

SECTION 22 05 00 – PLUMBING

PART 1 — GENERAL

1.1 GENERAL CONDITIONS

- A. The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 23 01 00.

1.2 DESCRIPTION OF THE WORK

- A. The extent of the work is indicated on the Drawings. In general, the work consists of, but is not limited to, the following:
- B. Plumbing demolition and new plumbing fixture and piping installation.

1.3 RELATED WORK

- A. Insulation is specified in Section 23 07 10.
- B. Pipe hangers and supports are specified in Section 23 05 29.

1.4 QUALITY ASSURANCE

- A. All materials and installations are to comply with the following. If conflicts occur between plumbing codes and the specifications, the most restrictive requirements shall govern.
 - 1. National Electric Code
 - 2. Florida Building Code
 - 3. Florida Plumbing Code
 - 4. Florida Energy Efficiency Code for Building Construction
 - 5. Florida Administrative Code, 10D-10, Sanitary Facilities for Buildings Serving the Public and Places of Employment.
 - 6. Accessibility Requirements Manual, Florida Board of Building Codes & Standards
- B. Furnish and install equipment having the characteristics and accessories indicated on the drawings or in these specifications. The manufacturer's specifications for the models shown on the drawings or given as basis for design, plus all features, options, and accessories indicated on the drawings or in these specifications, whether or not standard for the model scheduled or offered as a substitute, shall constitute the minimum requirements for equipment furnished under this section.

1.5 SUBMITTALS

- A. Submit to the Architect/Engineer for approval electronic copies of brochures, technical data and/or shop drawings of the following, and as many additional copies as required for Contractor use:
 - 1. Piping and Fittings
 - 2. Plumbing fixtures

3. Valves, cleanouts, and floor drains
4. Proposed fire proofing systems at penetrations of rated walls.
5. Pipe hangers and supports.

1.6 CHANGES

- A. The Drawings indicate generally the locations of plumbing fixtures, apparatus, piping, etc., and while these are to be followed as closely as possible, if before installation, it is found necessary to change the location of same to accommodate the conditions at the building, such changes shall be made without additional cost to the Owner and as directed by the Architect/Engineer.

PART 2 — PRODUCTS

2.1 MATERIALS WHICH PENETRATE FIRE WALLS

- A. Where insulated piping or plastic materials penetrate fire walls, provide a UL listed systems for maintaining the rating.
- B. Where bare-metal piping systems penetrate fire walls, provide a permanent sleeve which is grouted or rocked into wall. Provide a UL listed fire caulk for the annular space.

2.2 PLUMBING FIXTURES, TRIM AND FITTINGS

- A. Furnish and install all plumbing fixtures and trim, floor drains and cleanouts as shown on the Drawings. Fixtures shall be as specified or equivalent quality fixtures by American Standard, Kohler, Universal Rundle or Eljer.
- B. Provide all items of brass and chrome plated finish except where otherwise noted.
- C. Brackets, Anchors, and Cleats: Furnish and install where required for support, conceal behind finished wall.

2.3 PIPING

- A. Where more than one material is specified for a particular application, comply with Drawing Notes. Where interfacing with an existing system supply materials to match the existing. Where not connecting to existing and where not specified on the Drawings, then the Contractor may select from the options listed.
- B. All materials shall comply with latest ASTM specifications in each instance that ASTM has specifications and standards relating to such materials.
- C. Sanitary Waste and Vent
 1. PVC DWV Soil Pipe, schedule 40, ASTM D2665
 2. PVC Sewer Pipe, schedule 40, ASTM D2665
 3. Copper tubing, Type L, conforming to ASTM B88, with brazed or solder-joint copper, brass or bronze fittings conforming to ANSI B16.18 or B16.22.
 4. Copper tubing, DWV grade, hard temper conforming to ASTM B306, with solder joint, cast bronze fittings conforming to ANSI B16.23. Tubing larger than 2 inches shall use wrought copper fittings conforming to ANSI B16.29.

D. Domestic Water Pipe:

1. Above grade domestic water pipe shall be type L hard copper, conforming to ASTM B88. ProPress cast or wrought fittings per ASME B16.18 or B16.22. Where required solder fittings are acceptable
2. Piping below grade shall be annealed soft copper per ASTM B88. Limit fittings where possible.
3. Below Grade Piping: PVC pipe: ASTM D2241, Class 150, working pressure 150 psig, fittings to be AWWA C151. J-M Ring-Tite or approved equal.
4. Below Grade Piping 4" and Above: PVC pipe: AWWA C900, Class 150, working pressure 150 psig, fittings to be AWWA C151. J-M Ring Tite or approved equal.

E. Exposed Pipe in Toilet Areas:

1. Exposed pipe shall be chrome plated brass, American Brass Co., or equivalent. Furnish and install chrome plated brass wall plates.

F. Lavatory and Similar Waste Arms:

1. Type M or L copper water tube, Mueller or equivalent.

G. Urinal Waste Arms:

1. PVC.

H. Roof Drain Piping:

1. PVC DWV Soil Pipe, schedule 40, ASTM D2665
2. PVC Sewer Pipe, schedule 40, ASTM D2665
3. Below grade and below slab piping may be PVC pipe and fittings: schedule 40, conforming to ASTM D2665 or D2661 respectively.

2.4 PIPE ACCESSORIES:

- A. Pipe sleeves: metal sized to allow minimum clearance between pipe and sleeves or insulation and sleeves.
- B. Provide chrome-plated brass escutcheon plates where exposed pipe passes through walls, floors, or ceiling in finished areas.
- C. Furnish and install dielectric or isolation fittings at all points where copper pipe connects to steel pipe.
- D. Adjustable wrought clevis type hanger and rods: Anvil or equivalent. Provide copper hangers for copper piping.
- E. Install water hammer arrestors as shown on the Drawings and where required by codes.

2.5 VALVES

- A. Ball Valves: 125 lb., bronze ball valve.

2.6 TRAPS

- A. For Lavatories and Sinks: Fully Cast Brass, 17ga., chrome plated.

2.7 TRAP PRIMERS

- A. 1/2 automatic trap primers: all bronze body with integral vacuum breaker and gasketed service cover.

PART 3 — EXECUTION

3.1 INSTALLATION OF PIPING

- A. Condensate piping shall be sloped same as sanitary waste and vent.
- B. On vertical sanitary drain lines, connect all soil and waste inlets through sanitary tees, wyes, or wyes and eighth bends. Short radius fittings may be used for vent piping. On horizontal lines connect all waste and soil connections through wyes or wyes and eighth bends. Double branch fittings may be used on vertical lines and horizontal runs, providing proper grades can be maintained.
- C. Make joints in PVC plastic pipe with solvent cement in accordance with pipe manufacturer's instructions.
- D. Lay horizontal drain pipes to uniform grade; riser pipes, vertical. Make changes in directions of drain pipes with long bends. No screwed joints permitted in drain pipes, except as described herein.
- E. Lay all sewers and branches, where practicable, on undisturbed earth cut at proper grade. Where laid on fill, provide adequate supports to maintain pitch of the line.
- F. Sizes of risers and mains of water system piping shall be as designated on the Drawings. Verify any omitted sizes before installation.
- G. Cover pipe openings at times the work is not in progress.
- H. Cut brass and copper pipe by means of hacksaw. Remove all burrs and metal chips, dirt, etc., before joining pipe. Chrome plated pipe shall show no wrench marks after installation; no threads shall show.
- I. Adequately support all piping above floors inside the building from or on the building structure. Support piping suspended from the building structure by means of the specified pipe hangers and rods. Support interval shall be per FBC Plumbing Table 308.5.
- J. Sanitary and storm drain piping shall be supported by at least one hanger on each full length of pipe close to hub where possible and at least one within 24 inches of each fitting, and wherever else required to prevent tendency toward deflection due to load. Provide a hanger at upper angle at each drop. Locate hangers adjacent to hubs on multiple fittings not more than four feet on centers.
- K. For support spacing of all other horizontal piping refer to MSS-SP-69 and provide additional supports at valves, strainers, in line pumps and other heavy components. Provide a support within one foot of each elbow.
- L. Vertical Pipe Supports: Up to 6 inch 60 feet long or not over 12-inch pipe up to 30 feet long, Riser clamps bolted to pipe below couplings, or welded to pipe and resting securely on the

- building structure. Vertical pipe larger than the foregoing, support on base elbows or tees, or substantial pipe legs extending to the building structure. Vertical runs less than 15 feet long may be supported by the hangers on the connecting horizontal runs.
- M. Bases of drain stacks: If not buried in earth support on concrete, brick in cement mortar, or metal brackets permanently attached to building structure.
 - N. Make joints in PVC plastic pipe with solvent cement in accordance with pipe manufacturer's instructions.
 - O. Yard supply main piping: Piping shall be installed in strict accordance with the manufacturer's recommendations. Provide 6" clean sand fill for pipe bedding. Insure minimum 18" of cover. Provide concrete thrust blocks at all changes of direction. Hand dig thrust block area just behind fittings. Bevel ends of PVC piping. Test piping in accordance with manufactures instruction.

3.2 INSTALLATION OF VALVES

- A. Isolate all major piping assemblies as shown on the Drawings and as required for proper operation and maintenance. All valves shall be accessible. Provide valve boxes and access panels where required for accessibility.
- B. Install service valve for hot and cold water at each plumbing fixture.

3.3 INSTALLATION OF TRAPS

- A. Trap each fixture by water sealing trap placed as near the fixture as possible.
- B. Vent all traps and place within 5 feet of the fixture which it serves unless otherwise noted.

3.4 INSTALLATION OF PIPE SLEEVES

- A. Install pipe sleeves at all locations where pipe passes through walls, floors, or ceilings above or below grade. Sleeves shall extend above floor a minimum of 1". Seal floor sleeves in concrete floors with mortar. Coordinate sleeve size with piping and firestopping requirements in advance.
- B. Where subject to moisture or weather, seal sleeves with watertight sealant.

3.5 INSTALLATION OF FIXTURES, TRIM, AND FITTINGS

- A. Install the fixtures, trim and fittings specified, taking care to properly anchor each fixture.
- B. Installation of carriers shall comply with manufacturers' maximum recommendations. Carriers shall be bolted to floor slab using all bolt holes or slots provided on carrier. Bolt size shall match hole or slot. Provide lock washer on each bolt. Use "Red Head" self-drilling anchors as manufactured by Phillips Drill Co. or approved equal product to set bolts.
- C. When the use of a wrench is necessary on chrome plated piping, protect the pipe from marring by use of felt or cloth wrapping beneath wrench jaws.

3.6 INSULATION

- A. Insulate all domestic hot water lines.

- B. Insulate all interior condensate piping with ¾" thick elastomeric closed cell foam insulation. Insulation shall have a flame spread of less than 25 and a smoke developed rating of 50 or less as tested by ASTM C534, E84, UL-723 and NFPA 255.
- C. Hot water pipe insulation shall be rigid glass fiber insulation with a nominal density of 3 pounds per cubic foot with a thermal conductivity of not more than 0.23 at 75 deg F mean temperature. Insulation cover shall be an all-service jacket with double self-sealing laps, with self-sealing butt strips. Insulation thickness shall be per FBC Energy Conservation Table C403.2.10 and as follows:
 - 1. 1" thick for pipe sizes 1-1/4" and smaller.
 - 2. 1-1/2" thick for pipe sizes 1-1/2" and larger.
- D. Insulate all domestic cold-water lines subject to ambient conditions. Use closed-cell elastomeric thermal insulation, minimum density of 5.5 pounds per cubic foot with a thermal conductivity of not more than 0.27 at 75 deg F mean temperature. The material shall have a flame spread of 25 or less and a smoke-developed rating of 50 or less as tested by ASTM C534, E84 (25/50) UL-723 (25-50) and NFPA 255 (25-50). Seal all joints, seams, etc. air tight. Insulation thickness shall be per FBC Energy Conservation Table C403.2.10 and as follows:
 - 1. 1/2" thick for pipe sizes 1-1/4" and smaller.
 - 2. 1" thick for pipe sizes 1-1/2" and larger.
- E. Pipe insulation is not required in crawl spaces where located more than 10' from a ventilation opening.
- F. Install insulation in accordance with manufacturer's recommendations.

3.7 TESTS AND INSPECTIONS

- A. Make all water and air tests of the piping systems in the presence of and to the satisfaction of the Architect/Engineer or his designated representative. Conduct these tests at such places and with timing to permit work to proceed with as little interruption as possible. Make tests before work is concealed.
- B. Test water piping to hydrostatic pressure at 125 psi and hold for 4 hours.
- C. After the installation of sanitary piping and before the pipe is concealed or the fixtures are installed, cap or plug the ends of the system and fill all lines with water to top of vents above roof and allow to stand until a thorough inspection has been made. Should leaks appear, repeat the tests until the system is tight.

3.8 STERILIZATION

- A. The sterilization process shall comply with all governing regulations and with the sterilization procedures recommended by the American Water Works Association. The chlorination process may be simplified by first flushing the system thoroughly clean, then charging with water containing a minimum of 50 parts per million of chlorine, allowing this to stand for 24 hours, then thoroughly flushing. After sterilization and final flushing, the local health authority is to be notified and their approval obtained in writing. Provide copies to the Construction Manager, engineer, and Owner. Include a copy in the close out manual.

END OF SECTION 22 05 00

SECTION 22 08 00 - COMMISSIONING OF SERVICE WATER HEATING SYSTEMS

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes commissioning process requirements for Service Water Heating Systems, assemblies, and equipment.

1.3 Related Sections:

- A. Section 019113 "General Commissioning Requirements" for general commissioning process requirements.

1.4 DEFINITIONS

- A. BAS: Building Automation System as specified in Section 2309 "HVAC Control System."
- B. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- C. CxA: Commissioning Authority.
- D. Service Water Heating Systems: Service Water Heating Equipment, Pressure Regulating Devices, Mixing Valves, Piping, Insulation, Pumps, Variable Speed Drives, Controls, Interlocks, Interfaces, Safeties, Accessories and Appurtenances.
- E. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.
- F. TAB: Testing, Adjusting and Balancing work as specified in Section 230594 "Testing and Balancing for HVAC."

1.5 INFORMATIONAL SUBMITTALS

- A. Certificates of readiness, refer to Section 019113 "General Commissioning Requirements."
- B. Pre-Functional Test Checklists and Equipment Start-up Reports

1.6 CONTRACTOR'S RESPONSIBILITIES

- A. Attend construction phase commissioning kick-off meeting.
- B. Attend commissioning team meetings held on a variable basis.
- C. Attend TAB review and coordination meeting, if applicable to Service Hot Water Systems.
- D. Notify CxA when manufacturer will be onsite to startup service water heating equipment.
- E. Provide sufficient notice (14 days minimum) so that the CxA can plan to be onsite to witness.
- F. Complete pre-functional test checklists provided by the CxA. Contractor may use the manufacturer's factory startup checklists to avoid duplication of data entry.

- G. Perform commissioning tests at the direction of the CxA. Include an additional site visit from the equipment manufacturer if necessary to demonstrate the operation of the system and perform the requirements of functional testing.
- H. Provide owner training as required by the Contract Documents and provide documentation of the training to the CxA. CxA may witness owner training.
- I. Provide information requested by the CxA for final commissioning documentation.
- J. Participate in warranty walk-through of building and system operation 10 months after completion.

1.7 CxA'S RESPONSIBILITIES

- A. Organize and lead the commissioning team and convene commissioning team meetings.
- B. Provide project specific construction checklists and functional performance test procedures for actual Service Water Heating Systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.
- C. Conduct commissioning site visits and distribute field observation reports.
- D. Prepare and maintain the commissioning Issues Log.
- E. Witness major equipment or system start-ups.
- F. Direct commissioning functional performance testing.
- G. Compile commissioning related documentation and include it in the final commissioning process report and systems manual.
- H. Verify owner training is complete.
- I. Review of building and system operation 8-10 months after completion.

1.8 COMMISSIONING DOCUMENTATION

- A. Provide the following information to the CxA for inclusion in the commissioning plan:
- B. Plan for delivery and review of submittals, operation and maintenance manuals, and other documents and reports.
- C. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
- D. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for Service Water Heating Systems, assemblies, equipment, and components to be verified and tested.
- E. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
- F. Test and inspection reports and certificates.
- G. Corrective action documentation for commissioning related issues.
- H. Testing, adjusting, and balancing (TAB) reports.

- I. Certificate of readiness certifying that Service Water Heating Systems, subsystems, equipment, and associated controls are ready for testing.

PART 2 -PART 2 - PRODUCTS (Not Used)

PART 3 -PART 3 - EXECUTION

3.1 TESTING PREPARATION

- A. Provide a fully executed Certificate of Readiness signed by Contractor, Subcontractors, TAB Agent and BAS provider certifying that Service Water Heating Systems, instrumentation and control systems have been completed and calibrated, pre-tested and inspected and that they are operating according to the Contract Documents, and that pretest set points have been recorded.
- B. Provide completed Certificate of Readiness to CxA no less than 7 days prior to the scheduled beginning of on-site CxA functional performance testing.
- C. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
- D. Inspect and verify the position of each device and interlock.
- E. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.2 GENERAL TESTING REQUIREMENTS

- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.
- B. Scope of Service Water Systems testing shall include entire Service Water Heating Systems installation, from central equipment for heat generation through distribution systems to each water outlet and device.
- C. Testing of systems and equipment shall include measuring capacities and effectiveness of operational and control functions, in addition to, or in conjunction with any statutory and regulatory testing required by Authorities Having Jurisdiction over the project and testing required in other Sections of this Project Manual.
- D. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
- E. The CxA along with the Service Water Heating Systems Subcontractor shall prepare detailed testing plans, procedures, and checklists for Service Water Heating Systems, subsystems, and equipment.
- F. Tests will be performed using design conditions whenever possible.
- G. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions.

- H. Before simulating conditions, calibrate testing instruments.
- I. Provide equipment to simulate loads.
- J. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation.
- K. After tests, return settings to normal operating conditions.
- L. The CxA may direct that set points be altered when simulating conditions is not practical.
- M. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
- N. If tests cannot be completed because of a deficiency outside the scope of the Service Water Heating Systems system, document the deficiency and report it to the Owner.
- O. After deficiencies are resolved, reschedule tests.
- P. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests....

END OF SECTION 22 08 00