

**SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following basic plumbing materials and methods to complement other Division 22 Sections.
 - 1. Pipe joining materials.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Sleeves.
 - 5. Mechanical sleeve seals.
 - 6. Escutcheons.
 - 7. Grout.
 - 8. Fabricated metal equipment supports.
 - 9. Installation requirements common to plumbing specification Sections.
 - 10. Piping joint construction.
 - 11. Cutting and patching.
 - 12. Painting and finishing
- B. Pipe and pipe fitting materials are specified in piping systems sections.

1.3 REFERENCES

- A. Comply with the latest revision of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
 - 1. 2015 Building Code of New York State
 - 2. 2015 Mechanical Code of New York State
 - 3. 2015 Plumbing Code of New York State
 - 4. American Society of Mechanical Engineers (ASME)
 - 5. American National Standards Institute (ANSI)
 - 6. National Fire Protection Association (NFPA)
 - 7. Underwriters Laboratories (UL)
 - 8. American Society for Testing and Materials (ASTM)
 - 9. American Welding Society (AWS)
 - 10. Occupational Safety and Health Administration (OSHA)

B. Definitions:

1. Pipe, pipe fittings, and piping include tube, tube fittings, and tubing.
2. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
3. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
4. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
5. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
6. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
7. The following are industry abbreviations for plastic materials:
 - a. ABS: Acrylonitrile-butadiene-styrene plastic.
 - b. CPVC: Chlorinated polyvinyl chloride plastic.
 - c. PE: Polyethylene plastic.
 - d. PVC: Polyvinyl chloride plastic.
8. The following are industry abbreviations for rubber materials:
 - a. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - b. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Submit the following in accordance with the General Conditions.
- B. Product Data: "Catalog cuts" and spec sheets marked to specifically indicate the equipment and materials proposed for this project. Indicate selections with arrows, and cross out irrelevant data. Submit product data for following items:
 1. Mechanical sleeve seals.
 2. Transition fittings.
 3. Dielectric fittings.
 4. Escutcheons.

1.5 WARRANTY

- A. Provide parts and labor warranty in accordance with the General Conditions.

PART 2 - PRODUCTS**2.1 PIPE JOINING MATERIALS**

- A. Materials and Construction:

1. Refer to individual piping system specification Sections in Division 22 for special joining materials not listed below.
2. Solder Filler Metal: ASTM B32.
 - a. Alloy Sn95 or Alloy Sn94: Tin (approximately 95 percent) and silver (approximately 5 percent), having 0.10 percent lead content.
 - b. Alloy Sn50: Tin (50 percent) and lead (50 percent).
3. Brazing Filler Metals: AWS A5.8.
 - a. BCuP Series: Copper-phosphorus alloys for general duty brazing.
 - b. BAg1: Silver alloy for refrigerant piping.
4. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
5. Solvent Cements: Manufacturer's standard solvents complying with the following:
 - a. Acrylonitrile-Butadiene-Styrene (ABS): ASTM D2235.
 - b. Chlorinated Poly (Vinyl Chloride) (CPVC): ASTM F493.
 - c. Poly (Vinyl Chloride) (PVC): ASTM D2564.
 - d. PVC to ABS Transition: Made to requirements of ASTM D3138, color other than orange.

2.2 TRANSITION FITTINGS

A. Materials and Construction:

1. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
 - a. Manufacturers:
 - 1) Eslon Thermoplastics.
 - 2) Or equal
2. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
 - a. Manufacturers:
 - 1) Thompson Plastics, Inc.
 - 2) Or equal.
3. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.
 - a. Manufacturers:
 - 1) NIBCO INC.
 - 2) Or equal.
4. Flexible Transition Couplings for Underground Piping Systems: ASTM C1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.
 - a. Manufacturers:

- 1) Cascade Waterworks Mfg. Co.
- 2) Fernco, Inc.
- 3) Mission Rubber Company.
- 4) Plastic Oddities, Inc.
- 5) Or equal.

2.3 DIELECTRIC FITTINGS

A. Manufacturers:

1. Capitol Manufacturing Co.
2. Central Plastics Company.
3. Eclipse, Inc.
4. Epco Sales, Inc.
5. Hart Industries
6. International, Inc.
7. Watts Industries, Inc.
8. Water Products Div.
9. Zurn Industries, Inc.
10. Wilkins Div.
11. Or equal

B. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

C. Performance/Design Criteria:

1. Insulating Material: Suitable for system fluid, pressure, and temperature.
2. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

D. Materials and Construction:

1. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

a. Manufacturers:

- 1) Capitol Manufacturing Co.
- 2) Central Plastics Company.
- 3) Epco Sales, Inc.
- 4) Watts Industries, Inc.; Water Products Div.
- 5) Or equal.

2. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

a. Manufacturers:

- 1) Advance Products & Systems, Inc.

- 2) Calpico, Inc.
 - 3) Central Plastics Company.
 - 4) Pipeline Seal and Insulator, Inc.
 - 5) Or equal.
- b. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
3. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
- a. Manufacturers:
- 1) Calpico, Inc.
 - 2) Lochinvar Corp.
 - 3) Or equal.
4. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
- a. Manufacturers:
- 1) Perfection Corp.
 - 2) Precision Plumbing Products, Inc.
 - 3) Sioux Chief Manufacturing Co., Inc.
 - 4) Victaulic Co. of America.
 - 5) Or equal.

2.4 SLEEVES

- A. Materials and Construction:
1. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
 2. Steel Pipe: ASTM A53, Type E, Grade B, Schedule 40, galvanized, plain ends.
 3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
 4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - a. Underdeck Clamp: Clamping ring with set screws.
 5. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
 6. PVC Pipe: ASTM D1785, Schedule 40.
 7. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.5 MECHANICAL SLEEVE SEALS

- A. Manufacturers:

1. Advance Products & Systems, Inc.
 2. Calpico, Inc.
 3. Metraflex Co.
 4. Or equal
- B. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
- C. Materials and Construction:
1. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 2. Pressure Plates: Stainless steel. Include two for each sealing element.
 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. Materials and Construction:
1. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
 2. One-Piece, Cast-Brass Type: With set screw.
 - a. Finish: Polished chrome-plated.
 3. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - a. Finish: Polished chrome-plated.
 4. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

2.7 GROUT

- A. Description: ASTM C1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
- B. Materials and Construction:
1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 2. Design Mix: 5000-psi, 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

2.8 FABRICATED METAL SUPPORTS

- A. Description: Structural Steel Shapes: ASTM A36.

2.9 GENERAL

- A. All components of like size and type shall be the product of the same manufacturer for purposes of parts interchangeability.

PART 3 - EXECUTION

3.1 PLUMBING DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.
- C. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
- D. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
- E. Equipment to Be Removed: Disconnect and cap services and remove equipment.
- F. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
- G. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- H. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality

3.2 EXAMINATION

- A. Examine areas and conditions for compliance with manufacturer's installation recommendations and requirements.
- B. Examine walls, floors, roofs, and concrete bases for suitable conditions for installation, for example, all overhead work of other trades is complete.
- C. Verify that ground connections are in place and that installation of grounding described in Section "Grounding" is complete.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Install plumbing fixtures and piping systems as shown on the Contract Drawings and in accordance with the manufacturer's installation instructions.
- B. Plumbing System Installations
 - 1. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:
 - a. Coordinate plumbing systems, equipment, and materials installation with other building components.
 - b. Verify all dimensions by field measurements.
 - c. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for plumbing installations.

- d. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
- e. Sequence, coordinate, and integrate installations of plumbing materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
- f. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
- g. Coordinate connection of plumbing systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
- h. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Owner's Representative.
- i. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
- j. Install plumbing equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
- k. Install access panel or doors where units are concealed behind finished surfaces.
- l. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

C. Piping Installation

1. General: Install piping as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Division 22 specify piping installation requirements unique to the piping system.
2. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.
3. Install piping at indicated slope.
4. Install components having pressure rating equal to or greater than system operating pressure.
5. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
6. Install piping free of sags and bends.
7. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.

8. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
 9. Install piping to allow application of insulation plus 3-inch clearance around insulation.
 10. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
 11. Install fittings for changes in direction and branch connections.
 12. Install couplings according to manufacturer's printed instructions.
 13. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings in finished areas.
 14. Verify final equipment locations for roughing in. Refer to equipment specifications in other Sections for roughing-in requirements.
 15. Angle (wye) type strainers shall be provided with shutoff valve and cap on blowdown connection.
 16. Where mains are reduced, provide eccentric reducing fittings installed with flat side on the bottom.
 17. Horizontal piping shall not be installed less than 6 inches above finished floor (along walls), less than 7 ft-6 inches above finished floor (other areas), or in front of windows.
 18. Piping shall be offset, relocated, or changed to clear ducts, beams, conduits and other obstacles.
 19. Piping systems shall be free of noise and vibration under normal operating conditions.
 20. Install piping to permit valve servicing.
 21. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - g. Bare Piping in Unfinished Service Spaces: No escutcheon.
 - h. Bare Piping in Equipment Rooms: No escutcheon.
 - i. Bare Piping at Floor Penetrations in Equipment Rooms: No escutcheon.
- D. Sleeves
1. Install sleeves for pipes passing through concrete and masonry walls, fire-rated partitions, concrete floor and roof slabs, and where indicated.
 - a. Cut sleeves to length for mounting flush with both surfaces.
 - 1) Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 4 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring where specified.

- b. Build sleeves into new walls and slabs as work progresses.
 - c. Install large enough sleeves to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - 1) Steel Pipe Sleeves: For pipes smaller than 6 inches.
 - 2) Steel Sheet-Metal Sleeves: For pipes 6 inches and larger that penetrate gypsum-board partitions.
 - 3) Cast Iron Sleeve Fittings: For floors having membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
 - d. Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.
 - e. Except for below-grade wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants specified in Division 7 Section "Joint Sealants."
 - f. Above Grade, Exterior Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installation of mechanical seals.
 - 1) Install steel pipe for sleeves smaller than 6 inches.
 - 2) Install cast-iron wall pipes for sleeves 6 inches and larger.
 - 3) Assemble and install mechanical seals according to manufacturer's printed instructions.
 - g. Below Grade, Exterior Wall, Pipe Penetrations: Install cast-iron wall pipes for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installation of mechanical seals.
 - h. Below Grade, Exterior Wall, Pipe Penetrations: Install ductile-iron wall penetration system sleeves according to manufacturer's printed installation instructions.
 - i. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping sealant material. Firestopping materials are specified in Division 7 Section Penetration Firestop.
2. Sleeves are not required for core-drilled holes.
- E. Piping Joint Construction
- 1. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
 - 2. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 - 3. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 - 4. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B32.
 - 5. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
 - 6. 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 inside diameter. Join pipe fittings and valves as follows:

- a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - b. 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.
 7. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
 8. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
 9. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - a. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
 - b. ABS Piping: Join according to ASTM D2235 and ASTM D2661 Appendices.
 - c. CPVC Piping: Join according to ASTM D2846/D2846M Appendix.
 - d. PVC Pressure Piping: Join schedule number ASTM D1785, PVC pipe and PVC socket fittings according to ASTM D2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D2855.
 - e. PVC Nonpressure Piping: Join according to ASTM D2855.
 - f. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D3138 Appendix
 10. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D3139.
 11. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D3212.
 12. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D2657.
 - a. Plain-End Pipe and Fittings: Use butt fusion.
 - b. Plain-End Pipe and Socket Fittings: Use socket fusion.
 13. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.
- F. Piping Connections
1. Piping Connections: Except as otherwise indicated, make piping connections as specified below.
 - a. Install unions in piping 2 inches and smaller adjacent to each valve and at final connection to each piece of equipment having a threaded pipe connection.
 - b. Install flanges in piping 2-1/2 inches and larger adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
 - c. Dry Piping Systems (Gas, Compressed Air, and Vacuum): Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - d. Wet Piping Systems (Water and Steam): Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.
- G. Equipment Installation – Common Requirements

1. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.
 2. Install equipment according to submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Owner's Representative.
 3. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.
 4. Install plumbing equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
 5. Install equipment giving right-of-way to piping systems installed at a required slope.
- H. Painting and finishing
1. Refer to Division 9 for field painting requirements.
 2. Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.
- I. Fabrication and erection of metal equipment supports and anchorage
1. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical equipment.
 2. Field Welding: Comply with AWS D1.1 "Structural Welding Code – Steel."
- J. Cutting and patching
1. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for plumbing installations. Perform cutting by skilled mechanics of the trades involved.
 2. Repair cut surfaces to match adjacent surfaces.
- K. Grouting
1. Install non-metallic non-shrink grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions.
 2. Clean surfaces that will come into contact with grout.
 3. Provide forms for placement of grout, as required.
 - a. Avoid air entrapment when placing grout.
 - b. Place grout to completely fill equipment bases.
 4. Place grout on concrete bases to provide a smooth bearing surface for equipment.
 5. Place grout around anchors.
 6. Cure placed grout according to manufacturer's printed instructions.

3.4 PROTECTION

- A. Protect installed equipment from damage through Substantial Completion.

END OF SECTION

**SECTION 22 05 23
GENERAL DUTY VALVES FOR PLUMBING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes general duty valves for Plumbing piping as shown on the Contract Drawings.
- B. Section Includes:
 - 1. Bronze ball valves.
 - 2. Bronze swing check valves.
 - 3. Bronze gate valves.
 - 4. Manual Air Vents
 - 5. Low Point Drains

1.3 REFERENCES

- A. Comply with the latest revision of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
 - 1. American Society for Testing and Materials (ASTM)
 - 2. American National Standards Institute (ANSI)
 - 3. American Society of Mechanical Engineers (ASME)
 - 4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - a. ASME B31.1 for power piping valves.
 - b. ASME B31.9 for building services piping valves.

1.4 COORDINATION REQUIREMENTS

- A. Coordinate layout and installation of plumbing valves with electrical equipment, light fixtures, HVAC equipment and ductwork, piping, and roof drains.

1.5 SUBMITTALS

- A. Submit the following in accordance with the General Conditions.
- B. Product Data: "Catalog cuts" and spec sheets marked to specifically indicate the equipment and materials proposed for this project. Indicate selections with arrows, and cross out irrelevant data.

1.6 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer's Factory Qualifications: Manufacturing facilities shall have accreditation to ISO 9000:2000 or an equivalent quality management system acceptable to the Engineer.

1.7 DELIVERY, STORAGE AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Handle plumbing valve components according to manufacturer's written instructions. Use factory-installed lifting provisions.

1.8 WARRANTY

- A. Provide parts and labor warranty in accordance with the General Conditions.

PART 2 - PRODUCTS**2.1 GENERAL REQUIREMENTS FOR VALVES**

A. Refer to Plumbing valve schedule for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Handwheel: For valves other than quarter-turn types.
2. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller

E. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
 2. Grooved: With grooves according to AWWA C606.
 3. Threaded: With threads according to ASME B1.20.1.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BALL VALVES

- A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Valve, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. Crane Co.; Crane Valve Group; Crane Valves.
 - d. Hammond Valve.
 - e. Lance Valves; a division of Advanced Thermal Systems, Inc.
 - f. Legend Valve.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Red-White Valve Corporation.
 - j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig (1035 kPa).
 - c. CWP Rating: 600 psig (4140 kPa).
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Bronze.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.
 - k. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:
 3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Conbraco Industries, Inc.; Apollo Valves.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Hammond Valve.

- d. Lance Valves; a division of Advanced Thermal Systems, Inc.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
4. Description:
- a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig (1035 kPa).
 - c. CWP Rating: 600 psig (4140 kPa).
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Stainless steel.
 - i. Ball: Stainless steel, vented.
 - j. Port: Full.

2.3 BRONZE SWING CHECK VALVES

- A. Class 125, Bronze Swing Check Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell Valves.
 - j. Red-White Valve Corporation.
 - k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - l. Zy-Tech Global Industries, Inc.
 2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.

- e. Ends: Threaded.
 - f. Disc: Bronze.
- B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Hammond Valve.
 - e. Kitz Corporation.
 - f. Milwaukee Valve Company.
 - g. NIBCO INC.
 - h. Red-White Valve Corporation.
 - i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 2. Description:
 - a. Standard: MSS SP-80, Type 4.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: PTFE or TFE.
- C. Class 150, Bronze Swing Check Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Kitz Corporation.
 - f. Milwaukee Valve Company.
 - g. NIBCO INC.
 - h. Red-White Valve Corporation.
 - i. Zy-Tech Global Industries, Inc.
 2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 300 psig (2070 kPa).

- c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: Bronze.
- D. Class 150, Bronze Swing Check Valves with Nonmetallic Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Hammond Valve.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.
 - f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 2. Description:
 - a. Standard: MSS SP-80, Type 4.
 - b. CWP Rating: 300 psig (2070 kPa).
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: PTFE or TFE.

2.4 BRONZE GATE VALVES

- A. Class 125, NRS Bronze Gate Valves:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell Valves.
 - j. Red-White Valve Corporation.
 - k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - l. Zy-Tech Global Industries, Inc.

2. Description:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded [or solder joint].
 - e. Stem: Bronze.
 - f. Disc: Solid wedge; bronze.
 - g. Packing: Asbestos free.
- B. Class 125, RS Bronze Gate Valves:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell Valves.
 - j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - k. Zy-Tech Global Industries, Inc.
 2. Description:
 - a. Standard: MSS SP-80, Type 2.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded [or solder joint].
 - e. Stem: Bronze.
 - f. Disc: Solid wedge; bronze.
 - g. Packing: Asbestos free.
- C. Class 150, NRS Bronze Gate Valves:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Hammond Valve.
 - b. Kitz Corporation.
 - c. Milwaukee Valve Company.

- d. NIBCO INC.
- e. Powell Valves.
- f. Red-White Valve Corporation.
- g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

- a. Standard: MSS SP-80, Type 1.
- b. CWP Rating: 300 psig (2070 kPa).
- c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
- d. Ends: Threaded.
- e. Stem: Bronze.
- f. Disc: Solid wedge; bronze.
- g. Packing: Asbestos free.

D. Class 150, RS Bronze Gate Valves:

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

- a. Crane Co.; Crane Valve Group; Crane Valves.
- b. Crane Co.; Crane Valve Group; Stockham Division.
- c. Hammond Valve.
- d. Kitz Corporation.
- e. Milwaukee Valve Company.
- f. NIBCO INC.
- g. Powell Valves.
- h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- i. Zy-Tech Global Industries, Inc.

2. Description:

- a. Standard: MSS SP-80, Type 2.
- b. CWP Rating: 300 psig (2070 kPa).
- c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
- d. Ends: Threaded.
- e. Stem: Bronze.
- f. Disc: Solid wedge; bronze.
- g. Packing: Asbestos free.

2.5 MANUAL AIR VENTS

- A. Bronze body and nonferrous internal parts; 150-psig working pressure; 225 deg F operating temperature; manually operated with screwdriver or thumbscrew; with 1/8-inch discharge connection and 1/2-inch inlet connection.

2.6 AUTOMATIC AIR VENTS

- A. Designed to vent automatically with float principle; bronze body and nonferrous internal parts; 150-psig working pressure; 240 deg F operating temperature; with 1/4-inch discharge connection and 1/2-inch inlet connection.

2.7 LOW-POINT DRAIN VALVES

- A. Low-point drain valves shall be 3/4-inch hose end ball valve with chained gasketed cap rated for system working temperature and pressure.

2.8 SOURCE QUALITY CONTROL

- A. Factory Quality Certification
 - 1. Submit copy of factory quality assurance certificate.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.
- F. Examine areas and conditions for compliance with manufacturer's installation recommendations and requirements.
- G. Examine walls, floors, roofs, and concrete bases for suitable conditions for installation, for example, all overhead work of other trades is complete.
- H. Verify that ground connections are in place and that installation of grounding described in Section "Grounding" is complete.
- I. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install plumbing valves as shown on the Contract Drawings and in accordance with the manufacturer's installation instructions.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.

- F. Install check valves for proper direction of flow

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 1. Shutoff Service: Ball or Gate Valves.
 2. Pump-Discharge Check Valves:
 - a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze disc.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
 4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
 5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.

3.5 IDENTIFICATION

- A. Identify valves in accordance with Identification for Plumbing Piping and Equipment.

3.6 CLEANING

- A. On completion of installation, inspect interior and exterior of equipment. Remove dust, dirt, paint splatters and other spots from exterior and wipe down with damp cotton cloth. Touch up exposed surfaces to match original finish. Do not use compressed air to assist in cleaning.

3.7 PROTECTION

- A. Protect installed equipment from damage through Substantial Completion.

3.8 POTABLE AND NON-POTABLE WATER AND TEMPERED WATER VALVE SCHEDULE

- A. Pipe NPS 2 (DN 50) and Smaller:
 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
 2. Ball Valves: Two piece, full port, bronze with bronze trim.
 3. Bronze Swing Check Valves: Class 125 bronze disc.

4. Bronze Gate Valves: Class 125 NRS bronze.

3.9 SUMP PUMP DISCHARGE VALVE SCHEDULE

- A. Pipe NPS 2 and smaller:
 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
 2. Retain only valve types, in five subparagraphs below, required for Project.
 3. Caution: No one-piece, reduced-port, brass ball valves with stainless-steel trim; three-piece, regular-port, brass ball valves with brass trim; or bronze ball valves with bronze trim are included in the Section Text. Retain brass or stainless-steel trim with brass ball valves, or bronze or stainless-steel trim with bronze ball valves.
 4. Ball Valves: Two piece, full port, bronze with bronze trim.
 5. Bronze Swing Check Valves: Class 125 bronze disc.
 6. Bronze Gate Valves: Class 125 NRS bronze.

END OF SECTION

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

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes hangers, supports, and restraints for Plumbing systems including piping and equipment as shown on the Contract Drawings.

1.3 REFERENCES

- A. Comply with the latest revision of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
- B. 2009 International Plumbing Code
- C. Manufacturers Standardization Society (MSS):
 - 1. MSS SP-58-2009 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation
 - 2. MSS SP-127-2001 - Bracing for Piping Systems - Seismic-Wind-Dynamic Design, Selection, Application

1.4 REQUIREMENTS

- A. Coordinate layout and installation of hangers, supports and restraints of plumbing piping systems with other mechanical systems including HVAC equipment and ductwork, electrical equipment, and light fixtures

1.5 SUBMITTALS

- A. Submit the following in accordance with the General Conditions.
- B. Product Data: "Catalog cuts" and spec sheets marked to specifically indicate the equipment and materials proposed for this project. Indicate selections with arrows, and cross out irrelevant data.
- C. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support, trapeze, and seismic restraint by a qualified professional engineer.
 - 1. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of hangers and supports that are similar to those indicated for this Project in material, design, and extent.

1.6 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturer's Factory Qualifications: Manufacturing facilities shall have accreditation to ISO 9000:2000 or an equivalent quality management system acceptable to the Engineer.
 - 2. Seismic Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing seismic engineering services, including the design of seismic restraints, that are similar to those indicated for this Project.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All components of like size and type shall be the product of the same manufacturer for purposes of parts interchangeability.

2.2 MISCELLANEOUS MATERIALS

- A. Structural steel: ASTM A36.
- B. Grout: ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

2.3 UPPER HANGER ATTACHMENTS

- A. Standard-Duty Beam Clamps (for piping): Malleable iron jaw, steel tie-rod, nuts, and washer. Underwriters Laboratories (UL) listed, Factory Mutual approved
- B. Heavy-Duty Beam Clamps (for large pipe and equipment): Forged steel
- C. Welded Structural Attachments: Carbon steel
- D. Brace Fitting: Malleable iron bracket and pipe end, hex-head cap screw and nut
- E. Wall Brackets: Factory-fabricated carbon steel bracket with knee brace
- F. Concrete Inserts [for new upper deck construction only]:
 - 1. Malleable iron inserts, threaded for rod.
 - 2. Carbon steel inserts with lateral adjustment capability
- G. Concrete Attachments: carbon steel plate with factory-drilled and anchor holes and factory-welded rod attachments

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Anchor Fasteners: Insert wedge-type, stainless steel anchors, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 METAL PIPE HANGERS AND SUPPORT

- A. Carbon-Steel Pipe Hangers and Supports
 - 1. Description: MSS SP-58, Types 1 through 58, factory fabricated components.

2. Galvanized Metal Coatings: Pregalvanized or hot dipped.
 3. Nonmetallic coatings: Plastic coating, jacket or liner.
 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Stainless Steel Pipe Hangers and Supports:
1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
- C. Copper Pipe Hangers:
1. Description: MSS SP-58, Types 1 through 58, copper coated steel, factory-fabricated components.
 2. Hanger Rods: Continuous-thread rod, nuts and washer made of stainless steel.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Vertical Piping:
1. Support vertical risers of piping systems by means of heavy duty hangers installed close to base of pipe risers, and by riser clamps with extension arms at intermediate floors, with the distance between clamps not to exceed 25feet, unless otherwise specified. Support pipe risers in vertical shafts equivalent to the aforementioned. Install riser clamps above floor slabs, with the extension arms resting on floor slabs or pipe sleeves. Provide adequate clearances for risers that are subject to appreciable expansion and contraction caused by operating temperature ranges.
 2. Support for extension arms of riser clamps which are secured to risers to be insulated for cold service shall be 4 inches above floor slabs, to allow room for insulation and vapor sealing around riser clamps.
- C. Use clevis hangers for horizontal runs less than 20 feet long.
- D. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes.
- E. Insulated Piping: Comply with the following:
1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.9.
 2. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN100) and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.

3.2 HANGER SCHEDULE

- A. Horizontal piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
- B. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
- C. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
- D. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. C-Clamps (MSS Type 23): For structural shapes.
 2. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
- E. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
- F. Comply with MSS SP-58 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- G. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.3 PIPE HANGER SPACING

- A. Space hangers or supports for horizontal piping on maximum center distances as indicated in Table 4 of MSS SP-58.
- B. CPVC pipe operating above 70 deg F shall have continuous support.
- C. For Directional Changes: Install a hanger or support close to the point of change of direction of all pipe runs in either a horizontal or vertical plane.
- D. For Concentrated Loads: Install additional hangers or supports, spaced as required and directed, at locations where concentrated loads such as in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.
- E. For Branch Piping Runs and Runouts over 5 feet in Length: Install a minimum of one hanger, and additional hangers if required by the hanger spacing schedules.
- F. Parallel Piping Runs: Where several pipe lines run parallel in the same place and in close proximity to each other, trapeze hangers may be submitted for approval. Base hanger spacing for trapeze type hangers on the smallest size of pipe being supported. Design the entire hanger assembly based on a safety factor of five, for the ultimate strength of the material being used.

- G. Support floor drain traps from the overhead construction, with hangers of type and design as required. Over-head supports are not required for floor drain traps installed directly below earth supported concrete floors

3.4 ANCHORS, RESTRAINTS, RIGID SUPPORTS, STAYS AND SWAY BRACES

- A. Install pipe anchors, restraints and sway braces, at locations noted on the Drawings. Design anchors so as to permit piping to expand and contract freely in opposite directions, away from anchor points. Install anchors independent of all hangers and supports, and in a manner which will not affect the structural integrity of the building.
- B. In grooved-end piping systems, install restraints, anchors, and rigid supports as recommended by the manufacturer of the grooved end fittings to ensure proper support and alignment of the piping under operating and testing pressures (maximum hanger or support spacing shall be as previously specified).:
 - 1. Horizontal piping shall maintain a constant pitch without sags, humps, or lateral deflections.
 - 2. Branch piping shall remain perpendicular to main piping and/or risers.
 - 3. Vertical piping shall remain plumb without deflections.
 - 4. Vertical piping shall be rigidly supported, or anchored at both top and bottom and wherever necessary to prevent movement and/or shearing forces at branch connections

3.5 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 EQUIPMENT HANGERS

- A. Provide vibration isolating hangers for equipment with motors.
- B. Support air terminal units independent of ductwork.
- C. Support slot diffusers independent of suspended ceiling grid.

3.7 RODS

- A. Pipe and duct hanger rods shall be full size to match hangers.
- B. Trapeze and equipment hanger rods shall be sized for maximum load with a safety factor of five.
- C. Provide two nuts at each end of rods for positioning rod and hanger and locking each in place.

3.8 UPPER HANGER ATTACHMENTS

- A. General
 - 1. Upper hanger attachments shall be made to structural steel wherever possible.
 - 2. Powder-driven drive pins shall not be used.
 - 3. Expansion nails shall not be used.
 - 4. Powder-driven fasteners shall not be used in precast concrete.
 - 5. Loads in excess of 250 pounds shall not be supported from a single welded or powder-driven stud.

- B. Steel Frame Construction
 - 1. Provide intermediate structural steel members where required by ductwork support spacing. Select members based on a minimum safety factor of five.
 - 2. Secure upper hanger attachments to steel bar joists within 6 inches of panel points, or provide intermediate strut to transfer load to top chord of joist.
 - 3. Holes shall not be drilled in structural steel members.
 - 4. Friction clamps shall not be used.

3.9 EXAMINATION

- A. Examine areas and conditions for compliance with manufacturer's installation recommendations and requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.10 PAINTING

- A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 painting sections.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

**SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes Identification for Plumbing Piping and Equipment as shown on the Contract Drawings.

1.3 REFERENCES

- A. Comply with the latest revision of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
 - 1. American Society for Testing and Materials (ASTM)
 - 2. American National Standards Institute (ANSI)
 - a. ANSI A13.1 - Scheme for the Identification of Piping Systems.

1.4 SUBMITTALS

- A. Submit the following in accordance with the General Conditions.
- B. Product Data: "Catalog cuts" and spec sheets marked to specifically indicate the equipment and materials proposed for this project. Indicate selections with arrows, and cross out irrelevant data. For each product specified submit manufacturer's catalog sheets and specifications showing its compliance with this specification and the referenced standards.

1.5 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturer's Factory Qualifications: Manufacturing facilities shall have accreditation to ISO 9000:2000 or an equivalent quality management system acceptable to the Engineer.
- B. Identifying labels and markings for piping shall conform to ANSI A13.1 for legend, color, visibility, and size of legend and letters.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers are named to establish a standard of quality necessary for the Project:
 - 1. Seton Identification Company, Branford, Connecticut.

2. W. H. Brady Corporation, Milwaukee, Wisconsin.
3. Or equal.

2.2 MATERIALS AND CONSTRUCTION

- A. Pipe Identification Painting
 1. Type: As identified in Section entitled "Field Painting."
 2. Color: As scheduled in Paragraph 3.2.

- B. Pipe Identification Markers:
 1. Snap-On Type: Precoiled acrylic plastic marker with clear polyester coating, incorporating flow arrows, and legend printed in alternate directions.
 - a. Piping or insulation under 6 inch O.D.: One piece wrap around type with 3/4 inch adhesive strip on inside edge and 360 degree visibility.
 - b. Piping or insulation 6 inch O.D. and larger: Strip type with factory applied grommets, secure with stainless steel spring fasteners.
 2. Stick-On Type: One piece pressure sensitive adhesive backed plastic marker with clear polyester coating, incorporating flow arrows, and legend printed in alternate directions.
 - a. Piping or insulation under 8 inch O.D.: Wrap around type with 360 degree visibility.
 - b. Piping or insulation 8 inch O.D. and larger: Strip type.
 3. Markers shall be color coded based on pipe contents. Color selection shall be according to chart in Part 3 of this Section.

- C. Pipe Banding Tape:
 1. 1-1/2 inch width (minimum), pressure sensitive adhesive backed type, of same material as pipe identification mark, and of color to match background color of pipe identification marker.

- D. Pipe Service Identification Tags:
 1. Type: Brass, 19 B&S gage, with 1/4 inch high pipe service abbreviated lettering over 1/2-inch high pipe size lettering. Lettering shall be deep stamped and black filled. Tag to have 3/16 inch diameter hole at top for fastening.
 2. Size: 2 inch square tag.
 3. Fasteners: Brass "S" hook or brass jack chain, size as required for pipe to which tag is attached.

- E. Valve Identification Tags:
 1. Type: Brass, 19 B&S gage, with 1/4 inch high valve service abbreviated lettering over 1/2-inch high lettering indicating valve service chart number. Lettering shall be deep stamped and black filled. Tag to have 3/16 inch diameter hole at top for fastening.
 2. Size:
 - a. Plumbing: 1-1/2 inch hexagon tag.
 3. Fasteners: Brass "S" hook or brass jack chain, size as required for valve stem or handle to which tag is attached.

- F. Equipment Identification Letters & Numbers:
 1. Type: Stick-on type, made of all purpose polyester, single character letters and numbers, specifically designed for outdoor use.

2. Color: Black letters on bright yellow background.
3. Size: Letters and numbers shall be 1 inch or 3 inches in height, as specified.

2.3 ACCESSORIES

- A. Valve Service Identification Chart Frames:
 1. Satin finished extruded aluminum frame of size to fit 8-1/2 x 11 inch valve chart and complete with rigid clear plastic glazing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with manufacturer's installation recommendations and requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 IDENTIFICATION

- A. Piping General:
 1. Piping shall be identified as to content and direction of flow by use of pipe identification markers or tags.
 2. Identify all piping, bare or insulated, whose contents match those listed in the Pipe Identification Schedule, with the following exceptions:
 - a. Piping in furred spaces or above plastered ceilings, except at access panels where valves and piping shall be identified as specified for exposed piping.
 - b. Piping in finished spaces such as offices, toilet rooms, locker rooms, etc.
 3. Marker legend size, field color, and length of field shall be in accordance with ANSI A13.1.
 4. Legend wording shall be developed by the Contractor and submitted for review (see Section 1.3,B). Whenever possible, standard terminology should be used. Identification by the combination of two or more standard labels (at each identification point) is acceptable.
- B. Use of Markers or Tags:
 1. Pipe or insulation with an outside diameter (O.D.) of 3/4 inch and less shall be identified by the use of Pipe Service Identification Tags.
 2. Pipe or insulation with an O.D. larger than 3/4 inch shall be identified by the use of Pipe Identification Markers.
 3. Either snap-on or stick-on type markers may be used; except that stick-on markers shall not be used in the following situations:
 - a. Areas where humid, wet, or dripping conditions are anticipated.
 - b. Areas where chemical fumes are anticipated.
 - c. Outdoor installations.
 - d. On lines subject to 50 degree F temperature variations.
- C. Location of Markers and Tags:
 1. Pipe markers and tags shall be located so as to be readily visible from any reasonable point of observation.

2. Locate identification at all valves, branch or riser take-offs, and both sides of pipe passage through walls, floors, and ceilings.
3. On continuous pipe runs locate identification at 20 foot intervals, but not less than one marker or tag on any length of 10 feet or greater.

D. Preparation:

1. Insure that any painting is complete and the paint has thoroughly dried before applying identification.
2. Prepare surface in accordance with the manufacturer’s instructions for the type of identification used and the surface to which it is applied.

E. Installation:

1. Install markers and tags in accordance with the manufacturer’s instructions.
2. Secure both ends of stick-on type markers with 360 degree application of pipe banding tape. Tape shall have one inch lap on pipe or insulation.

F. Pipe Identification Schedule: Identify the following types of piping with markers and/or tags.

Pipe Service	Pipe Label Abbreviation	Valve Tag Abbreviation	Background Color	Letter Color
Domestic Cold Water Supply	Dom. Cold Water Sup.	DCWS	Green	White
Domestic Hot Water Supply	Dom Hot Water Sup.	DHWS	Yellow	Black
Domestic Hot Water Return	Dom. Hot Water Ret.	DHWR	Yellow	Black
Tempered Water Supply	Tempered Water Sup.	TWS	Green	White
Non-Potable Water (Plant Water)	Non-Potable Water	NPW	Green	White
Sanitary Drainage	Sanitary Drain	SAN	Green	White
Sanitary Vent	V	SAN-V	Blue	White

G. Installation:

1. Fasten tags to valve stems or handles using brass “S” hooks or jack chain.
2. Fasten tags in a manner and location that will permit easy reading, but will not interfere with the operation of the valve.

- H. Valve Service Identification Chart:
1. Provide two framed valve charts for each piping system to have valve identification tags.
 2. Charts shall be typed, in the reviewed format, on 8-1/2 x 11 inch heavy white bond paper and framed in an aluminum frame. Hang framed charts at location(s) directed.
- I. Equipment Identification General:
1. Identify plumbing equipment, bare or insulated, in the following locations, by use of stick-on letters and numbers:
 - a. Mechanical Equipment Rooms.
 - b. Boiler rooms.
 - c. Penthouses.
 - d. Suspended ceiling plenums.
 - e. Roof mounted equipment.
- J. Location and Content of Identification:
1. Equipment shall be identified with a minimum of two sets of lettering. Center identification lettering, vertically and horizontally, on opposite vertical sides of the equipment.
 2. Vertical sides selected shall have the longest dimension (i.e., label sides of equipment and not the ends), unless view is obstructed to those sides. If view is obstructed to sides of equipment, locate identification lettering on the two most visible vertical sides and/or ends.
 3. Equipment identification numbers and letters shall match the designation found in the equipment schedules on the Contract Drawings.
- K. Size of Lettering:
1. Use the largest lettering size (3 inch or 1 inch height) that will easily fit the available surface space.
 2. Use only one lettering height on any given piece of equipment (i.e., do not mix lettering sizes).
- L. Installation:
1. Prepare surface to which lettering is applied and install lettering in accordance with the manufacturer's instructions.
 2. Apply lettering in a straight line along the axis of the equipment. Lettering edges should touch, but not over-lap.

END OF SECTION

SECTION 22 05 93.5
PIPE PRESSURE TESTS FOR PLUMBING

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes pipe pressure tests for plumbing piping systems as scheduled in Part 3 of this section.

1.3 REFERENCES

- A. Comply with the latest revision of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
 - 1. 2015 International Plumbing Code

1.4 SUBMITTALS

- A. Submit the following in accordance with the General Conditions.
- B. In addition to those submittals identified in the General Conditions, the following items shall also be submitted:
- C. Test Reports
 - 1. A separate test report shall be submitted for each pressure test performed.
 - 2. Information presented in test reports shall be typewritten, clear, concise, and accurate.
 - 3. Reports shall be signed and dated by the supervisor in charge of performing the test and designated Inspector. Signatures shall certify that all information contained in the report is true and accurate to the best of the signatory's knowledge.
 - 4. Reports shall contain, as a minimum, the following information:
 - a. Type of test performed (e.g., hydrostatic, pneumatic, refrigerant, etc.)
 - b. Description of system or portion of system to which testing was performed.
 - c. Date of test.
 - d. Time of pressure start.
 - e. Time of pressure test completion.
 - f. Test fluid used in test (e.g., tap water, dry air, refrigerant, etc).
 - g. Pressure reading at beginning of test.
 - h. Pressure reading at end of test.
 - i. Location of pressure indicating devices.
 - j. Precise location of leaks detected.
 - k. Summary of leaks detected and suggested corrective action.
 - l. Conclusions regarding overall fitness and condition of tested system.
 - m. Signatures as described above.
 - n. Appendix: Calibration history of instruments used.

1.5 QUALITY ASSURANCE

- A. Tester's Qualifications
 - 1. Workers and their supervisors performing the Work of this section shall be personally experienced in testing of pipe systems and shall have been regularly employed by a company with three years minimum experience in testing of similar pipe systems.
- B. Inspection
 - 1. Tests shall be performed by the Contractor in the presence of designated Inspector(s). Witness and signoff is required.
 - 2. Inspectors shall, at all times, have access to any place where work is in preparation or in progress and Contractor shall provide sufficient safe and proper facilities for such access and inspection.
- C. Qualifications
 - 1. Manufacturer's Factory Qualifications: Manufacturing facilities shall have accreditation to ISO 9000:2000 or an equivalent quality management system acceptable to the Engineer.

1.6 SCHEDULING AND SEQUENCING

- A. Perform test operations on complete piping system or in sections as required and/or directed to progress Work in satisfactory manner and not delay the general construction of the project.
- B. If testing is performed in sections, valve or cap-off sections of piping to be tested, utilizing valves to be installed in permanent piping systems or temporary valves or caps as required to perform tests.
- C. Transmit written notification of proposed date and time of pressure tests to the Owner's Representative at least 5 days in advance of such tests.
- D. Pressure tests shall be performed prior to the installation of piping insulation or coverings.
- E. Pressure tests on underground piping shall be performed when piping has been partially backfilled with joints exposed.
- F. Pressure tests shall be performed prior to initial operation of piping systems.

PART 2 - PRODUCTS

2.1 TEST MATERIALS

- A. Test Fluid: Where scheduled, test media shall meet the following criteria.
 - 1. Tap Water: Untreated well water or plant water.
 - 2. Drinking Water: Treated, chlorinated potable water.

2.2 TEST EQUIPMENT

- A. Gauges: Calibrated, dial-type, suitable for use with specified test fluid. Upper limit of gauge pressure range shall be 1.33 times the specified test pressure. Gauge accuracy shall be 1 percent of the indicated reading or better.
- B. Soap Solution: American Gas & Chemical, "Leak-Tec"; or equivalent.
- C. Air Compressor: Unit rated to supply compressed air at or above required test pressure. Unit shall have necessary filters and driers to deliver clean, oil-free, dry compressed air. Unit shall have shut-off valve installed on discharge connection.
- D. Pressure Relief Valve: Suitable for use with compressed air, set to relieve at 10 to 15 percent above designated test pressure.

PART 3 - EXECUTION

3.1 GENERAL

- A. Tests shall be conducted at ambient temperature, unless otherwise specified.
- B. Do not use permanent system pressure gauges for pressure testing; remove and plug or isolate such gauges from the system during pressure tests.
- C. Instrumentation in, or attached to, the piping being tested shall be protected during testing by isolation or removal. Return instrumentation to pre-test condition after completion of pressure testing.
- D. Piping connected to specialties or equipment with a lower pressure rating than the specified test pressure shall be disconnected from the equipment (after the isolation valve) and openings plugged during the pressure test. After the completion of pressure testing, the piping shall be reconnected to the equipment.
- E. Expansion joints shall be provided with temporary restraint or blocked off during testing.
- F. Pressurization of piping systems by liquids or gases shall be executed in a slow and prudent manner to maintain safety, avoid over-pressurization, and avoid excessive leakage.
- G. If the piping fails the test requirements, the Contractor shall determine the cause of leakage, make necessary repairs, and retest the piping. This procedure shall be repeated until the piping complies with test requirements. A separate test report shall be submitted for each test to a piping system or section of piping.
- H. No caulking or putty shall be used in the repair of leaks. Back welding of threaded joints shall not be permitted as a means of repairing leaks.
- I. Test reports shall be filled out and readings recorded as testing proceeds.
- J. Safety glasses and hard hats shall be worn by personnel involved in or witnessing tests conducted at pressure of 20 psig or greater.

3.2 EXAMINATION

- A. Examine equipment and construction in the area of piping to be tested. Note equipment and existing construction that may be damaged by leakage of the test fluid.
- B. Verify that piping system bracing, alignment harnesses, and thrust restraints are in place before pressure is applied. Concrete restraints shall have cured adequately to withstand test pressure.
- C. Proceed with testing only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Protect equipment and construction which may be damaged by leakage of test fluid by covering with appropriate material or removing from area.
- B. Verify that piping to be tested is clean and all outlets in the system are closed.
- C. Open non-outlet valves in piping section to be tested. Check valves that can prevent system sections from being filled or pressurized shall have their discs, etc. removed for testing (restore check valves to their pre-test) condition after completion of pressure testing).
- D. Evacuate test areas of personnel not involved in the pressure testing.

3.4 HYDROSTATIC PRESSURE TEST

- A. Install pressure gauge to measure system pressure at low point in system.
- B. Connect pressurization pump to system.
- C. Fill the system with test liquid, opening vents to permit complete filling. Close vents.
- D. Using the pump, raise the pressure in the system to the scheduled test pressure. Hold pressure for a minimum of 1 hour.
- E. Reduce and hold the pressure 20 percent below test pressure. Inspect the entire system for visible leaks. Note location of leaks for repair.
- F. If leaks or defects are found, release the pressure, drain the system, and make repairs. Repeat the test procedure on the repaired piping.
- G. If the piping shows no visible leakage, raise the pressure in the system to the scheduled test pressure and isolate the system, under pressure, from the pump. The system should be closed with the pressure gauge indicating test pressure within system.
- H. System shall remain pressurized for the duration indicated in the test schedule. After the specified duration, check pressure reading on system gauge. No detectable drop in pressure shall have occurred in the system.
- I. If a drop in pressure occurs, Contractor shall determine cause. Once cause is determined release the pressure, drain the system, repair pipe as necessary, and retest.

- J. Upon compliance with test requirements, drain the system, remove items added or replace those removed for testing.

3.5 PIPE TEST SCHEDULE

- A. Perform pressure tests, of type indicated, on piping system(s) indicated using scheduled test fluid and pressure.
- B. Schedule

UTILITY	TEST METHOD	TEST MEDIUM	TEST PRESSURE	TEST DURATION	LEAKAGE
Potable Cold and Hot Water & Tempered Water	Hydrostatic	Water	100 psig	1 Hour	0
Non-Potable Water	Hydrostatic	Water	100 psig	1 Hour	0
Sanitary DWV	Gravity	Water	10 ft. of water	3 hours	0

END OF SECTION

SECTION 22 07 19
PLUMBING INSULATION

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes insulating the following plumbing piping services:
1. Domestic cold-water piping.
 2. Domestic hot-water piping.
 3. Supplies and drains for handicap-accessible lavatories and sinks.
- B. Insulation Materials:
1. Mineral Fiber (MF).
 2. Flexible Elastomeric (FE).

1.3 REFERENCES

- A. Comply with the latest revision of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
1. 2015 Plumbing Code of New York State
 2. American Society for Testing and Materials (ASTM)
 3. Military Specifications (MIL), as applicably noted.
 4. International Energy Conservation Code.

1.4 SUBMITTALS

- A. Submit the following in accordance with the General Conditions.
- B. Product Data: "Catalog cuts" and spec sheets marked to specifically indicate the equipment and materials proposed for this project. Indicate selections with arrows, and cross out irrelevant data.
- C. Shop Drawings:
1. Pipe
 - a. Application of protective shields, saddles, and inserts at pipe hangers for each type of insulation and hanger.
 - b. Attachment and covering of heat trace inside insulation.
 - c. Insulation application at pipe expansion joints for each type of insulation.
 - d. Removable insulation at piping specialties and equipment connections.
 - e. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - f. Application of field-applied jackets.

1.5 QUALITY ASSURANCE

- A. Qualifications
 - 1. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
 - a. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
 - b. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.
- B. Maintain ambient conditions required by manufacturers of tapes, adhesives, mastics, cements, and insulation materials.

PART 2 - PRODUCTS

2.1 MINERAL FIBER INSULATION

- A. Manufacturers:
 - 1. CertainTeed Saint-Gobain.
 - 2. Johns Manville
 - 3. Knauf Insulation
 - 4. Owens Corning
 - 5. Or equal.
- B. Description:
 - 1. Fibrous Glass (Mineral-fiber) Insulation: Glass fibers bonded with a thermosetting resin complying with the following:
 - a. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket with or without self-sealing lap as applicable for application.
 - b. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:
 - 1) Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
 - 2) Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.
 - c. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
 - d. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
 - e. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.

- f. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

2.2 FLEXIBLE ELASTOMERIC INSULATION

- A. Manufacturers:
1. Armacell
 2. Aeroflex USA Inc., Aerocel.
 3. Rubatex International
 4. Or equal.
- B. Description:
1. Flexible Elastomeric: Closed cell, sponge or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials
 - a. Flexible Elastomeric Adhesive: Comply with MIL-A-24179a, Type II, Class I.

2.3 FIELD-APPLIED JACKETS

- A. Manufacturers:
1. Johns Manville; Zeston.
 2. P.I.C. Plastics, Inc.; FG Series.
 3. Proto Corporation; LoSmoke.
 4. Speedline Corporation; SmokeSafe.
 5. Or equal.
- B. Description:
1. Field-applied jackets shall comply with ASTM C921, Type I, unless otherwise indicated.
 2. Heavy PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 30-mil-thick, high-impact, ultraviolet-resistant PVC. Application; as noted for mechanical rooms and outdoor use.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
 - b. Adhesive: As recommended by insulation and/or material manufacturer for temperature application.
 3. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil-thick, high-impact, ultraviolet-resistant PVC for indoor use only.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
 - b. Adhesive: As recommended by insulation and/or material manufacturer for temperature application.

2.4 ACCESSORIES

- A. Description:
1. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz/yd².
 - a. Tape Width: 4 inches.
 2. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:

- a. Stainless Steel: ASTM A 666, Type 304; 0.020 inch thick.
 - b. Galvanized Steel: 0.005 inch thick.
 - c. Aluminum: 0.007 inch thick.
 - d. Brass: 0.010 inch thick.
 - e. Nickel-Copper Alloy: 0.005 inch thick.
3. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with manufacturer's installation recommendations and requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 INSTALLATION GENERAL

- A. Install materials as shown on the Contract Drawings and in accordance with the manufacturer's installation instructions.
- B. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of equipment, fittings and piping, including fittings, valves and specialties.
- C. Refer to schedules at the end of this Section for materials, jackets, and thicknesses required for each piping system.
- D. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- E. Apply multiple layers of insulation with longitudinal and end seams staggered.
- F. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- G. Keep insulation materials dry during storage, application and finishing.
- H. Apply pipe insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- I. Apply insulation with the least number of joints practical.

- J. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
- K. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.
- L. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.
1. Apply insulation continuously through hangers and around anchor attachments.
 2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
 3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.
- M. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- N. Apply insulation with integral jackets as follows:
1. Pull jacket tight and smooth.
 2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
 3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.
 4. Circumferential Joints: Cover with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches o.c.
 5. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.
- O. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.
- P. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.
1. Seal penetrations with vapor-retarder mastic.
 2. Apply insulation for exterior applications tightly joined to interior insulation ends.
 3. Seal insulation to roof flashing with vapor-retarder mastic.
 4. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches below top of roof flashing.

- Q. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.
- R. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.
- S. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.
 - 1. For insulation indicated to have vapor retarders, taper termination and seal insulation ends with vapor-retarder mastic.

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Apply insulation to straight pipes and tubes as follows:
 - 1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
 - 2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet to form a vapor retarder between pipe insulation segments.
 - 3. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.
 - 4. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.
- B. Apply insulation to flanges as follows:
 - 1. Apply preformed pipe insulation to outer diameter of pipe flange.
 - 2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
 - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
- C. Apply insulation to fittings and elbows as follows:
 - 1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
 - 2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
 - 3. Cover indoor fittings with standard PVC fitting covers.
 - 4. Cover mechanical room and outdoor fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
- D. Apply insulation to valves and specialties as follows:
 - 1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

2. When premolded insulation sections are not available, apply glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.
3. Apply insulation to flanges as specified for flange insulation application.
4. Indoors: Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
5. Outdoors: Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Apply insulation to straight pipes and tubes as follows:
 1. Follow manufacturer's written instructions for applying insulation.
 2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
- B. Apply insulation to flanges as follows:
 1. Apply pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of the same thickness as pipe insulation.
 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
- C. Apply insulation to fittings and elbows as follows:
 1. Apply mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
- D. Apply insulation to valves and specialties as follows:
 1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.
 2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to strainer basket.
 3. Apply insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.6 INSTALLATION OF FIELD-APPLIED JACKET

- A. Apply PVC jacket where indicated, with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer’s recommended adhesive.
- B. Apply metal jacket where indicated, with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 FIELD QUALITY CONTROL

- A. Inspection: Engage a qualified inspection agency to perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements:
- B. Insulation applications will be considered defective if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.
- C. Reinstall insulation and covers on piping uncovered for inspection according to these Specifications.

3.8 IDENTIFICATION

- A. Identify piping and valves as specified in Identification for Plumbing Piping and Equipment Section.

3.9 SCHEDULE

- A. Refer to insulation application Table 1 for required insulation thicknesses.

PART 4 - TABLE 1 – PIPE INSULATION THICKNESS

Pipe Service	Insulation Thickness	
	MF	FE
Domestic cold and non-potable water – All sizes	½”	½”
Domestic Hot water – up to & including 1 ½” dia.	1”	1”
Domestic Hot water – 2” dia. & larger	1 ½”	1 ½”

END OF SECTION

SECTION 22 11 16 DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes Domestic Water Piping including all potable water piping systems as shown on the Contract Drawings.

1.3 REFERENCES

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
 - 1. 2015 Plumbing Code of New York State
 - 2. American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
 - a. ANSI/ASME B16.3 – Malleable Iron Threaded Fittings Class 150 NS 300.
 - b. ANSI/ASME B16.22 – Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
 - c. ANSI/ASME B16.29 – Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings – DWV.
 - 3. American National Standards Institute (ANSI)/American Society for Testing and Materials (ASTM)
 - a. ANSI/ASTM B32 – Solder Metal.
 - b. ANSI/ASTM F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 - c. AWWA C110/ANSI A21.10 - Ductile-Iron and Gray-Iron Fittings, 3" through 48" for Water.
 - d. AWWA C115/ANSI A21.15 - Flanged Ductile-Iron Pipe with Ductile Iron or Gray-Iron Threaded Flanges.
 - e. AWWA C151/ANSI A21.51 - Standard for Ductile-Iron Pipe, Centrifugally Cast.
 - 4. American Society For Testing and Materials (ASTM)
 - a. ASTM A53 – Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
 - b. ASTM B88 – Seamless Copper Water Tube.
 - c. ASTM D2846 – Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic and Cold Water Distribution Systems.
 - d. ASTM F438 – Specification for Socket-type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.

- e. ASTM F493 – Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- f. ASTM D2855 – Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
- g. ASTM D1785 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.
- h. m. ASTM D2466 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- 5. National Sanitation Foundation
 - a. NSF 61 --- Drinking Water System Components: Health Effects.
- 6. 2009 International Plumbing Code

1.4 COORDINATION REQUIREMENTS

- A. Coordinate layout and installation of domestic water piping system with electrical equipment, light fixtures, HVAC equipment and ductwork, piping, and roof drains.
- B. Submit specially prepared Coordination Drawings for this Project, including floor plans and sections, drawn to scale. Include scaled equipment layouts and relationships between equipment and adjacent structural, mechanical, HVAC, and electrical elements. Show the following:
 - 1. Vertical and horizontal runs, offsets, and transitions.
 - 2. Clearances for access above and to the side.
 - 3. Show dimensions and details, including connections.
 - 4. Support locations, type of support, and weight on each support.
 - 5. Location of adjacent construction elements including light fixtures, HVAC and plumbing equipment, fire sprinklers and piping, signal and control devices, and other equipment.

1.5 SUBMITTALS

- A. Submit the following in accordance with the General Conditions.
- B. Product Data: “Catalog cuts” and spec sheets marked to specifically indicate the equipment and materials proposed for this project. Indicate selections with arrows, and cross out irrelevant data.

1.6 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturer’s Factory Qualifications: Manufacturing facilities shall have accreditation to ISO 9000:2000 or an equivalent quality management system acceptable to the Engineer.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Coordinate delivery of domestic water piping and fittings to allow movement into designated space.

1.8 WARRANTY

- A. Provide parts and labor warranty in accordance with the General Conditions.

PART 2 - PRODUCTS

2.1 POTABLE COLD WATER PIPING, ABOVE GRADE

A. Manufacturers:

- 1. Cerro Flow Products Inc.
- 2. NIBCO INC.
- 3. U. S. Pipe.
- 4. Or equal.

B. Description:

- 1. 3" diameter and below: Copper Tubing: ASTM B88, Type L. Fittings: ANSI/ASME B16.22, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.
- 2. 4" diameter and larger: /AWWA C151/ANSI A21.15 - Ductile Iron Pipe - Double Thickness Cement Lined in accordance with AWWA C104/ANSI 21.4. Fittings: AWWA C110/ANSI A21.10 or AWWA C115/ANSI A21.15.

2.2 POTABLE COLD WATER PIPING, BELOW GRADE

A. Manufacturers:

- 1. Cerro Flow Products Inc.
- 2. NIBCO INC.
- 3. U.S. Pipe.
- 4. Or equal.

B. Description:

- 1. 3" diameter and below: Copper Tubing: ASTM B88, Type K. Fittings: ANSI/ASME B16.22, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.
- 2. 4" diameter and above: Ductile iron, Class 53 with Megalug joints. Refer to the Section entitled "Ductile Iron Pipe."

2.3 POTABLE HOT WATER

A. Manufacturers:

- 1. Cerro Flow Products Inc.
- 2. NIBCO INC.
- 3. Charlotte Pipe and Foundry Company.
- 4. Or equal.

B. Description:

- 1. 2-inch and below Copper Tubing: ASTM B88, Type L. Fittings: ANSI/ASME B16.22, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.

2. 2-inch and below: CPVC plastic pipe and tubing – ASTM D2846 and NSF 61. Fittings: CPVC plastic – ASTM F438. Joints: Solvent cement – ASTM F493.

2.4 TEMPERED WATER PIPING

A. Manufacturers:

1. Cerro Flow Products Inc.
2. NIBCO INC.
3. U. S. Pipe.
4. Or equal.

B. Description:

1. 3" diameter and below: Copper Tubing: ASTM B88, Type L. Fittings: ANSI/ASME B16.22, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.

2.5 GENERAL

- ### **A. All components of like size and type shall be the product of the same manufacturer for purposes of parts interchangeability.**

PART 3 - EXECUTION

3.1 EXAMINATION

- #### **A. Examine areas and conditions for compliance with manufacturer's installation recommendations and requirements.**
- #### **B. Proceed with installation only after unsatisfactory conditions have been corrected.**

3.2 INSTALLATION

- #### **A. Install piping and accessories in accordance with the configuration shown on Contract Drawings.**
- #### **B. All areas shall be interpreted as industrial and all piping shall be installed exposed unless otherwise shown or specified.**
- #### **C. Areas with a finished ceiling indicated on the Contract Drawings "Room Finish Schedule" shall have all piping concealed unless otherwise shown or specified.**
- #### **D. Sleeves shall be provided where piping passes through floors and walls.** 1. Sleeves shall be caulked watertight or gastight as required. 2. Where water tightness or gas tightness is not required and the pipe is insulated, the sleeve shall be sized to permit full insulation thickness of pipe to be installed through the sleeve.
- #### **E. Leakage tests shall be as specified.**
- #### **F. No fixture or equipment shall be connected directly to the potable water system in such a manner that a cross-connection exists and backflow of contaminated water into the potable water system could occur.**
- #### **G. All piping, except where noted, shall be kept as high as possible.**

- H. All connections between ferrous and non-ferrous piping and equipment shall be made with dielectric unions.
- I. Copper piping installed in concrete shall be coated with bitumastic paint.
- J. All water piping shall be run true and plumb, free of traps, and installed with adequate clearance from mechanical work.
- K. All water piping shall pitch to drain at a slope of $\frac{1}{4}$ inch per 10 feet unless otherwise noted. Manual air vents shall be installed at all high points and drain valves shall be installed at all low points.
- L. Piping shall not be installed across or in front of doors or windows.
- M. All piping shall be routed parallel to building column lines.
- N. All hot and cold water lines above grade shall be insulated. All exposed insulated piping within five (5) feet of finished floor shall have a metal jacket.
- O. All potable water piping shall be disinfected in accordance with the International Plumbing Code, Section 610.
- P. Install water hammer arresters complete with accessible isolation valve.
- Q. Install lowpoint drain valves with threaded nipple and cap.

3.3 IDENTIFICATION

- A. Identify piping as specified in accordance with the Section entitled "Identification for Plumbing Piping and Equipment."

3.4 PROTECTION

- A. Protect installed equipment from damage through Substantial Completion.

END OF SECTION

SECTION 22 11 19
DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes Plumbing Specialties including backflow preventers, water hammer arresters, hose bibbs, hose valves, wall hydrants, trap primer valves and distribution units as shown on the Contract Drawings.

1.3 REFERENCES

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
1. American National Standards Institute (ANSI)/American Society of Sanitary Engineering (ASSE)
 - a. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers
 - b. ANSI/ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.
 2. American National Standards Institute (ANSI)
 - a. ANSI A112.21.1 - Floor Drains.
 - b. ANSI A112.2.1.2 - Roof Drains.
 - c. ANSI A112.26.1 - Water Hammer Arresters.
 3. American Society for Testing and Materials (ASTM)
 - a. ASTM A 48 – Specifications for Gray Iron Castings.
 - b. ASTM A126 – Specifications for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 4. National Sanitation Foundation (NSF)
 - a. NSF 61 – Drinking Water System Components – Health Effects.
 5. American Society of Mechanical Engineers (ASME)
 - a. ASME B120.1 – Pipe Threads, General Purpose (inch).
 6. Plumbing and Drainage Institute (PDI)
 7. 2009 International Plumbing Code
 8. AWWA Standard C700
 9. University of Southern California Foundation for Cross-Connection Control and Hydraulic Research
 - a. List of Approved Backflow Prevention Assemblies.

1.4 COORDINATION REQUIREMENTS

- A. Coordinate layout and installation of Domestic Water Piping Specialties with electrical equipment, light fixtures, HVAC equipment and ductwork, and piping.

1.5 SUBMITTALS

- A. Submit the following in accordance with the General Conditions.
- B. Product Data: "Catalog cuts" and spec sheets marked to specifically indicate the equipment and materials proposed for this project. Indicate selections with arrows, and cross out irrelevant data.
 - 1. In addition to those submittals identified in the General Conditions, the following items shall also be submitted.
 - 2. Submit minimum inlet pressure requirements and pressure drop data for backflow preventers.

1.6 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturer's Factory Qualifications: Manufacturing facilities shall have accreditation to ISO 9000:2000 or an equivalent quality management system acceptable to the Engineer.

1.7 WARRANTY

- A. Provide parts and labor warranty in accordance with the General Conditions.

PART 2 - PRODUCTS

2.1 BACKFLOW PREVENTERS

- A. Manufacturers / Models - 1" diameter:
 - 1. Ames – Model LF4000BM2
- B. Description:
 - 1. Reduced pressure zone backflow preventers shall have a relief valve located between two independently operating check valves. Backflow preventers shall be designed for horizontal flow installation and sized as indicated on Contract Drawings.

2.2 WATER HAMMER ARRESTER

- A. Manufacturers / Model:
 - 1. Precision Plumbing Products, Inc. - Model SC
 - 2. Watts - SG Series
 - 3. Zurn Industries, Inc - Wilkins Model 1250.
 - 4. or equal.
- B. Description:
 - 1. Water hammer arrester shall have copper body construction suitable for operating pressures up to 150 psig.

2.3 HOSE BIBB

- A. Manufacturers:
 - 1. Acorn Engineering Company - Model 8121-CP
 - 2. Woodford Mfg. – Model 24.
 - 3. Mifab – Series MHY-90.
 - 4. Or equal.

- B. Description:
 - 1. Hose bibbs shall have a 3/4-inch flanged female I.P.S. Inlet, 3/4-inch hose thread outlet with lock shield cap, vacuum breaker, and polished chrome plate finish.

2.4 HOSE REEL AND HOSE

- A. Manufacturers / Models:
 - 1. Reelcraft
 - 2. or equal.

- B. Description:
 - 1. Hose reel shall be constructed of heavy gauge steel with a capacity for 50 feet of 1 ½ - inch I.D. hose. Hose shall be 25 feet of 1 ½ inch Camlock heavy duty rubber hose with 1 ½” high flow washdown hose nozzle. Provide Coxreels model 1185-1124 or approved equal.

2.5 NON-FREEZE WALL HYDRANT

- A. Manufacturers:
 - 1. Josam Manufacturing Company.
 - 2. J.R. Smith Manufacturing Company.
 - 3. Zurn Industries, Inc.
 - 4. Or equal.

- B. Description:
 - 1. Wall Hydrant shall be of the non-freeze type with a bronze box and chrome plated face, bronze hydrant, bronze casing, hose connection, integral vacuum breaker, 3/4-inch inlet connection and a “T” handle key.

2.6 TRAP PRIMER VALVE

- A. Manufacturers:
 - 1. Precision Plumbing Products, Inc.
 - 2. J.R. Smith Manufacturing Company.
 - 3. Or equal.

- B. Description:
 - 1. Trap Primer Valve shall be provided to supply water to floor drain trap to prevent loss of trap seal.

2.7 TRAP PRIMER DISTRIBUTION UNIT

- A. Manufacturers:
1. Precision Plumbing Products, Inc.
 2. Or equal.
- B. Description:
1. Distribution unit shall have a copper reservoir with brass fittings and clear plastic inspection cover on side of reservoir. Unit shall be provided with mounting brackets.

2.8 WATER METER

- A. Manufacturers / Models
1. Neptune / T-10
 2. Or equal.
- B. Description:
1. Cold water meter shall be a magnetic-driven, positive displacement, flat nutating disc type.
 2. Maincase: corrosion resistant, lead-free, high copper alloy.
 3. Maximum Operating Water Pressure: 150 psig (1035 kPa)
 4. Connection: 1" NPS
 5. Normal Operating Accuracy: +/- 1.5% for flows between 1 to 50 GPM.
 6. Register Capacity: 10,000,000 US Gallons.

2.9 WATER PRESSURE REDUCING VALVE

- A. Manufacturers / Models
1. Watts / LF25AUB-Z
 2. Or equal.
- B. Description:
1. Suitable for supply pressures up to 300 psi.
 2. Adjustable from 25 psi to 75 psi.
 3. Body: Lead free cast copper silicon alloy construction.
 4. Seat: Replaceable engineered polymer
 5. Integral Strainer: stainless-steel.
 6. Diaphragm: Reinforced EPDM with PTFE wetted surface.
 7. Valve Disc: EPDM
 8. Connection: 3/4" NPT

2.10 GENERAL

- A. All components of like size and type shall be the product of the same manufacturer for purposes of parts interchangeability.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with manufacturer's installation recommendations and requirements.
- B. Examine walls, floors, roofs, and concrete bases for suitable conditions for installation, for example, all overhead work of other trades is complete.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install Domestic Water Piping Specialties as shown on the Contract Drawings and in accordance with the manufacturer's installation instructions.
- B. Install water hammer arresters complete with accessible isolation valve.

3.3 IDENTIFICATION

- A. Identify Domestic Water Piping Specialties as specified in Section "Identification for Plumbing Piping and Equipment".

3.4 CLEANING

- A. On completion of installation, inspect interior and exterior of equipment. Remove dust, dirt, paint splatters and other spots from exterior and wipe down with damp cotton cloth. Touch up exposed surfaces to match original finish.

3.5 PROTECTION

- A. Protect installed equipment from damage through Substantial Completion.

END OF SECTION

**SECTION 22 11 23
DOMESTIC WATER BOOSTER PUMP**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes Domestic Water Booster Pump (BP-1), Hydro-pneumatic Tanks (HPT-1, HPT-2) and pump controls, as shown on the contract drawings.

1.3 REFERENCES

- A. Comply with the latest revision of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
 - 1. American Society for Testing and Materials (ASTM)
 - 2. American National Standards Institute (ANSI)
 - 3. American Society of Mechanical Engineers (ASME)
 - a. ASME B120.1 – Pipe Threads, General Purpose (inch).
 - 4. Underwriters Laboratories (UL)
 - a. UL 94 – Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.
 - b. National Sanitation Foundation (NSF) NSF 61 – Drinking Water System Components – Health Effects
 - 5. 2015 New York State Plumbing Code

1.4 COORDINATION REQUIREMENTS

- A. Coordinate layout and installation of Domestic Water Piping Specialties with electrical equipment, light fixtures, HVAC equipment and ductwork, and piping.

1.5 SUBMITTALS

- A. Submit the following in accordance with the General Conditions/General Requirements
- B. Product Data: “Catalog cuts” and spec sheets marked to specifically indicate the equipment and materials proposed for this project. Indicate selections with arrows, and cross out irrelevant data. Submit pump curves for booster pumps with operating point clearly indicated.

1.6 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturer’s Factory Qualifications: Manufacturing facilities shall have accreditation to ISO 9000:2000 or an equivalent quality management system acceptable to the Engineer.

1.7 DELIVERY AND HANDLING

- A. Deliver booster pump in shipping splits that can be moved past obstructions in the delivery path.
- B. Coordinate delivery of booster pump to allow movement into designated space.
- C. Handle booster pump components according to manufacturer's written instructions. Use factory-installed lifting provisions.

1.8 WARRANTY

- A. Provide parts and labor warranty in accordance with the General Conditions.

PART 2 - PRODUCTS**2.1 BOOSTER PUMP (BP-1)**

- A. The following manufacturers are named to establish a standard of quality necessary for the Project:
 - 1. Goulds
 - 2. Grundfos
 - 3. Or equal
- B. Water pressure booster pump shall have capacities as scheduled in the contract documents.
- C. Provide one variable speed pumping station designed to provide constant pressure, at required flow rates.
- D. The pump station shall utilize one vertical multistage stainless-steel pump, in conjunction with variable speed pump controller. Appropriate check and shutoff valves, pressure transducers, suction/discharge piping.
- E. Pumps shall be constructed of 304 or 316 stainless steel and be of vertical multi-stage design. Pump case, impellers, diffusers, seal spring, inner bowls, seal spring, shaft sleeve and retainer clip shall be manufactured from stainless steel. Mechanical seal assembly shall be constructed of carbon/silicon or carbon/viton as standard. Shaft sleeves shall be from stainless steel. Pump curve shall rise continuously to shut off head. Best efficiency point of pump shall lie between 70% and 80% of maximum flow capacity of the pump.
- F. The pump base shall be designed and fabricated to provide proper structural support for all attached equipment, and provide anchor bolt support. Provide inline mounting and support as required for the pump.
- G. Motor for the pump shall be C-face frame type, TEFC enclosures, 1.15 service factor, min. insulation class F.

2.2 HYDRO-PNEUMATIC TANK (HPT-1, HPT-2)

- A. Provide ASME rated pressurized hydro-pneumatic tanks as shown on the contract drawings. Tanks to be designed and constructed per ASME Section VIII, Division 1.

2.3 CONTROLS (FOR BP-1)

- A. The pump controls and electrical protection shall be integrated into a single pump controller package. Features shall include input line reactors, lightning protection, low suction pressure switch, and flexible suction/discharge flanged connection.
- B. Pressure transducer shall be provided with the pump controller. The pump controller shall receive a 4-20 mA signal from the transducer. The pressure transducer will monitor system discharge pressure and provide an analog (4-20mA) to the pump control software, and allow the variable pump controller, to provide variable volts/Hz output to the motor. Once the pressure drops below the set system pressure, the pump will start and provide system pressure. All program settings shall be based on centrifugal pump language and centrifugal pumps. Program settings must be field adjustable to provide on-site adjustments. When the system experiences low demand, the variable speed pump controller will reduce the speed of the pump until the demand has stopped. Pump controllers will stop the pump at zero demand, without the use of external switches or controls.
- C. Pumping controller to include an electrical enclosure, complete with main fusible disconnect, variable speed pump controller, pressure sensor and transducer, NEMA motors, instrumentation and controls to automatically start, stop and modulate pump speed to smoothly, efficiently and reliably provide pump variable flow rates at a constant discharge pressure. Pumping station shall provide full pump, motor and drive safety features needed to protect the equipment and the piping system.
- D. Disconnect shall have a through door operator. Motor fusible disconnect panel shall be housed in a NEMA 4 enclosure with integral latches.
- E. The control panel with controls shall be built in accordance with NEC, and shall comply with U.L. standard UL508A. Panel face switches and lights to include:
 - 1. Reset – Acknowledges pump station alarms
 - 2. Run and alarm lights
 - 3. Low suction pressure reset.
- F. All electrical equipment shall be protected by a UL approved Category C and Category B surge arrester, which shall suppress excessive voltage surges on incoming power. The device shall withstand an impulse of 10Kv/10Ka under IEEE C62.41 Category C and shall withstand a ringwave of 6Kv/500a and an impulse of 6Kv/3Ka under Category B.
- G. The pump controller shall provide an adjustable carrier frequency with IGBT power switching, and utilize PWM technology. The drive shall provide noiseless operation of the driving motor, short circuit and grounding protection, and work with controlled sinusoidal current synthesis and dynamic over current limitations.

2.4 ACCESSORIES (FOR BP-1, HPT-1, HPT-2)

- A. Provide the following accessories for the pump, hydropneumatic tank:
 - 1. Provide isolation valves -- full port ball valves.
 - 2. Provide pump discharge (BP-1 only) with a spring-loaded silent non-slam check valve, appropriately sized to allow no greater than 5 psi of head loss at full station rated capacity. Check valve 2" and below shall have brass body and PTFE Teflon seat. Check valves 2" and below shall be pressure rated to 400 psi WOG.
 - 3. Dielectric fittings at connections between piping and equipment.
 - 4. Provide pressure gauges before and after pump. Pressure gauges shall be liquid filled, bourdon tube type. Gauges shall be supplied for both suction and discharge manifolds.
- B. Testing: The entire package shall be hydrostatically and electrically tested prior to shipment.
- C. The manufacturer shall warranty the water pumping system to be free from defects in material and workmanship for one year (12 months) from date of authorized start-up, not to exceed 18 months from the date of the manufacturers invoice.
- D. Water pressure booster system shall have capacities as scheduled on the Contract Drawings.

2.5 PERFORMANCE REQUIREMENTS

	Minimum	Maximum
System Flow Rate (2 pump system)	3.0 Gpm.	20.0 Gpm.
Pump Flow Rate	3.0 Gpm.	20.0 Gpm.
Inlet Pressure	24 psig	48 psig
Outlet Pressure	76 psig	86 psig
Total system lift	0 ft.	162 Ft.
Motor Horsepower		2 HP / 480V 3 Ph.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with manufacturer’s installation recommendations and requirements.
- B. Examine roughing-in of booster pump systems to verify the following:
 - 1. Each utility pipe and conduit is in the correct location.
- C. Examine walls, floors, roofs, and concrete bases for suitable conditions for installation, for example, all overhead work of other trades is complete.

- D. Verify that ground connections are in place and that installation of grounding described in Section "Grounding" is complete.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install booster pump as shown on the Contract Drawings and in accordance with the manufacturer's installation instructions.

3.3 IDENTIFICATION

- A. Identify in accordance with Specification Section 22 05 53.

3.4 PROTECTION

- A. Protect installed equipment from damage through Substantial Completion.

END OF SECTION

**SECTION 22 11 30
NON-POTABLE WATER PIPING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes Non-Potable Water Piping as shown on the Contract Drawings.

1.3 REFERENCES

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
1. American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
 - a. ANSI/ASME B16.3 – Malleable Iron Threaded Fittings Class 150 NS 300.
 - b. ANSI/ASME B16.22 – Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
 - c. ANSI/ASME B16.29 – Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings – DWV.
 2. American National Standards Institute (ANSI)/American Society for Testing and Materials (ASTM)
 - a. ANSI/ASTM B32 – Solder Metal.
 - b. ANSI/ASTM F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 - c. AWWA C110/ANSI A21.10 - Ductile-Iron and Gray-Iron Fittings, 3" through 48" for Water.
 - d. AWWA C115/ANSI A21.15 - Flanged Ductile-Iron Pipe with Ductile Iron or Gray-Iron Threaded Flanges.
 - e. AWWA C151/ANSI A21.51 - Standard for Ductile-Iron Pipe, Centrifugally Cast.
 3. American Society For Testing and Materials (ASTM)
 - a. ASTM A53 – Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
 - b. ASTM B88 – Seamless Copper Water Tube.
 - c. ASTM D2846 – Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic and Cold Water Distribution Systems.
 - d. ASTM F438 – Specification for Socket-type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
 - e. ASTM F493 – Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
 - f. ASTM D2855 – Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
 - g. ASTM D1785 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.

- h. m. ASTM D2466 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- 4. 2015 Plumbing Code of New York State

1.4 COORDINATION REQUIREMENTS

- A. Coordinate layout and installation of domestic water piping system with electrical equipment, light fixtures, HVAC equipment and ductwork, piping, and roof drains.
- B. Submit specially prepared Coordination Drawings for this Project, including floor plans and sections, drawn to scale. Include scaled equipment layouts and relationships between equipment and adjacent structural, mechanical, HVAC, and electrical elements. Show the following:
 - 1. Vertical and horizontal runs, offsets, and transitions.
 - 2. Clearances for access above and to the side.
 - 3. Show dimensions and details, including connections.
 - 4. Support locations, type of support, and weight on each support.
 - 5. Location of adjacent construction elements including light fixtures, HVAC and plumbing equipment, fire sprinklers and piping, signal and control devices, and other equipment.

1.5 SUBMITTALS

- A. Submit the following in accordance with the General Conditions.
- B. Product Data: “Catalog cuts” and spec sheets marked to specifically indicate the equipment and materials proposed for this project. Indicate selections with arrows, and cross out irrelevant data.

1.6 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturer’s Factory Qualifications: Manufacturing facilities shall have accreditation to ISO 9000:2000 or an equivalent quality management system acceptable to the Engineer.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Coordinate delivery of domestic water piping and fittings to allow movement into designated space.

1.8 WARRANTY

- A. Provide parts and labor warranty in accordance with the General Conditions.

PART 2 - PRODUCTS

2.1 NON-POTABLE COLD WATER PIPING, ABOVE GRADE

- A. Manufacturers:
 - 1. Cerro Flow Products Inc.

2. NIBCO INC.
3. U.S. Pipe
4. Or equal.

B. Description: [ADDENDUM 4]

1. 3" diameter and below: Copper Tubing: ASTM B88, Type L. Fittings: ANSI/ASME B16.22, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.
2. 4" diameter and larger: /AWWA C151/ANSI A21.15 - Ductile Iron Pipe - Double Thickness Cement Lined in accordance with AWWA C104/ANSI 21.4. Fittings: AWWA C110/ANSI A21.10 or AWWA C115/ANSI A21.15.

2.2 NON-POTABLE COLD WATER PIPING, BELOW GRADE

A. Manufacturers:

1. Cerro Flow Products Inc.
2. NIBCO INC.
3. U.S. Pipe
4. Or equal.

B. Description:

1. 3" diameter and below: Copper Tubing: ASTM B88, Type K. Fittings: ANSI/ASME B16.22, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.
2. 4" diameter and above: Ductile iron, Class 53 with Megalug joints. Refer to the Section entitled "Ductile Iron Pipe."

2.3 GENERAL

- A. All components of like size and type shall be the product of the same manufacturer for purposes of parts interchangeability.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with manufacturer's installation recommendations and requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install piping and accessories in accordance with the configuration shown on Contract Drawings.
- B. All areas shall be interpreted as industrial and all piping shall be installed exposed unless otherwise shown or specified.
- C. Areas with a finished ceiling indicated on the Contract Drawings "Room Finish Schedule" shall have all piping concealed unless otherwise shown or specified.
- D. Sleeves shall be provided where piping passes through floors and walls.

1. Sleeves shall be caulked watertight or gastight as required.
 2. Where water tightness or gas tightness is not required and the pipe is insulated, the sleeve shall be sized to permit full insulation thickness of pipe to be installed through the sleeve.
- E. Leakage tests shall be as specified.
- F. All piping, except where noted, shall be kept as high as possible.
- G. All connections between ferrous and non-ferrous piping and equipment shall be made with dielectric unions.
- H. Copper piping installed in concrete shall be coated with bitumastic paint.
- I. All water piping shall be run true and plumb, free of traps, and installed with adequate clearance from mechanical work.
- J. All water piping shall pitch to drain at a slope of $\frac{1}{4}$ inch per 10 feet unless otherwise noted. Manual air vents shall be installed at all high points and drain valves shall be installed at all low points.
- K. Piping shall not be installed across or in front of doors or windows.
- L. All piping shall be routed parallel to building column lines.
- M. All hot and cold water lines above grade shall be insulated. All exposed insulated piping within five (5) feet of finished floor shall have a metal jacket.
- N. Install water hammer arresters complete with accessible isolation valve.
- O. Install low point drain valves with threaded nipple and cap.

3.3 IDENTIFICATION

- A. Identify piping in accordance with the Section entitled "Identification of Plumbing Piping and Equipment".

3.4 PROTECTION

- A. Protect installed equipment from damage through Substantial Completion.

END OF SECTION

SECTION 22 13 16
SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes Sanitary Waste and Vent Piping Systems including all sanitary drainage piping systems and sump pump discharge systems as shown on the Contract Drawings.

1.3 REFERENCES

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
1. American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
 - a. ANSI/ASME B16.3 – Malleable Iron Threaded Fittings Class 150 NS 300.
 - b. ANSI/ASME B16.22 – Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
 - c. ANSI/ASME B16.29 – Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings – DWV.
 2. American National Standards Institute (ANSI)/American Society for Testing and Materials (ASTM)
 - a. ANSI/ASTM B32 – Solder Metal.
 - b. ANSI/ASTM F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 3. American National Standards Institute (ANSI)/American Water Works Association (AWWA)
 - a. ANSI/AWWA C110 – Ductile-Iron and Gray-Iron Fittings 3 in. through 48 in., for Water and Other Liquids.
 - b. ANSI/AWWA C111– Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.
 - c. ANSI/AWWA C151 – Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
 4. American Society For Testing and Materials
 - a. ASTM A53 – Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
 - b. ASTM A74 – Cast Iron Soil Pipe and Fittings.
 - c. ASTM B306 – Copper Drainage Tube (DWV).
 - d. ASTM C564 – Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
 - e. ASTM F438 – Specification for Socket-type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
 - f. ASTM F493 – Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.

- g. ASTM D2665 – Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
- h. ASTM D3311 – Specification for Drain, Water and Vent (DWV) Plastic Fittings Patterns.
- i. ASTM D2855 – Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
- j. ASTM D1785 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.
- k. ASTM D2466 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- l. ASTM D3034 – Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- 5. Cast Iron Soil Pipe Institute (CISPI)
 - a. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
- 6. 2015 Plumbing Code of New York State

1.4 COORDINATION REQUIREMENTS

- A. Coordinate layout and installation of Sanitary Waste and Vent Piping with electrical equipment, light fixtures, HVAC equipment and ductwork, and piping.
- B. Submit specially prepared Coordination Drawings for this Project, including floor plans and sections, drawn to scale. Include scaled equipment layouts and relationships between equipment and adjacent structural, mechanical, HVAC. Show the following:
 - 1. Vertical and horizontal runs, offsets, and transitions.
 - 2. Clearances for access above and to the side.
 - 3. Show dimensions and details, including connections.
 - 4. Support locations, type of support, and weight on each support.
 - 5. Location of adjacent construction elements including light fixtures, HVAC and plumbing equipment, fire sprinklers and piping, signal and control devices, and other equipment.

1.5 SUBMITTALS

- A. Submit scaled layout drawings of the piping system. Coordinate layout drawings with architectural, structural, electrical, plumbing and mechanical work. Drawings shall specify pipe and joint type, size, elevation and slope.
- B. Product Data: “Catalog cuts” and spec sheets marked to specifically indicate the equipment and materials proposed for this project. Indicate selections with arrows, and cross out irrelevant data.

1.6 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturer’s Factory Qualifications: Manufacturing facilities shall have accreditation to ISO 9000:2000 or an equivalent quality management system acceptable to the Engineer.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Handle Sanitary Waste and Vent Piping components according to manufacturer's written instructions.

1.8 WARRANTY

- A. Provide parts and labor warranty in accordance with the General Conditions.

PART 2 - PRODUCTS

2.1 SANITARY DRAINAGE PIPING, BELOW GRADE

- A. Description:
 - 1. Cast Iron Soil Pipe: ASTM A74 service weight. Fittings: Cast iron. Joints: hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.
 - 2. Polyvinyl Chloride (PVC) Plastic Pipe (Type DWV): ASTM D2665. Fittings: PVC, Type DWV – ASTM D3311. Joints: Solvent cement in accordance with ASTM D2855.

2.2 SANITARY VENT PIPING, BELOW GRADE

- A. Description:
 - 1. Cast Iron Soil Pipe: ASTM A74 service weight. Fittings: Cast iron. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.
 - 2. Polyvinyl Chloride (PVC) Plastic Pipe (Type DWV): ASTM D2665. Fittings: PVC, Type DWV – ASTM D3311. Joints: Solvent cement in accordance with ASTM D2855.

2.3 SANITARY DRAINAGE PIPING, ABOVE GRADE

- A. Description:
 - 1. Cast Iron Soil Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
 - 2. Copper Pipe: ASTM B306, DWV. Fittings: ANSI/ASME B16.3, cast bronze, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 50B.
 - 3. Polyvinyl Chloride (PVC) Plastic Pipe (Type DWV): ASTM D2665. Fittings: PVC, Type DWV – ASTM D3311. Joints: Solvent cement in accordance with ASTM D2855.

2.4 SANITARY VENT PIPING, ABOVE GRADE

- A. Description:
 - 1. Cast Iron Soil Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
 - 2. Copper Pipe: ASTM B306, DWV. Fittings: ANSI/ASME B16.3, cast bronze, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 50B.
 - 3. Polyvinyl Chloride (PVC) Plastic Pipe (Type DWV): ASTM D2665. Fittings: PVC, Type DWV – ASTM D3311. Joints: Solvent cement in accordance with ASTM D2855.

2.5 PUMP DISCHARGE

- A. Description:
 - 1. Galvanized Steel Pipe - Schedule 40: ASTM A53. Fittings: Cast Iron. Joints: Threaded.

2.6 MANUFACTURERS

- A. The following manufacturers are named to establish a standard of quality necessary for the Project:
 - 1. Cast Iron Soil Pipe Institute.
 - 2. Charlotte Pipe and Foundry Co.
 - 3. Harvel Plastics Inc.
 - 4. Nibco.
 - 5. Or equal.

2.7 GENERAL

- A. All components of like size and type shall be the product of the same manufacturer for purposes of parts interchangeability.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with manufacturer's installation recommendations and requirements.
- B. Examine walls, floors, roofs, and concrete bases for suitable conditions for installation, for example, all overhead work of other trades is complete.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install piping as shown on the Contract Drawings and in accordance with the manufacturer's installation instructions.
- B. Install piping and accessories in accordance with the configuration shown on Contract Drawings.
- C. All areas shall be interpreted as industrial and all piping shall be installed exposed unless otherwise shown or specified.
- D. Areas with a finished ceiling indicated on the Contract Drawings "Room Finish Schedule" shall have all piping concealed unless otherwise shown or specified.
- E. Sleeves shall be provided where piping passes through floors and walls.
 - 1. Sleeves shall be caulked watertight or gastight as required.

2. Where watertightness or gastightness is not required and the pipe is insulated, the sleeve shall be sized to permit full insulation thickness of pipe to be installed through the sleeve.
- F. Leakage tests shall be as specified.
 - G. No fixture or equipment shall be connected directly to the potable water system in such a manner that a cross-connection exists and backflow of contaminated water into the potable water system could occur.
 - H. All piping, except where noted, shall be kept as high as possible.
 - I. All connections between ferrous and non-ferrous piping and equipment shall be made with dielectric unions.
 - J. Copper piping installed in concrete shall be coated with bitumastic paint.
 - K. Piping shall not be installed across or in front of doors or windows.
 - L. All piping shall be routed parallel to building column lines.
 - M. Cleanouts shall be installed at the base of all risers and below floors and where shown.
 1. Cleanouts shall be the full size of the pipe up to and including four (4) inches in diameter. Cleanouts on pipe larger than four (4) inches in diameter shall remain 4 inches in diameter.
 2. Cleanouts installed buried below the floor shall have deckplate cleanouts (DPCO). Cleanouts concealed in walls or partitions shall have wallplate cleanouts.
 - N. Label plumbing pipes in accordance with the Section entitled "Identification for Plumbing Piping and Equipment"

3.3 IDENTIFICATION

- A. Identify Sanitary Waste and Vent Piping as specified in Section "Identification for Plumbing Piping and Equipment".

3.4 CLEANING

- A. On completion of installation, inspect interior and exterior of equipment. Remove dust, dirt, paint splatters and other spots from exterior and wipe down with damp cotton cloth. Touch up exposed surfaces to match original finish.

3.5 PROTECTION

- A. Protect installed piping from damage through Substantial Completion.

END OF SECTION

**SECTION 22 13 19
SANITARY WASTE PIPING SPECIALTIES**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes Sanitary Waste Piping Specialties including floor drains and cleanouts as shown on the Contract Drawings.

1.2 REFERENCES

- A. Comply with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
 - 1. American National Standards Institute (ANSI)/American Society of Sanitary Engineering (ASSE)
 - 2. American National Standards Institute (ANSI)
 - a. ANSI A112.21.1 - Floor Drains.
 - 3. American Society for Testing and Materials (ASTM)
 - 4. 2015 Plumbing Code of New York State

1.3 COORDINATION REQUIREMENTS

- A. Coordinate layout and installation of Sanitary Waste Piping Specialties with electrical equipment, light fixtures, HVAC equipment and ductwork, and piping.

1.4 SUBMITTALS

- A. Submit the following in accordance with the General Conditions.
- B. Product Data: "Catalog cuts" and spec sheets marked to specifically indicate the equipment and materials proposed for this project. Indicate selections with arrows, and cross out irrelevant data.

1.5 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturer's Factory Qualifications: Manufacturing facilities shall have accreditation to ISO 9000:2000 or an equivalent quality management system acceptable to the Engineer.
- B. Source Limitations: Obtain Sanitary Waste Piping Specialties and accessories through one source from a single manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Handle Sanitary Waste Piping Specialties components according to manufacturer's written instructions. Use factory-installed lifting provisions.

1.7 WARRANTY

- A. Provide parts and labor warranty in accordance with the General Conditions.

PART 2 - PRODUCTS

2.1 FLOOR DRAINS (F.D.)

- A. Manufacturers:
 - 1. J.R. Smith Manufacturing Company.
 - 2. Zurn Industries, Inc.
 - 3. Josam Manufacturing Company.
 - 4. Or equal.

- B. Description:
 - 1. Type "A" floor drain to be used in finished areas. The drain shall have a cast iron body with a flashing collar, an adjustable nickel bronze strainer head with a 6-inch diameter round top a 1/2-inch trap primer connection and a bottom outlet connection.
 - 2. Type "B" floor drain to be used for indirect waste. The drain shall have a cast iron body and flashing collar, seepage openings, 8-inch diameter nickel-bronze adjustable strainer head with 4-inch nickel-bronze funnel attached, 1/2-inch trap primer connection, and a bottom outlet connection.
 - 3. Type "C" floor drain to be used in unfinished areas. The drain shall have a cast iron body and flashing collar, 12" diameter adjustable top and bar grate with sediment bucket, and a bottom outlet connection.
 - 4. Type "D" floor drain to be used in unfinished areas. The drain shall have a cast iron body and flashing collar, 15" diameter adjustable top and bar grate with sediment bucket, and a bottom outlet connection.

2.2 DECKPLATE CLEANOUT (D.P.C.O.)

- A. Manufacturers:
 - 1. J.R. Smith Manufacturing Company.
 - 2. Zurn Industries, Inc.
 - 3. Manufacturing Company.
 - 4. Or equal.

- B. Description:
 - 1. Cleanout for finished floor areas shall have a cast iron body with round nickel-bronze adjustable top.
 - 2. Cleanout for unfinished floor areas shall have a cast iron body with round extra heavy duty cast iron adjustable top.

2.3 WALL CLEANOUT FRAME AND COVER (W.C.O.)

- A. Manufacturers:
 - 1. J.R. Smith Manufacturing Company.
 - 2. Zurn Industries Inc.
 - 3. Josam Manufacturing Company.

4. Or equal.

B. Description:

1. A. Wall cleanout frame and cover shall be square with a secured bronze cover. Opening shall be 8 inches square.

2.4 GENERAL

A. All components of like size and type shall be the product of the same manufacturer for purposes of parts interchangeability.

2.5 FLAP VALVE

A. Provide 4" Kennedy Flap valve or approved equal for backflow preventer drain applications.

2.6 DUPLEX PUMPING SYSTEMS

A. Manufacturers:

1. Bell & Gossett Domestic Pump; ITT Corporation.
2. Goulds Pumps; ITT Corporation.
3. Grundfos Pumps Corp.
4. Little Giant Pump Co.
5. Weil Pump Company, Inc.
6. Zoeller Company.

B. Description:

1. Factory-assembled and -tested sump-pump unit.
2. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller,
3. centrifugal sump pump.
4. Pump Casing: Cast iron, with strainer inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
5. Impeller: Statically and dynamically balanced, designed for clear wastewater handling, and keyed and secured to shaft.
6. Pump and Motor Shaft: Steel, with double factory-seal, grease-lubricated ball bearings.
7. Seal: double mechanical.
8. Motor: Hermetically sealed, with built-in overload protection; lifting eye or lug; and three conductor, waterproof power cable of length required and with grounding plug and cable sealing assembly for connection at pump.
 - a. Motor Housing Fluid: Oil
 - b. Moisture sensor for primary seal failure.

C. Duplex Sump Pump Control Panel

1. Provide a factory-assembled UL listed and labeled Duplex Sump Pump Control Panel for the following sump pumps:
2. Control Panel shall have the following components:
 - a. NEMA 1 enclosure with main disconnect.
 - b. Control power transformer with primary and secondary fuses, line voltage primary and 120V grounded secondary.

- c. For each pump: Combination motor circuit protector and starter with NEMA Class 10 overload relay, with a door-mounted RESET pushbutton.
 - d. Pump motor moisture and winding temperature protection relay for each pump.
 - e. Door-mounted HAND-OFF-AUTO selector switch, and red RUNNING and green
 - f. OFF pilot lights for each pump. Provide label at HAND-OFF-AUTO selector switch
 - g. "DO NOT LEAVE H-O-A SWITCH IN HAND UNATTENDED."
 - h. Selector switches, pilot lights, relays and control wiring configured for the specified functionality.
 - i. Provide compression type cord connectors for the submersible pump and float switch cords.
3. Sump float switches shall be mounted as shown on the Drawings, with the following functionality:
- a. a. First level float switch: turn off Primary Pump and Standby Pump
 - b. b. Second level float switch: turn on Primary Pump
 - c. c. Third level float switch: sound and send alarm to SCADA (direct connection).
 - d. d. Fourth level float switch: turn on Standby Pump
4. Pump AUTO sequence of operation shall be as follows:
- a. HAND-OFF-AUTO selector switch is normally left in AUTO position, disconnect switch in ON position.
 - b. RUNNING lights off.
 - c. OFF lights illuminated.
 - d. Sump level below respective first level float switch actuation level for pump: pump off.
 - e. Sump level rises to second switch: Primary pump on.
 - f. Sump level rises to third switch: sound and send alarm to SCADA (direct connection).
 - g. Sump level rises to fourth switch: Standby pump on.
5. Pump HAND sequence of operation shall be as follows:
- a. In HAND and OFF, pump motor shall start and stop respectively (no low level cutoff).
6. Sump Pump Control Panel power supply wiring and alarm wiring shall be per Specification 26 00 00. Other field wiring required for pump operation shall be provided under this section of the Specification.
- D. Performance/Design Criteria
- 1. As scheduled on the Contract Drawings

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with manufacturer's installation recommendations and requirements.
- B. Examine walls, floors, roofs, and concrete bases for suitable conditions for installation, for example, all overhead work of other trades is complete.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install Sanitary Waste Piping Specialties as shown on the Contract Drawings and in accordance with the manufacturer's installation instructions.
- B. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

3.3 IDENTIFICATION

- A. Identify Sanitary Waste Piping Specialties as specified in Section "Identification for Plumbing Piping and Equipment."

3.4 CLEANING

- A. On completion of installation, inspect interior and exterior of equipment. Remove dust, dirt, paint splatters and other spots from exterior and wipe down with damp cotton cloth. Touch up exposed surfaces to match original finish.

3.5 PROTECTION

- A. Protect installed equipment from damage through Substantial Completion.

END OF SECTION

SECTION 22 33 00
ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes electric water heaters as shown on the Contract Drawings.

1.3 REFERENCES

- A. Comply with the latest revision of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
1. 2015 International Plumbing Code
 2. American Society for Testing and Materials (ASTM)
 3. American National Standards Institute (ANSI)
 - a. ANSI/UL 1453 – Electric Booster and Commercial Storage Tank Water Heaters.
 4. ASME B120.1 – Pipe Threads, General Purpose (inch).
 5. Underwriters Laboratories (UL)
 - a. UL 94 – Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.
 - b. UL 499 – Standard for Electrical Heating Appliances.
 - c. ETL/UL 508 – Standard for Industrial Control Equipment.
 6. National Sanitation Foundation (NSF)
 - a. NSF 61 – Drinking Water System Components – Health Effects.

1.4 COORDINATION REQUIREMENTS

- A. Coordinate layout and installation of Electric Domestic Water Heaters with electrical equipment, light fixtures, HVAC equipment and ductwork, and piping.

1.5 SUBMITTALS

- A. Submit the following in accordance with the General Conditions.
- B. Product Data: “Catalog cuts” and spec sheets marked to specifically indicate the equipment and materials proposed for this project. Indicate selections with arrows, and cross out irrelevant data.

1.6 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturer's Factory Qualifications: Manufacturing facilities shall have accreditation to ISO 9000:2000 or an equivalent quality management system acceptable to the Engineer.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Handle Domestic Electric Water Heaters according to manufacturer's written instructions.

1.8 WARRANTY

- A. Provide parts and labor warranty in accordance with the General Conditions.

PART 2 - PRODUCTS

2.1 ELECTRIC WATER HEATERS

- A. Manufacturers:
 - 1. A.O. Smith Company
 - 2. State Water Heaters
 - 3. Or equal
- B. Description:
 - 1. Electric water heaters shall be commercial style water heaters with storage capacities and heater element requirements as scheduled on the Contract Drawings.
- C. Performance/Design Criteria:
 - 1. Water heaters shall be provided with ASME rated temperature and pressure relief valves.

2.2 GENERAL

- A. All components of like size and type shall be the product of the same manufacturer for purposes of parts interchangeability.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with manufacturer's installation recommendations and requirements.
- B. Examine walls, floors, roofs, and concrete bases for suitable conditions for installation, for example, all overhead work of other trades is complete.

- C. Verify that ground connections are in place and that installation of grounding described in Section "Grounding" is complete.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install Domestic Electric Water Heater as shown on the Contract Drawings and in accordance with the manufacturer's installation instructions.

3.3 IDENTIFICATION

- A. Identify Domestic Electric Water Heater as specified in Section "Identification of Plumbing Piping and Equipment".

3.4 CLEANING

- A. On completion of installation, inspect interior and exterior of equipment. Remove dust, dirt, paint splatters and other spots from exterior and wipe down with damp cotton cloth. Touch up exposed surfaces to match original finish.

3.5 PROTECTION

- A. Protect installed equipment from damage through Substantial Completion.

END OF SECTION

**SECTION 22 40 00
PLUMBING FIXTURES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes Plumbing Fixtures including water closets, urinals, lavatories, sinks, mop basins, water coolers, showers, shower trim, rough-in and final connections of fixtures as shown on the Contract Drawings.

1.3 REFERENCES

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
 - 1. American Society of Mechanical Engineers – ASME
 - a. ASME A112.18.1 – Plumbing Fixture Fittings.
 - b. ASME A112.19.1 – Enameled Cast Iron Plumbing Fixtures.
 - c. ASME A112.19.2 – Vitreous China Plumbing Fixtures.
 - d. ASME A112.19.3 – Stainless Steel Plumbing Fixtures.
 - e. ASME A112.19.6 – Hydraulic Performance for Water Closets and Urinals.
 - f. American Society of Sanitary Engineering – ASSE
 - g. ASSE 1037 – Performance Requirements for Pressurized Flushing Devices for Plumbing Fixtures.
 - 2. American Society for Testing and Materials (ASTM)
 - 3. American National Standards Institute (ANSI)
 - 4. 2015 Plumbing Code of New York State

1.4 COORDINATION REQUIREMENTS

- A. Coordinate layout and installation of Plumbing Fixtures with electrical equipment, light fixtures, HVAC equipment and ductwork, and piping.

1.5 SUBMITTALS

- A. Submit the following in accordance with the General Conditions.
- B. Product Data: “Catalog cuts” and spec sheets marked to specifically indicate the equipment and materials proposed for this project. Indicate selections with arrows, and cross out irrelevant data.

1.6 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturer's Factory Qualifications: Manufacturing facilities shall have accreditation to ISO 9000:2000 or an equivalent quality management system acceptable to the Engineer.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Handle Plumbing Fixtures according to manufacturer's written instructions.

1.8 WARRANTY

- A. Provide parts and labor warranty in accordance with the General Conditions.

PART 2 - PRODUCTS

2.1 GRAVITY TANK TYPE WATER CLOSETS (WC-1)

- A. Manufacturers:
 - 1. American Standard Companies, Inc. – Model Exposed Trapway Cadet Touchless
 - 2. Crane Plumbing L.L.C.
 - 3. Kohler Co.
 - 4. Or equal.
- B. Description:
 - 1. Gravity tank type water closet shall be a white vitreous china toilet suitable for flushing 1.6 gal./flush (6-L/flush).
 - 2. Bowl Type: Floor mounting, floor outlet elongated with siphon-jet design. Bolts and caps matching fixture.
 - 3. Tank: gravity type with trim. Unit shall meet requirements of ASME A112.19.2.
 - 4. Trip Mechanism: Touchless tank with sensor, activated by a simple hand wave. Sensor and control module shall be battery powered.
 - 5. Supply: NPS ½ chrome plated with handle type stop.

2.2 WATER CLOSET SEATS

- A. Manufacturers:
 - 1. Beneke – Model 525 SS.
 - 2. Church – Model 9500SSCT.
 - 3. Or equal.
- B. Description:
 - 1. Seat for Water Closet shall be white solid plastic with extended back, open front, check hinge and of the elongated design.

2.3 WALL-MOUNTED LAVATORY FOR HANDICAPPED (LAV-1)

- A. Manufacturers:
 - 1. American Standard - Model 9141.011.

2. Kohler – Morningside Model K-12636.
 3. Or equal.
- B. Description:
1. Wall-mounted lavatory for the handicapped shall be a vitreous china wheelchair lavatory with a front over-flow, and single centered faucet hole suitable for electronic proximity lavatory faucet. Unit shall meet requirements of ASME A112.19.2.
 2. Lavatory faucet shall be electronic proximity lavatory faucet, American Standard – Model Selectronic, or approved equal. Faucet shall be single inlet, battery powered, and provided with thermostatic mixing valve. Unit shall meet requirements of ASME A112.18.1.

2.4 GENERAL

- A. All components of like size and type shall be the product of the same manufacturer for purposes of parts interchangeability.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with manufacturer’s installation recommendations and requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install materials and equipment as shown on the Contract Drawings and in accordance with the manufacturer’s installation instructions.

3.3 CLEANING

- A. On completion of installation, inspect interior and exterior of equipment. Remove dust, dirt, paint splatters and other spots from exterior and wipe down with damp cotton cloth.

3.4 PROTECTION

- A. Protect installed equipment from damage through Substantial Completion.

END OF SECTION