater.

F. Install a dewatering system to keep subgrades dry and convey ground and surface water away from excavations and subgrades.

G. Include dewatering systems in the base bid.

3.03 EXPLOSIVES

A. Explosives: The use of explosives is not permitted.

3.04 EXCAVATION, GENERAL

A. Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

B. Contractor shall make their own determination regarding the import of fill materials or the hauling offsite of excess materials as necessary to attain the indicated elevations. Import of fill material and the hauling offsite of excess material shall be included in the Base Bid. Removal of all displaced soil from utility trenches shall be included in the Base Bid.

C. Fill and backfill materials may be stockpiled in areas onsite that do not interfere with other portions of the work. Contractor shall protect stockpiled soils from wind or erosion by covering with plastic sheeting and securing, or other effective methods. Remove subsoil not being reused from site. Shortage of material caused by premature disposal of any material by the Contractor shall be replaced by the Contractor at their own expense.

D. Direct surface water away from excavation and stockpile site to prevent erosion or deterioration of materials.

E. Remove soil stockpiles; leave area in a clean and neat condition. Grade site surface to prevent standing surface water.

F. All fill placed beneath structures, foundations, and paving shall meet Structural Fill requirements.

G. Boulders of 18 inches or greater in the largest dimension must be removed from the site.

3.05 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch.

1. Excavation for Basins: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavate and remove entirely existing fill from within the zone of influence of the proposed structure and replace with Structural Fill. The upper 12 inches of exposed ground area to receive fill shall be recompacted to 90 percent of the modified proctor dry density.

C. Any fill materials deemed as unsuitable by the Geotechnical Engineer shall be removed.

3.06 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches unless otherwise indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

3.07 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross-sections, elevations, and subgrades.

B. Existing fill shall be exposed, proof rolled, and the upper 12 inches of exposed ground area compacted to 95 percent of the modified proctor maximum dry density. If yielding conditions are encountered, existing fill shall be removed and replaced with Imported Structural Fill. The depth of replacement shall be confirmed with the Geotechnical Engineer.

C. Any fill materials deemed as unsuitable by the Geotechnical Engineer shall be removed.

3.08 PROOF ROLLING

A. Proof rolling shall be observed by the Geotechnical Engineer.

B. Proof roll the building area, sidewalk, and pavement areas to identify soft or yielding subgrades. Before any fill material is placed, Contractor shall proof roll building, other structures, pavement, and walk areas to identify any soft or yielding subgrades. Those areas found to be unsuitable by the Contractor or Geotechnical Engineer shall be brought into compliance by one of the following methods:

1. Excavation, moisture conditioning, and placement of existing materials.

2. Excavation, disposal, and replacement materials as directed by the Geotechnical Engineer. Replacement materials will be compatible with the originally placed materials.

3.09 SHORING

A. Where sheet piling, shoring, sheeting, bracing, moveable trench boxes, or other supports are necessary, they shall be designed, furnished, placed, maintained, and removed by the Contractor.

B. All sheeting, shoring, and bracing shall be accomplished in accordance with all local and State regulatory requirements.

3.10 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with Imported Structural Fill material as directed. Onsite soils may be used as structural fill during dry weather when approved by the Geotechnical Engineer.

C. Proof roll subgrade below pavements with heavy, pneumatic-tired equipment, such as a fully loaded dump truck weighing not less than 15 tons, to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

1. Expose existing fills, proof roll, and compact, as required by the Geotechnical Engineer.
2. Proof roll shall be observed by Geotechnical Engineer.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Geotechnical Engineer, and replace with Imported Structural Fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.11 OVER-EXCAVATION

A. Subgrade areas shall be examined and approved by the Geotechnical Engineer.

B. Where the undisturbed condition of native soils or where the excavated subgrade is inadequate for support of the planned construction, the Contractor will be directed in writing by the Geotechnical Engineer to perform over-excavation to adequate supporting soils. The in-place volume to be excavated shall be determined and agreed upon by the Owner and Contractor prior to commencement of work. The excavated space shall be filled and compacted to the adjacent grade elevation with Structural Fill material. The excavated material shall be disposed of offsite at a permitted location.

C. Authorized over excavation and associated backfill shall be quantified at the time of work by the Owner and agreed upon by the Contractor. Payment shall be based on the agreed quantity as measured in place and determined by the Geotechnical Engineer, and according to contract provisions for changes in the work.

D. An adjustment of the Contract Sum and Contract Time shall not be considered or provided for over-excavation work at or below subgrades that become unsuitable because they are left exposed, saturated, damaged, or adversely affected by the Contractor’s work.

3.12 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Geotechnical Engineer.

1. Fill unauthorized excavations under other construction or utility pipes identified by the Geotechnical Engineer.

3.13 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
2. Stockpiled soil materials shall be protected from rain by covering with plastic sheeting in accordance with WSDOT Specification 8-01.3(5).

3.14 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, damproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing trash and debris.
5. Subgrade shall be inspected and approved by Geotechnical Engineer.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.15 UTILITY TRENCH BACKFILL

A. Place bedding course on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill voids with trench backfill soil while removing shoring and bracing.

D. Backfill and compact all excavated trench areas with suitable fill, as specified on the contract documents, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
2. Trench backfill greater than 2 feet below finish grade shall be compacted to at least 92 percent of maximum dry density based on ASTM D1557.
3. Trench backfill less than 2 feet below finish grade shall be compacted to at least 95 percent of maximum dry density based on ASTM D1557.

E. Cobbles and boulders shall not be used for trench backfill.

F. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section 03 30 00 “Cast-in-Place Concrete.”

G. Place and compact final backfill of specified material soil to final subgrade elevation.

H. Coordinate backfilling with utilities testing.

I. Install warning tape directly above utilities, 12 inches below finished grade. Utilities requiring warning tape shall include electrical, gas, side sewer, roof drains, water service, water main, fire main, telephone, and communications.

3.16 SOIL FILL

A. Fill areas to contours and elevations indicated with unfrozen materials conforming to the requirement for type of fill material specified.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

C. Contractor shall make their own determination regarding the import of fill materials or the hauling offsite of excess materials as necessary to attain the indicated elevations. Import of fill material and the hauling offsite of excess material shall be included in the Base Bid. Removal of all displaced soil from utility trench and footing excavations shall be included in the base bid.

D. General Site Fill:

1. For general site grading outside of pavement, and fill slopes, provide moisture-controlled General Site Fill material which is approved for re-use as determined by the Geotechnical Engineer. Contractor shall moisture-condition soils as necessary to meet compaction requirements.
2. When directed by the Geotechnical Engineer, soils contaminated with deleterious material or which are soft and yielding shall be over-excavated and replaced with Imported Structural Fill.
3. After stripping, the upper 12 inches of exposed ground in areas to receive fill should be recompacted to 90 percent.
4. Use hand-operated compaction equipment to densely compact fills around cobbles of less than 18 inches diameter.

E. Pavement and Surfacing Fill:

1. Provide moisture-controlled Structural Fill at all future paved and surfaced embankment areas. Extend the embankment at least 5 feet beyond asphalt-paved areas.
2. Onsite soils with fine-grained material (smaller than No. 200 sieve) greater than 5 percent are moisture sensitive and shall only be used as structural fill during dry weather and dry subgrade conditions, and approved by the Geotechnical Engineer.

F. Place fill material in continuous layers and compact to a firm and unyielding condition. Unless directed otherwise by the Geotechnical Engineer, compact all fills, in loose layers not exceeding eight (8) inches, with approved mechanical compacting devices and material to attain the minimum specified compaction.

G. Make grade changes gradual. Blend slopes into level areas.

H. Fill Slopes:

1. Provide moisture-controlled Structural Fill.
2. Onsite soils with fine-grained material (smaller than No. 200 sieve) greater than 5 percent are moisture sensitive and shall only be used as structural fill during dry weather and dry subgrade conditions.
3. Fills with sloping faces that cannot be compacted directly by a vibratory roller shall be compacted by over building, then cutting back to a compacted slope core. Track walking alone is not an effective means of compacting a fill slope.

I. Building Fills:

1. All fill within future building envelope shall be moisture-controlled Structural Fill as approved by Geotechnical Engineer.
2. Onsite soils with fine-grained material (smaller than No. 200 sieve) greater than 5 percent are moisture sensitive and shall only be used as structural fill during dry weather and dry subgrade conditions.
3. Provide a 2-foot section of Structural Fill beneath building footings, per the Geotechnical Data.

3.17 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.
3. Limit the areas that are stripped of topsoil and exposed during wet weather. The Contractor is responsible for over-excavating of material beneath subgrade that becomes unsuitable because it is left exposed, saturated, damaged, or adversely affected by the Contractor's work.

3.18 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent.
4. For utility trenches, compact each layer of initial and backfill soil material greater than 2 feet below finish grade to 95 percent with Crushed Surfacing Top Course per WSDOT Specification 9-03.9(3).
5. For fill slopes, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.

3.19 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from future buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerance:

1. Plus or minus 1/10 foot.

C. Any work that is determined not to conform shall be reworked by the Contractor to bring into conformance at the Contractor's expense.

D. Grading Inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straight edge.

E. Any work that is determined not to conform shall be reworked by the Contractor to bring into conformance at the Contractor's expense.

3.20 BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place base course under pavements and walks as follows:

1. Shape base course to required crown elevations and cross-slope grades.
2. Place base course 6 inches or less in compacted thickness in a single layer.

3. Place base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

C. Pavement Shoulders: Place shoulders along edges of base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of Structural Fill and compact simultaneously with each base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.21 CAPILLARY BREAK DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Place drainage course 6 inches or less in compacted thickness in a single layer.
2. Compact drainage course to required cross sections and thicknesses to a dense and unyielding condition.
3. Install vapor barrier on prepared capillary break according to manufacturer's written instructions, overlapping sides and ends.
4. Provide a 4-inch thick capillary break layer.

3.22 WET WEATHER EARTHWORK

A. Onsite soils are moisture sensitive. These soils will become unstable and unsuitable when wet.

B. Slope the ground surface within and surrounding the construction area to promote runoff away from work areas and to prevent ponding of water.

C. Work areas should be covered with plastic to protect from rainfall. Measures such as sloping, ditching, dewatering, and installation sumps shall be employed.

D. Earthwork should be accomplished in small sections to minimize exposure to wet conditions. Each section should be small enough so that the removal of unsuitable soil and placement and compaction of clean Structural Fill can be accomplished on the same day.

E. Fill material used between October 1 and April 30 and during wet weather shall be Imported Structural Fill.

F. Do not leave soil uncompacted and exposed to moisture. A smooth-drum vibratory roller, or equivalent, should roll the surface to seal out as much water as possible.

G. In-place soil or fill soil that becomes unsuitable for compaction shall be removed and replaced with Imported Structural Fill at no additional cost to the Owner.

H. Grading and earthwork shall not be performed during periods of continuous rainfall.

3.23 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections as follows:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests may be performed at the following locations and frequencies:

1. Future Paved Areas and Building Slab: At subgrade and at each compacted fill and backfill layer, at least one test for every 2,000 sq. ft. or less of paved area, but in no case fewer than three tests.
2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

E. Contractor shall provide as-built drawings of the completed work.

1. If grades do not conform to the plan, it is the Contractor's responsibility to bring site into conformance.

3.24 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.25 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 31 25 13
EROSION CONTROL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Conform to all requirements of the Construction Stormwater Pollution Prevention Plan (CSWPPP)
2. Provide Certified Erosion and Sediment Control Lead (CESCL).
3. Provide and maintain temporary erosion control measures as indicated on the drawings and as required by Washington State Department of Ecology (WSDOE) and the City of Kirkland.
4. Provide and maintain additional temporary erosion control measures, at no additional cost to the Owner, as may become necessary due to weather or environmental conditions.
5. Prevent pollution or excess turbidity in State waters.
6. Removal of temporary erosion control measures after completion of project.

B. Related Sections:

1. Division 01 Sections 01 40 00 “Quality Requirements,” 01 73 29 “Cutting and Patching,” and 01 50 00 “Temporary Facilities & Controls” for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures during site operations.
2. Division 31 Section 31 10 00 “Site Clearing and Site Demolition.”
3. Division 31 Section 31 20 00 “Earth Moving” for soil materials, excavating, backfilling, and site grading.

1.03 REFERENCE STANDARDS

A. WSDOT Specification: Standard Specifications for Road, Bridge and Municipal Construction, prepared jointly by the Washington State Department of Transportation, and the American Public Works Association, Washington State Chapter, 2025 edition. All references to measurement and payment shall be deleted from consideration, and terms agreed to in the contract substituted therefor.

B. Conform to OSHA (Occupational Safety and Health Act) requirements.

C. Conform to WISHA (Washington State Industrial Safety and Health Act) for trench safety.

D. City of Kirkland Standards and details.

1.04 DEFINITIONS

A. CESCL: Certified Erosion and Sediment Control Lead.

B. CSWPPP: Construction Stormwater Pollution Prevention Plan.

C. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

D. Utilities: On-site and off-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

E. Wet Weather: Between dates of October 1 and April 30. Exposed soil shall not remain uncovered for more than 2 days unless it is being actively worked during this period. No earthwork shall occur during the wet season.

F. ESC: Erosion and Sediment Control.

1.05 MATERIALS OWNERSHIP

A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.06 SUBMITTALS

A. See Division 01 – General Requirements.

B. Submit proof of certification for the CESCL.

C. Submit copies of CESCL field reports, ESC Maintenance Reports, and stormwater sampling reports to WSDOE, Owner, and Architect within 24 hours of each inspection.

D. Certification

1. Provide a letter, signed by the supplier and reviewed and also signed by an officer of the General Contractor's company, certifying that the following products to be incorporated into the work meet the requirements specified.
2. Products:
    a. Filter Fabric Fence
    b. Plastic Covering
    c. Mulch
    d. Hydroseeding Mix
    e. Catch Basin Inlet Protection
    f. Erosion Control Blanket

E. Construction Stormwater Pollution Prevention Plan (CSWPPP): Contractor shall provide a site-specific CSWPPP. Contractor's CSWPPP shall meet the minimum requirements of the Washington State Department of Ecology 2019 Stormwater Management Manual for Western Washington.

1.07 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. The Contractor shall utilize a utility locate service and shall notify affected utility companies before starting work and comply with all their requirements. The Contractor shall conform to applicable regulatory procedures when discovering hazardous or contaminated materials.

C. The locations of existing underground utilities are approximate only and have not been independently verified by the Owner. The Contractor shall determine the exact location of all existing utilities before commencing work and shall be fully responsible for any and all damages that happen due to the Contractor's failure to locate exactly and preserve all underground utilities that are designated to remain.

D. The Contractor shall include in their bid the maintenance and addition of erosion control measures as needed to comply with City of Kirkland and WSDOE requirements.

E. All required erosion/sediment controls must be constructed and in operation prior to land clearing.

F. During the period from October 1 to April 30, any area stripped of vegetation, including roadway embankments, shall be stabilized within 12 hours with the approved control methods (e.g., seeding, mulching, netting, erosion blankets, etc.). Long-term use of plastic covering shall be limited to this period of time.

G. During the period from May 1 to September 30, any cleared areas shall not lie open for a period longer than 7 days. If any erosion problems already exist on the stie, immediate seeding, mulching, or other cover protection will be required.

H. Developer/Contractor is responsible for controlling dust, mud, and debris within the project limits and onto existing streets.

I. Do not allow runoff from the washing of trucks or other tools/equipment (generating mud, silt, concrete waste, paint, etc.) into the drainage system.

1.08 QUALITY ASSURANCE

A. Maintain a copy of the CSWPPP on the project site.

B. Maintain at least one copy of the WSDOT Standard Specifications for Road, Bridge and Municipal Construction, 2025 edition, and project plans and specifications onsite.

C. Field inspection and testing will be performed under Section 01 40 00 “Quality Requirements.”

D. Tests and analysis of aggregate material will be performed in accordance with ANSI/ASTM D1557, ASTM D2922, ASTM D3017, ASTM D4318, and ASTM C136, as applicable.

E. If tests indicate materials do not meet specified requirements, change material and retest or obtain written approval of the Engineer. Costs associated with the retesting of materials will be the responsibility of the Contractor.

F. Construction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section 01 40 00 “Quality Requirements.”

1.09 REGULATORY REQUIREMENTS

A. Conform to all requirements of the CSWPPP.

B. Conform to applicable agency code for dust control and runoff control.

C. Obtain, post, and pay for required permits from authorities according to provisions of the Contract, including General and Supplemental Conditions and Division 01 Specification Sections.

D. Proposed erosion control facilities are minimum requirements for anticipated site conditions. During the construction period, the erosion control facilities shall be maintained and/or modified as needed to comply with City of Kirkland erosion control policies and as directed by Owner.

E. Meet all Ground Water Protection requirements identified by the City of Kirkland during the review process and during construction. Mitigation Plan shall be updated through construction.

F. Per Kirkland Zoning Code 115.25, Limit Construction activity to Monday through Friday, from 7:00 a.m. to 8:00 p.m. and Saturday 9:00 am to 6:00pm. No development work shall occur on Sundays or Holidays unless note otherwise.

G. Per Kirkland Municipal Code 15.52.100, the City of Kirkland may determine at any time during construction that implemented dust, erosion, and sedimentation control measures are note sufficient and additional action is required.

1.10 COORDINATION

A. Coordinate work under provisions of Division 01 Section 01 40 00 “Quality Requirements.”

B. Erosion control measures shall be maintained, coordinated, adjusted, and added to address changes in site conditions and construction phases at no additional cost to the Owner.

1.11 INTENT

A. It is the intent of this Specification that the Contractor provide the Work defined herein complete in every respect, and in accordance with the good practices involved in the installation of erosion control facilities, including modifying facilities as needed for storm events and changing site conditions, and the requirements of this Specification, regardless of whether or not full details of such completeness, workmanship, or practices are contained herein.

PART 2 PRODUCTS

2.01 EROSION AND SEDIMENT CONTROL MATERIALS

A. Filter Fabric Fence: Conform to detail on Drawings. Geotextile fabric shall meet the following standards:

Polymeric Mesh AOS (ASTM D4751)	0.60 mm maximum for slit film wovens (#30 sieve). 0.30 mm maximum for all other geotextile types (#50 sieve). 0.15 mm minimum for all fabric types (#100 sieve).
Water Permittivity (ASTM D4491)	0.02 sec^{-1} minimum
Grab Tensile Strength (ASTM D4632)	100 lbs minimum for standard strength fabric.
Grab Tensile Strength (ASTM D4632	30% maximum
Ultraviolet Resistance (ASTM D4355)	70% minimum

B. Plastic Covering: Conform to WSDOT Specification 9-14.6(3).

C. Hydroseeding: Conform to notes on plan and the following:

	% Weight	% Purity	% Germination
Chewings or red fescue	40	98	90
Annual or perennial rye	40	98	90
Redtop or colonial bentgrass	10	92	85
White dutch clover	10	98	90

D. Straw Mulch: Conform to notes on plan. Air dried hay or straw; free from undesirable seed and coarse material, 2-inch depth minimum with no bare spots.

E. Catch Basin Inlet Protection: Conform to detail on Drawings and to City of Kirkland requirements.

F. Erosion Control Blanket: Conform to WSDOT Specification 9-14.6(2). Place erosion control blanket on all disturbed areas with slopes steeper than 3H:1V in accordance with WSDOT Standard Plan I-60.10-01. Hydroseed after placement of erosion control blanket.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that site conditions are satisfactory to receive the work of this Section. Do not begin the work of this Section until unsatisfactory conditions are corrected. Beginning the work of this Section constitutes the Contractor's acceptance of site conditions as satisfactory.

B. CESCL shall be responsible for ESC measures. The CESCL shall be designated prior to commencement of work on-site.

3.02 INSTALLATION AND CONDUCT OF WORK

A. Complete and receive approval of the site-specific CSWPPP.

B. Install temporary erosion control measures as indicated on the Drawings, or as directed by the Civil Engineer or the City of Kirkland Inspector prior to beginning any work that will disturb the existing vegetation on the site.

C. Install erosion control measures to minimize impacts to the existing site conditions and to allow proper performance.

D. Contractor shall conform to requirements of the site-specific Construction Stormwater Pollution Prevention Plan (CSWPPP).

E. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

F. Inspect, maintain, and repair erosion and sedimentation control measures during construction until permanent vegetation has been established.

G. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.03 MAINTENANCE AND INSPECTION

A. Temporary erosion control measures shall be maintained as required to achieve proper performance, as indicated in the Contract Documents and required by the Civil Engineer and as required by WSDOE.

B. Use care during maintenance of erosion control facilities so as not to discharge collected sediment into the protected area.

C. The Contractor shall provide and designate a Certified Erosion and Sedimentation Control Lead (CESCL) who shall be responsible for monitoring the installation, performance, maintenance, and review of ESC measures, and for compliance with all permit conditions. The CESCL shall be designated prior to commencement of work on the site.

D. Contractor shall provide a contact phone number, fax number, and address where the CESCL can be contacted. The CESCL shall have completed the training and certification requirements of BMP C160 of the WSDOE Stormwater Management Manual for Western Washington.

1. CESCL responsibilities include:

a. Be on-site or available on-call during the project duration.

b. Implement the TESC and the CSWPPP.

c. Oversee maintenance practices identified on the plans for the erosion control measures.

d. Conduct or provide for inspection and monitoring activities.

e. Identify other potential pollution sources and make sure they are mitigated.

f. Identify deficiencies in the TESC measures and make sure they are corrected.

E. Contractor shall conform to requirements of the site-specific CSWPPP.

3.04 REMOVAL

A. When approved by the City of Kirkland Inspector and WSDOE, remove temporary facilities when the need for the facilities no longer exists.

B. Clean sediment and/or pollutants from facilities that are to remain.

3.05 CLEAN-UP

A. Upon completion of the work of this Section, remove all rubbish, trash, and debris resulting from operations.

B. Remove materials, equipment, and tools; leave the site in a neat and orderly condition acceptable to the Owner.

C. At the completion of the site improvements and after the work area has been stabilized with final surfacing and landscaping or seeding, the Contractor shall remove all temporary erosion control mechanisms and facilities.

D. The Contractor shall sweep streets as necessary to remove sediment from the project, and at project completion.

3.06 WASTE MANAGEMENT

A. See Division 01 Section 01 50 00 “Temporary Facilities & Controls” and the requirements of Part 1 of this section for requirements related to waste management.

END OF SECTION

SECTION 32 12 16
ASPHALT PAVING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Cold milling of existing Hot-Mix Asphalt Pavement
   2. Hot-Mix Asphalt Patching
   3. Hot-Mix Asphalt Paving "HMA"
   4. Pavement-Marking Paint

B. Related Sections:
   1. Division 31 Section 31 20 00 "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.

1.03 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.04 REFERENCE STANDARDS

A. Washington State Department of Transportation (WSDOT) Specification: Standard Specifications for Road, Bridge and Municipal Construction, prepared jointly by the Washington State Department of Transportation, and the American Public Works Association, Washington State Chapter, 2025 edition. All references to measurement and payment shall be deleted from consideration; and terms agreed to in the contract substituted therefor.

B. WSDOT Standard Plan Standard Plans for Road and Bridge Construction, prepared by Washington State Department of Transportation, current issue in effect at bid date.

C. City of Kirkland Standards and details

1.05 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
   1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
   2. Crushed aggregate sieve analysis.

B. Certification:
   1. Provide a letter, signed by the supplier and reviewed, and also signed by an officer of the General Contractor's company, certifying that all products to be incorporated into the work meet the requirements specified.
   2. Products:
      a. Hot-Mix Asphalt “HMA” Class 1/2 Inch.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by WSDOT.

B. Installer Qualifications: Imprinted-asphalt manufacturer's authorized installer who is trained and approved for installation of imprinted asphalt required for this Project.

C. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

D. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of WSDOT for asphalt paving work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

E. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:

a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.

b. Review condition of subgrade and preparatory work.

c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.

2. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F, and not exceeding 95 deg F.

C. Existing Paving and Surfacing: Contractor shall take care in protecting pavement and walks intended to remain. The contractor shall replace any existing sidewalks or concrete curbs that are damaged at their own expense.

PART 2 PRODUCTS

2.01 MATERIALS

A. Hot-Mix Asphalt “HMA” Materials: Conform to WSDOT Specifications 5-04.2 and 9-03.9(3).

1. Parking Lots and Driveways: HMA Class 1/2 Inch, PG 58H-22.

B. Sand: ASTM D 1073, Grade Nos. 2 or 3.

C. Joint Sealer: Conform to WSDOT Specification 9-04.

D. Pavement Marking: Paint materials conform to WSDOT Specification 9-34.2. White, yellow, red, and blue colors to be used. Conform to City of Kirkland requirements for markings in the right-of-way.

E. ADA Parking Symbol: Conform to Chapter 7 of the ICC/ANSI A117.I-2017.

F. ADA Signage: Conform to plan detail.

G. Thermoplastic Pavement Marking: Conform to WSDOT Specification 9-34.3(1) or 9-34.3(2). Color shall be white, unless noted otherwise on the plans.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

1. Completely proof roll subgrade in one direction, repeating proof rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
4. All proof rolling shall be witnessed by the Geotechnical Engineer.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.02 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

1. Mill to a depth of 1-1/2 inches.
2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. Transport milled hot-mix asphalt to asphalt recycling facility.
7. Keep milled pavement surface free of loose material and dust.

3.03 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

C. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

1. All utility trenches in the right-of-way shall be permanently patched within 30 days after the initial trench is made. All streets which require asphalt overlays (See Public Works Policy R-7) shall be overlaid within 120 days after the permanent patching is complete, or prior to completion of the project, whichever occurs first.
2. Three or more patches in an asphalt roadway within 150 feet of each other triggers a grind and overlay street. Other overlay criteria may apply. Refer to public Works Policy R-7.

3.04 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.05 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.06 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

B. Conform to construction requirements, WSDOT Specification 5-04.3 with the following modifications.

1. Delete Section 5-04.3 (8) A, Acceptance Sampling and Testing Dense Graded Mixture.
2. Delete Section 5-04.3 (10) B, Control, and replace with the following: For asphalt concrete Class ½ inch, where paving is in the traffic lanes, including lanes for ramps, truck climbing, weaving, speed changes, and left-turn channelization, and the specified compacted course thickness is greater than 0.10 foot, the acceptable level of compaction shall be a minimum of 92 percent of the maximum density as determined by WSDOT Test Method 705.

C. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

D. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.07 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
5. Compact asphalt at joints to a density within 2 percent of specified course density.

3.08 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 95 percent of reference laboratory density according to AASHTO T 209, but not less than 90 percent nor greater than 100 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.09 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.
2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.
2. Surface Course: 1/8 inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

C. Asphalt surface shall not allow ponding of water to exceed 1/8-inch depth or encompass a surface area greater than 10 square feet.

D. No ponding shall occur within 10 feet of a catch basin.

E. Conform to WSDOT Specification 5-04.3(13).

3.10 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Marking-paint manufacturers caution that paint will bleed or tear surface of new asphalt unless asphalt is aged before painting. This aging period may vary from 30 to 90 days. If pavement marking must proceed immediately, consider revising to a phased application of a thin first coat followed by a thicker second coat once asphalt has aged. Verify that two-coat application is recommended by pavement-marking manufacturer.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

1. Broadcast glass beads uniformly into wet pavement markings at a rate of 6 lb/gal.

E. ADA Parking Symbol shall conform to City of Kirkland CK-R.33.

F. Conform to WSDOT Specification 8-22.

G. Conform to City of Kirkland requirements.

3.11 PROTECTION

A. Protect unfinished Work from any disturbance.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

C. Protect existing benchmarks and survey monuments from damage during construction.

3.12 ADJUST UTILITIES

A. Adjust manhole ring and cover, and other utilities to maintain finish grade of new pavement. Catch basin, frame, and grate are to be depressed 0.1 feet below rim elevations on plans to enhance drainage.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.

2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.

b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

G. Sweep and clean pavement surface to eliminate loose material and dust.

3.14 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from project site and legally dispose of them in an approved landfill.

1. Do not allow milled materials to accumulate onsite.

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Onsite Pedestrian Concrete.

B. Related Sections:

1. Division 03 Section 03 30 00 "Cast-in-Place Concrete" for general building applications of concrete.
2. Division 31 Section 31 20 00 "Earth Moving" for subgrade preparation, grading, and subbase course.

1.03 REFERENCE STANDARDS

A. WSDOT Specification: Standard Specifications for Road, Bridge and Municipal Construction, prepared jointly by the Washington State Department of Transportation, and the American Public Works Association, Washington State Chapter, 2025 edition. All references to measurement and payment shall be deleted from consideration; and the terms agreed to in the contract substituted therefor.

B. WSDOT Standard Plan Standard Plans for Road and Bridge Construction, prepared by Washington State Department of Transportation, current issue in effect at bid date.

C. City of Kirkland Standards and details.

1.04 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.05 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

1. Aggregates.

D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Applied finish materials.
5. Bonding agent or epoxy adhesive.
6. Joint fillers.

E. Field quality-control test reports.

F. Minutes of preinstallation conference.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section 01 40 00 “Quality Requirements."

1.07 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular traffic as required for other construction activities.

B. Pedestrian and Bicycle Route Maintenance: Unless an approved pedestrian or bicycle lane detour route has been approved by the City, all sidewalks and bicycle lanes shall be temporarily repaired at the end of each day according to the following (see Public Works Policy G-6 for a list of street classifications):

1. Arterial and Collector type streets: Sidewalks and bicycle lanes shall be restored temporarily at the end of each day with a cold-mix asphalt or steel plates.

2. Sidewalks and bicycle lanes shall be restored permanently within 20 working days from the date of the original excavation. However, this is a minimum standard, and the City may request that sidewalks and bicycle lanes be restored permanently in less than 20 days.

3. A sidewalk shall never be closed without a City-approved pedestrian detour route.

PART 2 PRODUCTS

2.01 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves with a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.02 CONCRETE MATERIALS

A. Conform to WSDOT Specification 8-14 and City of Kirkland details and requirements for sidewalks.

2.03 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:

1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Chemical Surface Retarder: Water-soluble, liquid-set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.

1. Available Products:

a. Burke by Edeco; True Etch Surface Retarder

b. ChemMasters; Exposee

c. Conspec Marketing & Manufacturing Co., Inc.; Delay S

d. Euclid Chemical Company (The); Surface Retarder S

e. Kaufman Products, Inc.; Expose

f. Metalcrete Industries; Surftard

g. Nox-Crete Products Group, Kinsman Corporation; Crete-Nox TA

h. Scofield, L. M. Company; Lithotex

i. Sika Corporation, Inc.; Rugasol-S

j. Vexcon Chemicals, Inc.; Certi-Vex Envioset

2.04 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi.

2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.

3. Slump Limit: 4 inches, plus or minus 1 inch.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 4.5 percent to 7.5 percent for commercial concrete per WSDOT Specification 6-02.3(2) B.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements as follows:

1. Fly Ash or Pozzolan: 25 percent.

2. Ground Granulated Blast-Furnace Slag: 50 percent.

3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

2.05 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

1. Completely proof roll subbase in one direction. Limit vehicle speed to 3 mph.
2. Proof roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons.
3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 31 Section 31 20 00 "Earth Moving."

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.02 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.03 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.04 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Butt Joints: Use epoxy bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

2. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 18 feet, unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete at 6-foot intervals unless otherwise indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 3/8-inch radius. repeat grooving of contraction joints after applying surface finishes.
    a. Within the right-of-way only, Provide 2-inch smooth concrete surface shiners on either side of internal construction joints.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 3/8-inch radius. Repeat tooling of edges after applying surface finishes.

1. Within the right-of-way only, provide 2-inch smooth concrete surface shiners on all edges, with edger tool with a 3/8-inch radius at all forms and expansion joints.

3.05 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Place top layer of concrete, strike off, and screed.

1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer or use bonding agent if approved by Architect.

J. Screed pavement surfaces with a straightedge and strike off.

K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

N. When adjoining pavement areas are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

O. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.

2. Do not use frozen materials or materials containing ice or snow.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

P. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3. Fog-spray forms and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

Q. Recycled Concrete: Recycled concrete is not allowed on-site for any purpose. Refer to Policy D-16 for details.

3.06 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
2. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16- to 1/8-inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.07 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.08 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
4. Joint Spacing: 3 inches.
5. Contraction Joint Depth: Plus 1/4 inch, no minus.
6. Joint Width: Plus 1/8 inch, no minus.

3.09 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 100-cu. yd. or fraction thereof of each concrete mix placed each day.
    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
    a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Owner, Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 32 33 00
SITE FURNISHINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Bike racks.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Data: For site furnishings to include in maintenance manuals.

1.05 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.

PART 2 PRODUCTS

2.01 GENERAL

A. Products: Subject to compliance with requirements, provide the following or equal approved by the Landscape Architect / Owner.

2.02 BIKE RACK

A. Manufacturer: Sportworks, 888-661-0555, sales@sportworks.com.

B. Model: Tofino.

C. Mount: Surface Mount.

D. Finish: Bead Blast Steel.

2.03 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are assembled or installed to minimize contrast.

B. STEEL AND GALVANIZED-STEEL FINISHES
   1. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.
   2. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.

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

3.02 INSTALLATION

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and securely anchored or positioned at locations indicated on Drawings.

END OF SECTION

SECTION 32 84 00
PLANTING IRRIGATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Piping.
   2. Encasement for piping.
   3. Manual valves.
   4. Pressure-reducing valves.
   5. Automatic control valves.
   6. Automatic drain valves.
   7. Transition fittings.
   8. Dielectric fittings.
   9. Miscellaneous piping specialties.
   10. Sprinklers.
   11. Quick couplers.
   12. Drip irrigation specialties.
   13. Controllers.
   14. Boxes for automatic control valves.

B. Related Sections:
   1. Section 31 10 00 “Site Clearing and Site Demolition.”
   2. Section 31 20 00 “Earth Moving.”
   3. Section 33 11 00 “Facility Water Distribution Piping”
   4. Section 32 91 13 “Soil Preparation.”
   5. Section 32 92 00 “Turf and Grasses”

1.03 REFERENCES:

A. ASTM B43 – Standard Specification for Brass Pipe and Fittings.

B. ASTM D1785 – Standard Specification for Schedule 40 PVC Pipe.

C. ASTM D2241 – Standard Specification for PVC Plastic Pipe.

D. ASTM D2466 – Standard Specification for Schedule 40 PVC Fittings.

E. ASTM D2466-78 – Schedule 80 PVC Fittings.

F. ASTM D2564 – Standard Specification for PVC Solvent Cements.

G. ASTM D2855 – Standard Recommended Practice for making Solvent Cemented Joints with PVC Pipe and Fittings.

H. ASTM D3139 – Swing Joint Pipe and Fittings.

I. ASTM F-656 – Standard Specifications for PVC Primers.

J. ASTM 645 – Standard Guide for Selection, Design, and Installation of Thermoplastic Water-Pressure Piping System.

K. NFPA 70 – National Electrical Code (NEC).

L. Washington State CCC regulations (WAC 246-290-490) and related definition.

1.04 DEFINITIONS

A. Circuit Piping: Downstream from control valves to sprinklers, specialties, and drain valves. Piping is under pressure during flow.

B. Drain Piping: Downstream from circuit-piping drain valves. Piping is not under pressure.

C. ET Controllers: EvapoTranspiration Controllers. Irrigation controllers which use some method of weather-based adjustment of irrigation. These adjusting methods include use of historical monthly averages of ET; broadcasting of ET measurements; or use of on-site sensors to track ET.

D. Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.

E. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.05 PERFORMANCE REQUIREMENTS

A. Irrigation zone control shall be automatic operation with controller and automatic control valves.

B. Location of Sprinklers and Specialties: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards. Maintain 100 percent irrigation coverage of areas indicated.

C. Minimum Working Pressures: The following are minimum pressure requirements for piping, valves, and specialties unless otherwise indicated:
   1. Irrigation Main Piping: 200 psig.
   2. Circuit Piping: 150 psig.

1.06 ACTION SUBMITTALS

A. Product Data: Submit product data before beginning work. Include manufacturer's product literature for all products to be installed in this system. Include material showing manufacturer's name, catalog numbers, catalog cuts, technical data, installation, operation, and maintenance instructions for each product.

B. Substitutions to the specified equipment will be permitted with the express written approval of the Owner. Substitutions will be approved only when the substituted item is equivalent or better in quality and performance than the item originally specified. The final determination for "equivalents" rests with the Owner. Their decision shall be final and binding.

C. Point of Connection Water Pressure Test: Test water pressure at point of connection. Verify pressure is in the range indicated on the construction drawings. Submit written results of test to Architect.

D. Submit shop drawings for review and approval prior to beginning work.

E. Maintain a current record of all pipe and equipment placement and record any variations approved by the Architect. Upon completion of the system and prior to release of final payment, the Contractor shall provide the Owner with a neat and legible record drawing of the completed system. Any pipe not installed in accordance with the plans as originally contracted shall be sufficiently dimensioned to a permanent structure for location after burial. Record drawings shall be updated DAILY.

1.07 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Irrigation systems, drawn to scale, on which components are shown and coordinated with each other, using input from Installers of the items involved. Also include adjustments necessary to avoid plantings and obstructions such as signs and light standards.

B. Qualification Data: For qualified Installer.

C. Zoning Chart: Show each irrigation zone and its control valve.

D. Controller Timing Schedule: Indicate timing settings for each automatic controller zone.

E. Field quality-control reports.

1.08 CLOSEOUT SUBMITTALS

A. Maintenance Manuals: Follow 01 77 00 “Close Out Procedures” for Maintenance Manual deliverable. Include the following items/information:
   1. List of authorized distributors and service representatives (in the area) for each item of irrigation equipment: include names, addresses, and phone numbers.
   2. Guarantee/warranty certificates for all equipment used and Contractor's written warranty for entire system 1-year guarantee.
   3. Manufacturer's maintenance sheets, replacement parts list and equipment brochures for all equipment used. All composite data sheets shall have the specified products used in the field clearly highlighted.
   4. Winterization and spring start up procedures.
   5. A pocket for one blueline copy of the approved record drawings. This print shall be added at the time of the final inspection).

1.09 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.

B. Spray Sprinklers: Equal to 10 percent of amount installed for each type and size indicated, but no fewer than 5 units.

1.10 RECORD DRAWINGS

A. Record accurately on one set of full-size prints all changes in the work constituting departures from the Contract Drawings, including changes in pressure and nonpressure line locations.

B. Record the changes and dimensions in a legible and workmanlike manner to the satisfaction of the Resident Engineer. Before final inspection of work, submit record drawings to the Resident Landscape Architect for review.

C. Dimension from two permanent points of reference (buildings, monuments, sidewalks, curbs, and pavements). Record data shown on record drawings day-to-day as the Work is being installed.

D. Show locations, depths, size, and information as applicable, of the following items:
   1. Point of connection and available static water pressure.
   2. Backflow prevention device.
   3. Irrigation booster pump/enclosure.
   4. Routing of sprinkler pressure lines and nonpressure lines (dimension maximum 100 feet along routing).
   5. Spray sprinkler heads and rotary (rotator) heads.
   6. Gate valves.
   7. Remote control valves.
   8. Quick coupling valves.
   9. Routing of control wires.
   10. Related equipment as may be directed.

E. Maintain record drawings on Site.

1.11 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers that include a certified irrigation contractor qualified by The Irrigation Association.

B. 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.

C. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.

D. Comply with requirements of utility supplying water and authorities having jurisdiction for preventing backflow and back siphonage.

E. Comply with ASTM F 645, "Guide for Selection, Design, and Installation of Thermoplastic Water Pressure Piping Systems."

1.12 DELIVERY, STORAGE, AND HANDLING

A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.13 PROJECT CONDITIONS

A. Investigate and determine available water supply water pressure and flow characteristics of the existing irrigation system.

B. Underground utilities and elements: The Contractor must call Utility Notification Center at (811) or (800) 424-5555 or webpage www.callbeforeyoudig.org to locate all underground utilities (on or near Public Rights-of-Way / Property Lines) prior to digging and/or driving stakes

C. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
   1. Notify Construction Manager and Owner no fewer than two days in advance of proposed interruption of water service.
   2. Do not proceed with interruption of water service without Owner's written permission.

D. Site Inspection and Layout: Before proceeding with any work, the Contractor must inspect the site, carefully checking all grades and verifying all dimensions and conditions affecting the work to satisfy themselves that they may safely proceed. Changes or alterations to the system to meet actual conditions must be made at the Contractor's expense. Always use appropriate fittings for changes in direction or elevation. Do not bend the pipe more than that allowed by this specification. The irrigation plan is diagrammatic and is not intended to show exact locations of existing or proposed piping, valves, or controllers. Locate new items as closely as possible to related curbs, walls, fences, or edges of paving. Pipelines shown next to paved areas on drawing must be installed in the planting bed. Pipelines shown parallel may be placed in a common trench but separated by at least 6 inches and all pipes of dissimilar materials must be installed per UPC and standard details included with the plans. Sprinkler heads are shown accurately and must be installed as indicated by center of symbol.

E. When renovating or working around an existing irrigation system, the Contractor and the Landscape Architect must test and document the condition of the existing system prior to the Contractor beginning the work.

F. Contractor must install a temporary irrigation controller and take all necessary measures to maintain irrigation coverage for the athletic fields during construction.

G. Contractor must take precautions to neither disturb nor damage any existing above ground or underground utilities or elements. Keep streets, sidewalks, and site clean and free from debris, and affected drains open and free flowing at all times.

H. During the installation of the new irrigation system, if underground utilities are encountered or damaged, including (but not limited to) existing irrigation systems, the Contractor must notify the Landscape Architect immediately and perform repairs to that system per this section and/or as directed by the Landscape Architect. This also applies to the connection of new irrigation systems to existing older systems. Repairs and connections must be done per Plan Details and/or as directed by the Landscape Architect in the field.

1.14 DELIVERY, STORAGE, HANDLING AND PROTECTION

A. Protect work and materials from damage during construction and storage. PVC pipe and fittings shall be protected from ambient temperatures, weather, and direct sunlight in accordance with manufacturer's written recommendations.

B. Assume all responsibility for damage to existing construction and restore to its original condition should damage occur as a result of this work.

C. Deliver Products in sufficient quantities to allow a continuity of the Work.

1.15 WARRANTY

A. Guarantee system against defects of installation and material for a period of 1 year after acceptance of the irrigation system. Guarantee shall also cover repair or damage to any part of the premises resulting from leaks or other defects in material, equipment, and workmanship to the satisfaction of the Architect. Repairs, if required, shall be done promptly upon notification by the Owner, and, at no cost to the Owner.

B. The Warranty must include restoration of planted or paved areas due to settlement of trenches.

C. As part of the warranty, the Contractor shall be responsible for deactivating and draining the system prior to the onset of the freezing season and for reactivating the system at the onset of the spring growing season; each event must be accomplished once during the warranty period. In the event the system is completed in a season when it will not be in use, the Contractor shall winterize the system upon completion of testing (and approval by the Architect) and reactivate the system in the spring. The Contractor shall SUBMIT a letter to the Architect certifying that the system was winterized and drained and indicate the date such action was accomplished. The Contractor shall be responsible for any damage resulting from failure to comply.

1.16 SYSTEM FAMILIARIZATION

A. Before final acceptance of the system, the Contractor shall provide the necessary keys and/or other tools required to operate, drain, and activate the system. Provide two complete sets of tools and keys to the Owner (i.e., water keys, quick coupler keys, valve cover keys, controller keys and sprinkler adjustment and disassembling tools, etc.)

B. Contractor is to provide 5 percent extra stock of each sprinkler type on project.

C. Contractor is to provide the following minimum standards of training with Owner’s personnel before final acceptance of the system.
   1. General system operation, maintenance, and winterization: 4 hours.

PART 2 PRODUCTS

2.01 SUMMARY

A. All materials used throughout the system shall be new, unused, and in perfect condition. Refer to the irrigation materials legend, notes, detail drawings and these specifications for specific equipment to be used. Equipment or materials installed or furnished without prior approval of the Architect may be rejected and the Contractor required to remove such materials from the site at his own expense.

2.02 PIPES, TUBES, AND FITTINGS

A. Comply with requirements in the piping schedule for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

B. Copper Pipe and Fittings:
   1. All Copper Piping must be Type ‘K’ Copper and must conform to industry standards and be in conformance with applicable ASTM or ANSI standards.

2. Copper Tubing: ASTM B 88, Type 'K' water tube. For tubing up to 2 inches in diameter, use 'soft' copper (annealed temper). For tubing with diameters larger than 2 inches, use 'hard' copper.
    a. For 2 inch Outside Diameter (O.D.) and smaller: Cast-copper alloy solder-joint pressure fittings and soldered joints with Alloy Sn95 solder.
    b. Any copper pipe installed under or thru any paving and within 3 feet of the paving must be braised at each joint, per UPC Building Codes.
3. Copper Fittings:
    a. Cast-Copper-Alloy, Solder-Joint Pressure Fittings: ASME B16.18.
    b. Copper Unions: ASME B16.18, cast-copper-alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends.
    c. Threaded Ends: Threads conforming to ASME B1.20.1.

C. Brass Pipe and Fittings
1. Brass pipe must be seamless red brass per ASTM B 43 rated for 250-psi working pressure.
2. All Brass Pipe and fittings must conform to industry standards and be in conformance with applicable ASTM or ANSI standards.
3. Brass fittings must be Class 250 fittings rated for a minimum of 250-psi working pressure and must conform to ANSI/ASME B16.15 and ASTM B584.

D. PVC (Polyvinyl Chloride) Pipe, Fittings, Primer, and Glue
1. All PVC Pipe must be **Schedule 40 PVC** (or better) and must conform to all requirements of ASTM D1785
2. All PVC Pipe must be marked with the manufacturer's name, class of pipe and NSF seal. Pipe must bear no evidence of interior or exterior extrusion marks. Pipe walls must be uniform, smooth, and glossy. Pipe may be pre-belled or with individual solvent-weld couplings.
3. All PVC Pipe must be solvent welded pipe. All PVC pipe must be delivered in at least 20-foot lengths.
4. All PVC fittings must be of the solvent welded type except where risers, valves, etc., require threaded transition fittings. All threaded PVC tees, fittings, adaptors, and nipples must be **Schedule 80 PVC** (or better) and must conform to the requirements of ASTM D2466. All PVC Schedule 80 Female Adapters shall be Special Reinforced with Stainless Steel Collar.
5. All PVC pipes and fittings for swing joints must conform to all requirements of ASTM D3139. No additional threaded PVC nipples of any kind are allowed in swing joint fabrications. All swing joints must be threaded into Schedule 80 PVC tees or Schedule 80 PVC 90-degree ells that are glued into the Schedule 40 mainline and lateral pipes.
6. Use Teflon tape on all threaded fittings, regardless of pipe type.
7. Primer color must be P-70 (Purple) and glue color must be 717 (Gray).

E. Thrust Blocking
1. Thrust Blocking is required for all mainline pipe 4 inches and greater and shall comply details shown in the drawings.

F. Sleeves
1. Sleeves required for main and lateral lines located under paving (pathways and service roads within the park site) where light vehicles are anticipated, must be Schedule 80 PVC (or better). The inside diameter (I.D.) of the sleeve must be two times the O.D. of the inserted pipe with a maximum of one insert pipe per sleeve. All wiring must be in its own separate sleeve, independent from the piping sleeves Solid/Tight Line Pipe shall be Hancor "Blue Seal" or approved equal.

2.03 SPRINKLER HEADS

A. Fixed spray sprinkler heads: Hunter PROS-CV-F series heads with plastic adjustable arc and fixed spray nozzles as indicated on the plans. Lawn area sprinklers shall be PROS-04 series with 5 7/8” body and 4" pop-up riser or PROS-06 series with 8 3/4” body and 6” pop up riser. Shrub area sprinklers shall be PROS-12 series with 16 1/8” body and 12” pop up riser or PROS-06 series with 8 3/4” body and 6” pop up riser as shown on the plans. Install 6” pop up sprinklers in shrub areas adjacent to head in parking stalls. Sprinkler body shall be heavy-duty ultra-violet resistant plastic construction with stainless steel retraction spring. All sprinklers will have ratcheting riser feature for easy adjustment. ALL SPRINKLERS WILL BE BOTTOM INLET ONLY. Approved substitution: Rain Bird 1800-SAM-PRS series heads.

B. Rotor Heads:
   1. Large Radius Rotors: Hunter I-40-SS series rotor with stainless steel riser and check valve. Nozzle number indicated on drawings. Overall body height shall be 7 7/8” with a minimum 3 1/2” pop up. Check valve for up to 10’ elevation change to be standard. 1” NPT inlet. Install per detail drawing.
   2. Medium Radius Rotors: Hunter I-25 (ADS and 36S) 6” series lawn rotor with stainless steel riser and factory installed check valve. Overall body height of 9 7/8” with a minimum 6” pop up. FloStop feature allows stoppage of flow through an individual head while remainder of system is running. Both standard and low angle nozzle number indicated on drawing. Install per detail drawing.
   3. Rotor Swing Joints:
      a. Hunter I-40 Swing Joints: 1 1/4” marlex triple swing joint.

2.04 MANUAL VALVES

A. Curb Valve
   1. Stop and waste valve size per plan.
   2. Description:
      a. Standard: AWWA C800.
      b. NPS 1-1/4 to NPS 2 Pressure Rating: 150 psig
      c. Body Material: Brass or bronze with ball or ground-key plug.
      d. End Connections: Matching piping.
      e. Stem: With wide-tee head:

B. Drain Valve
   1. Brass Ball Valve
   2. Description:
      a. Standard: MSS SP-110
      b. SWP Rating: 150 psig.
      c. CWP Rating: 600 psig.
      d. Body Design: Two piece.
      e. Body Material: Forged brass.
      f. Ends: Threaded.
      g. Seats: PTFE or TFE.
      h. Stem: Brass.
      i. Ball: Chrome-plated brass.
      j. Port: Full

C. Main Line Isolation Valve
   1. Iron gate valve. Same size as pipe.
   2. Description:
      a. Standard: MSS SP-70, Type I.
      b. CWP Rating: 200 psig.
      c. Body Material: ASTM A 126, gray iron with bolted bonnet.
      d. Ends: Flanged.

e. Trim: All bronze.
f. Disc: Solid wedge.
g. Packing and Gasket: Asbestos free

D. Zone Manifold Ball Valve
1. True Union Ball Valve. Same size as remote control valve. Install upstream from RCV per detail.
2. Description:
a. Standard: MSS SP-122.
b. Pressure Rating: 150 psig.
c. Body Material: PVC. Schedule 80
d. Type: Union.
e. End Connections: Socket or threaded.
f. Port: Full

2.05 AUTOMATIC CONTROL VALVES

A. Size and type indicated on drawings. WEATHERMATIC 8200CR-XPR BRONZE BULLET solenoid operated diaphragm, globe type, normally closed, plastic valve with five-year manufacturer's warranty.

B. Master Valve: WEATHERMATIC 8200CR BRONZE BULLET solenoid operated, globe type, normally closed, brass valve with five-year manufacturer's warranty.

2.06 TRANSITION FITTINGS

A. General Requirements: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

B. Transition Couplings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Cascade Waterworks Mfg. Co.
b. Dresser, Inc.
c. Ford Meter Box Company, Inc. (The).
d. JCM Industries, Inc.
e. Smith-Blair, Inc.
f. Viking Johnson.
2. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.

C. Plastic-to-Metal Transition Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Harvel Plastics, Inc.
b. Spears Manufacturing Company.
2. Description: PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-socket or threaded end.

D. Plastic-to-Metal Transition Unions:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Colonial Engineering, Inc.
b. NIBCO INC.
c. Spears Manufacturing Company.
2. Description: MSS SP-107, PVC four-part union. Include one brass or stainless-steel threaded end, one solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.

2.07 MISCELLANEOUS PIPING SPECIALTIES

A. Pressure Gages: ASME B40.1. Include 4-1/2-inch- diameter dial, dial range of two times system operating pressure, and bottom outlet.

2.08 QUICK COUPLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Rain Bird Corporation.

B. Description: Factory-fabricated, bronze or brass, two-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.
   1. Locking-Top Option: Vandal-resistant locking feature. Include one matching key(s).

2.09 CONTROLLERS

A. Existing controller and sensors (Rain, Wind) to be removed and handed to owner.

B. Owner furnished, Contractor install:
   1. Calsense
      a. Model: CS3000
      b. Rain Sensor: CS3-W-KIT
      c. Tipping Bucket RB-1
      d. Wind Gauge WG-1

C. Contractor to provide a temporary power supply and a temporary controller wired to all existing valves prior to Contractor's installation of the Owner-furnished controller. Refer to Irrigation Notes on Drawings, Sheet L3.01 Irrigation Construction Notes, #2.

2.10 BOXES FOR AUTOMATIC CONTROL VALVES

A. Plastic Boxes:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Armorcast Products Company.
      b. Carson Industries LLC.
      c. Nationwide Plastics, Inc.
      d. NewBasis.
      e. Oldcastle, Inc.
      f. Orbit Irrigation Products, Inc.
      g. USFilter/Plymouth Products, Inc.

B. Description: Box and cover, with open bottom and openings for piping; designed for installing flush with grade.

C. Color: Black

2.11 POLYMER-CONCRETE BOXES:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Armorcast Products Company.
   2. Carson Industries LLC.
   3. Christy Concrete Products.
   4. NewBasis.
   5. Quazite: Hubbell Power Systems, Inc.

B. Description: Box and cover, with open bottom and openings for piping; designed for installing flush with grade.

C. Drainage Backfill: Cleaned gravel or crushed stone, graded from 3/4 inch minimum to 3 inches maximum.

2.12 ACCESSORIES

A. Detectable marking tape: Christy's 3" detectable marking tape consists of a minimum 5 mil overall thickness; five ply composition; ultra-high molecular weight; 100% virgin polyethylene; acid, alkaline and corrosion resistant. The tape shall have a 20-gauge solid aluminum foil core, encapsulated within 2.55 mil polyethylene backing. Tape tensile strength shall be in accordance with ASTM D882-80A and be not less than 7,800 psi. Tape Legend: Caution Irrigation Line Below. TA-DT-3-GI.

B. Valve Markers: Christy's Identification Tags manufactured from polyurethane Behr Desopan, incorporating an integral attachment neck and reinforced attachment hole and will be capable of withstanding 180 lbs. Pull force. Tag shall be approximately 2.25" x 2.75" in size. All lettering will be hot stamped in black and capable of withstanding outdoor usage. The standard alphanumeric designations shall incorporate lettering 1 1/8" in height. Tag color will be yellow. Marking tag will be double side stamped with zone valve number.

C. Tracer Wires: Plastic-coated copper tracer wire, 1.8 mm (14 gage), green, Type TW, installed with non-metallic irrigation main lines and lateral lines.

PART 3 EXECUTION

3.01 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 31 20 00 "Earth Moving."

B. Install warning tape directly above pressure piping, 12 inches below finished grades, except 6 inches below subgrade under pavement and slabs.

C. Provide minimum cover over top of underground piping according to the following:
   1. Irrigation Main Piping: Minimum depth of 24 inches below finished grade, or not less than 12 inches below average local frost depth, whichever is deeper.
   2. Circuit Piping: 18 inches.
   3. Drain Piping: 18 inches.
   4. Sleeves: 24 inches.

3.02 PREPARATION

A. Set stakes to identify locations of proposed irrigation system. Obtain Architect's approval before excavation.

3.03 PIPING INSTALLATION

A. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings.

B. Install piping at minimum uniform slope of 0.5 percent down toward drain valves.

C. Install piping free of sags and bends.

D. Install groups of pipes parallel to each other, spaced to permit valve servicing.

E. Install fittings for changes in direction and branch connections.

F. Install unions adjacent to valves and to final connections to other components with NPS 2 or smaller pipe connection.

G. Install flanges adjacent to valves and to final connections to other components with NPS 2-1/2 or larger pipe connection.

H. Install underground thermoplastic piping according to ASTM D 2774 and ASTM F 690.

I. Install expansion loops in control-valve boxes for plastic piping.

J. Lay piping on solid subbase, uniformly sloped without humps or depressions.

K. Install ductile-iron piping according to AWWA C600.

L. Install PVC piping in dry weather when temperature is above 40 deg F. Allow joints to cure at least 24 hours at temperatures above 40 deg F before testing.

M. Install water regulators with shutoff valve and strainer on inlet and pressure gage on outlet. Install shutoff valve on outlet. Install aboveground or in control-valve boxes.

N. Install piping in sleeves under parking lots, roadways, and sidewalks.

O. Install sleeves made of Schedule 40 PVC pipe and socket fittings, and solvent-cemented joints.

P. Install transition fittings for plastic-to-metal pipe connections according to the following:
   1. Underground Piping:
   2. NPS 1-1/2 and Smaller: Plastic-to-metal transition fittings.
   3. NPS 2 and Larger: AWWA transition couplings.

3.04 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. PVC Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. PVC Pressure Piping: Join schedule number, ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
   3. PVC Nonpressure Piping: Join according to ASTM D 2855.

3.05 BACKFLOW PREVENTER

A. Existing backflow preventer.

B. The existing backflow prevention assemblies shall be inspected and tested, before use, in accordance with the applicable portions of the Washington Administrative Code and other applicable regulations as set forth by the Washington State Department of Health and the applicable jurisdiction. No water shall flow through the assembly until testing and inspection is approved by the Resident Engineer.

C. Inspections and tests shall be completed and the results recorded by a licensed Backflow Assembly Tester (BAT) Operator or by a Contracting Agency Certified Water Works Operator with a CCS-1 or CCS-2 Classification and shall document that the devices are in good operating condition prior to flushing and testing of any downstream water lines.

D. Installations shall be according to procedures outlined in the current edition of “Accepted Procedure and Practice in Cross-Connection Control Manual,” published by the Pacific Northwest Section, American Water Works Association.

3.06 VALVE INSTALLATION

A. Underground Curb Valves: Install in curb-valve casings with tops flush with grade.

B. Underground Iron Gate Valves, Resilient Seat: Comply with AWWA C600 and AWWA M44. Install in valve casing with top flush with grade.
   1. Install valves and PVC pipe with restrained, gasketed joints.

C. Remote Control Valves: Install in underground piping in boxes for automatic control valves.

D. Drain Valves: Install in underground piping in boxes for automatic control valves.

3.07 SPRINKLER INSTALLATION

A. Install sprinklers after hydrostatic test is completed.

B. Install sprinklers at manufacturer's recommended heights.

C. Locate part-circle sprinklers to maintain a minimum distance of 4 inches from walls and 2 inches from other boundaries unless otherwise indicated.

3.08 AUTOMATIC IRRIGATION-CONTROL SYSTEM INSTALLATION

A. Equipment Mounting: Install interior wall mounted controllers per drawings.

B. Install control cable in same trench as irrigation piping and at least 2 inches below or beside piping. Provide conductors of size not smaller than recommended by controller manufacturer. Install cable in separate sleeve under paved areas.

3.09 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment, valves, and devices to allow service and maintenance.

C. Connect wiring between controllers and automatic control valves, both existing and new valves.

3.10 IDENTIFICATION

A. Warning Tapes: Arrange for installation of continuous, underground, detectable warning tapes over underground piping during backfilling of trenches. See Section 31 20 00 "Earth Moving" for warning tapes.

3.11 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
   2. Tests and Inspections:
   3. Irrigation main line test: Contractor shall contact the landscape architect 48 hours in advance of main line testing and coordinate all tests with General Contractor. All tests shall be recorded and forwarded to the landscape architect.
   4. Main lines shall not lose more than 5 psi for the test duration.
   5. Testing: Hydrostatically test piping and valves before backfilling trenches. Piping may be tested in sections.
   6. Furnish necessary force pump and other test equipment.
   7. Cap and test piping with static water pressure of 50 psig (345 kPa) above system operating pressure and without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours.
   8. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
   9. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
   10. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Any irrigation product will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.12 STARTUP SERVICE

A. Perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Verify that controllers and sensors are installed and connected according to the Contract Documents.
   3. Verify that electrical wiring installation complies with manufacturer's submittal.

3.13 ADJUSTING

A. Adjust settings of controllers.

B. Adjust automatic control valves to provide flow rate at rated operating pressure required for each sprinkler circuit.

C. Adjust sprinklers and devices, except those intended to be mounted aboveground, so they will be flush with, or not more than 1/2 inch above, finish grade.

3.14 CLEANING

A. Flush dirt and debris from piping before installing sprinklers and other devices.

END OF SECTION

SECTION 32 91 13
SOIL PREPARATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes planting soils specified by composition of the mixes.

B. Related Requirements:
   1. Section 32 33 00 "Site Furnishings" for placing planting soil in exterior unit planters.
   2. Section 31 10 00 "Site Clearing" for topsoil stripping and stockpiling.
   3. Section 32 92 00 "Turf and Grasses" for placing planting soil for turf and grasses.
   4. Section 32 93 00 "Plants" for placing planting soil for plantings.
   5. Section 33 41 00 “Storm Utility Drainage Piping” for Bioretention soils.

1.03 DEFINITIONS

A. AAPFCO: Association of American Plant Food Control Officials.

B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.

C. CEC: Cation exchange capacity.

D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.

E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.

F. Imported Soil: Soil that is transported to Project site for use.

G. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.

H. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

I. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.

J. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."

K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

L. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.

M. SSSA: Soil Science Society of America.

N. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

O. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

P. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

Q. USCC: U.S. Composting Council.

1.04 REFERENCE STANDARDS

A. BMP T5.13: Post-Construction Soil Quality and Depth
   1. Guidelines and resources for implementing Post-Construction Soil Quality and Depth BMP T5.13, in WDOE Stormwater Management Manual for Western Washington, 2018 Edition

1.05 ACTION SUBMITTALS

A. Comply with requirements of Section 01 33 00.

B. Product Data: For each type of product.
   1. Include test data substantiating that products comply with requirements.
   2. Include sieve analyses for aggregate materials.

C. Submit guaranteed analysis of fertilizer mixes and product certificates signed by product manufacturer.

D. Samples: For each bulk-supplied material, 1-quart volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

1.06 TESTING REQUIREMENTS

A. General: Perform tests on soil samples according to requirements in this article.

B. Physical Testing:
   1. Soil Texture: Soil-particle and size-distribution analysis using the sieving method.
      a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.

C. Chemical Testing:
   1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
   2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1- Physical and Mineralogical Methods."
   3. Metals Hazardous to Human Health: Test for presence and quantities of RCRA metals including aluminum, arsenic, barium, copper, cadmium, chromium, cobalt, lead, lithium, and vanadium. If RCRA metals are present, include recommendations for corrective action.
   4. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.

D. Fertility Testing: Soil-fertility analysis according to standard laboratory protocol of SSSA NAPT WERA-103, including the following:
   1. Percentage of organic matter.
   2. CEC, calcium percent of CEC, and magnesium percent of CEC.
   3. Soil reaction (acidity/alkalinity pH value).
   4. Buffered acidity or alkalinity.
   5. Nitrogen ppm.
   6. Phosphorous ppm.
   7. Potassium ppm.
   8. Manganese ppm.
   9. Manganese-availability ppm.

10. Zinc ppm.
11. Zinc availability ppm.
12. Copper ppm.
13. Sodium ppm
14. Soluble-salts ppm.
15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
16. Other deleterious materials, including their characteristics and content of each.

E. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."

F. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.
1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. for 6-inch depth of soil.
2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. for 6-inch depth of soil.

1.07 QUALITY ASSURANCE

A. Soil-Testing Laboratory Qualification:

B. An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.

B. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways, and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Do not move or handle materials when they are wet or frozen.
4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

1.09 SCHEDULING

A. Schedule and coordinate soil preparation work with installation of other site improvements.

1.10 HERBICIDE APPLICATION & QUALIFICATIONS

A. Applications of herbicides for weed control as may be required shall be made only by an applicator licensed under Washington State Law and as accepted by the Landscape Architect.

B. Provide protective cover and barriers as necessary to prevent damage and staining to all site improvement and off-site structures, facilities, and property.

C. Contractor shall comply with current state law and notify Owner with the required notification prior to all herbicide or pesticide applications. Pesticides and herbicides will be limited to those approved by the City of Kirkland.

PART 2 PRODUCTS

2.01 MATERIALS

A. Soil Type A – 60/40 Lawn Mix
   1. Provide “60/40 Lawn Mix” from Cedar Grove Composting, Seattle, Washington, existing onsite topsoil amended to meet requirements, or approved equal.
   2. Import Topsoil for Planting Areas:

B. Topsoil shall be sand as defined by the USDA, with 4 to 10 percent organic matter; 60 percent sandy loam, 40 percent composted mulch.
   1. Sand shall meet 3/8-inch sieve size, 100% passing, and of phyto-toxic materials and viable seeds, rhizomes, or roots of state-listed noxious weeds.
   2. Compost shall meet requirements of Article 2.03.A.

C. pH range between 6 and 7.5.

D. Import Topsoil Source:
   1. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agriculture land, bogs, or marshes. Topsoil shall be free of invasive weeds.
   2. Import topsoil shall be free of roots, plants, sod, clay lumps, and stones ½ inch or larger in any dimension, and other extraneous materials harmful to plant growth.

2.02 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
   1. Class: T, with a minimum of 99 percent passing through a No. 8 sieve and a minimum of
   2. Provide lime in the form of dolomitic limestone.

B. Aluminum Sulfate: Commercial grade, unadulterated.

C. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

2.03 ORGANIC SOIL AMENDMENTS

A. Provide “Cedar Grove Compost” from Cedar Grove Composting, Seattle, Washington, or approved equal.

B. Compost:
   1. Shall be certified in compliance with U.S. Composting Seal of Testing Assurance (STA) program.
   2. Shall have an organic matter content of 40 to 60 percent.
   3. Shall have a carbon to nitrogen ratio less than 25:1.
   4. Feedstock shall originate from locally recycling collection programs and contain a minimum of 10% post-consumer foot waster as defined in WAC 173-550.

2.04 WATER

A. Shall be suitable for irrigation, free from oil, acid, alkali, salt, or other subraces harmful to plant life.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine the entire site for conditions that will adversely affect execution, permanence, and quality of work, and survival of plant materials.

3.02 PREPARATION OF SUBGRADE SURFACES

A. Locate and securely mark or flag all area drains, catch basins, and clean-outs.

B. In all areas shown in the Plans to receive soil preparation, the Contractor shall excavate existing soils to the depths required that will allow for the addition of imported topsoil and mulch as specified below. Contractor shall be responsible for clearing and disposing of all miscellaneous debris in planting and seeding areas prior to adding topsoil, including lumber, sticks, mortar, concrete, rubbish, contaminated soil, and all stones over 1 inch in diameter.

C. Before tilling or adding imported topsoil, Contractor shall remove or spray the subgrade as needed to eradicate noxious weed growth and roots from the subgrade, including, but not limited to, Johnson grass, Quackgrass, Morning glory, Nutgrass, Rushgrass, Canadian Thistle, Poison Oak, Poison Ivy, Scotch broom, and Himalayan blackberry. Contractor shall be responsible to coordinate herbicide application with a licensed herbicide applicator.

D. After debris and weed removal, scarify or till existing subgrade surfaces in two directions to 8 inches depth. Entire surface should be disturbed by scarification. Tilling with a backhoe bucket is not an acceptable method. Remove all stones larger than 1 inch in any dimension, and sticks, roots, rubbish, and other extraneous matter, and legally dispose of them off Owner's property. Do not till if subgrade is frozen, muddy, or excessively wet. Do not scarify within drip line of trees to be retained.

3.03 SOIL PREPARATION – SOIL TYPE A

A. Depth: See plan.

B. Unless otherwise noted on plan, after existing subgrade surfaces have been scarified or tilled as specified, place 4-inch depth of prepared, imported topsoil in the locations shown on the Plans, and till 8 inches minimum depth into scarified subgrade. Tilling with a backhoe bucket is not an acceptable method. Do not till if subgrade is frozen, muddy, or excessively wet.

C. Place remaining depth of prepared topsoil, or more if required to bring soil level to finish grade elevations after lightly rolling and natural settling. Do not spread if soils are frozen, muddy, or excessively wet.

3.04 FINE FINISH GRADES

A. Establish fine finish grades with even slopes between elevations indicated in Drawings. Previously established grades shall be maintained on the areas to be treated in a true and even condition; necessary repairs shall be made to previously graded areas. Where grades have not been established, the areas shall be graded as shown, and all surfaces shall be left in an even and properly compacted condition (85 percent proctor density) to prevent formation of depressions.

B. Finished grade shall be such that after subsequent treatment, i.e., planting and wood-mulch application, the planted grade will be 1/2 inch below adjoining surfaces, such as walks, steps, drives, parking lots, concrete curbs, and mow strips, unless otherwise indicated by the drawings.

3.05 CLEAN-UP

A. Keep project site free from accumulation of debris, topsoil, soil amendments, and other materials.

B. Remove topsoil from cement, concrete, and asphalt paving on a daily basis.

C. Maintain pavement in a clean condition by sweeping, raking, vacuuming, and/or hosing down. This material shall be removed from the site or placed into the plant bed if appropriate. All efforts shall be made to guarantee that catch basins, inlets, and area drains are kept clean of this debris.

D. At completion of each area of work, remove debris, equipment, and surplus materials.

END OF SECTION

SECTION 32 92 00
TURF AND GRASSES

PART 1 GENERAL

1.01 SUMMARY

A. Scope of Work:
   1. This section describes the preparation, amendments and seeding and or sodding of the areas as shown on the plans.
   2. The surfaces must be established and stabilized to finish grade and approved by the Landscape Architect, prior to commencing with seeding the process.
   3. The Contractor shall maintain the turf areas until the Owner's representative or Landscape Architect accepts the project as satisfactory.

B. Section Includes:
   1. Hydroseeding.
   2. Turf renovation.

C. Related Work:
   1. Section 31 25 13 "Erosion Control" for erosion control requirements of turf areas on steep slopes.
   2. Section 32 84 00 "Planting Irrigation" for turf grass area irrigation.
   3. Section 32 91 13 "Soil Preparation" for turf grass soil mix, amendments, and placement requirements.
   4. Section 32 93 00 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.

1.02 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil, prior to seeding. For sod placement, finished grade is the elevation of the top of sod soil. See details for exceptions adjacent to paving for drainage.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 32 91 13 "Soil Preparation" and drawing designations for planting soils.

E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

F. Planting Substantial Completion: Seeded and sodded areas have been reviewed and approved by landscape architect and found to meet requirements.

G. Lawn Substantial Completion: Seed has germinated, and grass has reached height of at least 2 inches and is ready for first mow. Lawns have been reviewed and approved by Landscape Architect and found to meet requirements.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

B. Agenda Items:
   1. Review of soil elevation, fine grading, and preparation.
   2. Irrigation installation completion and coverage.

3. Weather conditions.
4. Sod storage.

1.04 SUBMITTALS

A. Qualification Data: For landscape Installer clearly indicating the information required in the Quality Assurance section.

B. Product Data Submittals: For each product, seed mix, or sod type indicated prior to ordering.
   1. Include quantities, sizes, quality, and verified sources of materials.
   2. Include seed species and ratios.
   3. Substitutions shall be made in accordance with Division 01 specifications.

C. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
   1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.

D. Product Certificates: For fertilizers, from manufacturer.

E. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

F. Contractor Maintenance Schedule: Dates and tasks to be performed for maintenance through Lawn Substantial Completion per specification requirements.

G. Delivery invoices, showing quantities received at the site.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance period.
   1. Include product data sheets in manual, along with maintenance instructions and parts lists for those products.

B. Maintenance Report: Confirmation that scheduled maintenance visits were performed, with notes on challenges encountered. Reports to be provided to landscape architect and owner’s representative every month of maintenance period.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
   1. Pesticide Applicator: State licensed, commercial, and familiar with EPA standards if pesticide application is necessary on project.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable. Damaged packages will not be accepted.
   1. Seed shall be stored under cool and dry conditions so that endophytic seed in the mixture is capable of maintaining a high level of endophytes.

B. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways, and pavements, or on existing turf areas or plants.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
   3. Accompany each delivery of bulk materials with appropriate certificates.

C. Deliver fertilizer in sealed waterproof bags, printed with manufacturer's name, weight, and guaranteed analysis.

1.08 FIELD CONDITIONS

A. Planting Restrictions: Plant seed during the following period. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
   1. From March 15 to October 15 or as approved by owner’s representative. All seeding must be complete prior to project substantial completion date.
   2. Seeding and sodding may only be done after the irrigation system is installed and operational.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained, unless approved by owner’s representative. Apply products during favorable weather conditions according to manufacturer's written instructions. Do not plant during the following conditions unless approved.
   1. Cold weather: when ambient temperature is below 40 degrees F.
      a. For grass seed: when soil temperature is less than 50 degrees F.
   2. Hot weather: when temperature exceeds 90 degrees F.
   3. Windy weather: for seed when wind velocity exceeds 30 mph.
   4. Observe any additional limitations noted by manufacturer.

C. Soil Conditions- Proceed with planting only when existing soil conditions permit planting to be performed when beneficial and optimum results may be obtained, unless approved by owner’s representative. Do not plant during the following conditions unless approved.
   1. When soil is saturated.
   2. When soil is frozen.
   3. For grass seed: when soil temperature is above 65 degrees F.

PART 2 PRODUCTS

2.01 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species:
   1. Seed Law – All seeds shall conform to the requirements of the Washington State Seed Law and, where applicable, the Federal Seed Act.
   2. Noxious Weed Seed – All seed shall be free of seeds listed as primary noxious by the Washington State Seed Law. Seeds shall not contain seeds of weeds listed as secondary noxious by the Washington State Seed Law, singly or collectively, in excess of the labeling tolerance specified by the Washington State Seed Law.
   3. Rejection – When seeds furnished under this Specification fail to meet the requirements within tolerance as provided by the Washington State Seed Law, the lot shall be rejected.
   4. Preparation for Delivery – Seeds shall be packed in clean, dry, solid containers of uniform weight. Seed shall be labeled as required by law.

C. Seed Species:
   1. Western Washington Shade Mix:
      a. 60% Perennial Ryegrass.
      b. 40% Fine Fescue.
   2. Seeding rate: 5-7 lbs per 1,000 sq. ft.

2.02 FERTILIZERS

A. General: Use to be pre-approved by Owner before application.

B. Submittal: Provide product data prior to application.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
   1. Composition:
      a. 1 lb/1,000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
      b. 10 lbs/1,000 sq. ft. of a 10-20-10 or similar starter fertilizer. Apply uniformly to prevent burning seed and/or sod.
      c. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
   1. Composition:
      a. 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
      b. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.03 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
   1. Nutrient value, guaranteed minimum analysis:
      a. Compost: 1.10-0.40-1.10.
      b. Total Nitrogen (N): 1.10%.
      c. 1.10% Water Insoluble Organic Nitrogen.*
      d. Available Phosphate (P2O5): 0.40%.
      e. Soluble Potash (K2O): 1.10%.
      f. Calcium (Ca): 0.58%.
      g. *1.10% Slowly available nitrogen derived from compost.
      h. Derived from: Pure Compost. No additives.
      i. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

C. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

D. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors. Acceptable materials include:
   1. Guar.
   2. Plantago/Psyllium.
   3. Starch.
   4. Anionic Polyacrylamide (PAM)

2.04 PESTICIDES

A. General: Use to be pre-approved by Owner before application.

B. Submittal: If requesting use, pesticide treatment plan to be developed based on observed weeds and King County Noxious Weed Control Board Best Management Practices (BMPs), by an individual with a current pesticide applicator license.

C. Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
   1. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
   2. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
   1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
   2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
   3. Uniformly moisten excessively dry soil that is not workable or that is dusty.

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

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.02 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
   1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
   2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.03 TURF AREA PREPARATION

A. General: Prepare planting area for soil placement and mix planting soil according to Section 32 91 13 "Soil Preparation."

B. Placing Planting Soil: Place and mix planting soil in place over exposed and scarified subgrade.
   1. Reduce elevation of planting soil to allow for soil thickness of sod roll, so top of soil after sod is placed is at finished grade. Maintain full required topsoil depth.

C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

D. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.04 HYDROSEEDING

A. Hydroseeding: Mix specified seed, commercial starter fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
   1. Mix slurry with tackifier.
   2. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1,500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3.05 PROTECTING NEWLY PLANTED AREAS

A. Protect seeded and hydroseeded areas with slopes:
   1. For areas with slopes between 1:4 with erosion-control blankets and 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.

B. Protect seeded and hydroseeded areas with erosion-control mats where indicated on Drawings; install and anchor according to manufacturer's written instructions.

C. Protect seeded and hydroseeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by blower, or other suitable equipment.
   1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
   2. Bond straw mulch by spraying with asphalt emulsion at a rate of 10 to 13 gal./1,000 sq. ft. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.

D. Protect seeded and hydroseeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, blow in mulch uniformly to a thickness of 3/16 inch, and lightly water area to compact newly installed layer.

E. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from pedestrian and vehicular traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

F. Remove nondegradable erosion-control measures after grass establishment period.

3.06 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
   1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
   2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
   3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
   1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
   2. Water turf with fine spray at a minimum rate of 2 inches per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

D. Mow to a uniform height between 3 and 4 inches.

E. Turf Postfertilization: Apply slow-release fertilizer after initial mowing and when grass is dry.
   1. Use fertilizer that provides actual nitrogen of at least 1 lb/1,000 sq. ft. or as recommended by fertilizer manufacturer, whichever is greater to turf area.

3.07 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:
   1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
   2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.08 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.09 CLEANUP

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

3.10 MAINTENANCE SERVICE

A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Schedule maintenance hand off and site review walk with facility maintenance staff for end of maintenance period.

3.11 LANDSCAPE MANAGEMENT SCHEDULE EXAMPLES

A. Contractor Landscape Management Schedule Example

Fertilization (if applicable): indicate frequency, and N-P-K content:				
☐ Weekly	☐ Bi-weekly	☐ Monthly	☒ Bi-Monthly	☐ Other
Nitrogen: 15	Phosphorus: 15	Potassium: 15		

Weed Control: indicate frequency, mode of action or trade name:				
☐ Weekly	☐ Bi-weekly	☒ Monthly	☐ Bi-Monthly	☐ Other
Mode of Action: Hand		Trade / Common Name:		

Mowing by Month												
Frequency	J	F	M	A	M	J	J	A	S	O	N	D
	-	-	2	2	4	4	3	3	4	2	-	-

B. Owner Landscape Management Schedule Example

Monthly Maintenance

January

- Mulch-mow all turf areas once per month. (Use mulching mower that chops clippings finely and blows mulch down into turf to decompose and feed soil.)

February

- Apply granular fertilizer per manufacturer recommendations around Strawberry Trees in late February until trees have grown together. Make application prior to a moderate rainfall so the rain will wash the fertilizer in. Do not fertilize planter areas. (See “Fertilization” section C.3 for recommended products.)
- Mulch-mow all turf areas once per month.
- Add new mulch to shrub and tree areas where the mulch depth has been reduced to less than 2 inches (5 cm) thick. Bring depth up to 3”. Pull mulch away from plant stems and remove from leaves. Mulch not required where shrubs or groundcover completely hide the soil surface from view.
- Starting in 2022, evaluate dogwoods. If stem color is matured to a dull brown or branches are over 3’ in height, cut back to 6” height.
- Rake or groom ornamental grasses, sedges and liriope to remove dead leaves on plants maintaining growth through the winter. Cut back grasses, sedges and liriope to 3”-4” that have not maintained growth over the winter or need a refresh.

March

- Mulch-mow all turf areas twice per month.
- Spot treat and/or physically remove new weed growth at least monthly during active growing seasons. Apply all pesticides per manufacturers’ recommendations.
- Flush out irrigation systems as needed, run and check for proper operation of each valve zone. Test sensors (rain, soil, or weather sensors).
- Clean or replace inoperable sprinkler nozzles.
- Replace irrigation controller program back-up batteries.
- Evaluate Lavenders. For plants that are leggy or woody or have a gap in the center, cut out up to 1/3 of mature branches to encourage new growth. If multiple plants are leggy consider starting lavender replacement (see year 8). For plants that are shapely, cut back 1/3 or to about the third node beyond the woody section of the stem. Do not cut back all the way to the woody section; the plant does not sprout well when cut back that far.

April

- Mulch-mow all turf areas weekly. Maintain clean bed edges.
- Spot treat and/or physically remove new weed growth in native shrub area at least monthly during active growing seasons. Apply all pesticides per manufacturers’ recommendations.
- Fertilize lawn and Strawberry Tree areas until Strawberry Tree hedge has grown together. Written authorization from the owner's representative is required before the fertilization may be eliminated from the required work.

- Add new mulch to planters where the mulch depth has been reduced to less than 2 inches (5 cm) thick. Bring mulch depth up to 3". Mulch not required where shrubs or groundcover completely hide the soil surface from view.

May

- Mulch-mow all turf areas weekly.
- Spot treat and/or physically remove new weed growth at least monthly during active growing seasons. Apply all pesticides per manufacturers' recommendations.
- Submit receipts to owner's authorized representative as proof of fertilizer purchase.
- Turn on irrigation system, run, and visually inspect for proper zone coverage. Set ET-based, weather- or soil sensor-based, or seasonal programs to adjust irrigation up in July through August, and down for May through June and September. Adjust as required to prevent wilting in Dogwood.

June

- Mulch-mow all turf areas weekly.
- Spot treat and/or physically remove new weed growth at least monthly during active growing seasons. Apply all pesticides per manufacturers' recommendations.
- Prune perennial bulbs back to ground level as soon as leaf blades yellow and wilt (June through October, depending on bulb type).

July

- Mulch-mow all turf areas weekly.
- Spot treat and/or physically remove new weed growth at least monthly during active growing seasons. Apply all pesticides per manufacturers' recommendations.

August

- Mulch-mow all turf areas weekly.
- Spot treat and/or physically remove new weed growth at least monthly during active growing seasons. Apply all pesticides per manufacturers' recommendations.
- Shortly after Lavender have finished blooming, cut off bloom stems to half their length.

September

- Review planters and entry monument for damage and graffiti.
- Mulch-mow all turf areas weekly.
- Fertilize lawn and Strawberry Tree hedge in September or early October until strawberry trees have grown together. Written authorization from the owner's representative is required before the fertilization may be eliminated from the required work.
- Inventory all plant materials. Inventory shall include an exact count of all shrubs and trees, itemized by planter. Replace any dead or missing plants subject to the terms of these specifications.
- Prune perennial bulbs back to ground level as soon as leaf blades yellow and wilt (from June through October, depending on bulb type). Maintain 3 inches of mulch on ground surface over bulbs to insulate from cold and prevent winter weed growth.

- Spot treat and/or physically remove new weed growth at least monthly during active growing seasons. Apply all pesticides per manufacturers' recommendations.

October

- Mulch-mow all turf areas twice per month.
- Spot treat and/or physically remove new weed growth at least monthly during active growing seasons. Apply all pesticides per manufacturers' recommendations.
- Have backflow preventer (on irrigation water supply) tested annually by approved plumbing technician.
- Turn off and prepare irrigation system for winter. Make sure backflow preventer is well insulated or drained prior to first freeze. Blow out pipes using compressed air in areas where freezing could result in breakage. Any winter damage to irrigation system due to insufficient winterization shall be the responsibility of the contractor to repair.
- Add new mulch to planters and swale where the mulch depth has been reduced to less than 2 inches (5 cm) thick. Mulch additions are not required where shrubs or groundcover completely hide the soil surface from view.

November

- Mulch-mow all turf areas twice per month.

December

- Mulch-mow all turf areas once per month.
- Prune any tree branches that interfere with public safety. Prune all parking lot and street trees yearly as needed to remove dead and crossing branches and to encourage spreading and upward growth that fits the available space. Do not top trees.
- Prune summer and fall-blooming shrubs as needed to maintain proper shape.

END OF SECTION

SECTION 32 93 00
PLANTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Plant materials.
   2. Fertilizers.
   3. Mulches.
   4. Tree-stabilization materials.
   5. Tree-watering devices.

B. Related Requirements:
   1. Section 01 56 39 "Temporary Tree and Plant Protection."
   2. Section 32 84 00 "Planting Irrigation."
   3. Section 32 91 13 “Soil Preparation.”
   4. Section 32 92 00 "Turf and Grasses."

1.03 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil, prior to seeding. For sod placement, finished grade is the elevation of the top of sod soil. See details for exceptions adjacent to paving for drainage.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 32 91 13 "Soil Preparation" and drawing designations for planting soils.

E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

F. Planting Substantial Completion: planting has been reviewed and accepted by Landscape Architect as mostly complete.

G. Lawn Substantial Completion: Seed has germinated and grass has reached height of at least 2 inches and is ready for first mow. Lawns have been reviewed and approved by landscape architect and found to meet requirements.

1.04 SUBMITTALS

A. Product Data:
   1. Plant materials.
   2. Fertilizers.
   3. Mulches.

4. Tree-stabilization materials.
5. Tree-watering devices.

B. Product Data Submittals: For each product.
1. Plant Materials: Include quantities, sizes, quality, and verified sources for plant materials.

C. Samples for Verification: Actual sample of finished products for each of the following:
1. Organic Mulch: **1-quart**volume of each organic mulch required; typical of the lot of material to be furnished, in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Provide an accurate representation of color, texture, and organic makeup.

D. Field Quality-Control Reports: Percolation tests for tree pits. Include the following:
1. Tree identification number matching the plans.
2. Date of test.
3. Time when water was added to tree pit to start percolation test.
4. Time with photo documentation showing increments of testing with water level in tree pit.
5. Identification of tester.

E. Source(s) of planting material per Planting Schedule.

F. Qualification Data: For landscape Installer clearly indicating the information required in the Quality Assurance section.

G. Product Certificates: For each type of manufactured product, from manufacturer, and complying with manufacturer's certified analysis of standard products.

H. Pesticides and Herbicides: Product label and manufacturer's written application instructions specific to Project.

I. Contractor Maintenance Schedule: Dates and tasks to be performed for maintenance through Plant Substantial Completion per specification requirements.

J. Delivery invoices, showing quantities received at the site.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance period.
1. Include product data sheets in manual, along with maintenance instructions and parts lists for those products.

B. Maintenance Report: Confirmation that scheduled maintenance visits were performed, with notes on challenges encountered. Reports to be provided to landscape architect and owner’s representative every month of maintenance period.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

C. Measurements: Measure in accordance with ANSI Z60.1. Do not prune to obtain the required sizes.

D. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Architect/Owner of sources of planting materials **seven** days in advance of delivery to site.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, or walkways and pavements, or on existing turf areas or plants.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

3. Accompany each delivery of bulk materials with appropriate certificates.

C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

D. Handle planting stock by root ball.

E. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

G. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two hours. Reject plants with dry roots.

2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.

3. Do not remove container-grown stock from containers before time of planting.

4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.08 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, underground irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Planting Restrictions: Plant during one of the following periods unless otherwise approved by the Landscape Architect. Coordinate planting periods with maintenance periods to provide required maintenance from the date of Substantial Completion.

1. Western Washington: September 15 - May 30.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions in accordance with manufacturer's written instructions and warranty requirements.

D. Soil Conditions: Proceed with planting only when existing soil conditions permit planting to be performed when beneficial and optimum results may be obtained, unless approved by owner's representative. Do not plant during the following conditions unless approved.

1. When soil is saturated.
2. When soil is frozen.

1.09 WARRANTY

A. Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
    b. Structural failures, including plantings falling or blowing over.
2. Warranty Period: One year from the date of Planting Substantial Completion.
3. Include the following remedial actions as a minimum:
    a. Work with Landscape Architect to determine cause of plant failure and consider whether a different species or other corrections will be required to prevent additional failures.
    b. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
    c. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
    d. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
    e. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 PRODUCTS

2.01 PLANT MATERIALS

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; with tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); with crossing trunks; with cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable.
2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare in accordance with ANSI Z60.1.

D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for plant.

2.02 FERTILIZERS

A. General: Use to be pre-approved by Owner before application.

B. Submittal: Provide product data prior to application.

C. Granular Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition:

a. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

D. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and maximum of 5.5 percent inert material.

2.03 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of:

1. Wood Chips from an arborist chipping operation with less than 20% by volume green leaves. Chips stockpiled from the tree removal process may be used.

2. Size Range: 3 inches maximum, 1/2 inch minimum.

2.04 TREE-STABILIZATION MATERIALS

A. Trunk-Stabilization Materials:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.

2. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or **turnbuckles**.

3. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.

4. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.

2.05 TREE-WATERING DEVICES

A. Slow-Release Watering Device: Standard product manufactured for drip irrigation of plants and emptying its water contents over **an extended time period** manufactured from UV-light-stabilized nylon-reinforced polyethylene sheet, or HDPE plastic.

1. Color: **green**

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
3. Suspend planting operations during periods of excessive soil moisture until moisture content reaches acceptable levels to attain required results.
4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove soil and contamination as directed by Architect and replace with new planting soil.

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

3.02 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

3.03 PLANTING AREA ESTABLISHMENT

A. General: Prepare planting area for soil placement and mix planting soil in accordance with **Section 329113 "Soil Preparation."**.

B. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

C. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at application rate **in accordance with manufacturer's written instructions**.

3.04 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits.

1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
2. Excavate approximately three times as wide as ball diameter for **balled and burlapped** stock.
3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
4. Do not excavate deeper than depth of root ball, measured from the root flare to the bottom of root ball.
5. If area under the plant was initially dug too deep, add soil to raise it to correct level and thoroughly tamp the added soil to prevent settling.

6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
7. Maintain supervision of excavations during working hours.

B. Backfill Soil: Subsoil and topsoil removed from excavations may be used as backfill soil unless otherwise indicated.

C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.05 TREE, SHRUB, AND VINE PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Do not apply pruning paint to wounds.

3.06 INSTALLATION OF TREE-STABILIZATION MATERIALS

A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:

1. Upright Staking and Tying:
   a. Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend one-third of trunk height Minimum of 60 inches above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
   b. Stake trees with two stakes for trees up to 12 ft. high and 2-1/2 inches or less in caliper; three stakes for trees less than 14 ft. high and up to 4 inches in caliper. Space stakes equally around trees.
2. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree. Leave at least 3” of space at loop around trunk to prevent girdling.

3.07 INSTALLATION OF MULCHES

A. Mulch backfilled surfaces of planting areas and other areas indicated.

3.08 INSTALLATION OF TREE-WATERING DEVICES

A. Provide one device for each tree.

B. Place device on top of the mulch at base of tree stem and fill with water in accordance with manufacturer's written instructions.

3.09 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.

B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

D. Refill tree watering devices as required to maintain plant health. Remove when plant is established or rainfall supplies sufficient water, or as directed by manufacturer.

E. At end of maintenance period, pull all weeds, then top up mulch to 3-inch depth.

3.10 FIELD QUALITY CONTROL

A. Keep the following when there are concerns about drainage, for example with perched water tables or for winter installations when contractor may not follow saturated soil or tilling procedures.

B. Tests and Inspections:

1. Perform tree pit percolation tests.
2. Tree pit construction will be considered defective if it does not pass percolation tests and inspections.
3. Do not proceed with planting in tree pits until satisfactory percolation is demonstrated.

C. Prepare test and inspection reports.

3.11 REPAIR AND REPLACEMENT

A. Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Landscape Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Landscape Architect.

B. Remove and replace trees that are more than **25** percent dead or in unhealthy condition **before end of corrections period** or are damaged during construction operations that Landscape Architect determines are incapable of restoring to normal growth pattern.

3.12 CLEANING AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

D. After installation and before Planting **Substantial Completion** remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

END OF SECTION

SECTION 33 11 00
FACILITY WATER DISTRIBUTION PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. These specification supplement construction standards. In case of conflict, the City of Kirkland Standard Specifications shall govern.

1.02 SUMMARY

A. Section Includes:

1. Water-distribution piping and related components outside the building for water service.

B. Related Sections:

1. Division 31 Section 31 20 00 “Earth Moving” for trenching, bedding, and backfilling.
2. Division 31 Section 31 25 13 “Erosion Control” for temporary erosion control measures.

1.03 DEFINITIONS

A. PE: Polyethylene plastic.

1.04 REFERENCE STANDARDS

A. WSDOT Specification: Standard Specifications for Road, Bridge and Municipal Construction, prepared jointly by the Washington State Department of Transportation, and the American Public Works Association, Washington State Chapter, 2025 edition. All references to measurement and payment shall be deleted from consideration; and the terms agreed to in the contract substituted therefor.

B. City of Kirkland Standards and details.

C. American Water Works Association (AWWA) Standards.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Certification

1. Provide a letter, signed by the supplier and reviewed and also signed by an officer of the general contractor’s company, certifying that the following products to be incorporated into the work meet the requirements specified.
2. Products
    a. Pipe and Fittings

C. Record Drawings: At project closeout of installed water-service piping according to Division 01 Section 01 77 00 “Closeout Procedures,” Section 1.6 Project Record Documents.

D. Purging and Disinfecting Reports: As specified in “Cleaning” Article in Part 3.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

1.06 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
2. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. AC Pipe Certification Required: All persons working with or on Asbestos Cement (AC) pipe are required to have proof of certification for working with AC pipe as prescribed in WAS 296-62-07705 and follow OSHA, ISHA, and PSAPCO requirements.

C. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.08 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Do not proceed with interruption of water distribution service without Architect's and City of Kirkland's written permission.
2. Notify Architect and City of Kirkland no fewer than two days in advance of proposed interruption of service.

B. No water system work allowed on Fridays (or any day before a holiday or City closure day).

C. All water valves shall be operated only by City field crews.

D. For water emergencies such as a service or main break, first call Public Works Water Department at (425) 587-3900. Then, call your inspector.

E. Locate existing structures and piping to be closed and abandoned.

F. Prior to beginning the work, excavate, expose, and obtain the elevation of all connections to existing utilities. When discrepancy exists between the plans and existing conditions, the Contractor shall notify the architect and civil engineer immediately.

1.09 COORDINATION

A. Coordinate connection with City of Kirkland.

PART 2 PRODUCTS

2.01 PE PIPE AND FITTINGS

A. PE Service Line Pipe and Fittings: Conforming to AWWA C901, PE4710, ASTM D3035, ASTM D3350, and AWWA C104, with minimum pressure Class 250. Conform to WSDOT Specification 9-30.1(6).

B. Water Meter Service Installation per City of Kirkland Detail CK-W.19.

C. Water Meter Box per City of Kirkland Detail CK-W.22.

D. Individual Pressure Reducing Valve per City of Kirkland Detail CK-W.30.

PART 3 EXECUTION

3.01 EARTHWORK

A. Refer to Division 31 Section 31 20 00 "Earth Moving" for excavating, trenching, bedding, and backfilling.

3.02 PIPING APPLICATIONS

A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.

B. Install piping free of sags at indicated location and elevation. Ensure that minimum vertical clearance at 6 inches is provided where crossing other utilities.

C. Install components with pressure rating equal to or greater than system test pressure.

D. Install fittings for changes in direction and branch connections.

E. Pipe Separation: Minimum separation between utilities and structures is 5-feet horizontal and 18-inch vertical when in the right of way and/or public utility easement. Refer to Pre-Approved Plan notes for details.

3.03 VALVE APPLICATIONS

A. General Application: Use corporation valves and curb valves with ends compatible with piping.

B. Drawings indicate valve types to be used.

3.04 PIPING INSTALLATION

A. Service-Line Connection: Arrange with City of Kirkland and provide connection to existing service line as indicated on drawings.

B. Install PE pipe according to ASTM D 2774 and ASTM F 645.

C. Bury piping with depth of cover over top at least 36 inches.

D. Extend building water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at 5 feet from building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

E. Refer to Section 22 40 00 "Plumbing Fixtures" for potable-water piping inside the building.

F. Building Water Meter Installation Request: To request the 1½-inch water meter installation, call your Public Works inspection line to request a water service inspection and water meter installation to the new restroom building. Abandon existing water meter at the main per City of Kirkland Public Works Standards. The existing 2-inch irrigation water meter is to remain. If the water service passes inspection and is ready for a water meter installation, your inspector will schedule the water meter installation with the Water Department. Please allow 48 hours for installation once it has been approved.

3.05 JOINT CONSTRUCTION

A. Make pipe joints according to the following:

1. PE Piping Insert-Fitting Joints: Use plastic insert fittings and fasteners according to fitting manufacturer's written instructions.
2. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.06 VALVE INSTALLATION

A. Corporation Valves and Curb Valves: Install each underground pressure reducing valve with head pointed up and with service.

B. Provide concrete collar at valve box.

3.07 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water-distribution piping to existing water main as indicated on drawings.

C. Connect water-distribution piping to interior water piping.

3.08 FIELD QUALITY CONTROL

A. Piping Tests: Contractor to conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Contractor shall test at not less than one-and-one-half times working pressure for two hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

D. Conform to City of Kirkland requirements.

3.09 IDENTIFICATION

A. Install continuous underground warning tape during backfilling of trench for underground water-distribution piping. Locate 6 to 8 inches below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section 31 20 00 "Earth Moving."

3.10 CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
    a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
    b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
    c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.

d. Submit water samples in sterile bottles to Department of Health approved lab. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

C. Conform to City of Kirkland requirements.

END OF SECTION

SECTION 33 30 00
FACILITY SANITARY SEWERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Pipe and Fittings
2. Cleanouts

1.03 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

1.04 REFERENCE STANDARDS

A. Washington State Department of Transportation (WSDOT) Specification: Standard Specifications for Road, Bridge and Municipal Construction, prepared jointly by the Washington State Department of Transportation, and the American Public Works Association, Washington State Chapter, 2025 edition. All references to measurement and payment shall be deleted from consideration; and terms agreed to in the contract substituted therefor.

B. City of Kirkland Standards and details.

C. Division 26 - Electrical Specifications

1.05 SUBMITTALS

A. See Division 01 – General Requirements.

B. Product Data: For each type of product indicated.

C. Certification: Provide a letter, signed by the supplier and reviewed and also assigned by an officer of the general contractor’s company, certifying that the following products to be incorporated into the work meet the requirements specified.

1. Pipe and Gaskets
2. Cleanouts
3. Locate Wire

D. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

1.07 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Work to be completed includes abandoning the existing sewer line and new sanitary sewer connection.

B. Locate existing structures and piping. Abandon existing sewer line, provide new sewer connection.

C. Prior to beginning the work, excavate, expose, and obtain the elevation of all connections to existing utilities. When discrepancy exists between the plans and existing conditions, the Contractor shall notify the architect and civil engineer immediately.

D. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

E. Street Trees and Utility Structures: Street trees shall not be planted within 10 feet of any storm or sanitary sewer structure.

1.08 REGULATORY REQUIREMENTS

A. Conform to applicable codes for materials and installation of the Work of this section. Codes include, but are not limited to, the Uniform Plumbing Code (UPC).

B. Conform to OSHA (Occupational Safety and Health Act) and WISHA (Washington State Industrial Safety and Health Act) requirements for trench safety.

C. WSDOT Specification: Standard Specifications for Road, Bridge and Municipal Construction, prepared jointly by the Washington State Department of Transportation, and the American Public Works Association, Washington State Chapter, 2025 edition. All references to measurement and payment shall be deleted from consideration; and the terms agreed to in the contract substituted thereof.

D. Per Kirkland Zoning Code 115.25, Limit Construction activity to Monday through Friday, from 7:00 a.m. to 8:00 p.m. and Saturday 9:00 am to 6:00pm. No development work shall occur on Sundays or Holidays unless note otherwise.

1.09 PROJECT RECORD DOCUMENTS

A. Submit record drawings according to Division 01 Section 01 40 00 "Quality Requirements."

B. Drawings shall include surveyed invert elevations, rim elevations, and identify any discovery of uncharted utilities.

C. Conform to City of Kirkland requirements.

PART 2 PRODUCTS

2.01 PVC PIPE AND FITTINGS

A. PVC Type Sewer Piping:

1. Pipe: ASTM D 3034, SDR 35, PVC sewer pipe with bell-and-spigot ends for gasketed joints. Conform to WSDOT Specification 9-05.12(1).
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.
4. Conform to City of Kirkland standards.

2.02 CLEANOUTS

A. Cleanouts:

1. Conform to plan detail.

2.03 ACCESSORIES

A. Tracing Wire: Brightly colored No. 12 AWG insulated copper wire with plastic covering.

PART 3 EXECUTION

3.01 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section 31 20 00 "Earth Moving."

3.02 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

D. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of micro tunneling.

E. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at slope indicated.
2. Install piping with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.

F. Clear interior of piping of dirt and superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

G. Install gravity-flow piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

H. Extend sanitary sewerage piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

I. Pipe Separation: Minimum separation between utilities and structures is 5-feet horizontal and 18-inch vertical when in the right of way and/or public utility easement. Refer to Pre-Approved Plan notes for details.

J. Conform to City of Kirkland requirements.

3.03 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:

1. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

3.04 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade.

3.05 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Division 22 Section 22 13 16 "Sanitary Waste and Vent."

B. Make connections to existing piping.

1. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

C. Conform to City of Kirkland requirements.

3.06 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section 31 20 00 “Earth Moving.” Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

1. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.07 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:
    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours’ advance notice.
4. Submit separate report for each test to Owner and City of Kirkland inspector.
5. Test sanitary sewerage according to requirements of City of Kirkland.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified.

3.08 CLEANING

A. Clean dirt and superfluous material from interior of piping.

3.09 PROTECTION

A. Protect finished installation from any disturbance.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress. Damaged materials shall be replaced at the Contractor’s expense.

END OF SECTION

SECTION 33 41 00
STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Pipe and Fittings
   2. Nonpressure Transition Couplings
   3. Cleanouts
   4. Catch Basins/Manholes
   5. All temporary and permanent storm drainage piping, fittings, and accessories.
   6. Cleaning and flushing storm system at completion of project.

B. Related Sections
   1. Division 31 Section 31 20 00 “Earth Moving” for trenching, bedding, and backfilling.
   2. Division 31 Section 31 25 13 “Erosion Control” for temporary erosion control measures.

1.03 DEFINITIONS

A. CPEP: Corrugated polyethylene plastic pipe.

B. PVC: Polyvinyl chloride plastic pipe.

C. DIP: Ductile iron pipe.

1.04 SUBMITTALS

A. See Division 01 – General Requirements.

B. Product Data: For each type of product indicated.

C. Shop Drawings:
   1. Manholes and Catch Basins: Include plans, elevations, sections, details, frames, and covers.

D. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

E. Certification:
   1. Provide a letter, signed by the supplier and reviewed, and also signed by an officer of the Contractor’s company, certifying that the following products to be incorporated into the work meet the requirements specified.
   2. Products:
      a. Catch Basins, Grates, and Frames
      b. Pipe
      c. Cleanouts

F. Record drawings according to Division 01 Section 01 40 00 “Quality Requirements.”

G. Television Inspection Report: Prepared by a firm licensed to perform such analysis, submitted to Architect minimum of 14-days before final surfacing construction is scheduled.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle catch basins and manholes according to manufacturer's written rigging instructions.

1.06 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Field verify all connection points of existing facilities and contact Architect if proposed improvement cannot be provided.

B. Locate existing structures and piping to be closed and abandoned.

C. Drainage shall not be allowed to be discharged from the site without first meeting turbidity limitations of the NPDES permit. Provide temporary plugs in storm system for this purpose.

D. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

E. Street Trees and Utility Structures: Street trees shall not be planted within 10 feet of any storm or sanitary sewer structure.

1.07 REFERENCE STANDARDS

A. WSDOT Specification: Standard Specifications for Road, Bridge and Municipal Construction, prepared jointly by the Washington State Department of Transportation, and the American Public Works Association, Washington State Chapter, 2025 edition. All references to measurement and payment shall be deleted from consideration, and terms agreed to in the contract substituted therefor.

B. WSDOT Standard Plan: Standard Plans for Road and Bridge Construction, prepared by Washington State Department of Transportation, current issue in effect at bid date.

C. Washington State Department of Ecology 2019 Stormwater Management Manual for Western Washington.

D. City of Kirkland Standards and details.

1.08 REGULATORY REQUIREMENTS

A. Conform to Washington State Department of Labor and Industries requirements for entry to "Confined Spaces."

B. Per Kirkland Zoning Code 115.25, Limit Construction activity to Monday through Friday, from 7:00 a.m. to 8:00 p.m. and Saturday 9:00 am to 6:00pm. No development work shall occur on Sundays or Holidays unless note otherwise.

PART 2 PRODUCTS

2.01 PVC PIPE AND FITTINGS

A. PVC Gravity Sewer Piping:

1. Pipe: ASTM D 3034, SDR 35, PVC sewer pipe with bell-and-spigot ends for gasketed joints. Conform to WSDOT Specification 9-05.12(1).
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

2.02 DUCTILE IRON PIPE AND FITTINGS

A. Pipe: ASTM A 716, for push on joints. Conform to WSDOT Specification 9.05.13.

B. Standard Fittings: AWWA C110, ductile or gray iron, for push on joints.

C. Compact Fittings: AWWA C153, for push on joint.

D. Gaskets: AWWA C111, rubber.

2.03 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

2.04 CLEANOUTS

A. Cleanouts: Conform to detail on plans.

2.05 CATCH BASINS

A. Precast Concrete Catch Basins: Conform to detail on Plans.

B. Herringbone Grate: Conform to details on the plans and WSDOT Standard Plan, Section B-30.50-03.

2.06 PIPE ACCESSORIES

A. Pipe Joints: Gasket for positive seal for all non-perforated pipe.

B. Fittings: Prefabricated from the same material as pipe molded or formed to suit pipe size and end design, or as per manufacturer, in required tee, bends, elbows, cleanouts, reducers, traps, and other configurations as required.

C. Corrugated Pipe Joints: All welds shall develop the full strength of the parent metal.

1. Corrugated metal pipe bands shall be made of same material as pipe and comply with AASHTO M196. Bands shall have same size and shape corrugations of pipe with thickness complying with WSDOT Specification 9-05.

PART 3 EXECUTION

3.01 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section 31 20 00 “Earth Moving.”

B. Surface Water Adjustment: Soil Amendment per Pre-Approved Plan E.12 is required for all landscaped areas.

3.02 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer’s written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer’s written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes or catch basins for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of micro tunneling.

F. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.
2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
3. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
4. Install corrugated aluminum piping according to ASTM B 788/B 788M.
5. Install PE corrugated sewer piping according to ASTM D 2321.
6. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

G. Pipe Separation: Minimum separation between utilities and structures is 5-feet horizontal and 18-inch vertical when in the right of way and/or public utility easement. Refer to Pre-Approved Plan notes for details.

H. Roof Drainage shall be Separate from Footing Drains When roof and downspout drains are connected to the public storm system, the onsite private storm must be tight lined separately from the foundation footing drains. All pipe material must be PVC gravity storm-sewer pipe meeting the requirements of ASTM D-3034, from the building to the stub or connection.

3.03 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
2. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
3. Join corrugated aluminum sewer piping according to ASTM B 788/B 788M.
4. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
5. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
6. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.04 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade.

1. Conform to detail.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, conform to detail.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.05 CATCH BASIN INSTALLATION

A. Installation shall conform to WSDOT Specification Division 7.

B. Construct catch basins to sizes and shapes indicated.

C. Set frames and grates to elevations indicated.

D. No ponding shall occur within 10 feet of a catch basin.

3.06 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed.

B. Abandoned Structures: Excavate around structure as required.

3.07 CONNECTIONS

A. Make connections to existing piping and underground manholes.

1. Conform to City of Kirkland requirements.

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used unless otherwise indicated.

3.08 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section 31 20 00 “Earth Moving.” Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

3.09 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.

B. Inspect interior of conveyance piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill are in place, and again at completion of Project.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

D. Leaks and loss in test pressure constitute defects that must be repaired.

E. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified.

F. Provide repairs determined in the video inspection at the Contractor’s expense.

3.10 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

B. Where indicated, clean existing storm systems.

END OF SECTION