

DIVISION 22: PLUMBING

22 00 00 PLUMBING

22 05 01	COMMON PLUMBING REQUIREMENTS
22 05 03	PIPE, PIPE FITTINGS, PIPE HANGERS & VALVES
22 05 53	IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT
22 07 03	MECHANICAL INSULATION AND FIRE STOPPING
22 07 05	UNDERGROUND PIPING INSULATION
22 07 10	POTABLE WATER PIPE INSULATION
22 07 11	HANDICAPPED FIXTURES INSULATION
22 07 20	RAIN DRAIN INSULATION
22 08 00	FIRE STOPPING
22 0900	COMMISSIONING OF PLUMBING

22 10 00 PLUMBING PIPING AND VALVES

22 10 07	PRESS TYPE PIPE FITTINGS
22 11 14	NATURAL GAS SYSTEMS
22 11 16	DOMESTIC WATER PIPING SYSTEMS (COPPER)
22 11 16	DOMESTIC WATER PIPING SYSTEMS (PEX)
22 11 18	BACKFLOW PREVENTER VALVE
22 13 13	SOIL, WASTE, & VENT PIPING SYSTEMS
22 14 00	STORM DRAINAGE PIPING
23 26 00	CONDENSATE DRAIN PIPING

22 30 00 PLUMBING EQUIPMENT

22 33 30	ELECTRIC STORAGE TYPE WATER HEATERS
22 34 20	GAS FIRED STORAGE TYPE WATER HEATERS
22 35 00	KITCHEN EQUIPMENT CONNECTIONS
22 36 00	WATER SOFTENER

22 40 00 PLUMBING FIXTURES

22 40 01	PLUMBING FIXTURES
22 47 03	HANDICAP DRINKING WATER COOLING SYSTEM

END TABLE OF CONTENTS

SECTION 22 05 01

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. "2018 International Building Code", "2018 International Mechanical Code", and "2018 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. "2018 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

SECTION 22 05 03

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

SECTION 22 05 53

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 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 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.
 - 3) Sherwin Williams, Cleveland, OH 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

SECTION 22 07 03

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. Hot Water Piping Insulation (Domestic)
 3. 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

SECTION 22 07 05

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 hot and 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

SECTION 22 07 10

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

SECTION 22 07 11

HANDICAPPED FIXTURES INSULATION

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 05 00 apply to this Section.

1.2 SUMMARY

- A. Furnish and install handicapped fixtures insulation as described in Contract Documents.

1.3 QUALITY ASSURANCE

- A. Insulating device must comply with UBC-85 and federal accessibility standards.
- B. Cover must meet federal standards for protection from burns and abrasions.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Insulating device shall be molded fire resistant foam, to encapsulate hot water piping, stop, and P-trap.
 - 1. Approved Manufacturers:
 - a. TCI Products' Skal+Gard SG-100B
- B. Safety cover with recloseable sealing strips which allow for removal and replacement for line maintenance may be used on drain and supply lines under lavatories.
 - 1. Approved Manufacturers:
 - a. Handy-Shield
 - b. Plumberex
- C. Color shall be white.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install tamper-proof locking strap to discourage pilferage.

END OF SECTION

SECTION 22 07 20

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

SECTION 22 08 00

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

SECTION 22 09 00

COMMISSIONING OF PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

- A. Attention is directed to the printed form of Contract and General Conditions and Supplementary Conditions which are hereby made a part of this Section of the Specifications
- B. Furnish all labor, materials, equipment and services necessary to provide the owner with fully functional domestic water system.
- C. Commissioning: Commissioning (Cx) is a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meet the defined objectives and criteria set by the Owners.
- D. Commissioning Team: The members of the Cx team consist of the owner's contracted commissioning authority (CxA), the owner's representative or construction manager (CM), the general contractor (GC), the architect (Arch) and the design engineers (Engs), the mechanical Contractors (MC), the electrical contractor (EC), the testing and balancing (TAB) contractor, the control contractor (CC), the facility operating staff, and any other subContractors or suppliers of equipment. The CxA directs and coordinates the project Cx activities and reports to the owner. All team members work together to fulfill their contracted responsibilities and meet the objectives of the contracted documents.
Commissioning Shall:
 - 1. Verify that applicable equipment and systems are installed according to the contract documents, manufacturer's recommendations, and industry accepted minimum standards and that they receive adequate operational checkout by installing Contractors.
 - 2. Verify and document proper performance of equipment and systems.
 - 3. Verify that O&M documentation left on site is complete.
 - 4. Verify that the owner's operating personnel are adequately trained.
- E. The Cx process does not take away from or reduce the responsibility of the system designers or installing Contractors to provide a finished and fully functional product. Furthermore, it doesn't not remove any responsibilities, products or requirements of other specification sections. This includes equipment startup by factory trained personnel.
- F. The general or plumbing contractors are not required to provide the CxA. An independent, third party commissioning agent has been retained by the State of Idaho. Though the contractor is not required to provide a commissioning agent, requirements for participation in the commissioning process are included in this specification.

1.2 DESCRIPTION OF WORK

- A. The work of this Section shall include and provide all labor, tools, materials and equipment necessary for the CxA to verify installation and performance of the Plumbing systems.

1.3 RELATED WORK IN OTHER SECTIONS

- A. The following related work shall be furnished or performed under other Sections of these Specifications:
 - 1. Section 019113 – GENERAL COMMISSIONING REQUIREMENTS
 - 2. Section 019114 – COMMISSIONING PLAN
 - 3. Section 230900 – COMMISSIONING OF HVAC
 - 4. Section 260800 – COMMISSIONING OF LIGHTING AND CONTROLS
- B. Commissioning Plan documentation is included by reference for information only.
- C. ASHRAE Standard 202-2018
- D. IECC 2015

1.4 DEFINITIONS

- A. Commissioning Plan: The detailed set of checking and testing procedures, sequences of events, schedules, staffing plans, and management or administrative procedures required to provide a comprehensive coordinated approach for commissioning the systems and equipment described herein.
- B. CxA: Commissioning Authority. The Commissioning Representative of the Owner. The Commissioning Authority will manage all commissioning activities on behalf of the Owner and will serve as the Owner's agent in review and approval of commissioning related services.
- C. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.
- D. Commissioning Representatives: Those members of the Contractor's staff, Sub-contractor's staff, Owner's staff, Architect's staff, or Owner's independent contractor assigned to participate in the commissioning process.
- E. Commissioning Manager: The Commissioning Representative of the Contractor and/or commissioning team, to manage and lead the commissioning effort on behalf of the Contractor and/or commissioning team.
- F. Commissioning Procedures: A series of checks, tests, and operational procedures, applied in specific sequences, to each system or equipment component to be commissioned and intended to demonstrate full system installation, performance, and functionality, in accordance with the design intent. The term "procedures" shall be used throughout this specification and the Project Commissioning Plan in reference to these checking, testing, and operational procedures.
- G. Systems Pre-Functional Test: A test, or tests, of the static function and operation of equipment and systems using manual (direct observation) by the installing contractor prior, during and post-equipment startup as deemed appropriate. Systems Pre-Functional Performance Testing is meant to verify the as-built systems ability to operate trouble free in at least a limited fashion prior to TAB and Systems Functional Performance testing. This process is documented through population of the provided pre-functional checklists.
- H. Systems Functional Performance Test: A test, or tests, of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods meant to commence following the completion of TAB and

Systems Pre-Functional Testing. Systems Functional Performance Testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the circulation pumps are tied to a control system which turns it on/off) performed by the Commissioning Agent with support from the contractor as needed. Systems are tested under various modes, such as low and high demand conditions, component or power failures, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional water test and balancing (TAB) is not considered Systems Functional Performance Testing. TAB's primary work is setting up the system flows and pressures as specified, while System Functional Performance Testing is verifying that the system has already been set up properly and is functioning in accordance with the Construction Documents. The Commissioning Agent develops the Systems Functional Performance Test Procedures in a sequential written form, coordinates, witnesses, and documents the actual testing. Systems Functional Performance Testing is performed by the Contractor. Systems Functional Performance Tests are performed after startups, control systems are complete and operational, TAB functions and Pre-Functional Checklists are complete.

1.5 INTENT

- A. It is the intention of this Specification is a to require the Contractors performing work to cooperate with the CxA, to furnish all labor and equipment and measuring devices, to perform required measurements and tests to verify that the installed equipment and systems are performing in accordance with the construction documents.
- B. The CxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating or construction management.
- C. Plumbing system installation, start-up, testing and balancing, preparation of O&M manuals, and operator training are the responsibility of the Plumbing Contractor, with coordination by the General Contractor, Construction Manager or other entity acting under the requirements of Division 1. Observation, verification and Cx are the responsibility of the CxA who is to be assisted by installing Contractors in system operation as needed. The Cx process does not relieve Contractors from the obligations to complete all portions of work in a satisfactory and fully operational manner, nor does Cx remove any obligation the trades have for operation and maintenance manuals and training.

1.6 PLUMBING CONTRACTOR REQUIREMENTS

- A. Cx, Pre-Functional and Functional testing as defined by ASHRAE standard 202-2018 are mandatory requirements of this project. Provide any assistance needed to fully test systems in accordance with testing protocols.
- B. All applicable equipment submittals shall be forwarded to the CxA for review.
- C. No Functional Testing shall commence until the completion and submission of the populated pre-functional checklists to the CxA. The CxA will provide blank pre-functional testing forms for the contractor to populate. Pre-functional testing forms shall be provided to the CxA in submittal form.

- D. No Functional Testing shall commence until all systems TAB is complete (if applicable). Functional testing may commence, at the discretion of the CxA, once TAB is complete however only conditional acceptance can be achieved until the final TAB report is provided by the contractor to the CxA for review. Only after review and acceptance of the TAB report and tested values can final acceptance be achieved. The owner may elect to wait until final acceptance is achieved to consider the project substantially complete.
- E. The Cx responsibilities applicable to the plumbing subcontractor are as follows:
1. Provide startup for all equipment in the contracted scope by trained manufacturer representatives or personnel.
 2. Assist and cooperate with the Testing and Balancing (TAB) contractor and the CxA by:
 - a. Putting all equipment and systems into operation and continuing the operation during each working day of TAB and Cx as required.
 - b. Providing clearances for test holes, petes plugs and temperature sensors in piping where directed by TAB and design drawings.
 - c. Providing temperature and pressure taps according to the Construction Documents for TAB and Cx testing.
 3. List and clearly identify on the as-built drawings the locations of all P/T plugs, gauges, meters, sensors and all other such measure and verification devices.
 4. Prepare a preliminary schedule for all pipe system testing, flushing and cleaning, equipment start-up and TAB start and completion for use by the CxA. Update the schedule as appropriate.
 5. Notify the GC and CxA when pipe flushing, cleaning, fixture testing, major equipment startup and any TAB work will occur. Be responsible to notify the GC, ahead of time, when Cx activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that Cx processes are executed and that the CxA and GC both have the scheduling information needed to efficiently execute the Cx process.
 6. Attend Cx scoping meetings and other meetings necessary to facilitate the Cx process.
 7. Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, together during equipment submittals to the CxA for review and approval. See this specification section for additional information and requirements for the O&M manuals.
 8. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
 9. Review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
 10. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the PFTs from the CxA for all commissioned equipment. Submit to CxA for review and approval prior to startup.
 11. During the startup and initial checkout process, execute the plumbing-related portions of the PFTs for all commissioned equipment. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CxA.
 12. Address current outstanding punch list items before functional testing. Water Pressure Testing and Water Testing and Balancing (TAB) shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.

13. Complete Prefunctional Test Checklists (PFTs) provided by the CxA and return these to the CxA.
14. Provide access for equipment to be tested, such as removing ceiling tiles.
15. Provide skilled technicians to execute starting of equipment and to execute the pre-functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem solving.
16. Provide skilled technicians to assist with functional performance testing under the direction of the CxA for specified equipment outlined in the Cx Plan. Assist the CxA in interpreting the monitoring data, as necessary.
17. Correct deficiencies (differences between specified and observed performance). The CxA will provide one (1) functional retest of commissioned equipment at no additional charge to the contractor(s). If repeated failures of the equipment and/or system require retest beyond the first retest, the contractor (s) will be back charged for the time of the CxA required to complete the additional retesting.
18. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions. Provide assistance, cooperate and provide required materials to others as directed by the GC (and CxA) in the compilation of the O&M manuals. Prepare draft versions of the O&M Manual for use as the training syllabus.
19. During construction, maintain as-built red-line drawings for all drawings and final as-builts for contractor-generated coordination drawings. Update after completion of Cx (excluding deferred testing).
20. Provide Training Plan and training of the Owner's operating staff using expert qualified personnel, as specified. Use the draft O&M manual as the training manual.
21. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
22. Attend Cx coordination meetings and provided assistance and cooperate in the preparation of a Cx schedule with the GC and CxA.
23. Cx Tasks shall be performed by the same personnel who were involved in the installation and are familiar with the equipment.
24. During the Warranty Period execute seasonal or deferred functional performance testing, witnessed by the CxA, according to the specifications and correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

1.7 RESPONSIBILITIES OF THE THIRD-PARTY COMMISSIONING AUTHORITY

- A. Organize and lead the Cx team.
- B. Prepare a construction-phase Cx plan. Collaborate with Contractors and with subContractors to develop test and verification procedures. Include design changes and scheduled Cx activities coordinated with overall Project schedule. Identify Cx team member responsibilities, by name, firm, and trade specialty, for performance of each Cx task.
- C. Review and comment on submittals from Contractors for compliance with the OPR, BOD, Contract Documents, and construction-phase Cx plan. Review and

comment on performance expectations of systems and equipment and interfaces between systems relating to the OPR and BOD.

- D. Convene Cx team meetings for the purpose of coordination, communication, and conflict resolution; discuss progress of the Cx processes. Responsibilities include arranging for facilities, preparing agenda and attendance lists, and notifying participants. The CxA shall prepare and distribute minutes to Cx team members and attendees within five workdays of the Cx meeting.
- E. At the beginning of the construction phase, conduct an initial construction-phase coordination meeting for the purpose of reviewing the Cx activities and establishing tentative schedules for operation and maintenance submittals; operation and maintenance training sessions; manufacturer startup and Project completion.
- F. Observe and verify construction and report progress and deficiencies. In addition to compliance with the OPR, BOD, and Contract Documents, verify systems and equipment installation for adequate accessibility for maintenance and component replacement or repair.
- G. Prepare project-specific test and verification procedures and checklists.
- H. Schedule, direct, witness, and document tests and verifications.
- I. Compile test data, verification reports, and certificates and include them in the systems manual and Cx report.
- J. Develop custom pre-functional testing protocol for review by interested parties.
- K. Perform functional testing with assistance by appropriate contractors
- L. Certify date of acceptance and startup for each item of equipment for start of warranty periods.
- M. Review project record documents for accuracy. Request revisions from Contractor to achieve accuracy.
- N. Review and comment on operation and maintenance documentation and systems manual outline for compliance with the OPR, BOD, and Contract Documents. Operation and maintenance documentation requirements are specified in Division 1 Section "Operation and Maintenance Data."
- O. Review operation and maintenance training program and provide assessment and feedback on the completeness of the maintenance training program requirements. Operation and maintenance training is specified in contract documents
- P. Assemble the final Cx documentation, including the Cx report and Project Record Documents.

1.8 SYSTEMS TO BE COMMISSIONED

A. Domestic Hot Water System

1. Water Heaters
2. Hot Water Piping and Insulation
3. Hot Water Mixing Valves and Recirculation Systems
4. Cold Water Distribution Systems including water softener
5. Overall DHW System Functionality
6. Plumbing Fixtures
 - a. Lavatories
 - b. Water Closets
 - c. Urinals
 - d. Sinks
 - e. Other plumbing fixtures

- B. No Functional Testing shall commence until all Prefunctional Checklists are completed and returned to the CxA.

1.9 RECORD DRAWINGS

- A. Record drawings shall be kept on the job site and up dated continuously by the Contractor as the work progresses
- B. Record drawings shall show exact locations and sizes of all the work to be concealed. Especially note the location of the valves, volume dampers, fire dampers, etc.
- C. Non-availability of the updated record drawings or inaccuracies therein shall be grounds for cancellation and/or postponement of any final verification by the Engineer.

1.10 COMMISSIONING APPROACH

A. General

1. The commissioning approach shall include a series of checks, tests, and operational procedures, applied in specific sequences, to each system or equipment component to be commissioned.
2. The contractor shall perform startup tests in accordance with manufacturer's requirements and pre-functional testing in accordance with Commissioning Authority supplied checklists utilizing members of the construction staff and representatives of the equipment and system manufacturer's who are fully knowledgeable of the equipment and systems installation and operation.
3. The plumbing contractor is required to fill out the pre-functional testing forms provided by the Commissioning Agent. The Commissioning agent may observe certain pre-functional tests and their discretion.
4. The specific commissioning procedures required are described in the Project Commissioning plan found in 01 19 14. These procedures shall be performed in a specific sequence as described in the Project Commissioning Plan. The sequenced application of the procedures is intended to provide a step-wise development, proceeding from the individual component level, to the system level, and ultimately to the multiple integrated level of system operation. This sequencing approach will require certain procedures to be performed earlier in the construction process than for non-commissioned construction, and is intended to help ensure that the installation is free of defects at the earliest opportunity,

allowing increased time for correction or modification if defects or performance issues are found.

PART 2 PRODUCTS

2.1 Test equipment

- A. Plumbing subcontractor shall furnish all the equipment and labor to perform the systems and equipment installed under their section.
- B. Stand-alone datalogging equipment shall be provided by the CxA as needed.
- C. BMS tied datalogging equipment and software can be used for Cx as the discretion of the CxA and shall become the property of the Owner.
- D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available where applicable.
- E. Refer to the Cx Plan for details regarding equipment that may be required to simulate required test conditions.

PART 3 EXECUTION

3.1 Submittals

- A. Contractors shall provide submittal documentation for systems to be commissioned indicated herein and in the Cx Plan found in section 01 91 14.
- B. Plumbing Contractor shall provide documentation that includes results of static testing as required by all Division 22 specifications.
- C. Plumbing Contractor shall provide all manufacturer-based pre-startup, startup and other equipment specific pre-testing documentation.
- D. Contractor shall perform pre-functional testing and provide populated prefunctional checklists to the CxA (Blank forms to be provided by CxA)

3.2 PRE-COMMISSIONING Work Session & Kickoff Meeting

- A. The Plumbing subcontractor shall participate in the pre-commissioning work session to review the CxA's developing Commissioning Plan. The work session shall be held prior to Plumbing Rough In.
- B. The work session shall be held at the General Contractor's principle place of business or at the job site. The GC, CxA, appropriate subcontractors and representatives of the owner shall be scheduled for attendance as a minimum. Sub-contractor representatives of the principle trades involved in the commissioning process should also be in attendance and may be scheduled for attendance at the discretion of the CxM.
- C. Plumbing contractor(s) shall participate in both the work session and kickoff meeting.

3.3 Startup

- A. The plumbing contractor(s) shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this section and in the Cx Plan. Division 22 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents and manufacturer requirements. The Cx procedures and pre-functional and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the CxA, GC or Owner. Startup shall be conducted by qualified personnel provided by the installing contractor.

3.4 Pre-Functional Testing

- A. Prior to the beginning of the construction phase commissioning and testing specified under this section, the plumbing subcontractor adjust and check operation and performance of the systems and equipment installed under their respective sections. Blank forms will be provided by the CxA.
- B. At the discretion of the CxA the sub systems may be required to be tested prior completion of the entire system. This particularly applies to hydronic systems pressure testing.
- C. Provide populated forms to the CxA in submittal form.
- D. Without limiting the following work shall be performed:
 - 1. Verify and document that the systems and equipment are installed and functioning in accordance with the OPR and contract documents. The as-built drawings and operating manuals reflect the as built conditions.
 - 2. The systems shall be started and their performance shall be checked and compared with the manufacturers requirements as well as design documents.
 - 3. Blank Pre-functional checklists shall be provided by the CxA.
 - 4. Any system or equipment which is does not pass manufacturer startup requirements and Pre-functional testing shall be repaired and replaced at no cost to the owner. The contractor shall retest the system at their own cost until the manufacturers startup requirements and pre-functional testing criteria are met.

3.5 Functional Testing

- A. After review and acceptance of the manufacturer startup forms and pre-functional checklists, the CxA will schedule dates to begin functional testing.
- B. Functional testing is intended to begin upon completion of a system installation, startup and pre-functional testing. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CxA and Owner. Beginning system testing before full completion does not relieve the Contractor from fully completing the system, including all PFTs as soon as possible.
- C. Procedure Acceptance
 - 1. On-Site Conditional Acceptance

2. Upon satisfactory completion of each commissioning procedure and completion of the procedure close-out meeting, the CxA shall provide conditional acceptance of the procedure.
3. Conditional acceptance shall indicate that the related installation work checked by the procedure and the related performance verified by the procedure is satisfactory, and that the required procedure has been completed, only.
4. Conditional acceptance shall not imply that the equipment and systems involved with the procedure are fully approved and have been provided with final acceptance. Conditional acceptance shall additionally be subject to all notes and comments included in the field notes or test forms, and subject to the satisfactory demonstration that all associated pre-testing, special testing, special testing reports, or alignment reports have been fully completed.
5. Conditional acceptance shall be indicated by the signature of the CxA on the functional testing form.
6. At the completion of completion of testing, a conditional acceptance memo will be provided to the project team. Conditional acceptance suggests that the majority, if not all, testing has been completed and systems are largely functional and ready to support occupancy. This conditional acceptance memo will be attached to the most current issues log.

D. On-Site Procedure Rejection

1. The CxA shall have the authority to reject a procedure in its entirety or to cause the procedure to be stopped if in the opinion of the CxA, any of the following conditions exist:
 - a. The pre-procedure review meeting is incomplete.
 - b. Appropriate or sufficient contractor staff is not available or required commissioning representatives are not present.
 - c. Required pre-testing or report data, such as point-to-point control verifications, alignment reports, and trend log data is not available or is incomplete.
 - d. The installation is insufficient or incomplete as required for the procedure or not in compliance with the Contract Documents.
 - e. Numerous checks or tests fail or cannot be accomplished.
 - f. Installation and/or operation of equipment or systems beyond or in advance of the commissioning requirements.
 - g. Installation, operation, or commissioning not in compliance with the sequencing requirements.
 - h. Indication of improper maintenance or operation.
 - I Inadequate instrumentation
2. The CxA shall additionally reject a procedure and require the equipment operation or procedure to be stopped if in the opinion of the CxA unsafe conditions to either staff or equipment exist. Consideration of safety issues by the CxA shall not in any way relieve the Contractor from his sole responsibility for job site safety and protection of the equipment.
3. Direction to stop the procedure or halt the operation of equipment will be

given verbally. Upon notification the Contractor shall immediately stop the procedure and restore the system or equipment to a safe condition.

4. At the discretion of the CxA, the Contractor may be afforded the opportunity to correct the conditions indicated by the CxA and resume the procedure.
5. If in the opinion of the CxA corrections cannot be implemented in a satisfactory manner, within the scheduled time available for the procedure and with sufficient time available to complete the procedure, the procedure shall be stopped and rescheduled by the CxM. The CxA shall provide the CxM with written notification of procedure rejection stating the cause of the action.
6. The Contractor shall be liable for all actual costs associated with the required attendance by the CxA, the Owner's and A/E's commissioning representatives, and required outside agents, resulting from rejected procedure.
7. Actual costs shall include:
 - a. Cost for the CxA and for each Owner's and A/E's commissioning representative, which are comprised of contractual billing rate as defined in the respective organization's agreement for such work, including overhead and profit. For CxA and A/E's commissioning representatives, these rates may be found in the A/E schedule for additional services.
 - b. Travel-related expenses for the CxA and for each Owner's or A/E's commissioning representative, where such staff is required to be in attendance and not headquartered within the city limits, which are comprised of compensation for actual travel time, with an established minimum of 5 hours, and mileage rates, billed at the prevailing national government rate.
 - c. Costs assessed for required outside agents, contractors, or specialists employed by the Owner or A/E at the actual contractual billing rates as defined in the respective organization's agreement for such work.
 - d. Equipment rentals, special tools, and related material fees associated with the participation of contracted outside organizations and specialists.
8. The costs assessed will be documented by the CxA and will be deducted from the Contractor's fees or progress payments at the time of occurrence.

3.6 FINAL ACCEPTANCE

- A. Final acceptance will be contingent upon satisfactory completion of all commissioning tasks and submittals, with final review and approval by the Commissioning Authority.
- B. Where specific components, equipment, or system elements are unable to comply with the specified requirements due to improper or incomplete installation, product defect, or failure of a device to perform to the manufacturer's published or advertised capabilities, final acceptance will be contingent on repair, replacement, and correction of the deficiencies by the Contractor and satisfactory

completion of the commissioning procedures.

- C. Where specific components, equipment, or system elements are demonstrated to comply with the specified requirements and perform to the manufacturer's published or advertised capabilities, but are demonstrated not to provide the performance as required by the Contract Documents and the commissioning procedures, disposition of the issue and/or related modifications shall be provided as directed by the Architect. Final acceptance shall be contingent on the completion of any resulting correction work and related commissioning requirements determined as necessary in final disposition of the issue.
- D. Upon satisfactory completion of all commissioning work and resolution of all related issues, the CxA shall provide the Owner, Contractor, and the Architect with a final report documenting recommendation for final acceptance. Recommendation for final acceptance by the CxA shall indicate that in the opinion of the CxA, and as demonstrated within the extent and scope of the commissioning process, the equipment and systems have been installed in compliance with, and function as required by the Contract Documents.
- E. The Owner may accept the recommendation of the CxA and provide final acceptance by providing the appropriate authorized signature and by providing copies of the signed acceptance to all parties involved. The Owner's final acceptance of the commissioning work shall indicate that Owner accepts that the systems and equipment, as demonstrated within the extent and scope of the commissioning process, have been installed in compliance with, and function as required by, the Contract Documents. The Owner's acceptance shall not constitute agreement that all contractual obligations are fulfilled and does not constitute final acceptance of the project under the terms and conditions of the Contract Documents.

END OF SECTION

SECTION 22 10 07

PRESS TYPE PIPE FITTINGS

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 05 01 apply to this Section.

1.2 SUMMARY

- A. Copper Tubing and Fitting System for Hot and Cold Water Distribution Systems, Sprinkler and Standpipe Systems and Hydronic Piping Systems

1.3 DEFINITIONS

- A. ASME: American Society of Mechanical Engineers
- B. ASTM: American Society for Testing and Materials
- C. EPDM: Ethylene-propylene-diene-monomer
- D. IAPMO: International Association of Plumbing & Mechanical Officials
- E. ICC: International Code Council
- F. MSS: Manufacturers Standardization Society
- G. AWWA: American Water Works Association
- H. NSF: National Sanitation Foundation
- I. UL: Underwriters Laboratory
- J. NFPA: National Fire Protection Association

1.4 REFERENCES

- A. ASME A13.1: Scheme for the Identification of Piping Systems
- B. ASME B1.20.1: Pipe Threads, General Purpose (inch)
- C. ASME B16.18: Cast Copper Alloy Solder Joint Pressure Fittings
- D. ASME B16.22: Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
- E. ASME B16.26: Cast Copper Alloy Fittings for Flared Copper Tube
- F. ASME B31.9: Building Services Piping

- G. ASTM B75: Standard Specification for Seamless Copper Tube
- H. ASTM B88: Standard Specification for Seamless Copper Water Tube
- I. ASTM B813: Standard Specification for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube
- J. ASTM B828: Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings
- K. AWWA C651: Standard for Disinfecting Water Mains
- L. IAPMO: Uniform Mechanical Code
- M. IAPMO: Uniform Plumbing Code
- N. ICC: International Plumbing Code
- O. ICC: International Mechanical Code
- P. MSS-SP-58 Pipe Hangers and Supports Materials, Design and Manufacturer
- Q. MSS-SP-69 Pipe Hangers and Supports Selection and Application
- R. NFPA 13 Standard for the Installation of Sprinkler Systems
- S. NFPA 13D Standard for the Installation of Sprinkler Systems in One/Two Family Dwellings and Mobile Homes
- T. NFPA 13R Standard for the Installation of Sprinkler Systems for Residential Occupancies up to and including Four Stories in Height
- U. NFPA 14 Standard for the Installation of Standpipe and Hose Systems
- V. NSF 61 Drinking Water System Components – Health Effects

1.5 QUALITY ASSURANCE

- A. Installer shall be a qualified installer, licensed within the jurisdiction, and familiar with the installation of ProPress copper press joint systems.
- B. ProPress copper press fittings shall be installed using the proper tool, actuator, jaws and rings as instructed by the press fitting manufacturer.
- C. The installation of copper tubing for hot and cold water distribution systems shall conform to the requirements of the ICC International Plumbing Code or IAPMO Uniform Plumbing Code.
- D. The installation of copper tubing in sprinkler or standpipe systems shall conform to NFPA 13, 13D, 13R and 14.
- E. The installation of copper tubing in Hydronic systems shall conform to the requirements of the ICC International Mechanical Code or the IAPMO Uniform Mechanical Code.

- F. ASME Compliance: ASME B31.9 for building services piping valves.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Copper tubing shall be shipped to the job site on truck or in such a manner to protect the tubing. The tubing and fittings shall not be roughly handled during shipment. Tubing and fittings shall be unloaded with reasonable care.
- B. Protect the stored product from moisture and dirt. Elevate above grade. When stored inside, do not exceed the structural capacity of the floor.
- C. Protect fittings and piping specialties from moisture and dirt.

1.7 PROJECT CONDITIONS

- A. Verify length of tubing required by field measurements.

1.8 WARRANTY

- A. The tubing and fittings manufacturer shall warrant that the tubing and fittings are free from defects and conform to the designated standard. The warranty shall only be applicable to tubing and fittings installed in accordance with the manufacturer's installation instructions.
- B. The manufacturer of the fittings shall not be responsible for the improper use, handling or installation of the product.

PART 2 - PRODUCTS

2.1 MANUFACTURES

- A. Press Fittings: Viega, Victaulic.

2.2 MATERIAL

- A. Tubing Standard: Copper tubing shall conform to ASTM B 75 or ASTM B88.
- B. Fitting Standard: Copper fittings shall conform to ASME B16.18, ASME B16.22 or ASME B16.26.
- C. Press Fitting: Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer.
- D. Threaded Fittings: Pipe Threads shall conform to ASME B1.20.1.
- E. Hanger Standard: Hangers and supports shall conform to MSS-SP-58.

2.3 SOURCE QUALITY CONTROL

- A. All fittings in contact with drinking water shall be listed by a third party agency to NSF 61.

- B. All fittings used in Fuel Gas Applications shall be listed by a third party agency as being acceptable for fuel gas piping systems.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The installing contractor shall examine the copper tubing and fittings for defects, sand holes or cracks. There shall be no defects of the tubing or fittings. Any damaged tubing or fittings shall be rejected.
- B. The installing contractor shall insure that sealing elements are properly in place and free from damage. For Sizes 2-1/2" to 4", installer should insure that the stainless steel grip ring is in place.

3.2 PREPARATION

- A. Copper tubing shall be cut with a wheeled tubing cutter or approved copper tubing cutting tool. The tubing shall be cut square to permit proper joining with the fittings.
- B. Remove scale, slag, dirt and debris from inside and outside of tubing and fittings before assembly. The tubing end shall be wiped clean and dry. The burrs on the tubing shall be reamed with a deburring or reaming tool.

3.3 INSTALLATION GENERAL LOCATIONS

- A. Plans indicate general location and arrangement of piping systems. Identified locations and arrangements are used to size tubing and calculate friction loss, expansion, pump sizing and other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.

3.4 INSTALLATION

- A. Pressure Rating: Install components having a pressure rating equal to or greater than the system operating pressure.
- B. Install piping free of sags, bends and kinks.
- C. Change in Direction: Install fittings for changes in direction and branch connections. Where approved, changes in direction may also be made by bending of Types K and L tube.
- D. Solder Joints: Solder joints shall be made in accordance with ASTM B 828. The temperature of the joint during soldering shall not be raised above the maximum temperature limitation of the flux.
- E. Threaded Joints: Threaded joints shall have pipe joint compound or teflon tape applied to the male threads only. Tighten joint with a wrench and backup wrench as required.
- F. Flared Joints: Flared copper tube joints shall be made by the appropriate use of cast copper alloy fittings. Flared ends of copper tube shall be of the 45-degree flare type and shall only be made with a flaring tool designed specifically for that purpose.

- G. Press connections: Copper and copper alloy press connections shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool(s) approved by the manufacturer.
- H. Pipe Protection: Provide protection against abrasion where copper tubing is in contact with other building members by wrapping with an approved tape, pipe insulation or otherwise suitable method of isolation.
- I. Penetration Protection: Provide allowance for thermal expansion and contraction of copper tubing passing through a wall, floor, ceiling or partition by wrapping with an approved tape or pipe insulation or by installing through an appropriately sized sleeve. Penetrations for fire resistant rated assemblies shall maintain the rating of the assembly.
- J. Backfill Material: Backfill material shall not include any ashes, cinders, refuse, stones, boulders or other materials which can damage or break the tubing or promote corrosive action in any trench or excavation in which tubing is installed.
- K. Horizontal Support: Install hangers for horizontal piping in accordance with MSS-SP-69 or the following maximum spacing and minimum rod sizes.
- L. Vertical Support: Vertical copper tubing shall be supported at each floor.
- M. Galvanic Corrosion: Hangers and supports shall be either copper or vinyl coated to prevent galvanic corrosion between the tubing and the supporting member.
- N. Seismic Restraint: In seismic areas, copper tubing shall be installed to withstand all seismic forces.
- O. Piping Identification: Copper tubing systems shall be identified in accordance with the requirements of ASME A13.1.

3.5 FIELD QUALITY CONTROL

- A. Water Testing: The copper tubing system shall be water tested for joint tightness. The piping system shall be filled with water. The system shall be pressurized to the maximum pressure and length of time required by the code or standard. The system shall have no leaks at the rated pressure.
- B. Air Testing: The copper tubing system shall be air tested for joint tightness. The piping system shall be pressurized with air to the maximum pressure of the system or to the code or standard required minimum for the required length of time. The system shall have no leaks at the rated pressure.

3.6 CLEANING (potable water systems)

- A. Disinfection: The copper hot and cold water distribution system shall be disinfected prior to being placed in service. The system shall be disinfected in accordance with AWWA C651 or the following requirements:

1. The piping system shall be flushed with potable water until discolored water does not appear at any of the outlets.
2. The system shall be filled with a water chlorine solution containing at least 50 parts per million of chlorine. The system shall be valved off and allowed to stand for 24 hours or the system shall be filled with a water chlorine solution containing at least 200 parts per million of chlorine. The system shall be valved off and allowed to stand for 3 hours.
3. Following the standing time, the system shall be flushed with water until the chlorine is purged from the system.

END OF SECTION

SECTION 22 11 14

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. 1/2" to 1 1/2 " 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

SECTION 22 11 16

POTABLE WATER PIPING SYSTEMS (COPPER) (1 1/2" and larger and anywhere exposed)

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

SECTION 22 11 16

POTABLE WATER PIPING SYSTEMS (PEX) (1" and smaller, only where concealed in walls or under floors)

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 manufacturer'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

SECTION 22 11 18

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

SECTION 22 13 13

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.

2.4 PRECISION TRAP PRIMERS:

- A. Provide and install Precision Plumbing Products "prime-time" (or approved equal) trap priming assembly.
- B. Complete assembly including:
 - 1) Atmospheric vacuum breaker.
 - 2) Pre-set 24 hour clock.
 - 3) Manual over-ride switch.
 - 4) 120v/220v solenoid valve.
 - 5) 3/4" FNPT connection with isolation valve.
 - 6) Calibrated manifold for equal water distribution.
 - 7) 5/8" outlet compression fittings (for 1/2" Pex piping connections).
 - 8) Manifold outlets as specified on plans.
 - 9) 12"x12"x4" Nema 1 metal cabinet with cover plate for surface mounting.
- C. Operation:
 - 10) Priming assembly will supply a minimum of 20 oz. of potable water at 20 psig at a preset factory setting of 10 seconds.
 - 11) The entire unit is pre-assembled in a steel cabinet for surface mounting.
 - 12) The priming assembly must be mounted above the finished floor.

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

SECTION 22 14 00

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

SECTION 22 26 00

CONDENSATE DRAIN PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install condensate drain piping as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 0501: Common HVAC Requirements.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM B 88-03, 'Standard Specification for Seamless Copper Water Tube.'

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Materials:
 - 1. Condensate Drains:
 - a. Schedule 40 PVC for condensate drains from furnace combustion chambers and furnace cooling coils, and auxiliary drain pans.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Condensate Drains:
 - 1. Support piping and protect from damage.
 - 2. Do not combine PVC condensate drain piping from furnace combustion chamber with copper condensate drain piping from cooling coil.
 - 3. Do not combine auxiliary drain pan piping with furnace / Cooling Coil Condensate drain piping.

END OF SECTION

SECTION 22 33 30

ELECTRIC STORAGE TYPE WATER HEATERS

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 05 00 apply to this Section.

1.2 SUMMARY

- A. Furnish and install water heater as specified in Contract Documents.

1.3 SUBMITTALS

- A. Warranty:
 - 1. Submit copy of specified warranty.

1.4 WARRANTY

- A. Three year non-prorated warranty on water heaters of 20 gallon capacity and larger.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Glass lined storage tank pressure tested and rated for 125 PSI working pressure.
- B. 40 Gallon - (Regular Height)
 - 1. (2) 4.5 Kw non-simultaneous operation.
 - 2. 3 inches minimum glass fiber insulation.
 - 3. Complete with two stage thermostat, magnesium anode, electric sheath rod type heating element, high limit control, and ASME rated temperature-pressure relief valve.
 - 4. Heater shall be pre-wired and entire unit bear UL label.
 - 5. Maximum Height - 50 inches.
 - 6. Approved Manufacturers:
 - a. A O Smith
 - b. State Industries
 - c. Ruud/ Rheem
 - d. Bradford/White

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Water heaters shall each have a temperature-pressure relief valve sized to match heat input and set to relieve at 120 psi.

- B. Install temperature-pressure relief valve rated at MBH input of heater minimum on hot water heater and pipe discharge to directly above funnel of floor drain.

- C. Thermal Expansion Absorbers.
 - 1. Bladder type for use with potable water systems.
 - 2. Acceptable Products:
 - a. Therm-X Trol ST-5 by Amtrol
 - b. Equal as approved by Architect before bidding.

3.2 WATER TEMPERATURE

- A. Contractor shall be responsible to verify and/or change temperature settings on water heaters supplied on this project to meet requirements of Life Safety and Health Department Codes. Any setting above 120 deg. F. shall require warning labels placed on outside of water heaters in conspicuous places indicating water temperature setting and fact that any temperature above 120 deg. F. may be a hazard.

END OF SECTION

SECTION 22 34 20

GAS FIRED STORAGE TYPE WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 0501 apply to this Section.

1.2 SUMMARY

- A. Furnish and install water heater as described in Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Glass lined storage tank, pressure tested and rated for 150 psi wp complete with thermostat, high limit control, gas valve, gas pressure regulator, 100% safety shut-off, and draft diverter. AGA approved.
- B. 92 to 100 Gallon:
 - 1. With hand hole cleanout and non-prorated three year tank warranty.
 - 2. Approved Manufacturers:
 - a. A O Smith
 - b. Bradford-White
 - c. Rheem
 - d. Ruud GL
 - e. State Industries

2.2 ACCESSORIES

- A. Anchoring Components:
 - 1. One inch by 18 ga galvanized steel straps.
 - 2. No. 10 by 2-1/2 inch screws.
- B. Thermal Expansion Absorbers:
 - 1. Bladder type for use with potable water systems.
 - 2. Acceptable Products:
 - a. Therm-X-Trol ST-12 by Amtrol.
 - b. Equal as approved by Architect before bidding. See Section 01600.
- C. Mixing Valve:
 - 2. Solid brass construction and CSA B125 certified.
 - 3. Includes integral check valves and inlet screen. Features advanced paraffin-based actuation technology.
 - 4. Flow of 5.7 GPM with maximum 10 psi (69 kPA) pressure drop. Perform to minimum flow of 0.5 GPM (1.89 LPM) in accordance with ASSE 1016 and 1070.
 - 5. Set for 110 deg F (43 deg C) Service.
 - 6. Class One Quality Standard: Powers LM495. See Section 01 6200.

7. Acceptable Manufacturers: Leonard, Powers, Sloan, Symmons, and Watts.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Water heaters shall each have temperature-pressure relief valve sized to match heat input and set to relieve at 120 psi.
- B. Install temperature-pressure relief valve on hot water heater and pipe discharge to directly above funnel of floor drain.

3.2 WATER TEMPERATURE

- A. Contractor shall be responsible to verify and/or change temperature settings on water heaters supplied on this project to meet requirements of Life Safety and Health Department Codes. Any setting above 120 deg. F. shall require warning labels placed on outside of water heaters in conspicuous places indicating water temperature setting and fact that any temperature above 120 deg. F. may be a hazard.

END OF SECTION

SECTION 22 35 00

KITCHEN EQUIPMENT CONNECTIONS

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 materials and labor necessary to make all required steam, hot water, cold water, waste, and vent rough-ins and to make all final connections for kitchen equipment as described in Contract Documents.
- B. Kitchen equipment, unless specifically noted otherwise, shall be furnished by the owner.
- C. The owner shall provide complete roughing-in drawings showing exact location of stub-ups in floor and in walls. It will be Plumbing Contractor's responsibility to install all sleeves through walls and floor and to connect all plumbing services. Floors shall be core drilled. Plumbing Contractor shall request this roughing-in information well in advance of installation of equipment.
- D. Each hot water, and cold water, connection to kitchen equipment shall include a valve and union and shall be capped for connection after equipment has been installed.
- E. Pipe sleeves shall be installed where piping rises through floors and shall be caulked with waterproof compound.
- F. The Owner shall provide and install all kitchen equipment, including faucets and sink wastes, swing faucets at kettles and ranges, strainers, and tailpieces.
- G. Plumbing Contractor shall provide cold water and hot water services stops and supplies sink wastes, all interconnection pipes, vacuum breakers, traps, etc., and shall make all final connections.
- H. Plumbing contractor shall provide a pressure reducing valve at hot water connection to dishwasher.

END OF SECTION

SECTION 22 36 00

WATER SOFTENER

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. The purpose of the water softening system will be to reduce the hardness to less than 0.8 mg/L. The system will be a Culligan Hi-Flo 55 duplex water softener model HV-363, or approved equal, designed to handle a peak flow rate of 185.0 gal/min at a pressure loss not exceeding 23 psi. The system will have a softening capacity of not less than 300.0 kilo-grains per regeneration when a salt dosage of 10 lbs/cu. ft. per tank is used.

1.3 SUBMITTALS

- A. Before fixtures are ordered, the Contractor shall submit a complete list of plumbing fixtures, giving the catalog number, cut and make, for approval. Fixtures shall not be ordered until this list is approved.

PART 2 - PRODUCTS

2.1 RESIN TANK

- A. Each softener resin tank will be 30.0 inches in diameter. The sideshell height will be 54.0 inches, sufficient to allow adequate freeboard above the resin bed for proper expansion of the resin during backwashing. Each tank will be designed for:
100 psi, AMCE construction.
- B. The tank will be supported by steel legs that permit skid mounting and comply with seismic loading requirements for Zone 4.
- C. The tank will be internally lined with a phenolic epoxy to a 4-6 mil thickness and then baked at 450 xF. The exterior will be sand blasted, painted with a rust-inhibiting primer, and then finished with a gloss epoxy top coat.
- D. The tank will be equipped with an opening in the top head for mineral filling and periodic inspection.

2.2 DISTRIBUTOR SYSTEM

- A. The softener tank will have a stainless steel upper distributor which will disperse water laterally to avoid channeling within the resin bed. The lower distributor will be of all-plastic construction in a hub-radial design. It will incorporate fine slot distributors to avoid possible passing of resin to service in the event of plumbing system upset. No slots will face upward to minimize the opportunity of channeling. One layer of gravel

will be provided to aid in the even collection of water and make efficient use of the softening capacity of the resin.

2.3 SOFTENING MEDIA

- A. Each softener tank will be provided with 15.0 cu.ft. of high quality non-phenolic Culler Hi-V resin having a minimum exchange capacity of 24,000 grains/cu.ft. When regenerated with 15 pounds of salt. The media shall be solid, of the proper particle size (16 by 30 mesh, U.S. standard screen) and will contain no agglomerates, shells, plates or other shapes that might interfere with the normal function of the water softener. The resins will be manufactured to comply with the food additive regulation, 21 CFR 173.25 as set forth by the US FDA.

2.4 BRINE SYSTEM

- A. A combination salt storage and brine tank, measuring 30 inches in diameter by 48 inches tall, with cover, will be provided. The tank will be molded of corrosion-proof, high-density polyethylene.
- B. The brine tank will be equipped with an elevated salt plate for brine collection, and a chamber to house a brine valve assembly. The brine valve will automatically open to admit brine to the resin tank during education and close automatically to prevent introduction of air into the resin tank. During refill, the brine valve will regulate the flow of treated water into the brine tank, working with the timed refill feature of the control valve; together these components will admit the correct volume of water to the brine tank in accordance with the salt dosage settings on the control valve. The brine valve will include a float-operated safety shut-off valve, as a back-up to the time refill valve on the control, to prevent brine tank overflow.

2.5 AUTOMATIC CONTROLS

- A. The automatic control will be of top mount design and all-brass construction. It will utilize a bolt-down flange connection to permit proper positioning between the valve and conditioner tank openings. It will have provision for either left-hand or right-hand raw water plumbing to simplify installation while maintaining a forward-facing timer for easy servicing. Service connections of the control will be 3.0 inch pipe size. The control will be a Culligan fully automatic multi-port control valve operated by a rotary pilot that hydraulically or pneumatically activates cartridge style diaphragm valves to accomplish regeneration. The multi-port valve will incorporate self-adjusting flow regulators to control the rate of flow and prevent resin loss during backwash, brine-rinse, and brine tank refill positions, regardless of pressure fluctuations between 30 and 100 psig. The control will open and close slowly to prevent noise and hydraulic shock. It will have provisions for bypass of hard water during the regeneration cycle or elimination of the bypass, depending upon the requirements. The electrical control mechanism will be enclosed in a gasketed, moisture-resistant case. The enclosure will conform to Nema 3 enclosure standards. The unit will have provisions for individual adjustment of backwash and rinse cycle, and provisions for manually regenerating by means of inlet hydraulic pressure even without the use of electric power. Regeneration will be controlled by a seven-day calendar clock that permits regeneration at any time of the day or night, any or every day of the week.

- B. A Culligan Digital Demand System will be installed in the outlet (service) pipe of the unit. It will include turbine meter(s) and a solid state control device to permit regeneration on a metered volume basis. The system will include:
- C. One turbine to allow two tanks to regenerate on an alternating basis.

PART 3 - EXECUTION

3.1 INSTRUCTIONS

- A. Complete instructions for the installation, operation, and maintenance of the equipment will be provided in booklet form. All component parts will be easily identified, in exploded views, by individual part numbers.

3.2 SERVICE

- A. Start-up and subsequent service such as maintenance, repair, and salt delivery will be available as desired from a local authorized independently operated dealer or licensee.

3.3 PRODUCT INTEGRITY

- A. All major components such as tanks, distributors, controls, front piping assemblies and regenerant systems will all be designed and assembled by a single source for optimum compatibility. The Culligan System referred to above carries a written limited warranty on workmanship and materials. Refer to the warranty itself for all information on warranty rights relating to this system. Independently operated Culligan dealerships throughout the country have replacement parts and factory authorized service available. Factory authorized service will be available through your local Culligan dealer so that the equipment can be maintained and serviced as needed.

END OF SECTION

SECTION 22 40 01

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and Section 22 0501 apply to this Section.

1.2 SUMMARY

- A. Furnish and install plumbing fixtures as described in Contract Documents.
- B. Before fixtures are ordered, the Contractor shall submit a complete list of plumbing fixtures, giving the catalog number, cut and make, for approval. Fixtures shall not be ordered until this list is approved.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Interior exposed pipe, valves, and fixture trim shall be chrome plated.
- B. Do not use flexible water piping.
- C. Flow Control Fittings:
 - 1. Vandal proof type and fit faucet spout of fixture used. Flow shall be controlled as required by local codes.
- D. Furnish and install the necessary plumbing fixtures in quantity as shown on plans. Provide all necessary valves, chrome plated 17 gauge or cast "P" traps, stops with risers, fittings, and accessories to make the job complete with the fixtures specified on the drawings. Exposed stops to be equal to Brasscraft with compression inlet, chrome plated nipples, cross handles, ¼ turn ball valves and flexible risers.
- E. Fixtures shall be PROFLO, Kohler, Crane, Briggs, Eljer, American Standard, or an approved equal. Specialties shall be Zurn, Josam, MiFab, J. R. Smith, Wade, or Watts.
- F. Toilet seat manufacturers shall be Beneke, Church, Olsonite, or Bemis.
- G. Carrier and wall hydrant manufacturers shall be Smith, Zurn, Wade, Josam, or Watts.
- H. Stainless steel sink manufacturers shall be Elkay or Just.
- I. Drinking fountain manufacturers shall be Elkay, Halsey Taylor, Haws, Cordley, Sunroc, or Oasis.
- J. Pressure balance mixing valves shall be Powers, Lawler, Leonard, or Symmons.

- K. Thermostatic mixing valves shall be Powers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fixtures including traps and accessories with accessible stop or control valve in each hot and cold water branch supply line.
- B. Mounting – Refer to Architectural Elevations:
 - 1. Urinals:
 - a. Standard - 20 inches from floor to bottom lip.
 - b. Handicap - 17 inches from floor to bottom lip.
- C. Make fixture floor connections with approved brand of cast iron floor flange, soldered or caulked securely to waste pipe.
- D. Make joints between fixtures and floor flanges tight with approved fixture setting compound or gaskets.
- E. Caulk between fixtures and wall and floor with white butyl rubber non-absorbent caulking compound. Point edges.
- F. Cleanouts: 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. Location of all cleanouts subject to approval of inspector.
- G. Traps: Install "P" traps in branch lines from floor drains or where required. Traps installed in connection with threaded pipe shall be recess drainage pattern. Traps installed in connection with cast iron pipe shall be of the same quality and grade as the pipe. Traps installed in connection with fixtures shall have a seal of not less than 2" nor more than 4". Exposed traps shall be chrome plated cast brass or chrome plated 17 gauge tubular type. Provide trap primers as required by Code.

3.2 FIXTURE INSTALLATION

- A. Provide stop valves and 18" minimum air chambers on all water connections to fixtures. Furnish and install wall carriers for wall mounted fixtures, wood backing, where necessary, to be installed by General Contractor at the direction of this Contractor. Provide exact locations, including proper mounting heights, obtained from details on drawings and from manufacturer's specifications. Provide hudee rims for countertop installations.
- B. Interior exposed pipe, valves, and fixtures trim shall be chrome plated.
- C. Complete installation of each fixture including trap and accessories with accessible stop or control valve in each hot and cold water branch supply line. Make fixture floor connections with approved brand of cast iron floor flange, soldered or caulked securely to waste pipe. Make joint between fixture and floor flange tight with approved fixture setting compound or gaskets.
- D. Polish chrome finish at completion of project.

E. Caulk between fixtures and wall and floor with white butyl rubber non-absorbent caulking compound. Paint all edges.

F. Install fixtures and fittings as per local codes and manufacturer's instructions.

END OF SECTION

SECTION 22 47 03

HANDICAP DRINKING WATER COOLING SYSTEM

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 handicap drinking water cooling system as described in Contract Documents.

PART 2 - PRODUCTS

2.1 HANDICAPPED FOUNTAIN

- A. Vandal proof operating bar on front and both sides. 7-1/2 GPH of 50 deg F water with 90 deg F room temperature, 1/5 horsepower compressor motor, 120 V, 60 Hz, single phase. One piece stainless steel back splash and basin. Flexi-guard or chrome plated brass bubbler.
- B. Approved Manufacturers:
 - 1. Sunroc
 - 2. Halsey Taylor
 - 3. Haws
 - 4. Elkay
 - 5. Oasis

2.2 HYDRATION STATION.

- A. Touchless sensor activated, 1.5 GPM Quick Fill, with automatic 20 second shut-off timer. 120V, 60 HZ single phase.
- B. Visual user interface display includes:
 - 1. Innovative Green Ticker counting number of bottles saved from waste.
 - 2. Filter monitor indicating when replacement is needed.
- C. Water Sentry Plus Filler:
 - 1. 3000 Gallon Capacity.
 - 2. Quick ¼ turn for easy installation.
 - 3. Polypropylene pre-filter mesh prevents coarse sediment from entering filter.
 - 4. Made with activated carbon and patented ATS lead-removal media.
 - 5. Final filter mesh prevents loose carbon from entering water.
 - 6. ANSI/NSF Standard 42 and 53.
- D. Approved Manufacturers:
 - 1. Sunroc
 - 2. Halsey Taylor

3. Haws
4. Elkay
5. Oasis

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Anchor bottom of fountain to wall.
- B. Top surface to be 32 inches above floor unless required otherwise by local code.
- C. Install 3/8 inch IPS union connection and Chicago No. 376 stop to building supply line.
- D. Install 1-1/4 inch IPS slip cast brass "P" trap. Install trap so it is concealed.

END OF SECTION

END OF DIVISION