

**DIVISION 22: PLUMBING**

**220000 PLUMBING**

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**SECTION 220501 - COMMON PLUMBING REQUIREMENTS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Furnish labor, materials, and equipment necessary for completion of work as described in Contract Documents.
- B. It is the intent of these specifications that the systems specified herein are to be complete and operational before being turned over to the owner. During the bidding process, the contractor is to ask questions or call to the engineer's attention any items that are not shown or may be required to make the system complete and operational. Once the project is bid and the contractor has accepted the contract, it is his responsibility to furnish and install all equipment and parts necessary to provide a complete and operational system without additional cost to the owner.
- C. Furnish and install fire stopping materials to seal penetrations through fire rated structures and draft stops.

**1.3 SUBMITTALS**

- A. Substitutions: By specific designation and description, standards are established for specialties and equipment. Other makes of specialties and equipment of equal quality will be considered provided such proposed substitutions are submitted to the Architect for his approval, complete with specification data showing how it meets the specifications, at least 5 working days prior to bid opening. A list of approved substitutions will be published as an addendum, but does not relieve Contractor from meeting all requirements of the specifications.
  - 1. Submit a single copy of Manufacturer's catalog data including Manufacturer's complete specification for each proposed substitution.
  - 2. The Architect or Engineer is to be the sole judge as to the quality of any material offered as an equal.
- B. Product Data, Shop Drawings: Within 30 days after award of contract, submit 10 sets of Manufacturer's catalog data for each manufactured item.
  - 1. Literature shall include enough information to show complete compliance with Contract Document requirements.
  - 2. Mark literature to indicate specific item with applicable data underlined.
  - 3. Information shall include but not be limited to capacities, ratings, type of material used, guarantee, and such dimensions as are necessary to check space requirements.
  - 4. When accepted, submittal shall be an addition to Contract Documents and shall be in equal force. No variation shall be permitted.
  - 5. Even though the submittals have been accepted by the Engineer, it does not relieve the contractor from meeting all of the requirements of the plans and specifications and providing a complete and operational system.
- C. Drawings of Record: One complete set of blue line mechanical drawings shall be provided for the purpose of showing a complete picture of the work as actually installed.
  - 1. These drawings shall serve as work progress report sheets. Contractor shall make notations neat and legible therein daily as the work proceeds.
  - 2. The drawings shall be kept at the job at a location designated by the Mechanical Engineer.

3. At completion of the project these "as-built" drawings shall be signed by the Contractor, dated, and returned to the Architect.
- D. Operating Instructions and Service Manual: The Mechanical Contractor shall prepare 2 copies of an Operation and Maintenance Manual for all mechanical systems and equipment used in this project. Manuals shall be bound in hard-backed binders and the front cover and spine of each binder shall indicate the name and location of the project. Use plastic tab indexes for all sections. Provide a section for each different type of equipment item. The following items shall be included in the manual, together with any other pertinent data. This list is not complete and is to be used as a guide.
1. Provide a master index at the beginning of the manual showing all items included.
  2. The first section of the manual shall contain:
    - a. Names, addresses, and telephone numbers of Architect, Mechanical Engineer, Electrical Engineer, General Contractor, Plumbing Contractor, Sheet Metal Contractor, and Temperature Control Contractor.
    - b. List of Suppliers which shall include a complete list of each piece of equipment used with the name, address, and telephone number of vendor.
    - c. General Description of Systems including –
      - 1) Location of all major equipment
      - 2) Description of the various mechanical systems
      - 3) Description of operation and control of the mechanical systems
      - 4) Suggested maintenance schedule
    - d. Copy of contractor's written warranty
  3. Provide a copy of approved submittal literature for each piece of equipment.
  4. Provide maintenance and operation literature published by the manufacturer for each piece of equipment which includes: oiling, lubrication and greasing data; belt sizes, types and lengths; wiring diagrams; step-by-step procedure to follow in putting each piece of mechanical equipment in operation.
  5. Include parts numbers of all replaceable items.
  6. Provide control diagram and operation sequence, along with labeling of control piping and instruments to match diagram.
  7. Include a valve chart indicating valve locations.
  8. Include air balance and/or water balance reports.

#### 1.4 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
1. Perform work in accordance with applicable provisions of local and state Plumbing Code, Gas Ordinances, and adoptions thereof. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
  2. In case of differences between building codes, state laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Architect in writing of such differences.
- B. Applicable Specifications: Referenced specifications, standards, and publications shall be of the issues in effect on date of Advertisement for Bid.
1. "Heating, Ventilating and Air Conditioning Guide" published by the American Society of Heating and Air Conditioning Engineers.
  2. "Engineering Standards" published by the Heating, Piping, and Air Conditioning Contractors National Association.
  3. "2015 International Building Code", "2015 International Mechanical Code", and "2015 International Fire Code" as published by the International Conference of Building Officials.
  4. "2017 Idaho Plumbing Code" as published by the International Association of Plumbing and Mechanical Officials.
  5. "National Electrical Code" as published by the National Fire Protection Association.
  6. "2015 International Energy Conservation Code".

## 1.5 INSPECTIONS AND PERMITS

- A. Pay for permits, fees, or charges for inspection or other services. Local and state codes and ordinances must be properly executed without expense to Owner and are considered as minimum requirements. Local and state codes and ordinances do not relieve the Contractor from work shown that exceeds minimum requirements.

## 1.6 ADDITIONAL WORK:

- A. Design is based on equipment as described in the drawing equipment schedule. Any change in foundation bases, electrical wiring, conduit connections, piping, controls and openings required by alternate equipment submitted and approved shall be paid for by this division. All work shall be in accordance with the requirements of the applicable sections.

## PART 2 - NOT USED

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Site Inspection:
  - 1. Examine premises and understand the conditions which may affect performance of work of this Division before submitting proposals for this work.
  - 2. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.
- B. Drawings:
  - 1. Plumbing drawings show general arrangement of piping, equipment, etc, and do not attempt to show complete details of building construction which affect installation. This Contractor shall refer to architectural, structural, mechanical, and electrical drawings for additional building detail which affect installation of his work.
    - a. Follow plumbing drawings as closely as actual building construction and work of other trades will permit.
    - b. No extra payments will be allowed where piping and/or ductwork must be offset to avoid other work or where minor changes are necessary to facilitate installation.
    - c. Everything shown on the plumbing drawings shall be the responsibility of Plumbing Contractor unless specifically noted otherwise.
  - 2. Consider architectural and structural drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over mechanical drawings.
  - 3. Because of small scale plumbing drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions. Do not scale drawings for locations of equipment or piping. Refer to large scale dimensioned drawings for exact locations.
- C. Insure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents.
  - 1. If approval is received to use other than specified items, responsibility for specified capacities and insuring that items to be furnished will fit space available lies with this Division.
  - 2. If non-specified equipment is used and it will not fit job site conditions, this Contractor assumes responsibility for replacement with items named in Contract Documents.

### 3.2 PREPARATION

- A. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.

1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.
2. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
3. Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.

### **3.3 INSTALLATION**

- A. Arrange pipes, ducts, and equipment to permit ready access to valves, unions, traps, starters, motors, control components, and to clear openings of doors and access panels.

### **3.4 STORAGE AND PROTECTION OF MATERIALS:**

- A. Provide storage space for storage of materials and assume complete responsibility for losses due to any cause whatsoever. Storage shall not interfere with traffic conditions in any public thoroughfare.
- B. Protect completed work, work underway, and materials against loss or damage.
- C. Close pipe openings with caps or plugs during installation. Cover fixtures and equipment and protect against dirt, or injury caused by water, chemical, or mechanical accident.

### **3.5 EXCAVATION AND BACKFILL**

- A. Perform necessary excavation of whatever substance encountered for proper laying of all pipes and underground ducts.
  1. Excavated materials not required for fill shall be removed from site as directed by Engineer.
  2. Excavation shall be carried low enough to allow a minimum coverage over underground piping of 5'-0" or to be below local frost level.
  3. Excess excavation below required level shall be backfilled at Contractor's expense with earth, sand, or gravel as directed by Engineer. Tamp ground thoroughly.
  4. Ground adjacent to all excavations shall be graded to prevent water running into excavated areas.
- B. Backfill pipe trenches and allow for settlement.
  1. Backfill shall be mechanically compacted to same density as surrounding undisturbed earth.
  2. Cinders shall not be used in backfilling where steel or iron pipe is used.
  3. No backfilling shall be done until installation has been approved by the Engineer.

### **3.6 COOPERATION**

- A. Cooperate with other crafts in coordination of work. Promptly respond when notified that construction is ready for installation of work under Division 22. Contractor will be held responsible for any delays which might be caused by his negligence or failure to cooperate with the other Contractors or crafts.

### **3.7 SUPERVISION**

- A. Provide a competent superintendent in charge of the work at all times. Anyone found incompetent shall be removed at once and replaced by someone satisfactory, when requested by the Architect.

**3.8 INSTALLATION CHECK:**

- A. An experienced, competent, and authorized representative of the manufacturer or supplier of each item of equipment indicated in the equipment schedule shall visit the project to inspect, check, adjust if necessary, and approve the equipment installation. In each case, the equipment supplier's representative shall be present when the equipment is placed in operation. The equipment supplier's representative shall revisit the project as often as necessary until all trouble is corrected and the equipment installation and operation is satisfactory to the Engineer.
- B. Each equipment supplier's representative shall furnish to the Owner, through the Engineer, a written report certifying the following:
  - 1. Equipment has been properly installed and lubricated.
  - 2. Equipment is in accurate alignment.
  - 3. Equipment is free from any undue stress imposed by connecting piping or anchor bolts.
  - 4. Equipment has been operated under full load conditions.
  - 5. Equipment operated satisfactorily.
- C. All costs for this installation check shall be included in the prices quoted by equipment suppliers.

**3.9 CLEANING EQUIPMENT AND PREMISES**

- A. Properly lubricate equipment before Owner's acceptance.
- B. Clean exposed piping, equipment, and fixtures. Repair damaged finishes and leave everything in working order.
- C. Remove stickers from fixtures and adjust flush valves.
- D. Trap elements shall be removed during cleaning and flushing period. Replace trap elements and adjust after cleaning and flushing period.

**3.10 TESTS**

- A. No piping work, fixtures, or equipment shall be concealed or covered until they have been inspected and approved by the inspector. Notify inspector when the work is ready for inspection.
- B. All work shall be completely installed, tested as required by Contract Documents and the city and county ordinances and shall be leak-tight before the inspection is requested.
- C. Tests shall be repeated to the satisfaction of those making the inspections.
- D. Water piping shall be flushed out, tested at 100 psi and left under pressure of supply main or a minimum of 40 psi for the balance of the construction period.

**3.11 WARRANTY**

- A. Contractor shall guarantee work under Division 22 to be free from inherent defects for a period of one year from acceptance.
  - 1. Contractor shall repair, revise or replace any and all such leaks, failure or inoperativeness due to defective work, materials, or parts free of charge for a period of one year from final acceptance, provided such defect is not due to carelessness in operation or maintenance.
- B. In addition to warranty specified in General Conditions and plumbing systems are to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.

### **3.12 SYSTEM START-UP, OWNER'S INSTRUCTIONS**

- A. Owner's Instructions
  - 1. Instruct building maintenance personnel and Owner Representative in operation and maintenance of mechanical systems utilizing Operation & Maintenance Manual when so doing.
  - 2. Minimum instruction periods shall be as follows –
    - a. Plumbing - Four hours.
  - 3. Instruction periods shall occur after Substantial Completion inspection when systems are properly working and before final payment is made.
  - 4. None of these instructional periods shall overlap another.

END OF SECTION 220501

**SECTION 220503 - PIPE, PIPE FITTINGS, PIPE HANGERS & VALVES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

**1.2 SUMMARY**

- A. General piping and valve materials and installation procedures for all piping systems.

**1.3 QUALITY ASSURANCE**

- A. Manufacture:
  - 1. Use domestic made valves, pipe and pipe fittings.
- B. General: Support components shall conform to Manufacturer's Standardization Society Specification SP-58.

**PART 2 - PRODUCTS****2.1 VALVES**

- A. Ball Valves:
  - 1. 2" and smaller for domestic water service:
    - a. Milwaukee BA-100, bronze, screwed, 600# WOG ball valve with Teflon seats
    - b. Victaulic S/722.
- B. Use ball valves or butterfly valves everywhere unless noted otherwise.
- C. Approved Manufacturers:
  - 1. Crane
  - 2. Nibco
  - 3. Hammond
  - 4. Stockham
  - 5. Milwaukee
  - 6. Victaulic

**2.2 PIPE**

- A. Exposed waste, vent and water piping connections to fixtures shall be chrome plated.
- B. Condensate Drain Piping: Type "M" copper with sweat fittings or Schedule 40 PVC pipe and fittings.

**2.3 PIPE HANGERS**

- A. Adjustable, malleable iron clevis type of a diameter adequate to support pipe size.
- B. Approved Manufacturers:
  - 1. B-Line Systems Fig. B3100
  - 2. Grinnell No. 260
  - 3. Kin-Line 455
  - 4. Superstrut CL-710



**2.4 INSULATING COUPLINGS**

- A. Suitable for at least 175 PSIG WP at 250 deg F.
- B. Approved Manufacturers:
  - 1. Central Plastics Co
  - 2. Victaulic Co
  - 3. Watts Regulator Co

**2.5 EXPANSION JOINTS**

- A. Install at all building expansion joints and as shown on the drawings, flexible, or nipple/flexible coupling combinations for added expansion/deflection. Submit Manufacturer's data.
- B. Approved Manufacturers
  - 1. Victaulic Style 155, 150
  - 2. Grinnell - Gruv-Lok
  - 3. Garlock Garflex 8100
  - 4. Vibration Mountings & Controls, Inc.

**2.6 SLEEVES**

- A. Sleeves shall be standard weight galvanized iron pipe, Schedule 40 PVC, or 14 gauge galvanized sheet metal two sizes larger than pipe or insulation.
- B. Steel or heavy steel metal of the telescoping type of a size to accommodate pipe and covering wherever it passes through floors, walls, or ceilings.

**2.7 INTERMEDIATE ATTACHMENTS**

- A. Continuous threaded rod may be used wherever possible.
- B. No chain, wire, or perforated strap shall be used.

**2.8 FLOOR AND CEILING PLATES**

- A. Brass chrome plated

**2.9 APPROVED MANUFACTURERS - Grinnell and Fee/Mason**

- A. Concrete Inserts: Grinnell Fig. 282
- B. Pipe Hanger Flange: Grinnell Fig. 163
- C. Vertical Pipe: Grinnell Fig. 261 or equal.
- D. Cast Iron Pipe: Grinnell Fig. 260 clevis hanger or equal
- E. Pipe Attachments for steel pipe with 1" or less of insulation:
  - 1. Grinnell Fig. 108 ring
  - 2. Grinnell Fig. 114 turnbuckle adjuster
  - 3. Or equal

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Contractor from responsibility for proper erection of systems of piping in every respect.
- B. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.
  - 1. Cut piping accurately for fabrication to measurements established at site and work into place without springing or forcing.
  - 2. Do not use pipe hooks, chains, or perforated metal for pipe support.
  - 3. Remove burr and cutting slag from pipes.
  - 4. Make changes in direction with proper fittings.
  - 5. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.
  - 6. Support piping at 8 feet on center maximum for pipe 1-1/4 inches or larger and 6 feet on center maximum for pipe one inch or less. Provide support at each elbow. Install additional support as required.
  - 7. Suspend piping from roof trusses or clamp to vertical walls using Unistrut and clamps (except underground pipe). Laying of piping on any building member is not allowed.
- C. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings. Provide accessible, ground joint unions in piping at connections to equipment.
- D. Make connections of dissimilar metals with insulating couplings.
- E. Provide sleeves around pipes passing through floors, walls, partitions, or structural members.
  - 1. Seal sleeves with plastic or other acceptable material.
  - 2. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete floors on grade.
- F. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.
- G. Install piping systems so they may be easily drained.
- H. Grade soil and waste lines within building perimeter 1/4 inch fall per ft in direction of flow.
- I. Insulate water piping buried within building perimeter.
  - 1. Do not use reducing bushings, street elbows, or close nipples.
  - 2. Bury water piping 6 inches minimum below bottom of slab and encase in 2 inches minimum of sand.
  - 3. Do not install piping in shear walls.

### **3.2 HORIZONTAL PIPING INSTALLATION**

- A. Locate hangers, supports, and anchors near or at changes in piping direction and concentrated loads.
- B. Provide for vertical adjustment to maintain pitch required for proper drainage.
- C. Allow for expansion and contraction of the piping.

**3.3 PIPE SLEEVES AND INSERTS**

- A. Set sleeves before concrete is poured or floors finished.
- B. Inserts for units should be placed in the concrete or masonry during construction to avoid cutting of finished work. When and if cutting becomes necessary, it must be done in accordance with the cutting and patching specifications.

**3.4 FLOOR AND CEILING PLATES**

- A. Install on all pipes passing through floors, partitions, and ceilings.

**3.5 UNIONS AND CONNECTIONS**

- A. Install malleable ground joint unions in hot and cold water piping throughout the system so that any portion can be taken down for repairs or inspections without injury to same or covering.
- B. Running threads or long screws will not be permitted in jointing any pipe.
- C. Provide dielectric waterways Style #47 between ferrous and non-ferrous metals.

**3.6 FIRE STOPPING**

- A. Fire stop all penetrations of fire walls, fire barriers, fire partitions, and other fire rated walls and ceilings and floors as per IBC Section 711. See Specification 22 0800.

END OF SECTION 220503

**SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install identification of plumbing piping and equipment as described in Contract Documents.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Paint:
1. One Coat Primer:
    - a. 6-2 Quick Drying Latex Primer Sealer over fabric covers.
    - b. 6-205 Metal Primer under dark color paint.
    - c. 6-6 Metal Primer under light color paint.
  2. Finish Coats: Two coats 53 Line Acrylic Enamel.
  3. Performance Standard: Paints specified are from Pittsburgh Paint & Glass (PPG), Pittsburgh, PA [www.pittsburghpaints.com](http://www.pittsburghpaints.com) or PPG Canada Inc, Mississauga, ON (800) 263-4350 or (905) 238-6441.
  4. Type Two Acceptable Products. See Section 01 6200.
    - a. Paint of equal quality from following Manufacturers may be submitted for Architect's approval before use. Maintain specified colors, shades, and contrasts.
      - 1) Benjamin Moore, Montvale, NJ [www.benjaminmoore.com](http://www.benjaminmoore.com) or Toronto, ON (800) 304-0304 or (416) 766-1176.
      - 2) ICI Dulux, Cleveland, OH or ICI Paints Canada Inc, Concord, ON [www.dulux.com](http://www.dulux.com).
      - 3) Sherwin Williams, Cleveland, OH [www.sherwin-williams.com](http://www.sherwin-williams.com).

**2.2 VALVE IDENTIFICATION**

- A. Make a list of and tag all valves installed in this work.
1. Valve tags shall be of brass, not less than 1"x2" size, hung with brass chains.
  2. Tag shall indicate plumbing or heating service.

**PART 3 - EXECUTION****3.1 SCHEDULES**

- A. Pipe Identification Schedule:
1. Apply stenciled symbols as follows:

Pipe Use	Abbreviation
Domestic Cold Water	CH
Domestic Hot Water	HW

END OF SECTION 220553

**SECTION 220703 - MECHANICAL INSULATION AND FIRE STOPPING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

**1.2 SUMMARY**

- A. Furnish and install mechanical insulation and fire stopping as described in Contract Documents including but not limited to the following:
  - 1. Cold Water and Rain Drain Piping Insulation
  - 2. Fire Stopping

**1.3 QUALITY ASSURANCE**

- A. Insulation shall have composite (insulation, jacket or facing and adhesive used to adhere facing or jacket to insulation) fire and smoke hazard ratings as tested by Procedure ASTM E-84, NFPA 255 and UL 723 not exceeding: Flame Spread of 25 and Smoke Developed of 50.
- B. Insulation Contractor shall certify in writing, prior to installation, that all products to be used will meet the above criteria.
- C. Accessories, such as adhesives, mastics, cements, and tapes, for fittings shall have the same component ratings as listed above.
- D. Products, or their shipping cartons, shall bear a label indicating that flame and smoke ratings do not exceed above requirements.
- E. Any treatment of jacket or facings to impart flame and smoke safety shall be permanent.
- F. The use of water-soluble treatments is prohibited.

END OF SECTION 220703

**SECTION 220705 - UNDERGROUND PIPING INSULATION****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

**1.2 SUMMARY**

- A. Furnish and install insulation on underground cold water pipes within confines of building as described in Contract Documents.

**PART 2 - PRODUCTS****2.1 MATERIAL**

- A. Insulation:
  - 1. 1/2 inch thick Armaflex Standard Pipe Insulation
  - 2. Equal by Rubatex
  - 3. Equal by Imcolock
- B. Joint Sealant:
  - 1. Armstrong 520

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Slip underground pipe insulation onto pipe and seal butt joints.
- B. Where slip-on technique is not possible, slit insulation, apply to pipe, and seal seams and joints.

END OF SECTION 220705

**SECTION 220710 - POTABLE WATER PIPE INSULATION****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

**1.2 SUMMARY**

- A. Furnish and install insulation on above ground hot and cold water lines, fittings, valves, pump bodies, flanges, and accessories as described in Contract Documents.

**PART 2 - PRODUCTS****2.1 INSULATION**

- A. One inch thick snap-on glass fiber pipe insulation.
- B. Heavy density pipe insulation with factory vapor jacket equal to Fiberglass ASJ may be used.
- C. Approved Manufacturers:
  - 1. CTM
  - 2. Manville
  - 3. Owens-Corning
  - 4. Knauf

**2.2 PVC FITTING, VALVE, & ACCESSORY COVERS**

- A. Approved Manufacturers:
  - 1. Knauf
  - 2. Zeston

**PART 3 - EXECUTION****3.1 APPLICATION**

- A. Piping:
  - 1. Apply insulation to clean, dry piping with joints tightly butted.
  - 2. Adhere "factory applied vapor barrier jacket lap" smoothly and securely at longitudinal laps with a white vapor barrier adhesive.
  - 3. Adhere 3 inch wide self-sealing butt joint strips over end joints.
- B. Fittings, Valves, & Accessories:
  - 1. Insulate with same type and thickness of insulation as pipe, with ends of insulation tucked snugly into throat of fitting and edges adjacent to pipe insulation tufted and tucked in.
  - 2. Cover insulation with one piece fitting cover secured by stapling or taping ends to adjacent pipe covering.
- C. Pipe Hangers:
  - 1. Do not allow pipes to come in contact with hangers.
  - 2. Provide 16 ga x 6 inch long galvanized shields at each pipe hanger to protect pipe insulation from crushing by clevis hanger.

END OF SECTION 220710

## **SECTION 220720 - RAIN DRAIN INSULATION**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

#### **1.2 SUMMARY**

- A. Furnish and install rain drain insulation as described in Contract Documents.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURED UNITS**

- A. 1/2 inch thick pre-formed fibrous glass pipe covering with a vapor barrier jacket or 1/2" thick rubber insulator.
- B. End joint strips and overlap seams shall be adhered with a vapor barrier mastic and stapled with outward clinch staples on 4-inch centers. Staples and seams shall be sealed with a second coat of vapor barrier adhesive.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Insulate rain drain lines, overflow lines, and drain bodies.
- B. Seal off vapor barrier to pipe at all fittings, hangers, and every 20 feet on straight runs.

END OF SECTION 220720



**SECTION 220800-- FIRE STOPPING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

**1.2 SUMMARY**

- A. Furnish and install fire stopping as described in Contract Documents.

**1.3 QUALITY ASSURANCE**

- A. Fire stopping material shall meet ASTM E814, E84 and be UL listed.

**PART 2 - PRODUCTS****2.1 MANUFACTURED UNITS**

- A. Material shall be flexible, long lasting, intumescent acrylic seal to accommodate vibration and building movement.
- B. Caulk simple penetrations with gaps of 1/4" or less with:
  - 1. Dow Corning Fire Stop Sealant
  - 2. Pensil 300
- C. Caulk multiple penetrations and/or penetrations with gaps in excess of 1/4" with:
  - 1. Dow Corning Fire Stop Foam
  - 2. Pensil 200
  - 3. IPC flame safe FS-1900
  - 4. Tremco "Tremstop 1A"

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Follow manufacturer's installation instructions explicitly.
- B. Seal penetrations of ductwork, piping, and other mechanical equipment through one-hour and two-hour rated partitions as shown on Architectural and Mechanical Drawings.
- C. Install fire stopping material on clean surfaces to assure adherence.

END OF SECTION 220800

**SECTION 221114-- NATURAL GAS SYSTEMS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, and Section 22 0501 apply to this Section.

**1.2 SUMMARY**

- A. Furnish and install gas piping and fittings within building including connection to meter.

**1.3 QUALITY ASSURANCE**

- A. Qualifications:
  - 1. Welders shall be certified and bear evidence of certification 30 days prior to commencing work on project. If there is doubt as to proficiency of welder, Owner's Representative may require welder to take another test. This shall be done at no cost to Owner. Certification shall be by Pittsburgh Testing Laboratories or other approved authority.

**PART 2 - PRODUCTS****2.1 PIPE**

- A. Meet requirements of ASTM A 53-89a, "Specification for Pipe, Steel, Black & Hot-Dipped Zinc-Coated Welded & Seamless".
- B. Carbon steel, butt welded, Schedule 40 black steel pipe.

**2.2 FITTINGS**

- A. Black Pipe:
  - 1. Welded forged steel fittings meeting requirements of ASTM A 234-89a, "Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures", or standard weight malleable iron screwed.

**2.3 VALVES**

- A. 125 psi bronze body ball valve, UL listed
- B. Approved Manufacturers & Models:
  - 1. ConBraCo - "Apollo" series 80-100
  - 2. Jenkins - FIG-30-A
  - 3. Jomar - Model T-204
  - 4. McDonald - 3410
  - 5. PGL Corp - "Red Cap" gas ball valve
  - 6. Watts - Model B-6000-UL

**2.4 PRESSURE REDUCING REGULATORS**

- A. Self- operated, spring loaded regulator with large diaphragm area.
- B. Internal registration and relief.
- C. Tamper-resistant adjustment with corrosion resistance brass for indoor or outdoor use.
- D. ½" to 1 ½ " Threaded NPT.

- E. 2" and Above Flanged.
- F. Max Inlet Pressure 10 psi., Max Outlet Pressure 0.5 psi.
- G. Temperature Capabilities - ~20 to 180° F.
- H. Install with manual shut off cock.
- I. Approved Manufactures and Models.
  - 1. Emerson Y600 AR.
  - 2. Maxitrol 3UP33.
  - 3. Or Approved Equal.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Pipe installed underground, through air plenums, in walls, and pipes 2-1/2 inches and larger shall have welded fittings and joints. Other pipe may have screwed or welded fittings.
- B. Wrap and lay underground pipe in accordance with local gas utility company regulations and specifications.
- C. Install gas cocks on lines serving boilers, furnaces, duct heaters, and water heaters adjacent to boiler, furnace, or heater on outside of boiler, furnace, or heater cabinet and easily accessible.
- D. Do not use flexible pipe connections to boilers, furnaces, duct heaters, or hot water heaters.
- E. Install dirt leg with pipe cap, 6 inches long minimum, on each vertical gas drop to heating equipment.
- F. Use fittings for changes of direction in pipe and for branch runouts.
- G. Paint exterior exposed gas piping with gray paint to match gas meter.

END OF SECTION 221114

**SECTION 221116 – POTABLE WATER PIPING SYSTEMS (COPPER)****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

**1.2 SUMMARY**

- A. Furnish and install potable water piping complete with necessary valves, connections, and accessories inside building and connect with outside utility lines 5 feet from building perimeter.
- B. Perform excavating and backfilling required by work of this Section.

**1.3 SUBMITTALS**

- A. Quality Control:
  - 1. Submit written report of sterilization test to Architect.

**PART 2 - PRODUCTS****2.1 PIPE**

- A. Type K copper for piping underground or beneath concrete slab. 3/4 inch minimum under slabs.
- B. Type L hard drawn copper for above ground applications.

**2.2 FITTINGS**

- A. Wrought copper.

**2.3 CONNECTIONS:**

- A. Sweat copper type with 95/5 or 96/4 Tin-Antimony solder. Victaulic copper connection system with "FS" flush-seal gasket and zero-flex couplings.
- B. Joints under slabs, if allowed by local codes, shall be brazed.

**2.4 BALL VALVES**

- A. Use ball valves exclusively unless otherwise specified. Ball valves shall be by single manufacturer from approved list below. Valves shall be for 150 PSI SWP.
- B. Approved Manufacturers:
  - 1. Nibco-Scott T595 or S595 or equal by
  - 2. ConBraCo (Apollo)
  - 3. Crane
  - 4. Hammond
  - 5. Jenkins
  - 6. Ohio Brass
  - 7. Stockham
  - 8. Walworth
  - 9. Watts
  - 10. Victaulic

## 2.5 STOP & WASTE VALVES

- A. Approved Manufacturers:
  - 1. Mark II Oriseal stop & waste valve H15134 by Mueller
  - 2. Buffalo screw type curb box H-10350 complete with lid and H-10349 enlarged base by Mueller.

## 2.6 COMBINATION PRESSURE REDUCING VALVE/STRAINER

- A. Integral stainless steel strainer, or separate 'Y' strainer installed upstream of pressure reducing valve.
- B. Built-in thermal expansion bypass check valve.
- C. Approved Manufacturers:
  - 1. Watts U5B or equal by
  - 2. Cash Valve
  - 3. Clayton Valve
  - 4. Spencer
  - 5. Thrush
  - 6. Wilkins

## 2.7 DOMESTIC WATER PRESSURE REGULATOR

- A. Bronze body
- B. Bronze trim
- C. Heat resistant seat and diaphragm
- D. Built-in monel strainer with separate cleanout plug
- E. Stainless steel body seat
- F. Screwed ends.
- G. Install with manual shutoff valve on each side and 3/4" bypass line with gate valve.
- H. Provide 0-200 psi pressure gauge on each side.
- I. Approved Manufacturers:
  - 1. Cash-Acme Type E
  - 2. or approved equal

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install piping under slabs without joints where possible.
- B. Locate cold water lines a minimum of 6 inches from hot water line.
- C. Run main water pipe and branches to all fixtures.
- D. Size piping as shown.
- E. Run piping direct and concealed from view, unless otherwise shown.
- F. Grade horizontal runs to allow for drainage.

- G. Provide sufficient drains to draw water from entire domestic water system and sections thereof where cutoffs are shown.
- H. Furnish and install complete hot and/or cold water to all fixtures as shown on drawings.
- I. Run lines parallel to each other and parallel with the lines of the building.
- J. Cut pipes accurately to required measurements and work into place without springing or forcing.
- K. Provide for expansion and contraction of piping.
- L. Paint exposed threads on underground piping one coat asphaltum varnish.

### **3.2 FIELD QUALITY CONTROL**

- A. Before pipes are covered, test systems in presence of Architect at 100 psi hydrostatic pressure for two hours and show no leaks.
- B. Sterilize potable water system with solution containing 250 parts per million minimum of available chlorine. Introduce chlorinating materials into system in manner approved by Architect. Allow sterilization solution to remain for 24 hours and open and close valves and faucets several times during that time.
- C. After sterilization, flush solution from system with clean water until residual chlorine content is less than 0.2 parts per million.
- D. Water system will not be accepted until negative bacteriological test is made on water taken from system. Repeat dosing as necessary until such negative test is accomplished.

END OF SECTION 221116

**SECTION 221117-- POTABLE WATER PIPING SYSTEMS (PEX)****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes ASTM F877 cross-linked polyethylene (PEX) tubing hot and cold water distribution systems, ASTM F876 cross-linked polyethylene (PEX) tube, ASTM F1807 fittings and ASTM F2159 fittings

**1.2 REFERENCES**

- A. ASTM International
  1. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
  2. ASTM F876 Standard Specification for Cross-linked Polyethylene (PEX) Tubing.
  3. ASTM F877 Standard Specification for Cross-linked Polyethylene (PEX) Plastic Hot and Cold Water Distribution Systems
  4. ASTM F1807 Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing
  5. ASTM F2159 Standard Specification for Plastic Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing
- B. National Sanitation Foundation (NSF)
  1. Standard 14 Plastics Piping System Components and Related Materials
  2. Standard 61 Drinking Water System Components – Health Effects
- C. International Code Council (ICC)
  1. International Mechanical Code
  2. International Plumbing Code
- D. International Association of Plumbing Officials (IAPMO)
  1. Uniform Plumbing Code
  2. Uniform Mechanical Code
- E. Plastic Pipe Institute (PPI)
  1. Technical Report TR-3 Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials.
  2. Technical Report TR-4 Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Piping and Fitting Compounds

**1.3 SYSTEM DESCRIPTION**

- A. A. Design Requirements
  1. Standard Grade hydrostatic pressure ratings from the Plastic Pipe Institute in accordance with TR-3 and listed in TR-4. The following three standard-grade hydrostatic ratings are required;
    - a. 200 degrees F at 80 psi
    - b. 180 degrees F at 100 psi
    - c. 73 degrees F at 160 psi
  2. Tubing tested in general accordance with ASTM E84 for a flame spread/smoke developed index of 25/50 or less for the following PEX tube sizes encased with ½ inch fiberglass insulation;
    - a. 1 ¼ inch
    - b. 1 ½ inch
    - c. 2 inch
  3. Tubing tested in general accordance with ASTM E84 for a flame spread/smoke developed index of 25/50 or less for the following PEX tube sizes;
    - a. 3/8 inch

- b. ½ inch
- c. 5/8 inch
- d. ¾ inch
- e. 1 inch

B. Performance Requirements

- 1. To provide a PEX tubing hot and cold potable water distribution system, which is manufactured, fabricated and installed to comply with regulatory agencies and to maintain performance criteria stated by the PEX tubing manufacturer without defects, damage or failure
  - a. Comply with NSF Standard 14
  - b. Comply with NSF Standard 61
  - c. Show compliance with ASTM F877

#### 1.4 SUBMITTALS

A. General

- 1. Upon request, submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section

B. Product Data

- 1. Upon request, submit manufacturer's product submittal data and installation instructions
- 2. Upon request, submit manufacturer's Professional Installation Limited Warranty

C. Shop Drawings

- 1. Upon request, provide installation drawings indicating tubing layout, manifold locations, plumbing fixtures supported and schedules with details required for installation of the system

D. Samples

- 1. Upon request, submit selection and verification samples of piping

E. Listing Certifications

- 1. Upon request, submit manufacturers third party listings

#### 1.5 QUALITY ASSURANCE

A. Installer Qualifications

- 1. Utilize an installer having demonstrated experience on projects of similar size and complexity and possesses the skills and knowledge to install a PEX potable water distribution system
- 2. Installer will utilize skilled workers holding a trade qualification license or equivalent or apprentices under the supervision of a licensed tradesperson

B. Pre-installation Meetings

- 1. Verify project timeline requirements
- 2. Manufacturer's installation instruction
- 3. Manufacturer's warranty requirements

#### 1.6 DELIVERY, STORAGE AND HANDLING

A. General

- 1. Comply with Division 1 Product Requirement Section

B. Delivery

- 1. Deliver materials in manufacture's original, unopened, undamaged containers with identification labels intact until ready for installation

C. Storage and Protection



1. Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer
2. Store PEX tubing indoors, in cartons or under cover to avoid dirt or foreign material from entering the tubing
3. Do not expose PEX tubing to direct sunlight for more than six months. If construction delays are encountered, cover the tubing that is exposed to direct sunlight

## 1.7 WARRANTY

- A. Project Warranty
  1. Refer to Conditions of the Contract for project warranty provisions
- B. Manufacturer's Warranty
  1. Shall cover the repair or replacement of properly installed tubing and fittings proven defective as well as incidental damages
  2. Warranty period for PEX tubing and subsequent system shall be 25 year non-prorated warranty against failure due to defect in material or workmanship, beginning with the date of installation
  3. It is the installer's responsibility to avoid mixing fittings manufactured by others as it will reduce the owner's warranty

## PART 2 - PRODUCTS

### 2.1 PRODUCT MANUFACTURERS

- A. Zurn
- B. Uponor
- C. Vanguard
- D. Rehau
- E. Viega

### 2.2 MATERIALS

- A. Tubing
  1. Cross-linked polyethylene (PEX).
  2. Non-barrier type.
    - a. Shall have a pressure and temperature rating of 160 PSI at 73°F, 100 PSI at 180°F and 80 PSI at 200°F.
    - b. Tubing shall have a minimum of 6 months UV protection.
  3. Manufactured in accordance with ASTM F876 and ASTM F877 and tested for compliance by an independent third-party agency.
- B. Fittings
  1. Manufactured in accordance with ASTM F1807 or ASTM F2159 and/or comply with ASTM F877 system standard as identified on the fitting
- C. Manifold
  1. Preassembled Manifold
  2. Copper Manifold System
  3. Multi Port Fittings
  4. Copper Manifold Header
- D. Valves
  1. Shall be of the metal type, meeting the requirements of ASTM F877, identified as such with the appropriate mark on the product

**PART 3 - EXECUTION****3.1 MANUFACTURER'S INSTRUCTIONS**

- A. A. Comply with manufacture's product data, including product technical bulletins, technical memo's, installation instructions and design drawings.

**3.2 EXAMINATION**

- A. Site Verification of Conditions
  - 1. Verify that site conditions are acceptable for the installation of the PEX potable water system
  - 2. Do not proceed with installations of the PEX potable water system until unacceptable conditions are corrected

**3.3 INSTALLATION**

- A. Install PEX tubing in accordance with tubing manufacturer's recommendations and as indicated in the PEX Plumbing Installation Guide
- B. Do not install PEX tubing within 6 inches of gas appliance vents or within 12 inches of any recessed light fixtures
- C. Do not solder within 18 inches of PEX tubing in the same waterline. Make sweat connections prior to making PEX connections
- D. Ensure no glues, solvents, sealants or chemicals come in contact with the tubing without prior permission from the tubing manufacturer
- E. Do not expose PEX tubing to direct sunlight for more than 6 months
- F. Use grommets or sleeves at the penetration for PEX tubing passing through metal studs
- G. Use a PEX manufacturer recommended fire stop sealant manufacturer
- H. Protect PEX tubing with sleeves where abrasion may occur
- I. Use nail plates where PEX tubing penetrates wall stud or joists and has the potential for being struck with a screw or nail
- J. Allow slack of approximately 1/8 inch per foot of tube length to compensate for expansion and contraction
- K. Minimum horizontal supports are to be installed not less than 32 inches between hangers in accordance with model plumbing codes.
- L. Pressurize PEX tubing in accordance with applicable codes or in the absence of applicable codes, test pressure shall be at least equal to normal system working pressure, but not less than 40 PSI water or air and not greater than 225 PSI water, 125 PSI air

**3.4 FIELD QUALITY CONTROL**

- A. Site Tests
  - 1. To ensure system integrity, pressure test the system before covering tubing in concrete and after other trades have worked in the vicinity of the tubing
  - 2. Repair and replace any product that has been damaged according to manufacturer's recommendation

**3.5 PROTECTION**

- A. Protect installed work from damage due to subsequent construction activity on the site

END OF SECTION 221117

## **SECTION 221118 – BACKFLOW PREVENTER VALVE**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

#### **1.2 SUMMARY**

- A. Furnish and install a backflow preventer valve as described in Contract Documents.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURED UNITS**

- A. Designed to provide separation of radiant hot water heating system water from domestic cold water supply in accordance with Code.
  - 1. Rated flow at 30 psi pressure drop rated for 175 psi inlet pressure and 140 deg. F maximum operating temperature.
  - 2. Brass body construction with 3/4 inch NPT connections.
- B. Approved Manufacturers:
  - 1. Beeco 12
  - 2. Watts 900
  - 3. Equal by Febco
  - 4. Equal by Conbraco

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Furnish and install a drain cup and pipe the waste line to the nearest floor drain or floor sink.

END OF SECTION 221118

**SECTION 221313 – SOIL, WASTE, & VENT PIPING SYSTEMS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

**1.2 SUMMARY**

- A. Furnish and install soil, waste, and vent piping systems within building and connect with outside utility lines 5 feet out from building where applicable.
- B. Perform excavation and backfill required by work of this Section.

**PART 2 - PRODUCTS****2.1 BURIED LINES**

- A. Service weight, single-hub type cast iron soil pipe and fittings meeting requirements of ASTM A 74-87, "Specification for Cast Iron Soil Pipe & Fittings".
  - 1. Joint Material:
    - a. Rubber gaskets meeting requirements of ASTM C 564-88, "Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings".
    - b. No hub stainless steel clamps with neoprene gasket.
- B. ABS-DWV or PVC-DWV plastic waste pipe and fittings as permitted by state and local plumbing code.

**2.2 ABOVE GRADE PIPING & VENT LINES**

- A. Same as specified for buried lines except no-hub pipe may be used.
- B. Vent lines 2-1/2 inches or smaller may be Schedule 40 galvanized steel.
- C. Joint Material:
  - 1. Bell & Spigot Pipe - rubber gaskets meeting requirements of ASTM C 564-88, "Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings".
  - 2. No-Hub Pipe - Neoprene gaskets with stainless steel cinch bands.
  - 3. Galvanized Pipe - Screwed Durham tarred drainage fittings, or Victaulic.
  - 4. ABS-DWV solvent weld fittings

**2.3 TRAP PRIMERS**

- A. Components:
  - 1. Drains And Drain Accessories:
    - a. Floor Drain FD-1:
      - 1) Approved types with deep seal trap and chrome plated strainer.
      - 2) Provide trap primer connection and trap primer equal to Sioux Chief 695-01.
      - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
        - a) Josam: 30000-50-Z-5A.
        - b) J. R. Smith: 2010-A.
        - c) Sioux Chief: 832.
        - d) Wade: 1100.
        - e) Watts: FD-200-A.
        - f) Zurn: Z-415.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Do not caulk threaded work.
- B. Slope horizontal pipe at 1/4 in/ft.
- C. Cleanouts:
  - 1. Provide and set full size cleanouts at foot of each riser, and ends of branches from toilets, at points where a change of direction occurs, on exposed and accessible traps, at points where required to remove rust accumulation or other obstructions and as shown on plans. Set screw cap in cleanout with graphite paste. Cleanouts in walls shall be flush and covered with a chrome plated cleanout cover screwed into the cleanout plug. Cleanouts in floors shall be flush using Zurn, Josam, or Wade floor level cleanout fittings. Location of all cleanouts subject to approval of inspector.
- D. Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have seal trap in connection with complete venting system so gasses pass freely to atmosphere with no pressure or syphon condition on water seal.
- E. Vent entire waste system to atmosphere. Discharge 14 inches above roof. Join lines together in fewest practicable number before projecting above roof. Set back vent lines so they will not pierce roof near edge or valley.
- F. Use torque wrench to obtain proper tension in cinch bands when using hubless cast iron pipe. Butt ends of pipe against centering flange of coupling.
- G. Flash pipes passing through roof with 16 oz sheet copper flashing fitted snugly around pipes and calk between flashing and pipe with flexible waterproof compound. Flashing base shall be at least 24 inches square.
  - 1. Flashing may be 4 lb per sq ft lead flashing fitted around pipes and turned down into pipe 1/2 inch with turned edge hammered against pipe wall.

**3.2 FIELD QUALITY CONTROL**

- A. Before piping is covered, conduct tests for leaks and defective work. Notify Architect prior to testing. Correct leaks and defective work. Fill waste and vent system to roof level with water, 10 feet minimum, and show no leaks for two hours.

END OF SECTION 221313

**SECTION 221400 - STORM DRAINAGE PIPING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 05 01 apply to this Section.

**1.2 SUMMARY**

- A. This Section includes storm-drainage piping inside the building and to locations indicated.
- B. Related Sections include the following:
  - 1. Division 22 Section "Plumbing Specialties" for storm drainage piping system specialties.

**1.3 PERFORMANCE REQUIREMENTS**

- 1. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
- 2. Storm Drainage Piping: 10-foot head of water.

**1.4 SUBMITTALS**

- 1. Product Data: For pipe, tube, fittings, and couplings.
- 2. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

**1.5 QUALITY ASSURANCE**

- 1. Piping materials shall bear label, stamp, or other markings of specified testing agency.

**PART 2 - PRODUCTS****2.1 PIPING MATERIALS**

- 1. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.
- 2. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.
- 3. Transition Couplings for Underground Pressure Piping: AWWA C219 metal, sleeve-type coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

**2.2 CAST-IRON SOIL PIPING**

- 1. Hub-and-Spigot Pipe and Fittings: ASTM A 74.
  - a. Gaskets: ASTM C 564, rubber.
- 2. Hubless Pipe and Fittings: ASTM A 888 or CISPI 301.
  - a. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral center pipe stop.
  - b. Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; stainless-steel bands; and sleeve.
    - 1) NPS 1-1/2 to NPS 4: 3-inch- wide shield with 4 bands.
    - 2) NPS 5 to NPS 10: 4-inch- wide shield with 6 bands.

**PART 3 - EXECUTION****3.1 PIPING APPLICATIONS**

- A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.

### 3.2 PIPING INSTALLATION

- A. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers.
- B. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
- C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.
- D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight.
- E. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- F. Make changes in direction for storm piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- G. Lay buried building drain piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- H. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:
  - 1. Building Storm Drain: 1 percent downward in direction of flow for piping.
  - 2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.

### 3.3 JOINT CONSTRUCTION

- A. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
  - 1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
  - 2. Hubless Joints: Make with rubber gasket and sleeve or clamp.

### 3.4 HANGER AND SUPPORT INSTALLATION

- A. "Hangers and Supports" install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. 60 inches with 3/4-inch rod.
- C. Install supports for vertical cast-iron soil piping every 15 feet.

### 3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.



- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping to roof drains and storm drainage specialties.

### 3.6 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
  - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  - 2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - 3. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
  - 4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  - 5. Prepare reports for tests and required corrective action.

### 3.7 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221400

END OF DIVISION 22