**SECTION 22 1005  
PLUMBING PIPING AND VALVES**

**PART 1 GENERAL**

1. **SECTION INCLUDES**
2. Pipe, pipe fittings, specialties, and connections for piping systems.
3. Sanitary sewer.
4. Domestic water.
5. Storm water.
6. Flanges, unions, and couplings.
7. Pipe hangers and supports.
8. Valves.
9. Check.
10. **RELATED REQUIREMENTS**
11. Section 07 8400 – Fire stopping from csi.
12. Section 08 3100 - Access Doors and Panels from csi.
13. Section 09 9113 - Exterior Painting from csi.
14. Section 09 9123 - Interior Painting from csi.
15. Section 22 0516 - Expansion Fittings and Loops for Plumbing Piping.
16. Section 22 0548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
17. Section 22 0553 - Mechanical Identification.
18. Section 22 0719 - Plumbing Piping Insulation.
19. Section 31 2316 – Excavation from csi.
20. Section 31 2323 – Fill from csi.
21. **REFERENCE STANDARDS**
22. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 1999, and addenda A&B (R2004).
23. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; The American Society of Mechanical Engineers; 2011.
24. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2014 (ANSI/ASME B31.9).
25. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; The American Society of Mechanical Engineers; 2015.
26. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; The American Society of Mechanical Engineers; 2015.
27. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems; The American Society of Sanitary Engineering; 2009.
28. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2014).
29. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
30. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
31. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.
32. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2010.
33. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2002 (Reapproved 2010).
34. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.
35. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter; 2012.
36. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2015.
37. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2013.
38. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.
39. ASTM D2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe; 2015.
40. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.
41. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.
42. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; 2014.
43. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).
44. ASTM F437 - Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2015.
45. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40; 2015.
46. ASTM F439 - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2013.
47. ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 2015.

AA. ASTM F442/F442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR); 2013.

AB. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe; 2014.

AC. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2014.

AD. ASTM F679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings; 2015.

AE. AWWA C550 - Protective Interior Coatings for Valves and Hydrants; American Water Works Association; 2013.

AF. AWWA C606 - Grooved and Shouldered Joints; 2015 (ANSI/AWWA C606).

AG. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005 (ANSI/AWWA C651).

AH. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.

AI. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2015.

AJ. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.

AK. MSS SP-67 - Butterfly Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2011.

AL. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

AM. NSF 372 - Drinking Water System Components - Lead Content; 2011.

AN.UPC - Uniform Plumbing Code 2015

1. **SUBMITTALS**
2. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
3. Welder Certificate: Include welders’ certification of 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 spacing.
5. Sustainable Design Documentation: For soldered copper joints, submit installer's certification that the specified installation method and materials were used.
6. Project Record Documents: Record actual locations of valves.
7. Maintenance Materials: Furnish the following for Employer/Owner's use in maintenance of project.
8. Valve Repacking Kits: One for each type and size of valve.
9. **QUALITY ASSURANCE**
10. Perform work in accordance with local regulations and applicable codes.
11. Pipes: Manufacturer's name, quality control mark, pressure rating and manufacturing standard marked on pipe.
12. Valves: Manufacturer's name and pressure rating marked on valve body.
13. Fittings: Manufacturer's name and pressure rating pressed or embossed on fittings.
14. Welding Materials and Procedures: Conform to ASME BPVC-IX.
15. Welder Qualifications: Certified in accordance with ASME BPVC-IX or ASTM D 2657.
16. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.
17. Source pipe and fittings of the same specification from one manufacturer.
18. All pipe and fittings from different specifications connecting together in one system shall be compatible.
19. **DELIVERY, STORAGE, AND HANDLING**
20. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
21. Provide temporary protective coating on cast iron and steel valves.
22. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
23. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
24. **FIELD CONDITIONS**
25. Do not install underground piping when bedding is wet or frozen.

**PART 2 PRODUCTS**

1. **GENERAL REQUIREMENTS**

A. 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.

2.2 PIPE MATERIALS REFER TO BOQ

1. **PIPE HANGERS AND SUPPORTS**
2. Provide hangers and supports that comply with MSS SP-58.
3. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
4. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.

a. Cold and Hot Pipe Sizes 150 mm (6 Inches) and Over: Double hangers.

1. Trapeze Hangers: Welded steel channel frames attached to structure.
2. Vertical Pipe Support: Steel riser clamp.
3. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
4. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:

a. Bases: High density polypropylene.

1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
2. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
4. Height: Provide minimum clearance of 150 mm (6 inches) under pipe to top of roofing.
5. Plumbing Piping - Drain, Waste, and Vent:
6. Hangers for Pipe Sizes 15 mm (1/2 Inch) to 40 mm (1-1/2 Inches): Malleable iron, adjustable swivel, split ring.
7. Hangers for Pipe Sizes 50 mm (2 Inches) and Over: Carbon steel, adjustable, clevis.
8. Wall Support for Pipe Sizes to 80 mm (3 Inches): Cast iron hook.
9. Wall Support for Pipe Sizes 100 mm (4 Inches) and Over: Welded steel bracket and wrought steel clamp.
10. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
11. Plumbing Piping - Water:
12. Hangers for Pipe Sizes 15 mm (1/2 Inch) to 40 mm (1-1/2 Inches): Malleable iron, adjustable swivel, split ring.
13. Hangers for Cold Pipe Sizes 50 mm (2 Inches) and Over: Carbon steel, adjustable, clevis.
14. Hangers for Hot Pipe Sizes 50 mm (2 Inches) to 100 mm (4 Inches): Carbon steel, adjustable, clevis.
15. Hangers for Hot Pipe Sizes 150 mm (6 Inches) and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
16. Wall Support for Pipe Sizes to 80 mm (3 Inches): Cast iron hook.
17. Wall Support for Pipe Sizes 100 mm (4 Inches) and Over: Welded steel bracket and wrought steel clamp.
18. Wall Support for Hot Pipe Sizes 150 mm (6 Inches) and Over: Welded steel bracket and

wrought steel clamp with adjustable steel yoke and cast iron pipe roll.

1. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange,and concrete pier or steel support.
2. Floor Support for Hot Pipe Sizes to 100 mm (4 Inches): Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
3. Floor Support for Hot Pipe Sizes 150 mm (6 Inches) and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
4. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
5. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
6. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
7. **ALL VALVES**
8. Bodies of valves and cocks on mild steel pipework up to and including 50mm size shall be of cast gunmetal or bronze. Approved valves having hot pressed bodies may be offered as an alternative. Bodies of valves 65mm size and larger shall be of cast iron. Castings and pressings shall be of good quality, clean and smooth and free from scale or flaws.
9. Holes in covers or in gates for screwed portions of spindles shall have full threads of a length not less than the diameter of the spindle over the thread. Glands shall be machined to provide a running fit between the spindle and the stuffing box. Stuffing boxes shall be properly packed or fitted with "O" rings, which may be located in plastic bushes.
10. Valves and cocks on mild steel pipe work up to and including 50mm size shall have taper screwed ends TO BS 21 (ISO 7), and of 65mm size and above shall have flanged ends to BS EN 1092-1 and BS EN 1092-2 welded type or screwed type.
11. All screwed valves shall have heavy hexagonal reinforcements at openings, threads of ample length to ensure sound joint and heavy shoulders to prevent over entry of pipes, fittings or adapters.
12. Flanged valves shall have flat-faced flanges conforming to BS EN 1092-1 and BS EN 1092-2.
13. All valves and valve components (e.g. seating, packing, etc.) shall be suitable for the working pressures, operating temperatures and conditions of the fluid handled in the systems in which they will be installed. All valves shall be hydraulically tested to at least twice the working pressure of the systems in which they will be installed. Where necessary valves shall have extended spindles, stems or operating handles to facilitate insulation. The declared pressure rating of valves and strainers shall be equal to or greater than the maximum test pressure of the system but no less than PN 10.
14. The working pressure for valves and strainers is to be based on the total static pressure in the pipe work in addition to the operating pressure exerted by the pumps on the system.
15. Each valve shall have the manufacturer's name or trade mark, the BS number, the nominal diameters, the nominal pressure rating and body material all identified in the form of stamped or cast body markings.
16. All valves shall be factory tested to BS EN 12266-1 and BS EN 12266-2 or an approved equivalent standard.
17. Bronze Valves:
18. Fabricate from dezincification resistant material.
19. Copper alloys containing more than 15 percent zinc are not permitted.
20. For motorized flow control valves refer to section 23 0913.
    1. **GATE VALVES**
21. Up To and Including 50 mm (2 Inches): shall be bronze or gunmetal gate valves to BS 5154 or MSS SP-70 with solid wedge discs, non-rising stems, screwed in bonnets, metal hand wheels and screwed ends to BS 21 (ISO 7).
22. Larger than 50 mm (2 Inches): shall be cast iron gate valves to BS EN 1171 or MSS SP-70 with solid wedge discs with bronze trim and seating, bolted on cast iron bonnets, high grade PTFE Teflon packing, rising stems with outside screws and yokes, cast iron hand wheels and flanged ends to BS EN 1092-1 and BS EN 1092-2.
    1. **BALL VALVES**
23. Construction 100m and smaller: BS 5154 or BS EN 12288 or MSS SP-110, PN 20 or higher bronze, two-piece body, chrome plated bronze ball, full port, Teflon seats, blow-out proof stem, threaded ends to BS 21 (ISO 7), lever handle.
    1. **BUTTERFLY VALVES**
24. Construction 40 mm (1-1/2 Inches) and Larger: MSS SP-67 or BS ISO 10631,2000 kPa (300 psi) CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.
25. Provide gear operators for valves 150 mm (8 inches) and larger, and chain-wheel operators for valves mounted over 2400 mm (8 feet) above floor.
    1. **PIPING SPECIALTIES**

A. Flow Controls:

1. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blow-down/back-flush drain.
2. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 24 kPa (3.5 psi).
3. **SWING CHECK VALVES**
4. Up to 50 mm (2 Inches): BS EN 12288 or MSS SP-71, bronze body and cap, bronze seat, bronze disc, threaded ends BS 21.
5. Over 50 mm (2 Inches): BS 5153 or MSS SP-71, cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, bronze seat ring, graphite gasket, flanged ends BS EN 1092.
6. **WATER PRESSURE REDUCING VALVES:**
7. Valve shall be provided with by-pass arrangement complete with all valves and pressure gauges as detailed on drawings. Valve shall be selected away from cavitations range and to provide maximum outlet pressure of 250 kPa.
8. Up to 50 mm (2 Inches):
9. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
10. Over 50 mm (2 Inches):
11. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.
12. **RELIEF VALVES:**
13. Pressure:

1. AGA Z21.22 certified, bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated.

1. Temperature and Pressure:

1. AGA Z21.22 certified, bronze body, Teflon seat, stainless steel stem and springs,

automatic, direct pressure actuated, temperature relief maximum 98.9 degrees C (210 degrees F), capacity ASME BPVC-IV certified and labelled.

1. **STRAINERS:**
2. Size 50 mm (2 inch) and Under: Brass body, Y pattern with 0.8 mm (1/32 inch) stainless steel perforated screen, screwed on retainer cap with threaded plug. Provide blow off connection with valve on the retainer cap, where required.
3. Size 65mm (2-1/2 inch) and Above: Cast steel body with flanged ends, flanged cover with threaded bronze plug and stainless-steel screen. Provide blow off connection with valve, where required. Screen shall have 1.5 mm perforations for sizes from 65 to 100 mm (2 1/2 to 4 inch) nom. dia. Screen shall have 3.0 mm perforations for sizes over 100 mm (4 inch) nom. dia.
4. **DRAIN VALVES**

A. Drain valves shall be of the bronze straight type glanded pattern complete with brass hose union and malleable iron lever conforming to the requirements of BS EN 1982.

1. **AIR COCKS**

A. Air cocks shall be nickel or chrome plated, of the spout-less pattern and with screwed thread. Two loose keys shall be provided for each installation having up to 10 air cocks and one loose key shall be provided for every additional ten air cocks.

1. **AUTOMATIC AIR VENTS**

A. Automatic air vents shall be of bronze or gunmetal construction and be suitable for hot water. Vents shall be designed to eliminate air from the system automatically without passage of water. The unit shall be of the float operated type screwed connection on the outlet to enable the unit to be piped to a remote drain position.

1. **WATER METERS**

A. Shall be in accordance with the local water company specifications and section 22 0519

**PART 3 EXECUTION**

1. **EXAMINATION**
2. Verify that excavations are to required grade, dry, and not over-excavated.
3. **PREPARATION**
4. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
5. Remove scale and dirt, on inside and outside, before assembly.
6. Prepare piping connections to equipment with flanges or unions.
7. **INSTALLATION**
8. Install in accordance with manufacturer's instructions.
9. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
10. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
11. Install piping to maintain headroom, conserve space, and not interfere with use of space.
12. Group piping whenever practical at common elevations.
13. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 0516.
14. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

1. Refer to Section 22 0719.

1. Provide access where valves and fittings are not exposed.
2. Coordinate size and location of access doors with Section 08 3100.
3. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
4. Provide support for utility meters in accordance with requirements of utility companies.
5. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
6. Painting of interior plumbing systems and components is specified in Section 09 9123.
7. Painting of exterior plumbing systems and components is specified in Section 09 9113.
8. Excavate in accordance with Section 31 2316.
9. Backfill in accordance with Section 31 2323.
10. Install bell and spigot pipe with bell end upstream.
11. Install valves with stems upright or horizontal, not inverted. Refer to Section 22 0523.
12. Install water piping to ASME B31.9.
13. 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.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
14. [PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
15. [Sleeve pipes passing through partitions, walls and floors.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
16. [Purified water network shall be constructed, routed and connected to eliminate any dead legs.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [All valves installed on tap off points from purified water network shall be zero deadleg valves.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
17. [Inserts:](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
18. [Provide inserts for placement in concrete formwork.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
19. [Provide inserts for suspending hangers from reinforced concrete slabs and sides of](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [reinforced concrete beams.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
20. [Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 100](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [mm (4 inches).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
21. [Where concrete slabs form finished ceiling, locate inserts flush with slab surface.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
22. [Where inserts are omitted, drill through concrete slab from below and provide through-bolt](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [with recessed square steel plate and nut above slab.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
23. [Pipe Hangers and Supports:](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
24. [Install in accordance with ASME B31.9.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
25. [Support horizontal piping as scheduled.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
26. [Install hangers to provide minimum 15 mm (1/2 inch) space between finished covering and](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [adjacent work.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
27. [Place hangers within 300 mm (12 inches) of each horizontal elbow.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
28. [Use hangers with 40 mm (1-1/2 inch) minimum vertical adjustment. Design hangers for](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [pipe movement without disengagement of supported pipe.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
29. [Support vertical piping at every other floor. Support riser piping independently of](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [connected horizontal piping.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
30. [Where several pipes can be installed in parallel and at same elevation, provide multiple or](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [trapeze hangers.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
31. [Provide copper plated hangers and supports for copper piping.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
32. [Prime coat exposed steel hangers and supports. Hangers and supports located in crawl](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
33. [Painting of interior plumbing systems and components is specified in Section 09 9123.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
34. [Painting of exterior plumbing systems and components is specified in Section 09](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [9113.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
35. [Provide hangers adjacent to motor driven equipment with vibration isolation; refer to](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [Section 22 0548.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
36. [Insulate all valves installed on domestic hot water network.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
37. [Where any pipe is required to be shortened it shall be cut off square and cleanly with an](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [approved pipe-cutting machine.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
38. [Where special joints or jointing materials are shown for pipes of any materials, they shall be of](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [an approved type and manufacture, and the joint shall be made in accordance with the](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [manufacturer's instructions, or as directed.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
39. [All outlets shall be trapped and provided with accessible and adequate means of removal and](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [cleaning. The traps shall be designed to be self-cleaning all surfaces and joints are to be](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [smooth.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
40. [All traps with outlets for pipes up to and including 50 mm shall have a minimum water seal](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [of 75 mm.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
41. [T raps with outlets for pipes of over 50 mm shall have a minimum water seal of 50 mm.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)

[AA. Self siphon age tests: The contractor shall undertake tests for self-siphon age and induced](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)

[siphon age in branch discharge pipes by fitting each appliance to over flowing and then](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [discharging by removing the plugs and discharging the W.C(s) at the upstream end of the](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [discharge pipe. All seals are to remain in the traps.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)

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| [Number of appliances of](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [each kind on the stack](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) | WC | [Wash basin](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) |
| [1 to 4](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) | 1 | 1 |
| [5 to 9](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) | 1 | 2 |
| [10 to 13](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) | 2 | 2 |
| [14 to 26](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) | 2 | 3 |
| [27 to 39](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) | 3 | 4 |
| [40 to 50](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) | 3 | 5 |

[1. The numbers of sanitary appliances to be discharged for this performance test are](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [enumerated below:](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)

AB. Flexible joints are to be provided wherever pipes cross expansion joints.

[AC. All vertical drain and vent pipes are to have access doors provided on each floor, above flood](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [level of fittings served. Access to be provided in ducts to sanitary services. All vent pipes are to](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [terminate 300 mm above roof level, with suitable weathering slate apron and vent cowl or](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [copper wire balloon.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)

[AD. Responsibility shall be assumed to identify and install all necessary expansion couplings and](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [fire sleeves throughout the installations.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)

[AE. Hydrostatic Testing](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)

1. [All tests requested by Local Municipality or engineer on the entire installation shall be](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [carried out, and all necessary appliance and equipment for this purpose shall be supplied.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
2. [Whilst phased testing may be carried out (which may or may not have been witnessed) it](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [will be required to demonstrate the water tightness, alignment, and level and cleanliness of](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [the complete installation.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
3. [Hydrostatically test all piping networks in accordance with municipality regulations and/or](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)  [local codes and/or International Plumbing Code. Repair any leaks and retest until](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [system passes.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
   1. [**APPLICATION**](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
4. [Use grooved mechanical couplings and fasteners only in accessible locations.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
5. [Install unions downstream of valves and at equipment or apparatus connections.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
6. [Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
7. [Install ball or butterfly valves for throttling, bypass, or manual flow control services.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
8. [Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
9. [Provide spring loaded check valves on discharge of water pumps.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
10. [Provide flow controls in water re-circulating systems where indicated.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
    1. [**TOLERANCES**](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
11. [Drainage Piping: Establish invert elevations within 10 mm (1/2 inch) vertically of location](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) indicated and slope to drain at minimum of 1:50 (1/4 inch per foot) slope unless where [practicably impossible can be reduced to 1:100 (1/8 inch per foot).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
12. [Water Piping: Slope at minimum of 1:400 (1 /32 inch per foot) and arrange to drain at low](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [points.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
    1. [**DISINFECTION OF DOMESTIC WATER PIPING SYSTEM**](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
13. [Prior to starting work, verify system is complete, flushed and clean.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
14. [Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [or soda ash) or acid (hydrochloric).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
15. [Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [obtain 50 to 80 mg/L residual.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
16. [Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [percent of outlets.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
17. [Maintain disinfectant in system for 24 hours.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
18. [If final disinfectant residual tests less than 25 mg/L, repeat treatment.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
19. [Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
20. [Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [entry, and analyze in accordance with AWWA C651.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
    1. [**SERVICE CONNECTIONS**](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)

[A. Provide new sanitary sewer services. Before commencing work check invert elevations](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [required for sewer connections, confirm inverts and ensure that these can be properly](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [connected with slope for drainage and cover to avoid freezing.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)

1. [Provide new water service complete with approved double check backflow preventer and sand](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [strainer.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
2. [Provide sleeve in wall for service main and support at wall with reinforced concrete bridge.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [Calk enlarged sleeve and make watertight with pliable material. Anchor service main](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [inside to concrete wall.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
3. [Provide 1.21 mm (18 gage, 0.0478 inch) galvanized sheet metal sleeve around service](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [main to 150 mm (6 inch) above floor and 1800 mm (6 feet) minimum below grade. Size](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061) [for minimum of 50 mm (2 inches) of loose butt insulation stuffing.](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
   1. [**SCHEDULES**](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
4. [Pipe Hanger Spacing:](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
5. [Metal Piping:](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
6. [Pipe Size: 15 mm (1/2 inches) to 32 mm (1-1/4 inches):](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
7. [Maximum Hanger Spacing: 2 m (6.5 ft).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
8. [Hanger Rod Diameter: 9 mm (3/8 inches).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
9. [Pipe Size: 40 mm (1-1/2 inches) to 50 mm (2 inches):](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
10. [Maximum Hanger Spacing: 3 m (10 ft).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
11. [Hanger Rod Diameter: 9 mm (3/8 inch).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
12. [Pipe Size: 65 mm (2-1/2 inches) to 75 mm (3 inches):](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
13. [Maximum Hanger Spacing: 3 m (10 ft).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
14. [Hanger Rod Diameter: 13 mm (1/2 inch).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
15. [Pipe Size: 100 mm (4 inches) to 150 mm (6 inches):](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
16. [Maximum Hanger Spacing: 3 m (10 ft).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
17. [Hanger Rod Diameter: 15 mm (5/8 inch).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
18. [Pipe Size: 200 mm (8 inches) to 300 mm (12 inches):](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
19. [Maximum hanger spacing: 4.25 m (14 ft).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
20. [Hanger Rod Diameter: 22 mm (7/8 inch).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
21. [Pipe Size: 350 mm and Over (14 inches and Over):](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
22. [Maximum Hanger Spacing: 6 m (20 ft).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
23. [Hanger Rod Diameter: 25 mm (1 inch).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
24. [Plastic Piping:](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
25. [All Sizes:](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
26. [Maximum Hanger Spacing: 1.8 m (6 ft).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)
27. [Hanger Rod Diameter: 9 mm (3/8 inch).](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)

[**END OF SECTION**](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NSF%2061)