1. Section 221005   
   Plumbing Piping
   1. PART 1  GENERAL
      1. SECTION INCLUDES
         1. Sanitary waste piping, buried beyond 5 feet (1500 mm) of building.
         2. Sanitary waste piping, buried within 5 feet (1500 mm) of building.
         3. Sanitary waste piping, above grade.
         4. Chemical-resistant sanitary waste piping.
         5. Domestic water piping, buried beyond 5 feet (1500 mm) of building.
         6. Domestic water piping, buried within 5 feet (1500 mm) of building.
         7. Domestic water piping, above grade.
         8. Storm drainage piping, buried beyond 5 feet (1500 mm) of building.
         9. Storm drainage piping, buried within 5 feet (1500 mm) of building.
         10. Storm drainage piping, above grade.
         11. Propane gas piping, buried beyond 5 feet (1500 mm) of building.
         12. Propane gas piping, buried within 5 feet (1500 mm) of building.
         13. Propane gas piping, above grade.
         14. Natural gas piping, buried beyond 5 feet (1500 mm) of building.
         15. Natural gas piping, buried within 5 feet (1500 mm) of building.
         16. Natural gas piping, above grade.
         17. Vacuum piping, above grade.
         18. Pipe flanges, unions, and couplings.
         19. Pipe hangers and supports.
         20. Pipe sleeve-seal systems.
         21. Ball valves.
         22. Butterfly valves.
         23. Balancing valves.
         24. Flow-balancing valves.
         25. Pressure reducing valves.
         26. Pressure relief valves.
         27. Pressure-temperature valves.
         28. Strainers.
      2. RELATED REQUIREMENTS
         1. Section \_\_\_\_\_\_\_\_\_\_:  Roof penetrations.
         2. Section 078400 - Firestopping.
         3. Section 083100 - Access Doors and Panels.
         4. Section 099113 - Exterior Painting.
         5. Section 099123 - Interior Painting.
         6. Section 220516 - Expansion Fittings and Loops for Plumbing Piping.
         7. Section 220529 - Hangers and Supports for Plumbing Piping and Equipment.
         8. Section 220548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
         9. Section 220553 - Identification for Plumbing Piping and Equipment.
         10. Section 220719 - Plumbing Piping Insulation.
         11. Section 260583 - Wiring Connections:  Electrical characteristics and wiring connections.
         12. Section 312316 - Excavation.
         13. Section 312316.13 - Trenching.
         14. Section 312323 - Fill.
         15. Section 330110.58 - Disinfection of Water Utility Piping Systems.
      3. REFERENCE STANDARDS
         1. ANSI LC 1/CSA 6.26 - Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing; 2023.
         2. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).
         3. ANSI Z223.1 - National Fuel Gas Code; 2024.
         4. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
         5. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
         6. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.
         7. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
         8. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
         9. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV; 2021.
         10. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.
         11. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings—DWV; 2022.
         12. ASME B31.1 - Power Piping; 2024.
         13. ASME B31.3 - Process Piping; 2024.
         14. ASME B31.9 - Building Services Piping; 2020.
         15. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2023.
         16. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.
         17. ASSE 1003 - Water Pressure Reducing Valves for Potable Water Distribution Systems; 2023.
         18. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
         19. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
         20. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.
         21. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
         22. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.
         23. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2022.
         24. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).
         25. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings; 2018, with Editorial Revision.
         26. ASTM B32 - Standard Specification for Solder Metal; 2020.
         27. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2020.
         28. ASTM B43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes; 2020.
         29. ASTM B68/B68M - Standard Specification for Seamless Copper Tube, Bright Annealed; 2019.
         30. ASTM B75/B75M - Standard Specification for Seamless Copper Tube; 2020.
         31. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
         32. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
         33. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.
         34. ASTM B302 - Standard Specification for Threadless Copper Pipe, Standard Sizes; 2017.
         35. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2020.
         36. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.
         37. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2023.
         38. ASTM C4 - Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile; 2004 (Reapproved 2023).
         39. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe; 2020.
         40. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe (Metric); 2020.
         41. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2022a.
         42. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric); 2022a.
         43. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings; 2022.
         44. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2021.
         45. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric); 2021.
         46. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.
         47. ASTM C700 - Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated; 2018 (Reapproved 2022).
         48. ASTM C1053 - Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications; 2000 (Reapproved 2015).
         49. ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.
         50. ASTM C1540 - Standard Specification for Heavy-Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.
         51. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.
         52. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings; 2022.
         53. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter; 2022.
         54. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2020.
         55. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2023.
         56. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings; 2020.
         57. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020.
         58. ASTM D2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe; 2021.
         59. ASTM D2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings; 2021.
         60. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2020.
         61. ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping; 2020.
         62. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2020.
         63. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2021.
         64. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; 2019a.
         65. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020.
         66. ASTM D2996 - Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe; 2023.
         67. ASTM D2997 - Standard Specification for Centrifugally Cast "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe; 2021.
         68. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2023.
         69. ASTM D3262 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe; 2020.
         70. ASTM D3517 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe; 2019.
         71. ASTM D3754 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe; 2019.
         72. ASTM D3840 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Nonpressure Applications; 2019.
         73. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
         74. ASTM F437 - Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2021.
         75. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40; 2023.
         76. ASTM F439 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2019.
         77. ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 2023.
         78. ASTM F442/F442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR); 2023.
         79. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe; 2014 (Reapproved 2021).
         80. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2022.
         81. ASTM F628 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core; 2023.
         82. ASTM F679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings; 2021.
         83. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 2024.
         84. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2024.
         85. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems; 2024.
         86. ASTM F1281 - Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe; 2024.
         87. ASTM F1282 - Standard Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe; 2023a.
         88. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007 (Reapproved 2019).
         89. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-Linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing; 2023b.
         90. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.
         91. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).
         92. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.
         93. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.
         94. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.
         95. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2023.
         96. AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2024.
         97. AWWA C606 - Grooved and Shouldered Joints; 2022.
         98. AWWA C651 - Disinfecting Water Mains; 2023.
         99. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. through 60 In. (100 mm through 1500 mm); 2022.
         100. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 3/4 In. (19 mm) Through 3 In. (76 mm), for Water Service; 2020.
         101. AWWA C950 - Fiberglass Pressure Pipe; 2020.
         102. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.
         103. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.
         104. FM (AG) - FM Approval Guide; Current Edition.
         105. FM 1680 - Approval Standard for Couplings Used in Hubless Cast Iron Systems for Drain, Waste or Vent, Sewer, Rainwater or Storm Drain Systems Above and Below Ground, Industrial/ Commercial and Residential; 1989.
         106. IAPMO IGC 361 - Continuous Flexible Self-Plunging Waste Pipes; 2019.
         107. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).
         108. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).
         109. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).
         110. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.
         111. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
         112. MSS SP-67 - Butterfly Valves; 2022.
         113. MSS SP-70 - Gray Iron Gate Valves, Flanged and Threaded Ends; 2011.
         114. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends; 2018.
         115. MSS SP-78 - Gray Iron Plug Valves, Flanged and Threaded Ends; 2011.
         116. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.
         117. MSS SP-85 - Gray Iron Globe and Angle Valves, Flanged and Threaded Ends; 2011.
         118. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
         119. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
         120. NFPA 58 - Liquefied Petroleum Gas Code; 2024, with Amendment.
         121. NSF 61 - Drinking Water System Components - Health Effects; 2024.
         122. NSF 372 - Drinking Water System Components - Lead Content; 2024.
         123. PPI TR-4 - PPI HSB Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe; 2024.
         124. UL (DIR) - Online Certifications Directory; Current Edition.
         125. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.
      4. SUBMITTALS
         1. See Section 013000 - Administrative Requirements for submittal procedures.
         2. Product Data:  Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
         3. Welders' Certificates:  Submit certification of welders' compliance with ASME BPVC-IX.
         4. Shop Drawings:  For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.
         5. Sustainable Design Documentation:  For soldered copper joints, submit installer's certification that the specified installation method and materials were used.
         6. Sustainable Design Documentation:  For products meeting regulatory lead-content restrictions.
         7. Project Record Documents:  Record actual locations of valves.
         8. Maintenance Materials:  Furnish the following for Owner's use in maintenance of project.
            1. See Section 016000 - Product Requirements for additional provisions.
            2. Valve Repacking Kits:  One for each type and size of valve.
      5. QUALITY ASSURANCE
         1. Perform work in accordance with applicable codes.
         2. Valves:  Manufacturer's name and pressure rating marked on valve body.
         3. Welding Materials and Procedures:  Comply with ASME BPVC-IX and applicable state labor regulations.
         4. Welder Qualifications:  Certified in accordance with ASME BPVC-IX.
         5. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.
      6. DELIVERY, STORAGE, AND HANDLING
         1. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
         2. Provide temporary protective coating on cast iron and steel valves.
         3. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
         4. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
      7. FIELD CONDITIONS
         1. Do not install underground piping when bedding is wet or frozen.
   2. PART 2  PRODUCTS
      1. GENERAL REQUIREMENTS
         1. Potable Water Supply Systems:  Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
         2. Plenum-Installed Acid Waste Piping:  Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.
      2. DOMESTIC WATER PIPING, ABOVE GRADE
         1. Cross-Linked Polyethylene (PEX) Pipe:  ASTM F876 or ASTM F877.
            1. Manufacturers:

Zurn Industries, LLC; \_\_\_\_\_\_:  www.zurn.com/#sle.

* + - * 1. PPI TR-4 Pressure Design Basis:
    1. PRESSURE REDUCING VALVES
    2. PRESSURE RELIEF VALVES
       1. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.
    3. STRAINERS
  1. PART 3  EXECUTION
     1. EXAMINATION
        1. Verify that excavations are to required grade, dry, and not over-excavated.
     2. 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.
     3. INSTALLATION
        1. Install in accordance with manufacturer's instructions.
        2. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
        3. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
        4. Install piping to maintain headroom, conserve space, and not interfere with use of space.
        5. Group piping whenever practical at common elevations.
        6. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 220516.
        7. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
           1. See Section 220719.
        8. Provide access where valves and fittings are not exposed.
           1. Coordinate size and location of access doors with Section 083100.
        9. Establish elevations of buried piping outside the building to ensure not less than \_\_\_\_\_ ft (\_\_\_\_\_ m) of cover.
        10. Install vent piping penetrating roofed areas to maintain integrity of roof assembly; see Section \_\_\_\_\_.
        11. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
        12. Provide support for utility meters in accordance with requirements of utility companies.
        13. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
            1. See Section 099123 for painting of interior plumbing systems and components.
            2. See Section 099113 for painting of exterior plumbing systems and components.
        14. Excavate in accordance with Section 312316.
        15. Excavate in accordance with Section 312316.13.
        16. Backfill in accordance with Section 312323.
        17. Backfill in accordance with Section 312316.13.
        18. Install bell and spigot pipe with bell end upstream.
        19. Install valves with stems upright or horizontal, not inverted. See Section 220523.
        20. Install water piping to ASME B31.9.
        21. Copper Pipe and Tube:  Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
        22. PVC Pipe:  Make solvent-welded joints in accordance with ASTM D2855.
        23. Sleeve pipes passing through partitions, walls, and floors.
        24. Inserts:
            1. Provide inserts for placement in concrete formwork.
            2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
            3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm, DN).
            4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
            5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
        25. Pipe Hangers and Supports:
            1. Install in accordance with ASME B31.9.
            2. Support horizontal piping as indicated.
            3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
            4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
            5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment.  Design hangers for pipe movement without disengagement of supported pipe.
            6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
            7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
            8. Provide copper plated hangers and supports for copper piping.
            9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

Painting of interior plumbing systems and components is specified in Section 099123.

Painting of exterior plumbing systems and components is specified in Section 099113.

* + - * 1. Provide hangers adjacent to motor-driven equipment with vibration isolation; see Section 220548.
        2. Support cast iron drainage piping at every joint.
      1. Pipe Sleeve-Seal Systems:
         1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
         2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
         3. Locate piping in center of sleeve or penetration.
         4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
         5. Tighten bolting for a watertight seal.
         6. Install in accordance with manufacturer's recommendations.
      2. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
    1. APPLICATION
       1. Use grooved mechanical couplings and fasteners only in accessible locations.
       2. Install unions downstream of valves and at equipment or apparatus connections.
       3. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
       4. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
       5. Install globe valves for throttling, bypass, or manual flow control services.
       6. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.
       7. Provide spring-loaded check valves on discharge of water pumps.
       8. Provide flow controls in water recirculating systems where indicated.
    2. TOLERANCES
       1. Drainage Piping:  Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/4 inch per foot (1:50) slope.

1. END OF SECTION