DIVISION 22

SECTION 22 05 01: BASIC MATERIALS AND METHODS (PLUMBING)

22 05 01.01 GENERAL

A. DESCRIPTION

1. The provisions of Section 22 05 00 apply to all the work in this Section.

2. This section of specifications and related drawings describe requirements pertaining to basic materials and methods.

B. SUBMITTALS Submit the following in accordance with Section 22 05 00:

1. Manufacturer's cuts.

2. Certified capacity ratings.

3. Installation instructions.

4. Operating and Maintenance Instructions.

22 05 01.02 PRODUCTS

A. PIPE SPECIALTIES

1. Pipe specialty equipment shall be provided on all piping on all piping system as specified or as required by code.

2. Provide dielectric unions on the inlet and outlet connection to water heaters storage tanks and at all places where dissimilar metals join in piping and plumbing systems. Use dielectric unions as manufactured by Watts Regulator Inc., Zurn/Wilkins, Victaulic or equal.

3. Vacuum breaker shall be provided on each hose outlet. This includes hose bibbs, service sinks, wall hydrants, etc.

4. A system of pulsation absorbers shall be provided. The system shall be selected in accordance with PDI Standard W-201. Absorbers shall be by JOSAM, ZURN, SMITH or approved equal.

5. Valves and Accessories:

a. Provide valves as indicated and required as scheduled below. Figure numbers are provided to indicate type and quality. Insofar as possible, all valves shall be by a single manufacturer as specified or approved equal.

MANUFACTURER	GATES 125#	GLOBES 150#	CHECK 125#
NIBCO	T134	T235-Y	T413-B
CRANE	428-UB	7	37
STOCKHAM	B-105	B-22	B-319

6. SOLDER ENDS, SCREWED BONNET GATES, UNION BONNET GLOBES, (Globes with Teflon disc):

MANUFACTURER	GATES 125#	GLOBES 150#	CHECK 125#
NIBCO	S111	S235-Y	S413-B
CRANE	428-UB	-	1342
STOCKHAM	B-109	B-24	B-309

7. Hose end gate valves, 3/4 - 2" shall be JENKINS NO. 372, CRANE 451, POWELL 503 or approved equal.

8. Wall hydrants shall be cast brass non-freeze, heavy duty with polished chrome face, brass operating parts, adjustment locknut, renewable nylon seat, 3/4" standard hose outlet, locking cover.

9. Ball valves shall be Cast Red Bronze with Two Piece Body, full port. When installed in insulated piping furnish Extended Tee Handle. All isolation valves installed above ceilings shall be ball valves.

B. HANGERS AND SUPPORTS

1. Pipe supports shall be provided for all piping. Pipe support components shall conform to accepted standards.

   a. Hangers shall adequately support the piping system. On horizontal, hangers shall be located near or at changes in piping direction and concentrated loads. They shall provide vertical adjustment to maintain pitch required for proper drainage. They shall allow for expansion and contraction of the piping.

      1) Horizontal lines of copper tubing shall be supported as below:

Nominal Tubing Size	Rod Diameter	Maximum Spacing
Up to 1 inch	3/8 inch	6 feet
1-1/4" and 1-1/2"	3/8 inch	8 feet
2 inches	3/8 inch	9 feet
2-1/2 inches	1/2 inch	9 feet
3 and 4 inches	1/2 inch	10 feet

      2) Horizontal cast iron soil pipe shall be supported with one hanger for each pipe length and at fittings as required for proper support with hanger located close to hub or joint.

   b. Vertical Piping: When support locations are not indicated on the drawings, cast iron pipe shall be supported at every floor and cast iron soil pipe, and copper pipe at every other floor or as required to prevent vibration.

   c. Devices for attaching pipe supports to building structure shall be provided as required and shall be as herein specified.

1) Grinnell Type CB insert shall be provided for poured-in-place concrete construction. Drilled inserts approved equal to "Phillips" self-drilling inserts shall be provided in existing concrete construction and in precast and cast-in-place concrete construction where drilled inserts are approved by the Engineer. Other type inserts, if required, are specified in the section of this Division requiring such inserts.

2) Grinnell Figure 86 malleable C - clamp with restraining clip shall be provided for attaching 2" and smaller piping to steel structure. MSS-SP-69 malleable beam clamp with extension piece shall be provided for attaching 2-1/2" and larger piping to steel structure.

d. Intermediate attachments shall be hanger rods of size herein before specified and with vibration control devices as specified in the separate section of the Division. Rods may be continuous threaded or threaded each end as required. No chain, wire or perforated strap hangers shall be used.

e. Pipe attachments and spring hangers shall be as specified in individual section of this Division of the specifications.

C. ESCUTCHEON PLATES

1. Pipes entering finished or occupied areas shall be provided with polished chrome plated escutcheon plates, held in place with set screws. Escutcheon plates shall be Grinnell Figure 20 or approved equal.

22 05 01.03 EXECUTION

A. GENERAL

1. All products shall be installed as per the manufacturer's instructions.

B. CLEANING UP

1. Cleaning up is the responsibility of the Contractor. During construction, the site shall be kept neat so as not to be a safety hazard. Upon completion of the work, all surplus construction materials and debris shall be removed from the property.

C. PIPE TEST

1. All new soil, waste, drainage and vent piping shall be tested before fixtures are installed by capping or plugging the openings, and filling the entire system with water to a minimum height of 10 feet above grade or the highest fixture opening of the section being tested, and allowing it to stand thus filled for a period of four hours.

2. All water supply piping shall be tested before fixtures or faucets are connected by capping or plugging the opening and applying a hydrostatic test pressure of 150 psig.

3. Pipe found defective during tests shall be replaced at no additional cost to the Owner. Pipe joints found defective during tests shall be taken apart and remade.

4. The Contractor shall notify the Architect 72 hours before tests are to be made.

Concealed work shall remain uncovered until specified tests are completed. All tests shall be conducted in the presence of the Architect or his representative. Repairs to defects disclosed by the test shall be made with new materials. Caulking of screwed joints, cracks or holes will not be permitted. Test shall be repeated until system is proven tight.

DIVISION 22

SECTION 22 07 00: INSULATION

22 07 00.01 GENERAL

A. DESCRIPTION

1. This section of specifications and related drawings describe requirements pertaining to insulation.

2. Provide all insulation in conjunction with equipment, piping and ductwork furnished under this division.

3. The provisions of Section 22 05 00 apply to all the work in this section.

B. QUALITY ASSURANCE

1. Products of the manufacturers listed under MATERIALS will be acceptable for use for the specific functions noted. Adhesives, sealers, vapor barriers, and coatings shall be compatible with the materials to which they are applied, and shall not corrode, soften or otherwise attack such material in either the wet or dry state.

2. Materials shall be applied subject to their temperature limits. Any methods of application of insulating materials or finishes not specified in detail herein shall be in accordance with the particular manufacturer's published recommendations.

3. Insulation shall be applied by experienced workers regularly employed for this type of work.

C. SUBMITTALS Submit the following in accordance with Section 22 05 00:

1. Catalog cuts.

2. Materials ratings.

3. Insulation instructions.

D. RATING

1. Insulation and accessories such as adhesives, mastics, cements, tape and jackets, unless noted otherwise, shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50. Materials that are factory applied shall be tested individually. No fugitive or corrosive treatments shall be employed to impart flame resistance.

2. Flame spread and smoke developed ratings shall be determined by Method of Test of Surface Burning Characteristics of Building Materials, NFPA No. 255, ASTM E-84, UL 723.

3. Products of their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed above requirements.

4. Treatment of jackets or facings to impart flame and smoke safety shall be permanent. The use or water-soluble treatment is prohibited.

5. Certify in writing, prior to installation, that products to be used will meet RATING criteria.

22 07 00.02 PRODUCTS

A. PIPE INSULATION

1. Materials shall be heavy density fiberglass with an all-service jacket composed of an outer layer of vinyl, fiberglass scrim cloth, aluminum foil, and kraft paper, in that order, from outside to inside of pipe covering.

   a. Horizontal waste piping handling drain lines from chilled water coils.
   b. Domestic cold water supply and hot water supply and return and cold water make up piping.

2. Thicknesses:

   a. Domestic cold water supply, cold water make up lines, waste piping: All pipe sizes 1".
   b. Domestic hot water supply and return: Pipe size 2-1/2" and larger - 1-1/2", Pipe size 2" and smaller - 1".

B. EQUIPMENT

1. Tanks and other equipment handling hot water (not factory insulated). Insulate with semi-rigid fiberglass board l-l/2" thick. Cut to fit and cover with 8 oz. canvas jacket.

22 07 00.03 EXECUTION

A. PIPE INSULATION

1. Application:

   a. Insulation and surfaces to be insulated shall be clean and dry when insulation is installed and during the application of any finish.

2. Fiberglass Insulation:

   a. All fiberglass pipe covering shall be furnished with self-seal lap and 3" wide butt joint strips. The release paper is pulled from adhesive edge, pipe covering closed tightly around pipe and self-seal lap rubbed hard in place with the blunt edge of an insulation knife. This procedure applies to longitudinal as well as circumferential joints. Under no circumstances will staples be allowed. Care shall be taken to keep jacket clean, as it is the finish on all exposed work. All adjoining insulation sections shall be firmly butted together before butt joint strip is applied, and all cold water service lines shall have vapor seal mastic

thoroughly coated to pipe at butt joints every 21' and at all fittings. All fittings, valve bodies, unions, and flanges shall be finished as follows:

1) Apply molded or segmental insulation to fittings equal in thickness to the insulation on adjoining pipe and wire in place with 2#14 copper wires.
2) Apply a skim coat of insulating cement to the insulated fitting, if needed, to produce a smooth surface. After cement is dry, apply Owens-Corning Fiberglass Fitting Mastic, Type C, UL labeled.
3) Wrap the fitting with fiberglass reinforcing cloth overlapping the preceding layer by 1 to 2". Also, overlap mastic and cloth by 2" on adjoining sections of pipe insulation.
4) Apply a second coat of mastic over cloth, working it well into mesh of cloth and smooth the surface. Mastic to be applied at the rate of 40 square feet per gallon. All flanges and fittings on hot and cold lines in utility tunnels shall be insulated according to above. Omit insulation on flanges and unions over 60 degrees F. If painting is required, no sizing is necessary. To maintain the non-combustibility of the system only Glidden acrylic latex paint (#5370) is to be used.
5) All piping exposed to view (equipment rooms, etc.) shall be covered with an 8 oz. canvas jacket.

DIVISION 22

SECTION 22 11 16: DOMESTIC WATER SUPPLY PIPING

22 11 16.01 GENERAL

A. SCOPE

1. The provisions of Section 22 05 00 and 22 05 01 apply to all the work in this Section.

2. Contractor shall furnish and install domestic water systems as shown on the plans complete in all respects.

3. Connect to water main and provide supply lines to all fixtures and equipment requiring water service.

B. SUBMITTALS Submit the following in accordance with Section 22 05 00:

1. Manufacturer's cuts.

22 11 16.02 PRODUCTS

A. WATER PIPING AND FITTINGS

1. Water Piping:

a. All water piping inside the building shall be hard drawn copper tubing ASTM B 88 Type "L" above grade, Type "K" below grade. Fittings for copper tubing shall be ANSI B16.18 or B16.22 solder joint fittings. Ends of pipe shall be reamed, pipe and fittings cleaned. Use only 95-5 (95% tin and 5% antimony) solder with non-corrosive flux on 1-1/4" and smaller and on 1-1/2" and larger use silver solder (Minimum 12% Silver), with a melting point greater than 1000^{o}F. Submit solder for approval.

22 11 16.03 EXECUTION

A. INSTALLATION

1. Piping shall be installed so as to be free floating. 125 pound copper sweat pattern unions shall be provided in the piping as indicated on the drawings. Provide dielectric insulating unions where copper connects to ferrous piping. Use brass nipples or copper adapters at connections to fixtures.

2. Provide isolation valves for each individual riser and toilet group as required to service system.

3. Runouts:

a. Runouts to fixtures shall be grouted in place at the fixture stop to prevent pipe movement at this point. Use concrete mortar grout. Remove insulation

from pipe before grouting.

b. Runouts to urinal and water closet flush valves in block and concrete walls shall have an 8" long piece of 1/2" copper, flattened and soldered to the runout and anchored in the wall. Runouts in stud walls shall have a piece of 1/2" copper flattened and soldered to the runout and fastened to studs with 1/4" bolts with nuts and flat washers (two bolts each end).

4. Unions:

a. Unions shall be installed at each piece of equipment.

B. STERILIZATION OF WATER PIPING

1. Sterilization of water piping shall be in accordance with AWWA Specification 0601. After the pressure tests have been made, the system shall be flushed with water. The chlorinating material shall be liquid chlorine-water mixture calcium hypochlorite, sodium hypochlorite, or chlorinated lime-water mixture. The solution shall have not less than 50 PPM available chlorine. The disinfecting solution shall be allowed to remain in the system for a minimum period of 24 hours. After disinfection, the system shall be flushed with clean water until residual chlorine content is not greater than .02 PPM. After the system is flushed, water samples shall be taken and tested at the Contractor's expense by an independent testing lab and reports shall be furnished to the engineer's for approval. If the water is found unsafe for human consumption, the disinfection procedure shall be repeated.

DIVISION 22

SECTION 22 13 00: SOIL, WASTE, VENT AND DRAIN PIPING

22 13 00.01 GENERAL

A. SCOPE

1. The provisions of Section 22 05 00 and 22 05 01 apply to all the work in this Section.

2. All fixtures and equipment specified as requiring waste shall be connected to the sewer system. The sewer system shall be extended as shown on the drawings.

B. SUBMITTALS Submit the following in accordance with Section 22 05 00:

1. Manufacturer's cuts.

2. Installation instructions.

22 13 00.02 PRODUCTS

A. SOIL, WASTE, VENT AND DRAIN PIPING

1. Soil, waste, vent and drain piping shall be solid wall PVC plastic drain, waste and vent pipe and fittings conforming to ASTM D 2665.

B. WASTE ARMS

1. Waste arms serving lavatories, counter sinks and water coolers shall be threaded galvanized schedule 40 steel with schedule 40 drainage pattern fittings and adapters.

2. Waste arms serving urinals shall be standard pipe size threaded red brass pipe, with red brass threaded fittings.

C. SPECIALTIES

1. Cleanout Plugs: Cleanouts shall be of the same size as the pipe except that cleanout plugs larger than 4" will not be required. Cleanouts shall consist of long sweep fittings to an easily accessible place.

2. Traps: Each fixture and piece of equipment including floor drains and hub drains, requiring connections to the drainage system shall be equipped with a trap placed as near to the fixture as possible. No fixtures shall be double trapped. Traps for floor drains and hub drains shall be deep seal "P" traps. All other traps shall be supplied under the "Fixture Paragraph".

3. Floor Flanges: Cast iron floor flanges shall be provided for connection of all floor outlet water closets. The joint between the closet trap and the floor flange shall be made tight with a red or black rubber fixture setting gasket.

4. Flashing: Vent pipes shall be flashed and made watertight as the roof with 4 pound

sheet lead. Flashing shall extend not less than 8" from the vent pipes in all directions. Flashing shall be extended up the vent pipes and shall be turned down into the pipe. Minimum vent through the roof shall be 2" size.

5. Floor Drains: Floor drains shall be sized as indicated on the drawings. See plans for model number. Drains by Zurn, Josam, Jay R. Smith or equal will be acceptable.

22 13 00.03 EXECUTION

A. PIPE INSTALLATION

1. Horizontal drain and waste piping with the building shall be given a grade of 1/8" per foot below ground and 1/8" per foot above ceilings unless otherwise indicated on the drawings. Piping 3" and smaller shall have minimum grade of 1/4" per foot. Main vertical soil and waste stacks shall be extended full size to the roof line and 12" above as vents, unless otherwise indicated on the drawings. Fittings shall be service weight when used on service weight pipe. Reduction of the size of drainage piping in the direction of flow is prohibited. Vent or tap tees will not be permitted on waste lines.

B. JOINTS

1. Joints for PVC pipe shall be solvent cement in accordance with the manufacturer's instructions.

C. CLEANOUTS

1. Cleanouts shall be installed where shown on the drawings but in no case shall they be more than 50 feet apart in piping 3" and under and 75 feet apart in piping 4" and larger.

DIVISION 22

SECTION 22 40 00: PLUMBING FIXTURES AND EQUIPMENT

22 40 00.01 GENERAL

A. DESCRIPTION

1. The provisions of Section 22 05 00 apply to all work in this Section.

2. The Contractor shall furnish and install all plumbing fixtures complete with all equipment, fittings, trimmings and supports as specified.

3. Products designed for dispensing potable water shall meet both the NSF 61 and NSF 372 standard.

B. SUBMITTALS Submit the following in accordance with Section 22 05 00:

1. Manufacturer's cuts.

2. Certified capacity ratings.

3. Installation instructions.

4. Operating and Maintenance Instructions.

22 40 01.02 PRODUCTS

A. FIXTURES

1. All fixtures shall be Grade "A". The name or trademark of the manufacturer shall be printed or pressed on all water closets and lavatories and a label, which cannot be removed without destroying it, containing the manufacturer's name and trademark and the quality of the fixtures, shall be affixed to all fixtures.

2. Exposed metal parts of fixtures shall be chromium plated. Where fixtures are to be hung from the wall, the fixture or fixture hanger shall be supported by concealed 3" steel washers and through bolts. Furnish traps and supply fittings with stops for all fixtures.

3. All faucets and supply fittings shall be of the same manufacturer as the fixture except as noted otherwise. All exposed supply and waste piping shall be chrome plated. Supply piping serving flush valves shall be equipped with chrome plated pipe cover.

4. Fixtures shall be white or stainless steel as indicated on drawings.

5. Direct connections between domestic water system and sanitary waste system will not be permitted.

6. All enameled cast iron fixtures shall be Acid Resisting (AR) and shall bear

manufacturer's symbol signifying AR materials.

7. All flush valves shall be quiet acting, non-hold open feature and shall have sweat solder adaptor kit. Escutcheon shall be chrome plated brass with set screws.

8. Threaded adapters serving lavatory supply piping shall be concealed in walls. Runouts to fixture shall be chrome plated brass pipe.

9. All exposed waste piping serving fixtures, except service sinks, shall be 17 gauge chrome plated brass pipe with cast brass P-trap. Under Counters will be considered exposed areas.

10. Cut-Off Stops: All fixtures shall have individual loose key cut-off stops on cold and/or hot water lines except as specified hereinafter or indicated on the drawings.

11. Provide appropriate wall hangers for all wall-hung fixtures.

B. ELECTRIC WATER HEATER

1. Type. The water heaters shall be electric with automatic controls and approved by Underwriters' Laboratories, Inc. and approved by the National Sanitation Foundation.

2. Capacity. The storage capacity and recovery capacity shall be shown on the drawings.

3. Tank. Tank shall be heavy gauge steel with inner lining of glass. Tank shall have insulation completely around tank, top and bottom. There shall be a hose thread drain valve at bottom of tank and any pipe nipples used in water connections shall have interior surface to match interior surface of tank. Dielectric unions shall be used to connect glass coated galvanized pipe nipples to cover water pipe. Unit shall be constructed in accordance with ASME Code Section VIII and shall bear the appropriate symbol and be listed with the National Board as required.

4. Jacket. The water heater shall have a jacket of cold rolled steel with white baked on enamel finish. Jacket shall have provisions for access to all controls and heating elements.

5. Relief Valve. The heater shall be equipped with an ASME approved T & P relief valve pipe to drain.

6. Control compartment shall be hinged and shall house 120 volt control circuit transformer, transformer fusing, magnetic contactor(s), immersion style operating thermostat(s), element fusing per N.E.C. and medium watt density commercial grade INCO-LOY sheathed flange mounted elements with prewired leads. Include manual reset high temperature unit switch.

7. Electric Heating Element. Shall be copper sheathed immersion type element and shall be installed with thermostat hot water trap, and cold water inlet baffle.

8. Mounting. The electric water heater shall be set dead level in both directions.

9. Piping Connections. The electric water heater shall have piping connections as shown

on the drawings.

10. Cleaning. The electric water heater shall be cleaned and all construction dirt removed at the completion of the project.

11. Insulation shall meet requirements of latest ASHRAE Standard.

22 40 00.03 EXECUTION

A. GENERAL

1. Install all fixtures as per manufacturer's requirements and local codes.

B. CAULKING

1. Fixtures, fittings and accessories shall be caulked at floor and wall perimeter and behind flanges and fittings in a fashion that the wall openings are sealed, but no sealant is exposed.

2. Caulking shall be silicone rubber.

3. Install all caulking per manufacturer’s instructions.