

SECTION 22 0500
COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials and equipment and incidentals required to make ready for use complete plumbing systems as shown on the Drawings and specified herein.
- B. Where Sub-Contracts are used to perform portions of the work, division of labor between sub trades is the responsibility of the Contractor.
- C. Furnish all labor, materials and equipment and incidentals required to make ready for use complete plumbing systems as shown on the Drawings and specified herein.
- D. Work includes furnishing, installing and testing the equipment and materials specified in other sections of the Division Specifications and shown on the Plumbing Drawings. It is the intent of these Specifications that the plumbing systems shall be suitable in every way for the intended usage. All material and all work which may be reasonably implied as being incidental to the work of this Division shall be furnished at no extra cost.
- E. The general scope work includes, but is not limited to, furnishing, coordinating, and installing the following:
 - 1. Domestic waste and vent systems with connection to site utilities.
 - 2. Domestic water distribution systems with connection to site utilities.
 - 3. Plumbing fixtures, specialties and equipment.
- F. Visit all areas of the existing site, buildings and structures (as applicable) in which work under these sections is to be performed. Inspect carefully the existing conditions prior to bidding. Bid submission is evidence that the Contractor has examined the site and existing conditions, understands conditions under which the work will be performed, and takes full responsibility for complete knowledge of all factors governing the work.
- G. Schedule all service interruptions in existing facilities at the Owner's convenience with 24 hours (minimum) notice. Obtain prior approval for each interruption.
- H. Thoroughly test all plumbing systems after installation and make any minor corrections, changes or adjustments necessary for proper functioning of the systems and equipment. All workmanship shall be of the highest quality; substandard work will be rejected.

1.02 SUBMITTALS

- A. Clearly indicate proposed equipment and/or materials substitutions in shop drawings. Summarize all deviations from the specified quality, functionality, appearance or performance of proposed equipment and/or materials in the preface of each submittal. Include documentation to support deviations.
- B. Provide descriptive data on all materials and equipment as required to ascertain compliance with Specifications.
- C. Design layout shown on drawings is based on physical sizes of reputable equipment manufacturers. If equipment other than models indicated is installed, any resulting conflicts with space, maintenance access, clearances or codes are the responsibility of the Contractor to correct at his expense.

- D. Where specific models and manufacturers of materials and equipment are specified, substitutions as allowed by the specifications and State law will be considered. Substitutions must be equivalent in quality, function, suitability and arrangement to specified equipment. Architect/Engineer to have final authority as to equivalency of substitutions.
- E. Equipment model numbers noted in these specifications or on the drawings are intended to establish a minimum standard of quality and do not necessarily relate to specific options or arrangement as shown. Provide equipment with all standard features and optional features as stated and arranged as shown on the drawings.
- F. Where seismic design for supports is required, submit installation details for supports and engineering analysis as specified.

1.03 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with all applicable state and local codes, standards and regulations.
- B. Furnish all materials and labor which is be required for compliance with codes, standards and regulations, whether specifically mentioned in these specifications or shown on the drawings.
- C. Obtain required construction permit from the authority having jurisdiction and arrange, at the proper time, for all inspections required by such authority. Pay all permit and inspection costs required.

1.04 COORDINATION OF WORK

- A. Contractor is responsible for coordination of work between trades. Provide fully complete and functional systems.
- B. Compare plumbing drawings and specifications with the drawings and specifications for other trades.
- C. Coordinate plumbing installation with the work of other trades. Report any pertinent discrepancies to the Architect/Engineer and obtain written instructions for any necessary revisions. Before starting any construction, make proper provisions to avoid interferences in a manner approved by the Architect/Engineer. No extras will be allowed for rework of uncoordinated installations.
- D. Determine exact route and location of each plumbing item prior to fabrication and/or installation. Adjust location of piping and equipment, etc., to accommodate interferences anticipated and encountered.
- E. Right of Way: General priority for right of way is as follows:
 - 1. Items located per regulatory requirement.
 - 2. Piping with pitch requirement (plumbing drains, etc.)
 - 3. Ductwork
 - 4. Piping without pitch requirement.
 - 5. Electrical wiring (conduits, etc.)
- F. Arrange all work to permit removal (without damage to other parts) of any equipment requiring periodic replacement.
- G. Provide clearance and easy access to any equipment which requires periodic maintenance. Arrange ducts, piping and equipment to permit ready access to valves, cocks, traps, starters, motors, control components, etc., and to clear the opening of swinging doors and access panels.

1.05 EQUIPMENT AND MATERIALS (GENERAL)

- A. Provide all new materials unless specifically indicated otherwise.

- B. Manufacturers and models listed in drawings and specifications are used for layout and to convey to bidders the general style, type, character and quality of product desired. Listed examples are used only to denote the quality standard of product desired and are not intended to restrict bidders to a specific brand, make, manufacturer or specific name.
- C. Adjust layout, system connections and coordinate with other trades as required to properly install equivalent products.
- D. Where equivalent products are submitted, include all associated costs related to substitution in bid.
- E. Furnish materials bearing the manufacturer's name and trade name. Provide UL label where a UL standard has been established for the particular material.
- F. Furnish standard products of manufacturers regularly engaged in production of equipment types required for the work. Use the manufacturer's latest approved design.
- G. Use the same manufacturer for equipment and materials of the same general type throughout the work to obtain uniform appearance, operation and maintenance.
- H. Protect equipment and materials from dirt, water, chemical or mechanical injury and theft at all times during construction. Provide covers or shelter as required.
- I. If materials or equipment are damaged at any time prior to final acceptance of the work, repair such damage at no additional cost. If materials or equipment are damaged by water, provide replacement no additional cost.
- J. Follow manufacturer's directions completely in the delivery, storage, protection and installation of all equipment and materials. Notify the Architect/Engineer in writing of any conflicts between any requirements of the contract documents and manufacturer's directions. Obtain written instructions before proceeding with the work. The Contractor is responsible for correction of any work that does not comply with the manufacturer's directions or written instructions from the Architect/Engineer at no additional cost.
- K. Repair any damage to factory applied paint finish using touch up paint furnished by the equipment manufacturer. Repaint entire damaged panel or section per the field painting specifications in Division 9 at no additional cost.

1.06 OPERATION AND MAINTENANCE MANUALS

- A. Refer to individual plumbing sections.

1.07 SEISMIC REQUIREMENTS

- A. Install plumbing work in a manner to be fully compliant with the seismic restraint requirements of the North Carolina State Building Code (NCSBC). The Contractor shall provide any and all seismic restraint details and calculations that may be required by the NCSBC and/or the Authority Having Jurisdiction.
- B. Requirements for restraints are detailed in the NCSBC. All tables and references shall conform to building's location. Restraints shall be per Seismic Performance Category stated on Architectural Drawings.
- C. The Contractor shall retain the services of a Professional Engineer registered in the State of North Carolina to design seismic restraint elements required for this project. The Engineer's calculations, bearing his professional seal, shall accompany shop drawings and shall demonstrate Code compliance including certification that the seismic system components comply with the testing requirements of NCSBC Section 17 08.5. Calculations and shop drawings shall be submitted for review prior to the purchasing of materials, equipment, systems and assemblies. Internal seismic restraint elements of manufactured equipment shall be certified by a professional engineer retained by the manufacturer. Such certificate applies only to

internal elements of the equipment. All equipment anchorage requirements shall be coordinated with the building structure and shall be compatible thereto. All such anchorages shall be subject to the review and approval of the project's structural engineer.

- D. The Professional Engineer retained for seismic restraint calculations shall visit the job site upon completion of the seismic restraint installation to comply with the Special Inspections requirement of the Code. This engineer shall provide written verification of compliance of the installation with the approved seismic submittal. This verification shall be submitted as a Special Inspections Report and shall bear the Engineer's professional seal. Job site inspections by other than this engineer are not acceptable.
- E. Review of the seismic design computations and shop drawings by the Architect/Engineer or his agent shall not relieve the Contractor of his responsibility to comply with the seismic or any other requirements of the North Carolina State Building Code.

1.08 PAINTING

- A. Refer to Division 9.
- B. Protect fixtures, valves, trim, etc. from field painting operations. Do not install escutcheons and trim until painting is complete.

1.09 LOCATIONS AND MEASUREMENTS

- A. Location of plumbing work is shown on the drawings as accurately as possible. Field verify all measurements to insure that the work suits the surrounding trim, finishes and/or construction. Provide adjustment as necessary.
- B. Make minor relocations of work prior to installation as required or as directed by the Architect/Engineer at no additional cost.

1.10 SUPERVISION

- A. Contractor to provide an authorized and competent representative to constantly supervise the work from the beginning to completion and final acceptance. Insofar as possible, keep the same foreman and workmen throughout the project duration.
- B. Representatives of Architect/Engineer, Owner, and local inspection authorities will make inspections during the progress of the work. Contractor to accommodate such inspections and correct deficiencies noted.

1.11 QUALITY AND WORKMANSHIP

- A. Contractor to employ skilled tradesmen, laborers and supervisors. Final product to be a neat, well finished, and professional installation.
- B. Remove and replace any work considered substandard quality in the judgment of the Architect/Engineer.

1.12 EXCAVATION, TRENCHING AND BACKFILLING

- A. Provide all excavation, trenching and backfilling as required to complete the work under this Division.
- B. Contractor is responsible for investigating conditions prior to excavating and to exercise care during the excavation to avoid any utilities or other objects which may or may not be shown on the drawings.

- C. Excavate so as not to endanger or damage existing utilities and structures. If damage occurs, repair damage to the satisfaction of the Architect/Engineer at no additional cost.
- D. Lay out location of all ditching at grade and obtain approval from the Architect/Engineer prior excavating.
- E. Remove and dispose of all surplus earth from the site.
- F. Provide suitable backfill materials as required.
- G. Perform excavation, trenching and shoring in accordance with rules and regulations set forth in Article XXI, Bulletin 1 "Trenching" as published in a separate bulletin by the North Carolina Department of Labor, Division of Standards and Inspection Construction Bureau.
- H. Bid excavation work as unclassified with no extra payment for removal of rock, unsuitable soils, etc.

1.13 CLOSING IN WORK

- A. Do not cover up or enclose work until it has been inspected, tested and approved by authorities having jurisdiction over the work. Uncover any such work for inspection and/or test at no additional cost. Restore the work to its original condition after inspection and/or test at no additional cost.

1.14 CUTTING AND PATCHING

- A. Perform all cutting and patching necessary to install work under this Division.
- B. Perform cutting and patching in professional, workmanlike manner.
- C. Arrange work to minimize cutting and patching.
- D. Do not cut joists, beams, girders, columns or any other structural members without written permission from the Architect/Engineer.
- E. Cut opening only large enough to allow easy installation of piping, wiring or ductwork.
- F. Patching material to match material removed.
- G. Restore patched surface to its original appearance at completion of patching.
- H. Where waterproofed surfaces are patched, maintain integrity of waterproofing.
- I. Remove rubble and excess patching materials from the premises.

1.15 INTERPRETATION OF DRAWINGS

- A. Drawings and specifications under this Division are complementary each to the other. Provide any work specified herein and/or indicated on the drawings.
- B. Drawings are diagrammatic and indicate generally the location of fixtures, piping, devices, equipment, etc. Follow drawings as closely as possible, but arrange work to suit the finished surroundings and/or trim.
- C. The words "furnish", "provide", and/or "install" as used in these drawings and specifications are interpreted to include all material and labor necessary to complete the particular item, system, equipment, etc.

- D. Any omissions from either the drawings or specifications are unintentional. Contractor is responsible for notifying the Architect/Engineer of any pertinent omissions before submitting a bid. Complete and working systems are required, whether every small item of material is shown and specified or not.

1.16 ACCESSIBILITY

- A. Locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment to include, but not be limited to, valves, traps, cleanouts, motors, controllers and drain points. If required for accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility.
- B. Coordinate exact locations and size of access panels for each concealed device requiring service.
- C. Access panels: Steel construction with 16 gauge frames and 18 gauge panels, factory primed with rust inhibiting paint, finish paint by Contractor. Provide suitable UL listed doors where installed in rated construction.
- D. Coordinate access panel locations with architectural construction.
- E. Access panels are not required for access to work located above a lift out "T" bar type ceiling.

1.17 ELECTRICAL WORK IN CONNECTION WITH PLUMBING WORK

- A. Comply with Division 26. Any required Division 22 electrical work not explicitly specified to be furnished by Division 26 Contractor shall be provided by Division 22 Contractor.
- B. PLUMBING WORK IN CONNECTION WITH OTHER CONTRACTS
- C. Provide plumbing services as required for items furnished by other contractors or vendors as shown on the plumbing drawings. Include rough-ins and final connections to equipment. Locations of connections shown on the drawings are approximate and some adjustment of actual connection locations should be anticipated. Coordinate exact connection requirements. Make final connections only after approval of the other contractor or vendor, in the contractor's or vendor's presence.
- D. Site Utilities- In general, work under this Division covers work to five feet outside buildings. Extend and connect work under this Division to site utilities as required.
- E. Owner Furnished Equipment- Obtain exact plumbing requirements and rough-in locations for Owner furnished equipment. Provide complete plumbing installation for proper operation of equipment.

1.18 PROJECT RECORD DRAWINGS

- A. See Section 01 7800 – Closeout Submittals, for submittal requirements and procedures.
- B. As the work progresses, legibly record all field changes on a set of project contract drawings, herein after called the "record drawings."
- C. Accurately show the installed condition of plumbing work on record drawings.

1.19 ALTERNATES

- A. See Section 01 2300 - Alternates, for product alternatives affecting this Division.

1.20 PROJECT CLOSEOUT

- A. See Section 01 7800 – Closeout Submittals, for submittal requirements and procedures.

PART 2 PRODUCTS Not used.

PART 3 EXECUTION Not used.

END OF SECTION

SECTION 220700
PLUMBING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.02 SUBMITTALS

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, list of materials and thickness for each service, and locations.
- C. Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.03 QUALITY ASSURANCE

- A. Materials: Flame spread/smoke developed rating of 25/50 or less in accordance with ASTM E84, NFPA 255, UL 723.

1.04 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section with minimum three years experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products: Submit under provisions of relevant sections of the General and Supplemental General Conditions and Division 1 Specification Sections.
- B. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Store insulation in original wrapping and protect from weather and construction traffic.
- D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 CELLULAR FOAM

- A. Manufacturers: Armstrong, Rubatex, Halstead.
- B. Substitutions: Submit under provisions of relevant sections of the General and Supplemental General Conditions and Division 1 Specification Sections.

- C. Insulation: ASTM C534; flexible, cellular elastomeric, molded or sheet.
 - 1. 'K' Value: ASTM C177 or C518; 0.27 at 75 degrees F.
 - 2. Minimum Service Temperature: -40 degrees F.
 - 3. Maximum Service Temperature: 220 degrees F.
 - 4. Maximum Moisture Absorption: ASTM D1056; 1.0 percent (pipe) by volume, 1.0 percent (sheet) by volume.
 - 5. Moisture Vapor Transmission: ASTM E96; 0.20 perm inches.
 - 6. Maximum Flame Spread: ASTM E84; 25.
 - 7. Maximum Smoke Developed: ASTM E84; 50.
 - 8. Connection: Waterproof vapor barrier adhesive.
- D. Elastomeric Foam Adhesive
 - 1. Air dried, contact adhesive, compatible with insulation.
- E. Weatherproof Elastomeric Foam Coating
 - 1. Air dried, latex finish coating, compatible with insulation, in color selected by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install in accordance with NAIMA National Insulation Standards and manufacturer's instructions.
- B. On exposed piping, locate insulation and cover seams in least visible locations.
- C. Cold water piping:
 - 1. Insulate with cellular foam insulation.
 - 2. Insulate fittings, joints, and valves with miter cut sections of like material and thickness as adjacent pipe.
 - 3. Seal joints with elastomeric foam adhesive.
 - 4. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
 - 5. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
 - 6. Finish insulation exposed to weather with weatherproof coating.
- D. Hot water piping:
 - 1. Insulate with cellular foam insulation.
 - 2. Insulate fittings, joints, and valves with miter cut sections of like material and thickness as adjacent pipe.
 - 3. Seal joints with elastomeric foam adhesive.
 - 4. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
 - 5. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
 - 6. Finish insulation exposed to weather with weatherproof coating.
- E. Waste piping traps subject to freezing:
 - 1. Insulated with cellular foam insulation.
 - 2. Insulate trap and 2 feet along length of adjoining pipe.
- F. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
- G. Finish insulation at supports, protrusions, and interruptions.

3.03 TOLERANCE

- A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.04 GLASS FIBER INSULATION SCHEDULE

3.05	PIPING SYSTEMS	PIPE SIZE Inch	THICKNESS Inch
	Plumbing Systems within Heated Building Envelope (incl. attic)		
	Domestic Hot Water Supply	All	$\frac{3}{4}$ "
	Domestic Hot Water Recirc	All	$\frac{3}{4}$ "
	Domestic Cold Water	All	$\frac{3}{4}$ "
	Plumbing systems outside Heated Building Envelope (unheated storage, etc)		
	Domestic Hot Water Supply	All	1"
	Domestic Hot Water Recirc	All	1"
	Domestic Cold Water	All	1"

END OF SECTION

SECTION 22 1100
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
 - 1. Roof drain.
 - 2. Sanitary waste and vent.
 - 3. Domestic water.
 - 4. Fuel gas.

1.02 SUBMITTALS FOR REVIEW

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures..
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.03 SUBMITTALS AT PROJECT CLOSEOUT

- A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Project Record Documents: Record actual locations of valves.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with Code and local jurisdiction.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.05 REGULATORY REQUIREMENTS

- A. Use only Code approved piping materials.
- B. Perform Work in accordance with Code.
- C. Conform to applicable code for installation of backflow prevention devices.
- D. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.

- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Substitutions: Submit under provisions of relevant sections of the General and Supplemental General Conditions and Division 1 Specification Sections.
- B. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

- 2.01 ROOF DRAIN, SANITARY WASTE AND VENT PIPING, BURIED PVC Pipe: ASTM F891 or ASTM D2665.
 - 1. Fittings: ASTM D2665 PVC.
 - 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.02 ROOF DRAIN, SANITARY WASTE AND VENT PIPING, ABOVE GRADE

- A. PVC Pipe: ASTM F891 or ASTM D2665.
 - 1. Fittings: ASTM D2665 PVC.
 - 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.03 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Copper Tubing: ASTM B88, Type K, soft.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 - 2. Joints: ASTM B32, solder, Grade 95TA.

2.04 WATER SERVICE PIPING, BURIED BEYOND 5 FEET OF BUILDING

- A. PVC Pipe: ASTM D2241.
 - 1. Fittings: ASTM 2466 PVC.
 - 2. Joints: ASTM D2846, solvent weld with ASTM 2564 solvent cement.

2.05 WATER PIPING, ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L, hard drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, solder, Grade 95TA.

2.06 FUEL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53 Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable rin, or ASTM A234, forged steel welding type
 - 2. Joints: NFPA 54, threaded or welded.

2.07 FUEL GAS PIPING, BELOW GRADE

- A. High density polyethylene as approved by gas supplier.

2.08 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Unions for Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.09 PIPE HANGERS AND SUPPORTS

- A. Hangers:
 - 1. Conform to code.
 - 2. Hangers for Pipe Sizes $\frac{1}{2}$ to 1-1/2 Inch: Carbon steel, adjustable swivel, split ring, hot dip galvanized.
 - 3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 4. Vertical Support: Steel riser clamp.
 - 5. Copper pipe support: Carbon steel ring, adjustable, copper plated.
- B. Hanger Rods: Steel threaded both ends, threaded one end, or continuous threaded, hot dip galvanized.
- C. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.10 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Floors: Schedule 40 galvanized steel pipe.
- B. Sealant for Non-fire Rated Construction: Acrylic caulk.
- C. Sleeves for Pipes Through Fire Rated Construction: Schedule 40 galvanized steel pipe. Provide suitable listed penetration assembly.

2.11 GATE VALVES

- A. Up To and Including 3 Inches:
 - 1. Manufacturers: Nibco, Grinnell, Milwaukee.
 - 2. Substitutions: See Section 01 6000 – Product Requirements, for substitution procedures.
 - 3. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder ends.

2.12 GLOBE VALVES

- A. Up To and Including 3 Inches:
 - 1. Manufacturers: Nibco, Grinnell, Milwaukee.
 - 2. Substitutions: See Section 01 6000 – Product Requirements, for substitution procedures.
 - 3. MSS SP-80, Class 125, bronze body, bronze trim, handwheel, bronze disc, solder ends.

2.13 BALL VALVES

- A. Up to and including 3 inches:

1. Manufacturers: Nibco, Grinnell, Milwaukee.
2. Substitutions: See Section 01 6000 – Product Requirements, for substitution procedures.
3. Construction, 2 Inches and Smaller: MSS SP-80 Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, Teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder ends.

2.14 SWING CHECK VALVES

- A. Up To and Including 3 Inches:
 1. Manufacturers: Nibco, Grinnell, Milwaukee.
 2. Substitutions: See Section 01 6000 – Product Requirements, for substitution procedures.
 3. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder ends.

2.15 GAS COCKS

- A. Manufacturers: Nibco, Jenkins, Milwaukee.
- B. Substitutions: See Section 01 6000 – Product Requirements, for substitution procedures..
- C. Iron body, threaded plug valve, listed for intended service.

2.16 TAGS

- A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch with smooth edges.
- B. Chart: Typewritten letter size list in anodized aluminum frame.

2.17 PIPE MARKERS

- A. Color: Conform to ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Underground Plastic Pipe Markers: Bright colored continuously printed metallic detection ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.18 CEILING TACKS

- A. Description: Steel with 3/4 inch diameter color coded head.
- B. Color code: Green- Plumbing valves.

2.19 FLASHING

- A. Furnished under Division 7. Coordinate with roofing installer.
- B. Provide locations and types of flashing requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Establish locations of the work of other trades and coordinate plumbing work accordingly.
- C. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with Code. Install all equipment and appurtenances in accordance with manufacturer's instructions.
- B. Use only approved materials for piping installed in plenum spaces.
- C. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- D. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- E. Install piping to maintain headroom, conserve space, and not interfere with use of space. Coordinate plumbing pipe routing with the work of other trades.
- F. Polypropylene Piping Installation:
 - 1. Install strictly in accordance with manufacturer's instructions, technical bulletins and design details.
 - 2. Installed with the fewest number of underground joints possible.
 - 3. Install fittings and joints using manufacturer specified fusion welding equipment and procedures.
- G. Group piping whenever practical at common elevations.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings
- J. Provide access doors where valves and fittings are not exposed.
- K. Establish elevations of buried piping outside the building to ensure not less than 2 ft of cover.
- L. Install vent piping penetrating roofed areas to maintain integrity of roof assembly; coordinate flashing.
- M. Support piping from building structure in an approved manner. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- N. Provide support for utility meters in accordance with requirements of utility companies.
- O. Paint exposed unfinished pipe, fittings, supports, and accessories. Refer to Division 9.
- P. Pipe Trench Excavation:

1. Excavate pipe trench to indicated gradients, lines, depths and invert elevations in uniform width to provide working clearance on each side of pipe.
2. Excavate trench walls vertically from trench bottom to 12" higher than top of pipe.
3. Excavate trench 4" deeper than bottom of pipe to allow for bedding course. Hand excavate for bell of pipe.

Q. Pipe Trench Backfill:

1. Place, compact and shape bedding course to provide continuous support for pipes over unyielding bearing surfaces.
2. Place and compact initial backfill of satisfactory soil material or subbase material, free of particles larger than 1" to a height of 12" over the pipe. Place and compact final backfill of satisfactory soil material in to final subgrade.
3. Place backfill materials in layers not more than 4" in loose depth for materials compacted by hand-operated tampers. ASTM D1557 dry density compaction shall be as follows:

a.	<u>Location</u>	<u>Maximum Dry Density</u>
b.	Under slabs, structures, pavement, etc.	95%
c.	Under walkways	92%
d.	Under lawns, unpaved areas	85%

R. Install bell and spigot pipe with bell end upstream.

S. Install valves with stems upright or horizontal, not inverted.

T. Sleeve pipes passing through rated or non-rated partitions, walls and floors. Smokeproof all penetrations rated or non-rated per Code. Provide suitable listed penetration assemblies for piping penetrating rated construction.

3.04 PIPE HANGERS AND SUPPORTS

- A. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
- B. Place hangers within 12 inches of each horizontal elbow.
- C. Use hangers with 1-1/2 inch minimum vertical adjustment.
- D. Support vertical piping at every floor.
- E. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- F. Support riser piping independently of connected horizontal piping.
- G. Design hangers for pipe movement without disengagement of supported pipe.
- H. Locate pipe supports in accordance with Code. Provide support spacing in accordance with Code.
- I. Secure water and waste piping connections at fixtures to eliminate any movement within wall.

3.05 SLEEVES

- A. Set sleeves in position in formwork. Provide reinforcing around sleeves.
- B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- C. Extend sleeves through floors one inch above finished floor level. Calk sleeves.

- D. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- E. Install chrome plated steel or chrome plated brass escutcheons at finished surfaces.

3.06 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install gate, ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install globe, ball, or butterfly valves for throttling, bypass, or manual flow control services.

3.07 ERECTION TOLERANCES

- A. Establish invert elevations, slopes for drainage in accordance with codes. Maintain gradients.
- B. Slope water piping minimum 0.25 percent and arrange to drain at low points.

3.08 TESTING OF PIPING

- A. Testing indicated are minimum requirements. Provide all additional testing as required by Code and local jurisdiction.
- B. Domestic water piping: Hydrostatically test at 125 psi for a period of four hours with no pressure loss. Remake any joints found to leak. Caulking not allowed.
- C. Waste and vent piping: Subject entire system to a minimum head of 10 feet for a minimum period of three hours. Remake any joints found to leak. Caulking not allowed.

3.09 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Disinfect domestic water piping in accordance with Code and local health department requirements.
- C. Provide certification of acceptance of disinfection by local code authority.

3.10 SERVICE CONNECTIONS

- A. Extend waste piping as required and connect to site sewer. Coordinate invert and connection requirements. Refer to Section 22 0500 for additional requirements.
- B. Extend roof drain piping as required and connect to site storm sewer. Coordinate invert and connection requirements. Refer to Section 22 0500 for additional requirements.
- C. Extend water piping as required and connect to site water supply. Install approved backflow preventer as required by Code. Coordinate connection requirements. Refer to Section 22 0500 for additional requirements.

- D. Extend gas piping as required and connect to site gas supply. Coordinate connection requirements and perform all work per gas supplier requirements. Refer to Section 22 0500 for additional requirements.

3.11 PIPE & VALVE IDENTIFICATION

- A. Identify valves in main and branch piping with tags. Identify piping, concealed or exposed, with plastic pipe markers or plastic tape pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- B. Install tags on valves with corrosion resistant chain.
- C. Install plastic tape markers complete around pipe in accordance with manufacturer's instructions.
- D. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- E. Install ceiling tacks in lay-in tile at valve locations.

END OF SECTION

SECTION 22 1113
PLUMBING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Floor drains.
- B. Floor sinks.
- C. Cleanouts.
- D. Hydrants.
- E. Backflow preventers.
- F. Water hammer arrestors.
- G. Tempering valves.

1.02 SUBMITTALS FOR REVIEW

- A. Procedures for submittals: See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

1.03 SUBMITTALS FOR INFORMATION

- A. Procedures for submittals: See Section 01 3000 – Administrative Requirements, for submittal procedures
- B. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

1.04 SUBMITTALS AT PROJECT CLOSEOUT

- A. Procedures for submittals: See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.
- C. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND PROTECTION

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

PART 2 PRODUCTS

2.01 GENERAL

- A. Specifications are general in nature and are intended to denote standard of quality. See drawing schedules for specific manufacturers, models, sizes, arrangement, etc

2.02 FLOOR DRAIN

- A. ANSI A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer. Provide outlet connection to suit piping used. Where indicated or required, include trap primer connection.

2.03 FLOOR SINK

- A. Lacquered cast iron body with integral seepage pan, porcelain enamel epoxy coated interior, aluminum dome strainer, clamp collar, porcelain enamel coated, nickel bronze frame. Provide connection to suit piping used.

2.04 WALL HYDRANT

- A. ANSI/ASSE 1019; non-freeze, self-draining type with chrome plated wall plate hose thread spout, lockshield and removable key, and integral vacuum breaker.

2.05 CLEANOUTS

- A. Exterior Traffic Areas: Round cast nickel bronze access frame and non-skid cover. Provide concrete grade pad at unsurfaced areas.
- B. Exterior Non-traffic Areas: Line type with lacquered cast iron body and brass flush cleanout plug. Provide concrete grade pad at unsurfaced areas.
- C. Interior Finished Floor Areas: Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored nickel bronze cover in service areas and round gasketed depressed nickel bronze cover to accept floor finish in finished floor areas.
- D. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.
- E. Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.06 BACKFLOW PREVENTERS

- A. Reduced Pressure Zone Assemblies:
 - 1. Manufacturers: Watts, Febco, Wilkins.
 - 2. Substitutions: See Section 01 6000 – Product Requirements, for substitution procedures.

3. ANSI/ASSE 1013, AWWA C510; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.07 WATER HAMMER ARRESTORS

- A. ANSI A112.26.1; copper construction, piston type sized in accordance with PDI WH-201, precharged suitable for operation in temperature range 34 to 250 degrees F and maximum 150 psi working pressure.

2.08 TEMPERING VALVES

- A. Description: Bronze construction, high-low thermostatic mixing valve with integral stops, checks and temperature gauge.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install floor drains and floor sinks flush with floor and at elevation to promote proper drainage.
- C. Where required by Code, provide trap primer for floor drains
- D. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- E. Encase exterior cleanouts in concrete flush with grade.
- F. Install floor cleanouts at elevation to accommodate finished floor.
- G. Install wall hydrants in accordance with manufacturer's instructions. Fasten securely to wall. Where required make provision to prevent freezing.
- H. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; janitor rooms, premise isolation, irrigation systems, hose bibs, and hydrants.
- I. Install water hammer arrestors on hot and cold water branch supply piping to fixtures in locations as recommended by manufacturer.
- J. Install tempering valve strictly per manufacturer's recommendations,

END OF SECTION

SECTION 22 4000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water closets.
- B. Lavatories.
- C. Countertop Sinks.

1.02 SUBMITTALS FOR REVIEW

- A. Procedures for submittals: See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, utility sizes, trim, and finishes.

1.03 SUBMITTALS FOR INFORMATION

- A. Procedures for submittals: See Section 01 3000 – Administrative Requirements, for submittal procedures..
- B. Manufacturer's Instructions: Indicate installation methods and procedures.

1.04 SUBMITTALS AT PROJECT CLOSEOUT

- A. Procedures for submittals: See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.07 WARRANTY

- A. See Section 01 7800 – Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL

- A. Specifications are general in nature and are intended to denote standard of quality. See drawing schedules for specific manufacturers, models, sizes, arrangement, etc
- B. Substitutions: See Section 01 6000 – Product Requirements, for substitution procedures.

2.02 FLOOR MOUNT FLUSH VALVE WATER CLOSET

- A. Bowl: ASME A112.19.2.
- B. Flush Valve: ASME A112.18.1; chrome plated where exposed.
- C. Seat: Solid white plastic, brass bolts.

2.03 WALL HUNG URINAL

- A. Urinal: ASME A112.19.2.
- B. Exposed Flush Valve: ASME A112.18.1.
- C. Floor Support Carrier: Cast iron and steel frame floor attachment, wall hanger to match urinal, bearing plate and studs.

2.04 WALL HUNG LAVATORY

- A. Wall Hung Basin: ASME A112.19.1 or A112.19.2.
- B. Faucet Trim: ASME A112.18.1; chrome plated brass supply, maximum 0.5 gpm flow, Code accessible as indicated.
- C. Concealed Arm Carrier: ASME A112.6.1 cast iron and steel frame wall attachment, concealed arm supports, bearing plate and studs to match lavatory.
- D. Accessories: Chrome plated strainer, chrome plated 17 gage brass P-trap with clean-out plug, chrome plated arm with escutcheon, stops with removable key, rigid supplies.
- E. ADA insulation: Lavatory P-trap and supply insulation kit, 1/8" thick molded antimicrobial closed cell vinyl.

2.05 COUNTERTOP LAVATORY

- A. Top Mount Basin: ASME A112.19.1 or A112.19.2.
- B. Faucet Trim: ASME A112.18.1; chrome plated brass supply, maximum 0.5 gpm flow, Code accessible as indicated.
- C. Accessories: Chrome plated strainer, chrome plated 17 gage brass P-trap with clean-out plug, chrome plated arm with escutcheon, stops with removable key, rigid supplies.

2.06 COUNTERTOP SINK

- A. Sink: ASME A112.19.3.
- B. Faucet: ASME A112.18.1.
- C. Accessories: Crumbcup strainer, chrome plated 17 gage brass P-trap with clean-out plug, chrome plated arm with escutcheon, chrome plated stops with removable key, rigid supplies.
- D. ADA insulation: Lavatory P-trap and supply insulation kit, 1/8" thick molded antimicrobial closed cell vinyl.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that walls and floor finishes are prepared and ready for installation of fixtures. Pay particular attention to rough-in requirements for ADA fixtures.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks. Refer to Division 6.

3.02 PREPARATION

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

3.03 INTERFACE WITH OTHER PRODUCTS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- B. Review architectural drawings for arrangement of toilet and bath accessories. Refer to Division 10.

3.04 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid supplies to fixtures with loose key stops, reducers, and escutcheons. Solidly secure water supplies to wall.
- C. Install components level and plumb.
- D. Mount accessible fixtures in accordance with Code accessibility and ADA requirements.
- E. Install and secure fixtures in place with wall hangers and bolts.
- F. Seal fixtures to wall and floor surfaces with sealant as specified in Division 7, color to match fixture.
- G. Solidly attach water closets to floor.

- H. Install all faucets and fixtures with hot water connection on left side, cold water connection on right side with respect to user.

3.05 ADJUSTING

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

3.06 CLEANING

- A. Clean plumbing fixtures and equipment.

3.07 PROTECTION OF FINISHED WORK

- A. Do not permit use of fixtures.

3.08 SCHEDULES

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated on drawings. Comply with Code accessibility and ADA requirements as indicated.
- B. Fixture Rough-In: See schedule on drawings.

END OF SECTION

SECTION 22 4700
WATER COOLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water coolers.

1.02 SUBMITTALS FOR REVIEW

- A. Procedures for submittals: See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Provide dimension drawings of water coolers indicating components and connections to other equipment and piping.
 - 2. Provide electrical characteristics and connection requirements.

1.03 SUBMITTALS FOR INFORMATION

- A. Procedures for submittals: See Section 01 3000 – Administrative Requirements, for submittal procedures.
- B. Manufacturer's Instructions: Installation instructions.

1.04 SUBMITTALS AT PROJECT CLOSEOUT

- A. Procedures for submittals: See Section 01 3000 – Administrative Requirements, for submittal procedures.
- A. Project Record Documents: Record actual locations of components.
- B. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

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

1.06 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Transport, handle, store, and protect products to prevent damage.
- B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.08 WARRANTY

- A. See Section 01 7800 – Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL

- A. Specifications are general in nature and are intended to denote standard of quality. See drawing schedules for specific manufacturers, models, sizes, arrangement, etc
- B. Substitutions: See Section 01 6000 – Product Requirements, for substitution procedures

2.02 ELECTRIC WATER COOLER

- A. ARI 1010; arrangement as indicated on drawings.
- B. Performance: See drawings.

PART 3 EXECUTION

3.01 INSTALLATION

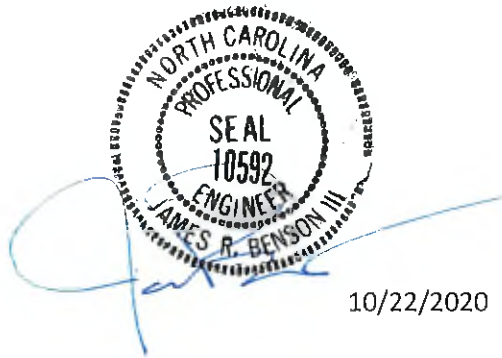
- A. Install water heaters in accordance with manufacturer's instructions and to UL requirements. Provide dielectric unions, shutoff valves and expansion tank on piping connections to heater.
- B. Install and secure water coolers in place with wall hangers and bolts. Coordinate with electrical to provide concealed power supply.
- C. Coordinate with plumbing piping and related electrical work to achieve operating system.

END OF SECTION

DIVISION 23 – HVAC

HVAC work shall be defined by drawings numbered with the prefix "M-", the general provision of the Contract including General Conditions and Supplementary Conditions, Division 1 Specification sections, and Division-23 HVAC Specifications.

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