

SECTION 15010 - BASIC PLUMBING REQUIREMENTS

PART I. - GENERAL

A. GENERAL CONDITIONS:

1. The stipulations and conditions stated in this section, together with all provisions of the "Instructions to Bidders", "General Conditions", "Supplemental General Conditions", and "Special Conditions", hereinbefore set forth, shall apply to this and the other sections of Division 15A.

B. GENERAL REQUIREMENTS:

1. The General Requirements hereinafter listed apply to the Plumbing Work Division. If there is any conflict between the General Requirements and the General Conditions, the General Conditions shall take precedence.

C. ALTERNATES:

1. Carefully examine all alternates at the back of this specification to determine if any work described under the Plumbing Section will be affected thereby.

D. INTENT:

1. The intent of these drawings and specifications are to describe the installation of a complete, fully adjusted, and operational system. Therefore, any items shown on drawings and not specifically called for in the specifications, or any items specified and not specifically indicated or detailed on the drawings, or any items neither specified or shown, but which are reasonably incidental to and commonly required to make a complete job, will be furnished and installed by the Plumbing Contractor at his own expense.

E. DEFINITIONS:

1. The Plumbing Contractor shall provide all supervision, labor, material equipment, machinery, plant, and any and all other items necessary to complete the plumbing systems. All items of equipment are specified in the singular; however, the Plumbing Contractor shall provide the number of items of equipment as indicated on the drawings, and as required for complete systems.

Where the word "provide" is used, it shall mean "furnish and install complete and ready to use."

F. VISIT TO THE SITE:

1. The Plumbing Contractor shall visit the site before submitting his bid so as to be thoroughly familiar with the job conditions and/or peculiarities. No extra payment will be allowed for anything which could have been anticipated from a visit to the site.

G. REGULATORY REQUIREMENTS

1. All work under this section shall be accomplished in strict accordance with State codes. Where these plans and specifications conflict with such codes, the codes shall govern. The Plumbing Contractor shall notify the architect or engineer of such conflicts in writing prior to receipt of bids.

H. PERMITS AND FEES:

1. The Plumbing Contractor shall make all necessary arrangements, obtain all necessary approval, obtain all permits and pay fees required for the installation of any of the work covered under the Plumbing Work Division of the specifications. Any fees required by any utility companies or municipal authorities for the final connections for these services shall be paid by the Plumbing Contractor under whose work such services appear. Before the job is certified as substantially complete, a certificate of approval from all authorities involved must be obtained and turned over to the Architect/Engineer.

I. DRAWINGS AND SPECIFICATIONS:

1. The Plumbing Drawings and Specifications are intended to cover all the work enumerated under the respective headings. The drawings are diagrammatic only. No contractor shall take advantage of conflict or error between drawings and specifications, or between general drawings and mechanical, plumbing and/or electrical drawings, but shall request a clarification of such from the Architect/Engineer, should this condition exist. If there is insufficient time to issue an addendum for this clarification, the Plumbing Contractor shall figure on the most expensive of the items in conflict.
2. The Plumbing Contractor shall refer to the architectural and structural drawings and specifications for the general construction of the building, for floors and ceiling heights, for locations of walls, partitions, beams, etc., and shall be guided accordingly for setting of all sleeves, inserts and equipment. The Plumbing Contractor shall under any circumstances scale drawings for the location of equipment. The Plumbing Contractor shall verify the locations of all utility services.
3. The Plumbing Contractor shall keep at least one set of corrected shop and design drawings at the site. Drawings are to be current, denoting approved modifications and actual installed departure. Submit drawings to Architect/Engineer before final payment is made.

J. SUPERVISION:

1. The Plumbing Contractor performing the work specified shall be required to employ a qualified superintendent or foreman to continuously supervise the installation of their work, with authorization to act as agent. Contractors. He shall be capable of checking layouts, coordinating and supervising the work, establishing grades and levels, and locating chases, openings, hangers, inserts, sleeves, etc.

PART II. - PRODUCTS

A. STANDARD PRODUCTS:

1. Unless otherwise indicated in writing by the Architect/Engineer, the materials to be provided under this specification shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest design. All items of the same type or rating shall be identical.

B. SUBMITTAL:

1. The Plumbing Contractor shall submit, for approval, detailed shop drawings on all major equipment and where requested. No materials or equipment may be delivered to the job site or installed until the Plumbing Contractor has in his possession the approved shop drawing for the particular material or equipment. The Plumbing Contractor shall furnish the number of copies required by the General or Special Conditions of the contract, but no case less than six (6) copies.
2. Submitted material shall be properly labeled indicating specific service for which material or equipment to be used, section and article number of specifications governing, Contractor's name, and name of job.
3. Approval of equipment will not relieve the Plumbing Contractor of compliance with the specifications even if such approval is made in writing, unless the attention of the Engineer is called to the non-complying features by letter accompanying the submittal data. Approval of submittal data by the Engineer shall not be construed as a complete check of approval of detailed dimensions, weights, gauges, and similar details with the proposed articles. The conformance with the necessary coordination between the various other contractors and suppliers shall be solely the responsibility of the Plumbing Contractor and with no additional expense to the owner.

C. SUBSTITUTIONS:

1. Manufacturer's lists are to establish a standard of quality and not intended to limit the selection to these manufacturers. All materials and equipment which are essential and have not been specified or shown shall be new and of the highest grade and quality. Free from defect or other imperfections. It should be understood that where the words "furnished and installed" are used, it is intended that the Plumbing Contractor shall purchase and install all materials required.
2. All materials and equipment proposed as substitutes for these specified shall require a ten (10) day prior approval from the Engineer prior to the bid date. No substitutions will be allowed after the ten (10) day period before the bid date.

D. PRODUCT HANDLING:

1. Equipment and materials shall be properly stored, adequately protected, and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored and protected in accordance with the manufacturer's recommendations and as approved by the Architect/Engineer. Equipment installed with a factory finish shall be fully protected during construction and shall be maintained free of dust, dirt, and foreign matter. Dents and other surface damage shall be repaired or replaced to the satisfaction of the Architect/Engineer at no additional cost to the Owner.
2. The Plumbing Contractor shall clean up and remove from the job site all waste materials, packaging, crating, and refuse resulting from his work on a daily basis.

E. MATERIALS AND WORKMANSHIP:

1. The Plumbing Contractor shall perform a first class job, both in material and workmanship. None other will be accepted. Deviations from either will be corrected by the Plumbing Contractor, at Plumbing Contractor's expense.
2. The Material used throughout the work, except when otherwise noted, shall be new and of the best of its kind. No substitutes shall be used unless approved by the Architect/Engineer. All work shall be executed with a maximum speed consistent with safety and good workmanship.
3. Any equipment furnished by the Plumbing Contractor that is larger than those indicated on the drawings and described in these specifications or have different electrical characteristics, the increase in cost to the Electrical Contractor for larger wires, conduit, circuit breakers, switches, etc. or for changes in work already installed shall be borne by the instigating contractor.

PART III. EXECUTION

A. EXCAVATION AND BACKFILL:

1. The Plumbing Contractor shall perform any and all trench and pit excavation and backfilling required for the installation of his work. Trenches shall be made with the sides vertical and shall be shored where necessary for the protection of men and equipment. All excavation work shall be done in a careful manner to avoid damage to footers and foundations. The backfilling shall be placed in layers not exceeding 4 inches in depth, wetting each layer as it is placed, and thoroughly compacting each layer with mechanical tamper or other approved means. Any damage done during excavation and backfilling operations to roads, sidewalks, curbs, shrubs, sod, footers, foundations, etc. shall be replaced to its condition prior to construction, at no expense to the owner.

B. SCAFFOLDING, RIGGING AND HOISTING:

1. The Plumbing Contractor shall furnish all necessary scaffolding, staging, rigging and hoisting required for the completion of his work. All such scaffolding, etc., shall be removed from the premises when its use is no longer required on the job.

C. CUTTING AND PATCHING:

1. The Plumbing Contractor shall provide all cutting and patching necessary to install the work specified in this section. The patching shall match adjacent surfaces.
2. No structural member shall be cut without the approval of the engineer, and all such cutting shall be done in a manner directed by him.

D. EQUIPMENT SPACE AND ARRANGEMENT:

1. The equipment shall fit into the space allotted and shall allow adequate clearance for entry, installation, replacement, servicing, and maintenance. The Plumbing Contractor shall coordinate the work to ensure that equipment may be moved into place without altering building components or other installations. Access space shall not be less than the equipment manufacturer's requirements.
2. These drawings indicate the extent and general arrangement of equipment, piping, and ductwork. If any departures are deemed necessary by the Plumbing Contractor, details of such departures and the reasons therefore shall be submitted to the Architect/Engineer for approval as soon as practicable and within 30 days after award of the contract. No departure shall be made without written approval of the Architect/Engineer.

E. DAMAGE TO WORK ALREADY IN PLACE:

1. The Plumbing Contractor shall assume full responsibility for any damage done by him, his agents or employees, to any work already in place. Any such damage done shall be repaired at the contractor's expense by mechanics skilled at their respective trades, to the approval of the Architect/Engineer.

F. JURISDICTION OF WORK:

1. It may become necessary for the Plumbing Contractor to furnish labor or materials which is not generally accepted as part of this trade. In cases of this type, he shall contract the work, or shall furnish materials and employ workmen of the trade involved in order not to cause any delay or stoppage of work caused by infringement of trade agreements as to jurisdiction, alleged or actual.

G. COORDINATION WITH OTHER TRADES:

1. All work shall be coordinated with other trades involved in the construction project. All work shall be carefully laid out in advance to coordinate architectural, structural, mechanical, plumbing and electrical features of construction. The Plumbing Contractor shall verify at the site all locations, grades, elevations, and utility service connections indicated. Any conflicts due to lack of proper coordination shall be brought to the attention of the Architect/Engineer for resolution. The Plumbing Contractor shall make required changes or relocations at no additional cost to the Owner.

2. Installation, inspection, and testing of work above ceilings shall be completed and approved by the Architect/Engineer prior to installation of the specified finished ceilings. However, ceiling suspension system may be installed as required for coordination.
3. The Plumbing Contractor shall consult with the other trades at the start of the work and periodically thereafter, as required to properly coordinate the various items of work, and to avoid interferences. Should any interferences of any nature develop as the work progresses, such interferences shall be resolved and eliminated as directed. The cost of any work directed shall be borne by the subcontractor or contractors directed to do this work.

H. DIVISION OF WORK:

1. This paragraph is intended to show exactly the point of division of work between the Electrical Division and the Plumbing Division.
2. All equipment covered in the Plumbing Division of the specifications shall be furnished, mounted, and aligned under the Plumbing Division. All disconnect switches, starters, conduit, wire for this equipment shall be furnished and installed under the Electrical Division. This includes wiring to the equipment from switches, starters, and disconnects.
3. All final electrical connections to equipment covered in the Plumbing Division of the specifications shall be completed under the Plumbing Division.

I. EQUIPMENT INSTALLATION:

1. Final connections to equipment, including pipe, duct, and controls, shall be provided under applicable sections of this Division, unless otherwise specified or indicated.
2. Manufacturer's Instructions: Equipment shall be installed as recommended by the manufacturer to conform to the requirements of the particular application, in accordance with these drawings and specifications.

J. OPERATION AND MAINTENANCE MANUALS:

1. One complete manual as outlined herein shall be submitted for approval before conducting instruction sessions in operation, before systems or equipment tests are performed, and before final or beneficial occupancy.
2. Manuals shall have rigid covers and index tabs for each major piece of equipment, auxiliaries, and systems. The following shall be inscribed on the cover: the words "OPERATION AND MAINTENANCE MANUAL," the name and location of the building, the name of the section, such as "Plumbing" and the name of the Plumbing Contractor. Two copies of each approved manual shall be submitted to the Owner and one copy shall be submitted to the Architect/Engineer.
3. Each piece of equipment shall be listed and identified with the same name, mark, number, or other identification as noted or scheduled in the contract documents.

4. Manuals shall include the following:
 - a. Complete operating installations, covering start-up and shutdown for all components installed.
 - b. Legible copies of all shop drawings. Any comments incorporated in "as-noted" approvals of shop drawings shall be recorded on the drawings included in the manuals.
 - c. All equipment maintenance and service manuals.
 - d. A complete parts list for each piece of equipment.
 - e. All descriptive literature for the equipment.
 - f. Operating characteristics, performance data, ratings, and curves for each piece of equipment.
 - g. Internal wiring and control diagrams.
 - h. All other information pertinent to the maintenance and servicing of equipment and systems provided in the project.
 - i. Name, address, and telephone number for service on each manufacturer's equipment.

K. OPERATING INSTRUCTIONS:

1. After all equipment and services are in operation, and the operation and maintenance manuals are available, an instruction and training session shall be conducted for the Owner's operating personnel.
2. Instruction sessions shall be conducted during the Owner's normal working periods, and at times and locations satisfactory to the Owner.

L. EQUIPMENT START-UP:

1. No equipment shall be placed in operation until it has been inspected by a qualified representative of the manufacturer and certified to be ready for operation. The manufacturer's representative shall supervise the start-up operation and shall be responsible for all adjustments required to meet design conditions. Such services shall be at no additional cost to the Owner.

M. GUARANTEE:

1. The Plumbing Contractor shall present to the Owner a written guarantee covering his work, including all equipment, material and workmanship. This guarantee shall be against all defects in any of the above work, and shall run for a period of one (1) year from the date of written acceptance of the Contractor's work.
2. Any defective work, equipment, material and/or workmanship that develops within the guarantee period, which is not caused by ordinary wear or abuse by other persons, shall be replaced by the Plumbing Contractor without cost to the Owner.

N. FINAL INSPECTION:

1. When the entire contract has been completed and the work is ready for final inspection, the Architect/Engineer or his duly authorized representative will make the inspection. At the time of inspection, the Plumbing Contractor shall demonstrate to the Architect/Engineer that the various systems and pieces of equipment have been adjusted to operate in accordance with the requirements of the contract.

O. FINAL PAYMENTS:

1. All final payments are contingent upon all necessary certificates and/or approvals cited above, together with the written guarantee being presented to the Owner.

END OF SECTION 15010

SECTION 15140 - HANGERS AND SUPPORTS

PART I - GENERAL

A. RELATED DOCUMENTS

1. Drawing and general provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. SUMMARY

1. This Section includes hangers and supports for plumbing systems piping and equipment.

C. QUALITY ASSURANCE

1. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code--Steel."
 - a. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

PART II - PRODUCTS

A. PIPE HANGERS AND SUPPORTS

1. Hangers: Carbon steel, adjustable, clevis.
2. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
3. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Vertical Support: Steel riser clamp.
6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
7. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.
8. Shields for Insulated Piping 2-1/2 Inches and Larger: Hard block non-conducting saddles in 90 degree segments, 12 inch minimum length, block thickness same as insulation thickness.

B. HANGER RODS

1. Steel Hanger Rods: Threaded both ends or continuous threaded.

C. FLASHING

1. Metal Flashing: 26 gage galvanized steel.
2. Lead Flashing: 5 lb/sq ft sheet lead for waterproofing.
3. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

D. SLEEVES

1. Sleeves for Pipes: Form with schedule 40, galvanized steel pipe.
2. Fire Stopping Insulation: Glass fiber type, non-combustible.
3. Calk: Fire Barrier type sealant.

E. MISCELLANEOUS MATERIALS

1. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Grout: ASTM C 1107, Grade B, nonshrink, nonmetallic.
 - a. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is nonstaining, noncorrosive, nongaseous and is recommended for both interior and exterior applications.
 - b. Design Mix: 5000-psi (34.5MPa), 28-day compressive strength.
 - c. Water: Potable.
 - d. Packaging: Premixed and factory-packaged.

F. ATTACHMENTS

1. Power-Actuated Drive Pin Fasteners: Powder-actuated-type, drive pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Permitted in concrete over 4 inches thick.
2. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Permitted in concrete over 4 inches thick.
3. Weld: Type 22.
4. Beam clamps: Types 20, 21, 28 or 29.

PART III - EXECUTION

A. HANGERS AND SUPPORTS INSTALLATION

1. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
2. Install building attachments within concrete or to structural steel. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping.
3. Install hangers and support complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
4. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
5. Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

6. Support horizontal piping as follows:

PIPE SIZE	MAX. HANGER SPACING	HANGER DIAMETER
1/2 to 1-1/4 inch	6'-6"	3/8"
1-1/2 to 2 inch	10'-0"	3/8"
2-1/2 to 3 inch	10'-0"	1/2"
4 to 6 inch	10'-0"	5/8"
Waste Pipe	5'-0"	3/8"

7. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
8. Place a hanger within 12 inches of each horizontal elbow.
9. Use hangers with 1-1/2 inch minimum vertical adjustment.
10. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
11. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
12. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
13. Support riser piping independently of connected horizontal piping.
14. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

B. EQUIPMENT BASES AND SUPPORTS

1. Provide equipment bases of concrete.
 2. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
- C. EQUIPMENT SUPPORTS
1. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.
 2. Grouting: Place grout under supports for equipment, and make a smooth bearing surface.
- D. METAL FABRICATION
1. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.
 2. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.
 3. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal-arc welding, appearance and quality of welds.
- E. FLASHING
1. Provide flashing and counterflashing where piping penetrate weather or waterproofed walls, floors, and roofs.
 2. Flash vent and soil pipes projecting 6 inches minimum above finished roof surface with lead worked one inch minimum into hub. For pipes through outside walls, turn flanges back into wall and calk, metal counterflash and seal.
- F. SLEEVES
1. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
 2. Design hangers without disengagement of supported pipe.
 3. Extend sleeves through floors one inch above finished floor level. Calk sleeves full depth and provide floor plate.
 4. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with fire stopping insulation and calk seal air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
 5. Install chrome plated steel or stainless steel escutcheons at finished surfaces.

END OF SECTION 15140

SECTION 15190 - PLUMBING IDENTIFICATION

PART I - GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. SUMMARY

1. This Section includes plumbing identification materials and devices.

C. QUALITY ASSURANCE

1. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

D. SEQUENCING AND SCHEDULING

1. Coordinate installation of identifying devices after completion of covering and painting where devices are applied to surfaces. Install identifying devices prior to installation of acoustical ceilings and similar concealment.

PART II - PRODUCTS

A. MATERIALS

1. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.
2. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.
3. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
4. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
5. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inch wide by 4 mil thick, manufactured for direct burial service.

PART III - EXECUTION

A. PREPARATION

1. Degrease and clean surfaces to receive adhesive for identification materials.

B. INSTALLATION

1. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners.
2. Plastic Tags: Install with corrosive-resistant chain.
3. Plastic Tape Pipe Markers: Install complete around pipe in accordance with manufacturer's instructions.
4. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above buried pipe.
5. Equipment: Identify pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with plastic tags.
6. Controls: Identify control panels and major control components outside panels with plastic nameplates.
7. Valves: Identify valves in main and branch piping with tags.
8. Piping: Identify piping, concealed or exposed, with plastic tape pipe markers. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

C. VALVE CHART AND SCHEDULE

1. Provide valve chart and schedule in aluminum frame with clear plastic shield. Install at location as directed.

END OF SECTION 15190

SECTION 15250 - PLUMBING PIPING INSULATION

PART I - GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. SUMMARY

1. This Section includes plumbing pipe insulation.

C. QUALITY ASSURANCE

1. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
 - a. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
 - b. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

D. SEQUENCING AND SCHEDULING

1. Schedule insulation application after testing of piping systems.
2. Schedule insulation application after installation and testing of heat trace tape.

PART II - PRODUCTS

A. MANUFACTURERS

1. Acceptable Manufacturers:
 - a. Glass Fiber:
 - (1) CertainTeed Corporation.
 - (2) Knauf Fiberglass GmbH.
 - (3) Manville.
 - (4) Owens-Corning Fiberglas Corporation.
 - (5) USG Interiors, Inc. - Thermafiber Division.
 - b. Flexible Elastomeric Cellular:
 - (1) Armstrong World Industries, Inc.
 - (2) Halstead Industrial Products.
 - (3) IMCOA.
 - (4) Rubatex Corporation.

B. GLASS FIBER

1. Material: Inorganic glass fibers, bonded with a thermosetting resin.
2. Jacket: All-purpose, factory-applied, laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.
3. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, jacketed.
 - a. Thermal Conductivity: 0.26 average maximum at 75 deg F mean temperature.
 - b. Density: 10 average maximum.
4. Adhesive: Produced under the UL Classification and Follow-up service.
 - a. Type: Non-flammable, solvent-based.
 - b. Service Temperature Range: Minus 20 to 180 deg F.

C. FLEXIBLE ELASTOMERIC CELLULAR

1. Material: Flexible expanded closed-cell structure with smooth skin on both sides.
2. Form: Tubular materials conforming to ASTM C 534, Type I.
3. Thermal Conductivity: 0.30 average maximum at 75 deg F.
4. Coating: Water based latex enamel coating recommended by insulation manufacturer.

D. INSULATING CEMENTS

1. Mineral Fiber, Hydraulic-Setting Insulating and Finishing Cement: ASTM C 449.
 - a. Thermal Conductivity: 1.2 average maximum at 400 deg F mean temperature.
 - b. Compressive Strength: 100 psi at 5 percent deformation.

E. ADHESIVES

1. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.
2. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:
 - a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.
 - b. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

F. JACKETS

1. PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil-thick, high-impact, ultra-violet-resistant PVC.

- a. Adhesive: As recommended by insulation manufacturer.
- 2. Interior exposed insulation: Install canvas jacket lagged in place for painting.

G. ACCESSORIES AND ATTACHMENTS

- 1. Bands: 3/4-inch wide, 0.007 inch thick, Aluminum.
- 2. Wire: 16-gage, soft-annealed stainless steel.

H. SEALING COMPOUNDS

- 1. Vapor Barrier Compound: Water-based, fire-resistive composition.
 - a. Water Vapor Permeance: 0.08 perm maximum.
 - b. Temperature Range: Minus 20 to 180 deg F.
- 2. Weatherproof Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints.
 - a. Water Vapor Permeance: 0.02 perm maximum.
 - b. Temperature Range: Minus 50 to 250 deg F.
 - c. Color: Aluminum.

PART III - EXECUTION

A. PREPARATION

- 1. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

B. INSTALLATION, GENERAL

- 1. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.
- 2. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.
- 3. Keep insulation materials dry during application and finishing.
- 4. Apply insulation continuously over fittings, valves, and specialties.
- 5. Apply insulation with a minimum number of joints.
- 6. Apply insulation with integral jackets as follows:
 - a. Pull jacket tight and smooth.
 - b. Cover circumferential joints with butt strips, at least 3-inches wide, and of same

material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.

- c. Longitudinal Seams: Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.
 - d. Vapor Barrier Coatings: Apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings.
 - e. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.
 - f. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.
7. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.
8. Flanges, Fittings, and Valves - Apply premolded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.
- a. Use same material and thickness as adjacent pipe insulation.
 - b. Overlap nesting insulation by 2 inches or 1-pipe diameter, which ever is greater.
 - c. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.
 - d. Insulate elbows and tees smaller than 3-inches pipe size with premolded insulation.
 - e. Insulate elbows and tees 3-inches and larger with premolded insulation or insulation material segments. Use at least 3 segments for each elbow.
 - f. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.
9. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified.
- a. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

C. GLASS FIBER INSULATION INSTALLATION

1. Bond insulation to pipe with lagging adhesive.
2. Seal exposed ends with lagging adhesive.
3. Seal seams and joints with vapor barrier compound.

D. FLEXIBLE ELASTOMERIC CELLULAR INSULATION INSTALLATION

1. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply

to the pipe. Seal seams and joints with adhesive.

2. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.
 - a. Miter cut materials to cover soldered elbows and tees.
 - b. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

E. JACKETS

1. Interior exposed insulation: Install canvas jacket lagged in place for painting.

F. FINISHES

1. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed insulation.

G. PIPE INSULATION SCHEDULES

H. SCHEDULE

PIPING	INSULATION	
	TYPE	THICKNESS Inch
Domestic Hot Water Supply	GLASS FIBER	1
Domestic Hot Water Recirculating	GLASS FIBER	1
Domestic Cold Water (INTERIOR)	GLASS FIBER	1
"P" trap at Handicapped fixtures	ELASTOMERIC	1/2

END OF SECTION 15250

SECTION 15410 - PLUMBING PIPING

PART I - GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. SUMMARY

1. This Section includes plumbing piping systems. Systems include the following:
 - a. Potable water distribution, including cold- and hot-water supply and hot-water circulation.
 - b. Drainage and vent systems, including sanitary and storm.

C. SYSTEM PERFORMANCE REQUIREMENTS

1. Provide components and installation capable of producing piping systems with the following minimum working pressure ratings, except where indicated otherwise:
 - a. Water Distribution Systems, Below Ground: 150 psig.
 - b. Water Distribution Systems, Above Ground: 125 psig.
 - c. Soil, Waste, and Vent Systems: 10-foot head of water.

PART II - PRODUCTS

A. SANITARY SEWER PIPING, BURIED

1. PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2564, solvent weld.

B. SANITARY SEWER PIPING, ABOVE GRADE

1. PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2564, solvent weld.

C. WATER PIPING, BURIED

1. Copper Tubing: ASTM B88, Type K, annealed. Fittings: ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.

D. WATER PIPING, ABOVE GRADE

1. Copper Tubing: ASTM B88, Type L, hard drawn. Fittings: ANSI/ASME B16.23, cast brass, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.

E. FLANGES, UNIONS, AND COUPLINGS

1. Pipe Size 2 Inches and Under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
2. Pipe Size Over 2 Inches: 150 psig forged steel slip-on flanges for ferrous piping; bronze

flanges for copper piping; neoprene gaskets for gas service; 1/16 inch thick preformed neoprene bonded to asbestos.

3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

F. MANUFACTURERS

1. Acceptable Manufacturers:
 - a. Crane
 2. Grinnell
 3. Nibco

G. GATE VALVES

1. 150 psig rated, bronze body, rising stem and handwheel, inside screw, double wedge or disc, threaded ends.

H. GLOBE VALVES

1. 150 psig rated, bronze body, rising stem and handwheel, inside screw, renewable composition disc, threaded ends, with backseating capacity.

I. BALL VALVES

1. 150 psig rated, bronze or Stainless steel body, stainless steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, threaded ends.

PART III - EXECUTION

A. PREPARATION

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

B. INSTALLATION

1. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
2. Route piping in orderly manner and maintain gradient.
3. Install piping to conserve building space and not interfere with use of space.
4. Group piping whenever practical at common elevations.
5. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
6. Provide clearance for installation of insulation and access to valves and fittings.

7. Slope water piping and arrange to drain at low points.
8. Establish elevations of buried piping outside the building to ensure not less than 1 ft of cover.
9. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
10. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting.
11. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.
12. Excavate in accordance with Sections 15010.
13. Backfill in accordance with Sections 15010.
14. Install bell and spigot pipe with bell end upstream.
15. Install valves with stems upright or horizontal, not inverted.

C. APPLICATION

1. Install unions downstream of valves and at equipment or apparatus connections.
2. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
3. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
4. Install globe or ball valves for throttling, bypass, or manual flow control services.

D. DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

1. Prior to starting work, verify system is complete, flushed and clean.
2. Inject disinfectant solution containing 100 ppm of available chlorine and allow to stand for 2 hours before flushing.
3. Flush disinfectant from system until residual is equal to that of incoming water or 1.0 mg/L.
4. Take samples from outlets and analyze in accordance with AWWA C601.

E. SERVICE CONNECTIONS

1. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
2. Provide new water service complete with water meter with by-pass valves.

END OF SECTION 15410

SECTION 15430 - PLUMBING SPECIALTIES

PART I - GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. SUMMARY

1. This Section includes plumbing specialties for water distribution systems; and soil, waste, and vent systems.

C. SUBMITTALS

1. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
2. Submit product data including rated capacities of selected models and weights (shipping, installation, and operation). Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections.

PART II - PRODUCTS

A. MANUFACTURERS

1. Acceptable Manufacturers:
 - a. Backflow Preventers:
 - (1) Ames Co., Inc.
 - (2) Hersey Products, Inc., Grinnell Corp.
 - (3) Watts Regulator Co.
 - (4) Wilkins Regulator Div., Zurn Industries, Inc.
 - b. Specialties:
 - (1) Josam Co.
 - (2) Smith by Jay R. Smith Mfg. Co. Div., Smith Industries, Inc.
 - (3) Watts Regulator Co.
 - (4) Woodford Manufacturing Co. Div., WCM Industries, Inc.
 - (5) Zurn by Hydromechanics Div., Zurn Industries, Inc.

B. CLEANOUTS

1. Exterior Surfaced Areas: Round cast nickel bronze access frame and non-skid cover.
2. Exterior Unsurfaced Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover.
3. Interior Finished Floor Areas: Lacquered cast iron, two piece body, round with scoriated cover in service areas and round with depressed cover to accept floor finish in finished floor areas.

4. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

C. WATER HAMMER ARRESTORS

1. ANSI A112.26.1; sized in accordance with PDI WH-201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psig working pressure.

D. BACKFLOW PREVENTERS

1. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013; bronze body with bronze and plastic internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

PART III - EXECUTION

A. PREPARATION

1. Coordinate construction areas to receive drains to required invert elevations.

B. INSTALLATION AND APPLICATION

1. Install specialties in accordance with manufacturer's instructions to permit intended performance.
2. Extend cleanouts to finished floor. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
3. Encase exterior cleanouts in concrete flush with grade.
4. Install water hammer arrestors complete with accessible isolation valve.

END OF SECTION 15430

SECTION 15440 - PLUMBING FIXTURES

PART I - GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. SUMMARY

1. This Section includes plumbing fixtures and trim, fittings, and accessories, appliances, appurtenances, equipment, and supports associated with plumbing fixtures.

C. SUBMITTALS

1. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
2. Product data for each type of plumbing fixture specified, including fixture and trim, fittings, accessories, appliances, appurtenances, equipment, supports, construction details, dimensions of components, and finishes.

PART II - PRODUCTS

A. MANUFACTURERS

1. Acceptable Manufacturers:
 - a. Fixtures and Trim:
 - (1) American Standard, Inc.
 - (2) Eljer; A Household International Co.
 - (3) Kohler Co.
 - b. Stainless Steel Sinks:
 - (1) Elkay Manufacturing Co.
 - (2) Just Manufacturing Co.
 - (3) Kohler Co.
 - c. Mop Basins:
 - (1) Crane Plumbing/Fiat Products.
 - (2) Florestone Products Co., Inc.
 - (3) Swan Corp.
 - d. Water Coolers:
 - (1) Elkay Manufacturing Co.
 - (2) Halsey Taylor; A Household International Co.
 - (3) Haws Drinking Faucet Co.
 - (4) Sunroc Corp.

- e. Toilet Seats:
 - (1) Bemis Mfg. Co.
 - (2) Beneke Div.; Sanderson Plumbing Products, Inc.
 - (3) Church Seat Co.
 - (4) Kohler Co.
 - (5) Olsonite Corp.

- f. Flushvalves:
 - (1) Coyne & Delany Co.
 - (2) Sloan Valve Co.
 - (3) Zurn Industries, Inc.; Flush Valve Operations.

- g. Commercial/Industrial Cast-Brass Faucets:
 - (1) American Standard, Inc.
 - (2) Chicago Faucet Co.
 - (3) Delta Faucet Co.
 - (4) Eljer; A Household International Co.
 - (5) T & S Brass and Bronze Works, Inc.
 - (6) Cambridge Brass
 - (7) Elkay Manufacturing Co.

PART III - EXECUTION

A. INSPECTION

- 1. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- 2. Verify adjacent construction is ready to receive rough-in work of this Section.

B. INSTALLATION

- 1. Install each fixture with trap, easily removable for servicing and cleaning.
- 2. Install components level and plumb
- 3. Install and secure fixtures in place with wall carriers and bolts.
- 4. Seal fixtures to wall and floor surfaces with sealant.

C. ADJUSTING AND CLEANING

- 1. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.
- 2. At completion clean plumbing fixtures and equipment.
- 3. Solidly attach water closets to floor with lag screws.

END OF SECTION 15440

SECTION 15450 - WATER HEATERS

PART I - GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. SUMMARY

1. This Section includes gas-fired water heaters.

C. SUBMITTALS

1. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
2. Product data including rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories, and indicating dimensions, required clearances, and methods of assembly of components, and piping and wiring connections.

PART II - PRODUCTS

A. MANUFACTURERS

1. Acceptable Manufacturers:
 - a. Water Heaters:
 - (1) Rinnai Gas Water Heater
 - (2) Noritz
 - (3) Or Equal

PART III - EXECUTION

A. WATER HEATER INSTALLATION

1. Install water heaters in accordance with manufacturer's instructions and to AGA NFPA and UL requirements.
2. Coordinate with plumbing piping and related fuel piping, gas venting and electrical work to achieve operating system.

B. PUMP INSTALLATION

1. Install in accordance with manufacturer's instructions.
2. Provide air cock and drain connection on horizontal pump casings.
3. Decrease from line size, with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings.

4. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION 15450