



DIVISION FIFTEEN

SECTION 15000 - PLUMBING

15001 GENERAL

05-04-2023

- A. Work under this section includes, but is not necessarily limited to, furnishing and installing the following:
1. Plumbing fixtures and trim.
 2. Waste and vent piping systems.
 3. Hot and cold water piping systems.
 4. Fuel gas piping systems.

15002 CODES, STANDARDS AND REGULATIONS

- A. All work shall be in accordance with all applicable federal, state, and local codes, standards and regulations.
- B. When these drawings and specifications call for materials or construction of a better quality or larger sizes than required by the above mentioned rules and regulations, the provisions of the drawings and specifications shall take precedence.
- C. Codes are minimum standards and if the codes require a more stringent method or material than the drawings or specifications require, then the codes shall govern.
- D. The Contractor shall furnish, without extra charge, any additional materials and labor which may be required for compliance with the above laws, rules and regulations, even though the work is not mentioned in these specifications or shown on the drawings. The Contractor shall secure all required permits, inspection, licenses and tests required for this work and pay all fees in connection therewith.

15003 DRAWINGS AND SPECIFICATIONS

- A. The drawings accompanying these specifications are generally diagrammatic and do not show all details of bolts, nuts, fittings, connections, etc., required for the complete system, and do not indicate the exact locations of piping, fixtures, ducts, equipment, etc., unless definitely dimensioned. While these drawings shall be followed as closely as possible, all dimensions shall be checked and verified at the building, and any necessary changes shall be made to accord with structural conditions, equipment to be installed, other systems, etc., without

additional cost to the Owner and as directed by the Project Architect.

- B. The drawings and specifications are complementary each to the other, and what is called for by one shall be as binding as if called for by both. Any details which are omitted and which are necessary for the proper installation or operation of the system included under this contract, must be supplied and installed by the Contractor without extra charge.
- C. It shall be understood that where the words "The Contractor" or "This Contractor" appear in either the drawings or specifications, it shall mean the Plumbing Contractor.
- D. Any omissions from either the drawings or these specifications are unintentional, and it shall be the responsibility of the Contractor to call to the attention of the Architect any pertinent omissions before submitting a bid. Complete working systems are required whether every small item of material is shown and specified or not.
- E. It shall be understood that where the words "provide, furnish and/or install" are used, it is intended that this Contractor shall purchase and install completely any and/or all materials necessary and required for this particular item, system, equipment, etc.
- F. Some items of equipment are specified in the singular; however, the Contractor shall provide and install quantity of items indicated on the drawings, and as required for complete systems.
- G. The term "as approved" in this division of the specifications shall mean as approved by the Project Architect in writing.

15004 COORDINATION OF WORK

- A. It is understood and agreed that the Contractor has by careful examination satisfied himself as to nature and location of work, conformation of the ground and building structure, the character, quality and quantity of materials to be encountered, general and local conditions and all other matters which can and may affect the work under this contract. The Contractor shall be held responsible for visiting the site and thoroughly familiarizing himself with existing conditions. No extras will be allowed because of additional work necessitated by evident job conditions that are not indicated on the drawings.
- B. The Contractor shall compare the drawings and specifications for this contract with the drawings and specifications for other trades, and shall report any discrepancies between them to the Project Architect and obtain from him written instructions for changes necessary in the work. The work shall be installed in cooperation with other trades installing interrelated work. Before installation, the Contractor shall make proper provisions to avoid interference in a manner

approved by the Project Architect. All changes required in the work of the Contract caused by his neglect to do so shall be made by him at his own expense. Coordinate work in this division with work of other divisions.

1. Location of pipes, ducts, electrical raceways, switches, panels, equipment, fixtures, etc., shall be adjusted to accommodate the work to interferences anticipated and encountered. The Contractor shall determine the exact route and location of each pipe, duct and electrical raceway prior to fabrication.
2. Installation and Arrangement: The Contractor shall install all work to permit removal (without damage to other parts) of all parts and equipment requiring periodic replacement and maintenance. The Contractor shall arrange pipes, ducts, raceways, and equipment to permit ready access to valves, starters, motors, control components, and to clear the opening of swinging and overhead doors and of access panels.

15005 ACCESSIBILITY

- A. The Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include, but not be limited to, valves, traps, cleanouts, motors, controllers and drain points. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility.
- B. The Contractor shall apprise the General Contractor of exact locations and size of access panels for each concealed device requiring service. Access panels shall be provided by this Contractor and installed by the General Contractor. Access panels shall be all steel construction with 16 gauge frames and 18 gauge panels. Units shall be Milcor, Miami Carey, or American Hatch Corporation. Panels and frames shall be factory primed with rust inhibiting paint; finish coat by General Contractor. Provide suitable UL listed doors where installed in rated construction.
- C. Locations of access panels shall be submitted in sufficient time to be installed in the normal course of work.
- D. Access panels will not be required for access to work located above a lift-out "T" bar type ceiling.

15006 MATERIALS AND WORKMANSHIP - GENERAL

- A. All materials shall be new and shall bear the manufacturer's name, trade name and the UL label in every case where a standard has been established for the particular material. The equipment furnished under this specification shall be essentially the standard products of a manufacturer regularly engaged in the production of the required type of equipment and shall be the manufacturer's

latest approved design.

1. Delivery and Storage: Equipment and materials shall be delivered to the site and stored in original containers, suitably sheltered from the elements, but readily accessible for inspection by the Project Architect until installed. All items subject to moisture damage (such as controls) shall be stored in dry, heated spaces.
 2. Equipment and materials of the same general type shall be of the same make throughout the work to provide uniform appearance, operation and maintenance.
 3. Protection: Equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury and theft. At the completion of the work, fixtures, equipment, and materials shall be cleaned and polished thoroughly and turned over to the Owner in a condition satisfactory to the Project Architect. Damaged or defects developing before acceptance of the work shall be made good at the Contractor's expense.
 4. Dimensions: It shall be the responsibility of the Contractor to insure that items to be furnished fit the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections, and shall furnish and install such sizes and shapes of equipment that the final installation shall suit the true intent and meaning of the drawings and specifications.
 5. Manufacturer's directions shall be followed completely in the delivery, storage, protection and installation of all equipment and materials. The Contractor shall promptly notify the Project Architect in writing of any conflicts between any requirements of the contract documents and manufacturer's directions and shall obtain the Project Architect's written instructions before proceeding with the work. Should the Contractor perform any work that does not comply with the manufacturer's directions or such written instructions from the Project Architect, he shall bear all cost arising in correcting the deficiencies.
- B. The Contractor shall furnish the services of an experienced superintendent who shall be constantly in charge of installation of the work together with all skilled workmen, fitters, metalworkers, welders, helpers and labor required to unload, transfer, erect, connect-up, adjust, start, operate and test each system.
- C. Unless otherwise specifically indicated on the drawings or specifications, all equipment and materials shall be installed with the approval of the Architect in accordance with recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.

15007 APPROVAL OF MATERIALS AND EQUIPMENT

- A. Certain models and manufacturers of materials and equipment are specified. The Contractor shall submit his proposal on the specified materials and equipment or their equivalent. Equivalent shall be interpreted to mean an item of material or equipment similar in quality to that named and which is suitable for the same use and capable of performing the same function as that named, the Project Architect being the judge of equality.
- B. Equipment model numbers noted in this specification or on the drawings are intended to denote a minimum standard of quality and do not necessarily relate to specific options or arrangement as shown. Contractor shall provide equipment with all standard features plus all optional features as stated and in the arrangement shown or as directed by the Architect if not shown.
- C. The Contractor shall submit to the Project Architect, within 10 days following award of the contract, a list of materials and equipment for approval that he proposes for use on the project. Such list shall include the manufacturer and the trade name, type, series or model of equipment proposed. When this list is approved by the Project Architect no further substitutions will be permitted except in unusual or extenuating circumstances. If no list is submitted within the specified time, the Contractor shall supply materials and equipment as specified.

15008 SHOP DRAWINGS, SUBMITTAL DATA AND PROCEDURES

- A. The Contractor shall submit to the Architect copies of certified prints, catalog data and specification sheets for all items of equipment and material specified or required for this job. Composite wiring diagrams shall be submitted for approval. The Contractor shall furnish the number of copies specified in general sections of the contract. All shop drawings for the project shall be submitted at the same time, reasonably promptly after the material list has been approved.
- B. The Contractor shall analyze all shop drawings before submittal to the Architect and certify that they meet requirements of the contract drawings and specifications. Certification to be in form of suitable approval stamp placed on each shop drawing. Data submitted for approval without Contractor's stamp of approval will not be considered.
- C. The Project Architect will review submittal data, and if found acceptable, will return all except two (2) sets marked "Approved" or "Approved as Noted".
- D. If the Project Architect deems submittal data is either incomplete or incorrect, one copy will be returned for correction and a new submittal set will be required.
- E. At least one set of all "Approved" shop drawings, certified prints, etc., shall be maintained at the job site and available to representatives of the Project Architect.

- F. Items that require submittals shall be:
1. All items of equipment
 2. Insulation
 3. Piping specialties
 4. Plumbing fixtures
- G. Approval by the Project Architect of shop drawings for any materials, apparatus, devices and layouts shall not relieve this Contractor from the responsibility from furnishing same of proper dimensions, size, quantity, quality and all performance characteristics to efficiently perform the requirements and intent of the contract documents. Such approval shall not relieve the Contractor from responsibility for errors of any sort on the shop drawings.
- H. If the submitted items or arrangement deviate from the Contract Documents, the Contractor shall advise the Project Architect of the deviations in writing accompanying the shop drawings, including the reason for the deviation.
- I. Failure of the Contractor to submit shop drawings in ample time for checking shall not entitle him to an extension of contract time, and no claim for extension by reason of such default will be allowed.

15009 EQUIPMENT DATA AND PERFORMANCE RECORDS

- A. The Contractor shall provide, in suitable loose leaf binders, a compilation of catalog data of each manufactured item of equipment used in the work and shall present his compilation to the Project Architect for transmittal to the Owner before final inspection and payment is made. Two copies are required.
- B. The following items shall be included in the binders:
1. Standard catalog data, descriptive brochures, etc.
 2. Installation instructions and diagrams.
 3. Wiring diagrams for appropriate equipment.
 4. Operating and maintenance data.
 5. Recommended spare parts list that should be stocked by Owner.
 6. Performance data test results as outlined hereinafter.

15010 RECORD DRAWINGS

- A. The Architect shall furnish the Plumbing Contractor one (1) set of drawings covering the plumbing contract upon which the Plumbing Contractor shall mark all changes, modifications, or revisions effected during construction such that the Architect may prepare record drawings from the information contained thereon upon completion of the work.

15011 VIBRATION ISOLATION

- A. All systems shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the Architect. In case of moving machinery, sound or vibration noticeable outside of room in which it is installed or annoyingly noticeable inside its own room will be considered objectionable. Sound or vibration conditions considered objectionable by the Architect shall be corrected in an approved manner by the Contractor at his expense.
- B. Where connections are made to pieces of equipment containing rotating or reciprocating machinery, suitable approved means shall be provided as required to prevent transmission of noise and vibration.
- C. Suspended equipment shall have steel spring vibration mounting with adjustable snubbers.
- D. Floor mounted equipment shall be mounted on vibration eliminators.

15012 EQUIPMENT STANDS, FOUNDATIONS AND MISCELLANEOUS STEEL OR HANGERS AND SUPPORTS

- A. Provide all equipment stands and supports for equipment as shown or required. Provide miscellaneous steel for hanging piping or other items as shown or required. Provide lintels as indicated or as directed by the Architect for wall openings larger than 12" x 12".
- B. All concrete foundations and all concrete pads shown under pumps and equipment shall be provided by this Contractor, unless otherwise noted. Pads shall be placed under each piece of equipment so that no equipment base rests directly on the concrete floor.
- C. All stands shall be adequately cross-braced to provide rigid supporting foundation. All stands shall be adequately anchored to wall or floor as required. All miscellaneous steel shall have one coat of shop paint and two finished coats of rust resistant paint if not furnished with a galvanized finish.
- D. Construction of foundations, supports, pads, bases and piers where mounted on the floor shall be of the same material and same quality of finish as the adjacent and surrounding flooring material. All pads shall be extended beyond machine base in all directions with top edge chamfered. Inset 6-inch steel dowel rods into floors to anchor pads. Concrete shall develop strength of 3,000 psi at 28 days.
- E. All equipment, unless shown otherwise, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong durable nature and any attachments that are, in the opinion of the Architect, inadequate shall be replaced as directed.

15013 CONCEALMENT OF PIPE, CHASES AND HOLE

- A. Unless otherwise indicated, all piping and/or ductwork shall be run in concealed spaces between floor and ceilings or in chases. Piping and/or ductwork in equipment rooms, crawl space and unfinished storage areas shall be installed exposed and as high as practical. This Contractor shall be responsible for the location and size of holes required for pipe and other equipment and shall advise the General Contractor of chase spaces and holes required as building progresses.

15014 CUTTING AND PATCHING

- A. This Contractor shall have an experienced mechanic upon the job before concrete floors, concrete or masonry walls are set in place; whose duty it shall be to locate the exact position of any and all sleeves and holes for the future installation of his pipe or duct work. This Contractor shall locate and size all openings required for his equipment and give this information to the General Contractor in time to not delay the building construction.
- B. If it becomes necessary to cut holes in concrete floors or concrete or other masonry walls, this Contractor shall call the General Contractor or his Superintendent of Construction and inform him of position and size of the hole or other opening to be provided and he shall determine the method to be used. Under no condition shall this Contractor make any cuts without permission from the General Contractor, nor shall he cut any green floors or walls.
- C. This Contractor shall arrange proper openings in the building to admit his equipment. If it becomes necessary to cut any portion of the building to admit any equipment, the portion cut must be restored to their former condition by this Contractor through agreeable arrangement with the General Contractor.

15015 SLEEVES AND INSERTS

- A. This Contractor shall provide and locate all sleeves and inserts required before the floors and walls are built or shall be responsible for the cost of cutting and patching required for pipes where sleeves and inserts were not installed, or where incorrectly located. This Contractor shall do all drilling required for the installation of his hangers.
- B. Sleeves shall be provided for all piping passing through concrete floor slabs and concrete, masonry, tile and gypsum wall construction. Sleeves shall not be provided for piping installed under concrete slabs on grade or paving unless specifically noted.
- C. Where sleeves are placed in exterior walls below grade, the space between the pipe or conduit and the sleeves shall be packed with oakum and lead and made completely watertight.

- D. Where pipe motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe. Where sleeves pass insulated pipes, the sleeves shall be large enough to pass the pipe and insulation. Check floor and wall construction finishes to determine proper length of sleeves for various locations; make actual lengths to suit the following:
1. Terminate sleeves flush with walls, partitions and ceiling.
 2. In areas where pipes are concealed, as in chases, terminate sleeves one inch above finished floor.
 3. In all areas where pipes are exposed, extend sleeves 1/4-inch above finished floor, except in rooms having floor drains where sleeves shall be extended 4 inches above floor.
- E. Sleeves shall be constructed of Schedule 40 galvanized steel pipe.
- F. Fasten sleeves securely in floors, walls, etc., so they will not become displaced when concrete is poured or when other construction is built around them. Take precautions to prevent concrete, plaster or other materials being forced into the space between pipe and sleeves during construction.
- G. All piping and/or ductwork passing thru sleeves in fire walls, fire partitions or floor acting as fire separation shall have opening around pipe or duct caulked smoke tight with approved fireproof material to form a fire and smoke stop. Each sleeve shall contain a minimum of one-inch of packing. At the Contractor's option, "Pyro-Pac" seals as manufactured by Thunderline Corporation may be used to seal around piping through fire and smoke walls. Any sleeves provided and not used shall be sealed with concrete or other approved fireproof material.
- H. Escutcheon plates shall be provided for all exposed pipes, insulated pipes and all exposed conduit passing thru walls, floors and ceilings in finished areas. Plates shall be nickelplated, of the solid ring type, of size to match the pipe or conduit. Where plates are provided for pipes passing thru sleeves which extend above floor surface in finished areas, provide deep recessed plates to conceal the pipe sleeves.
- I. Escutcheon plates will not be required in equipment rooms unless specifically noted on drawings.

15016 EXCAVATION, TRENCHING AND BACKFILL

- A. Perform all excavating, trenching and backfilling necessary to install work. Trenches are to be excavated so that pipe will have a solid bearing. Trenches are to be at least 12 inches wider than the diameter of the pipe. Furnish pumps as required to keep trenches dry during laying and jointing of mains. Provide shoring where required to maintain trench against settlement until final

acceptance. After work is installed, inspected, tested and approved, trenches shall be refilled in 6-inch layers with clean damp earth, and thoroughly tamped and brought to proper grade.

B. Excavation:

1. Excavation work under this contract shall be bid unclassified.
2. Where it is necessary to cut existing paving, sidewalks, etc., for the installation, the Contractor shall patch such paving to smooth finish with equal type paving construction as that cut.
3. Wherever shrubs, flowers, hedges and/or sod are removed, they shall be preserved and reset according to good nursery practice. In areas where sod is not suitable to preserve and replace, this Contractor shall provide top soil as required. Areas shall be backfilled and well tamped and brought up to finish grade. Re-seed all disturbed areas as required to equal surrounding grass types already established.

15017 ELECTRICAL WORK

- A. All electrical wiring for this contract will be performed by the Electrical Contractor.
- B. This Contractor shall coordinate electrical requirements and scheduling of wiring with the Electrical Contractor.
- C. All items of electrical equipment provided under this contract shall be in compliance with the electrical specifications for this project.

15018 KITCHEN AND LAUNDRY EQUIPMENT

- A. Plumbing rough-in and final connections for kitchen and laundry equipment shall be performed by the Plumbing Contractor.
- B. Kitchen and laundry equipment shown on the drawings are based on assumed manufacturers. Plumbing Contractor shall coordinate with the actual suppliers and provide appropriate plumbing connections for equipment installed. Complete, properly operating systems installed in accordance with equipment manufacturer's requirements are required.

15019 PLUMBING EQUIPMENT

- A. Domestic Hot and Chilled Water Pumps:
 1. Centrifugal inline pump, bronze fitted, NSF listed for use with potable domestic water, Taco design basis.

2. See drawing schedules and details for equipment arrangement, performance, options and accessories.
- B. Hot Water Boiler:
1. Outdoor package type for remote storage, gas fired, ASME tested and stamped, Raypak design basis.
 2. Heat exchanger: Copper fin tubes with bronze headers.
 3. Gas train: AGA design certified with main gas shutoff cock, pressure regulator, safety shutoff valve, and redundant control valve.
 4. Controls: Electronic intermittent ignition, 100% pilot safety, high limit control, storage tank aquastat operating control, circulation pump time delay control with inline flow switch.
 5. Circulation pump: Inline centrifugal, bronze fitted.
 6. See drawing schedules and details for equipment arrangement, performance, options and accessories.
 - 7.
- C. Hot water storage tank: ASME tested and stamped, NSF lined for domestic potable water use, open cell foam insulation, NST design basis. Provide tappings for relief valve, cold water inlet, hot water outlet, recirculation inlet and outlet, drain outlet, pressure gauge and aquastat.

15020 PLUMBING FIXTURES

- A. All exposed piping and metal parts shall be chrome-plated. Slip joints will not be permitted except on fixture side of trap. Rigid supplies are specified for certain fixtures and it is intended that they shall be installed true and plumb from fixtures to wall rough-in. Connections for water closets shall be made by use of heavy plastic closet flanges and verminproofed wax gaskets.
- B. All floor mounted closets shall be set and grouted with white grout between floor and closet.
- C. All wall hung fixtures shall be sealed between wall and fixtures with white silicone caulking.
- D. All counter mounted fixture rims shall be sealed with clear silicone caulking.
- E. All wall hung fixtures shall be furnished with suitable wall hangers and/or carriers. Fixtures shall be properly supported. Provide floor support uprights for carriers or additional wall bracing as required.

F. Fixtures shall be as scheduled on the drawings.

15021 PIPING

A. Pipe Installation:

1. General: Arrange and install piping approximately as indicated, straight, plumb and as direct as possible. Pipes to be kept close to walls, partitions, ceilings and run at right angles or parallel lines with building walls. They shall be offset only where necessary to follow walls as directed. Groups of pipes shall be located parallel to each other. Pipes to be spaced to permit full application of insulation and access for servicing valves. The Contractor shall be responsible during his guarantee for tightness of all joints made by him.
2. Greatest care shall be taken at all times to keep earth and rubbish out of piping system. The Contractor shall be responsible for any and all trouble which may develop after systems are in use, cause of which can be traced to dirt in pipes. All threads on piping shall be full and clean cut. Ends shall be reamed after cutting to remove all fins and burrs. Each length of pipe shall be up-ended as erected and rapped to dislodge dirt or scale. Short lengths of pipe coupled together shall not be used. Coupling shall be in runs of pipe only when distance is greater than a full length of pipe.
3. Supports: All piping shall be supported in such a manner so that all piping will be centered in sleeves. No water piping shall be in contact with masonry. All vertical pipe lines shall be supported at each floor. All piping shall be run plumb and parallel with building walls.
4. Grade all water piping uniformly to drain points allowing sufficient slope for proper drainage. Provide necessary valves for draining. Grade waste and drainage piping 3-inch and smaller at a minimum of 1/4-inch per foot, larger than 3-inch at a minimum of 1/8-inch per foot unless otherwise noted.
5. Concealed Piping: Where so indicated or specified, conceal piping in building construction or underground. Install such piping in time so as to not cause delay of work of other trades and to allow ample time for tests and approval. Do not cover before approval is obtained. Expose only as much as necessary for final connection.
6. The Contractor shall make provisions for expansion and contraction of all piping by using swing joints and expansion loops where necessary whether or not shown on the drawings. Anchor piping as necessary

between expansion loops, etc.

B. Piping:

1. Domestic Water:

- a) Below grade, sizes 1/2" thru 3", Type "K" soft copper (ASTM B-88) with wrought copper (ASA-B-16.22) fittings and 95-5 tin antimony soldered joints.
- b) Above grade, Sizes 1/2" thru 3", any of the following:
 - (1) Type "L" hard copper (ASTM B-88) with wrought copper (ASA-B16.22) fittings and 95-5 tin antimony soldered joints.
 - (2) Uphonor PEX-a, NSF certified, with manufacturer recommended cold expansion fittings.
 - (3) Schedule 80 CPVC (ASTM D2846) with solvent weld fittings and joints.
 - (4) SDR 7.4 Polypropylene (PP-R), (ASTM F2389) with manufacturer recommended fusion weld fittings and joints.
- c) Above grade, Sizes 4" thru 6", any of the following:
 - (1) Type "L" hard copper (ASTM B-88) with wrought copper (ASA-B16.22) fittings and 95-5 tin antimony soldered joints.
 - (2) Schedule 80 CPVC (ASTM D2846) with solvent weld fittings and joints.
 - (3) SDR 7.4 Polypropylene (PP-R), (ASTM F2389) with manufacturer recommended fusion weld fittings and joints.
- d) Other alternate piping materials, in compliance with Code and suitable to application may be considered. All substitutions shall be approved in advance by the Engineer.

2. Waste and Vent:

- a) Above grade (interior), Schedule 40 PVC DWV pipe (ASTM D-2335 or D-2665) with DWV fittings (ASTM-2665) and solvent weld (ASTM D-2564) joints.
- b) Below grade (interior), same as specified for above grade.

3. Fuel Gas (natural or LP) Piping:

- a) Interior, Schedule 40 black steel (ASTM A53 or ASTM A120) with Class 150 malleable iron threaded fittings (ANSI B16.3). Piping shall be installed in compliance with Code and NFPA 54.
- b) Exterior, plastic gas tubing as approved by gas supplier. Piping

shall be installed in compliance with NFPA 54 and gas supplier requirements.

C. Piping Specialties:

1. Nipples: Nipples shall conform to the requirements of U.S. Department of Commerce Commercial Standard CS5, "Pipe Nipples Brass, Copper, Steel and Wrought Iron". Use nipples from packages bearing manufacturer's statement "Guaranteed pipe nipples conforming to CS5, made from new pipe". Make nipples of same material and weight as pipe where used, except when length of unthreaded part of nipple is less than 1-1/2", then use extra strong pipe nipples. Do not use close nipples unless individually approved.
2. Unions:
 - a) For 2-1/2" and smaller copper tubing, use screwed brass unions with solder joint ends.
 - b) 3" copper tubing, use flanged brass body unions with brass bolts and rubber gaskets.
 - c) Install unions where indicated on the drawings, at tank and equipment connections, and in long runs of piping at intervals as directed to permit convenient disassembly for service and alterations.
 - d) Use dielectric unions for connecting copper tubing with tanks, equipment and piping made of ferrous materials.
3. Air Chambers: Provide 18" high air chamber at water connection to each fixture.
4. Gas regulators: Listed regulator, approved by gas supplier and gas equipment manufacturer. Regulate high pressure supply to low pressure as required by gas equipment. Install strictly per Code and manufacturer requirements.

15022 HANGERS, INSERTS AND SUPPORTS

- A. Support all interior piping from building structure by means of hangers or inserts to maintain required grading and pitching of lines, to prevent vibration and secure piping in place and arrange to provide for expansion and contraction.
- B. Swing joints, turns, expansion loops and long offsets to be provided wherever necessary to allow for expansion of piping. Broken pipe or fittings due to stiff connections shall be removed and replaced at the Contractor's expense. Any

damages to other work caused by this failure shall be repaired by Plumbing Contractor at his expense.

- C. All horizontal piping to be supported by means of all metal hangers or brackets of design provided with individual means of vertical adjustment for each leveling of lines after piping is in place. All hangers to be locked in place by means of separate locknut on hanger rod after line is properly leveled.
- D. Hangers on insulated lines shall encompass pipe insulation and shall have a 16 gauge steel saddle 12 inches long attached to hanger to protect insulation. All hangers shall be adjustable clevis type, Grinnell Fig. 260, Fee and Mason Fig. 239 or Modern Fig. 590.
- E. All hangers shall be supported by steel rods of the following sizes:

Size of Pipe	Size of Rod
2" and smaller	3/8"
2-1/2" and 3"	1/2"
4" and 5"	5/8"
6" and larger	3/4"

- F. Hanger rods shall be solid and have machine threads.
- G. Horizontal distance between hangers shall not exceed values indicated in the following table:

Maximum Hanger Spacing (Feet)

	Pipe Size (Inches)									
	<u><1</u>	<u>1-1/4</u>	<u>1-1/2</u>	<u>2</u>	<u>2-1/2</u>	<u>3</u>	<u>3-1/2</u>	<u>4</u>	<u>5</u>	<u>6</u>
Plastic Pipe	4	4	4	4	4	4	4	4	4	4
Copper Pipe	6	6	6	10	10	10	10	10	10	10

- H. Brackets shall be used to support piping runs along walls. Brackets shall be standoff type to allow for insulation.
- I. Soil, waste and vent stacks shall be well supported at the base by means of piers or heavy hangers close to the bottom of riser and secured at each floor by means of heavy iron riser clamps.

15023 CLEANOUTS

- A. Cleanouts must be accessible. In general, install cleanouts in the following locations:
 - 1. At base of each soil and waste stack.

2. At change or more than 45 degrees in direction of soil and waste lines.
 3. At intervals not to exceed fifty feet in all straight horizontal runs of soil and waste lines.
- B. In finished spaces of building, extend cleanouts flush with floors, partitions, walls and furred spaces in locations readily accessible for cleaning the lines. Cleanouts shall be of same size as line served up to 4 inches.
- C. Cleanouts shall be plastic body models by Plastic Oddities or equal.
1. Floor cleanouts shall have access housing with heavy duty round nickel bronze cover.
 2. Wall cleanouts shall have heavy duty stainless steel cover.
- D. All exposed portions of cleanouts in finished areas shall be nickel bronze alloy. All cleanouts shall have vertical adjustment. Any cleanout installed through floor slab with membrane waterproofing shall have flashing clamp devices. All plugs shall be recessed type to receive a common "T" handle.

15024 FLASHING AND WATERPROOFING

- A. The Plumbing Contractor shall coordinate flashing requirements for all plumbing piping passing through roof with General Contractor. General Contractor shall install flashing into the roofing system.

15025 VALVES AND COCKS

- A. All valves and cocks furnished throughout under this contract shall be of one make or manufacturer, best of their respective kind. Valves shall be Jenkins, Nibco, Milwaukee or approved equal.
- B. Valves and cocks, unless otherwise shown on the drawings or specified herein, shall be as listed in the following schedule. Locate valves for easy access and operation. Provide access panels where valves are inaccessible. Do not locate valves with stems below horizontal.

Size 3" and smaller:

	<u>Gate</u>	<u>Globe</u>	<u>Check</u>	<u>Ball</u>
Nibco	S-111	S-235-Y	S-413-B	S-595-Y
Jenkins	1242	1200	1222	902-T
Milwaukee	149	1590T	1509	BBI-350

- C. Shut-off valves shall be installed in runouts to all water risers, in branches to fixtures as shown or as required by Code, in supplies to all fixtures which are not

provided with stops and in branches to all equipment.

- D. Drain valves shall be of brass construction with 3/4-inch hose thread outlet and vacuum breaker.
- E. Gas cocks shall be Code approved 125 psi rated bronze flat head design.
- F. See Identification Section of specifications for labeling method.

15026 PLUMBING INSULATION

- A. Insulate all hot water storage tanks, above ground domestic cold/chilled water piping, domestic hot water piping, except exposed chrome plated piping at the fixture.
- B. Domestic cold (chilled) water piping shall be insulated with polyisocyanurate with factory recommended UL listed self-sealing vapor barrier jacket, 1" thick for >1" pipe, 1/2" thick for 1" and smaller pipe. All fittings, valves, piping accessories shall be fully insulated to prevent sweating.
- C. Domestic hot water piping shall be insulated with mineral wool with all service jacket, 1-1/2" thick for 1-1/2" and larger pipes, 1" thick for 1-1/4" and smaller pipes.
- D. Hot water storage tank shall be factory insulated with 2" minimum open cell foam.
- E. All joints shall be taped in accordance with manufacturer's recommendations to maintain vapor barrier seal. Fittings in concealed locations shall have miter cut and taped joints. Fittings in exposed areas shall have pre-formed PVC snap-on fitting covers to match insulation thickness. Insulation installed outdoors shall have 8 ounce canvas jacket with 2 coats lagging and continuous weatherproof PVC, aluminum or stainless steel covering.
- F. At Contractor' option, equivalent seamless flexible foamed elastomeric plastic tubing may be used in lieu of polyisocyanurate or mineral wool. Adhere strictly to manufacturer's recommendations to maintain vapor seal. No gaps at adhesive joints will be allowed.
- G. Installation shall comply with NAIMA (North American Insulation Manufacturers Association) standards and details.

15027 STERILIZING

- A. General: All water service, cold and hot piping, shall be sterilized with chlorine solution.
- B. Description: All water piping shall be thoroughly flushed for at least 30 minutes

before chlorine solution is added. Chlorine solution shall be introduced in the water piping so that every portion of the piping system contains water with a chlorine residual of at least 75 ppm. An adequate number of tests for chlorine residual shall be made during the initial dosing period to prove that equal distribution of chlorine solution throughout the piping system has been accomplished. After 12 hours of retention of the solution water, the chlorine residual shall be not less than 15 ppm; if the residual is less than 15 ppm, the piping shall be drained and fresh solution with chlorine residual of at least 75 ppm shall be introduced. When the piping has been sterilized satisfactorily, the piping shall be thoroughly flushed with clear water to obtain 2 ppm residual. Sterilization shall include piping provided by final connections of casework fixtures and specialties.

- C. A record of the entire sterilization shall be submitted to the Architect and shall include a record of each water sample tested showing the hour tested, chlorine residual and point of collection.
- D. The Plumbing Contractor shall notify the Board of Health in writing 7 days in advance of system sterilization.
- E. The Plumbing Contractor shall furnish a letter of acceptability of the system from the local Board of Health to the Architect.

15028 TESTING AND INSPECTION

- A. The Plumbing Contractor shall make all necessary preliminary tests to insure a tight system. The Plumbing Contractor shall notify the Architect 24 hours in advance of all tests. Any joint found to leak under test shall be broken, cleaned and remade.
- B. All tests shall be applied before any work is concealed or covered in any manner.
- C. All waste and vent piping shall be tested in the following manner: Plug all openings and fill entire waste and vent system to overflow with water and sustain a constant level for a minimum period of three hours. All portions of the system shall be tested under a minimum of a 10-foot head.
- D. All water piping, hot and cold, shall be made tight under a hydrostatic test pressure of 125 pounds per square inch and maintained without pressure loss for a minimum of 4 hours. No caulking of joints will be permitted. Any joint found to leak under this test shall be broken, remade and new test applied.
- E. The Plumbing Contractor shall furnish all necessary equipment, materials and labor to perform the above specified test.
- F. This Contractor shall have boiler installed under this contract inspected and approved by the State Fire Marshal. Comply with all State installation rules and

requirements.

15029 DIAGRAMS, VALVE SCHEDULE AND TAGS, PIPING IDENTIFICATION AND PAINTING

- A. The Contractor shall obtain from the Architect a print of each plumbing floor plan. These prints shall be used to mark the exact location and valve number of each valve on the job. A typewritten list of all valves shall be made giving valve number, fluid carried, and rooms or spaces(s) served. The valve list numbers and the numbers of the drawings shall correspond. At completion of the project, the prints and valve list shall be turned over to the Owner. Valves on lines serving individual fixtures or pieces of equipment where use is obvious, and drain valves with exposed discharge need not be tagged. Valve listing shall be approved by Architect.
- B. Valve tags shall be 1-1/2 inch diameter brass with depressed black filled numbers not less than 1/2-inch high and black filled letters not less than 1/4-inch high. Lettering on valves shall identify line service. Tags shall be attached to valve stems or body (not wheel handle) with brass "S" hooks or brass jack chain. Brass tag shall be Style 205 BL as manufactured by Seton Name Plate Company.
- C. All piping, exposed and concealed, shall be identified at intervals not exceeding 25 feet, on each side of wall, floor or ceiling which piping penetrates. Identification shall consist of color-coded directional flow arrow adjacent to a color coded label with letters of contrast identifying piping.
- D. Labels shall be of the snap-on "coil" type equal to Seton Name Plate Company, "Set Mark." Colors and lettering shall conform to the following schedule:

Pipe Marker Wording Background Color Valve Tag Abbreviation

Cold Water	Green	C.W.
Hot Water	Yellow (110°F)	H.W.
Hot Water	Yellow (140°F)	H.W. 140deg
Hot Water	Yellow (180°F)	H.W. 180 deg
Hot Water Return	Yellow	H.W.R.
Fuel Gas	Yellow	Gas

15030 CLEANUP, PLACING IN SERVICE AND INSTRUCTIONS

- A. It is the Plumbing Contractor's responsibility to turn over to the Owner all fixtures in a clean and first-class condition. It is the Plumbing Contractor's responsibility to see that all pipe lines are free from debris when the job is turned over to the Owner. Any damage to finished plumbing work before final acceptance, regardless of by whom caused, shall be repaired or replaced by the Plumbing Contractor without additional cost to the Owner. No additional payment will be

made for work damaged during construction. The Plumbing Contractor will not be responsible for damage to, or cleaning requirements for fixtures and specialties furnished by other contractors or the Owner unless otherwise noted.

- B. Prior to final inspection and upon completion of the installation, the entire system and all equipment shall be tested by actual operation to prove the same will function as intended. Adjustments and/or repairs shall be made at that time.
- C. When all of the requirements of the plans and specifications have been met and prior to final inspection, the Contractor shall then arrange to instruct the Owner or his representative in the correct and proper procedures for the operation and maintenance of the system.

15031 GUARANTEE

- A. The Contractor shall guarantee the entire plumbing system subject to the General Conditions of these specifications.

END OF SECTION 15000