

Chapter 12 was amended by [Local Law 77 of 2023](#). This law has an effective date of June 10, 2023.

CHAPTER 12

HYDRONIC PIPING

SECTION MC 1201 GENERAL

1201.1 Scope. The provisions of this chapter shall govern the construction, installation, alteration and repair of hydronic piping systems. This chapter shall apply to hydronic piping systems that are part of heating, ventilation and air-conditioning systems. Such piping systems shall include steam, hot water, chilled water, condenser water, cooling coil condensate drain, steam condensate and ground-source heat pump loop systems. Potable cold and hot water distribution systems shall be installed in accordance with the *New York City Plumbing Code*.

1201.2 Sizing. Piping and piping system components for hydronic systems shall be sized for the design requirements of the system.

1201.3 Standards. As an alternative to the provisions of Sections 1202 and 1203, piping shall be designed, installed, inspected and tested in accordance with ASME B31.1 and ASME B31.9, as applicable.

SECTION MC 1202 MATERIAL

1202.1 Piping. Piping material, other than those contained within this section and conforming with the ASTM standards listed within this chapter, shall be of an approved type.

Exception: Embedded piping regulated by Section 1209, and ground-source heat pump loop systems regulated by Section 1210.

1202.2 Used existing materials. Reused pipe, fittings, valves or other materials shall be clean and free of foreign materials.

1202.3 Material rating. Materials shall be rated for the operating temperature and pressure of the hydronic system. Materials shall be suitable for the type of fluid in the hydronic system.

1202.4 Piping materials standards. Hydronic pipe shall conform to the standards listed in Table 1202.4. The exterior of the pipe shall be protected from corrosion and degradation.

**TABLE 1202.4
HYDRONIC PIPE**

MATERIAL	STANDARD (see Chapter 15)
Acrylonitrile butadiene styrene (ABS) plastic pipe	ASTM D 1527; ASTM F 2806
Chlorinated polyvinyl chloride (CPVC) plastic pipe	ASTM D 2846; ASTM F 441; ASTM F 442
Copper, brass, or copper-alloy pipe	ASTM B 42; ASTM B 43; ASTM B 302
Copper, brass, or copper-alloy tube (Type K, L or M)	ASTM B 75; ASTM B 88; ASTM B 135; ASTM B 251

HYDRONIC PIPING

Cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pressure pipe	ASTM F 1281; CSA B137.10
Cross-linked polyethylene (PEX) tubing	ASTM F 876; ASTM F 877
Ductile iron pipe	AWWA C115/A21.15; AWWA C151/A21.51
Polyethylene/aluminum/polyethylene (PE-AL-PE) pressure pipe	ASTM F 1282; CSA B137.9
Polypropylene (PP) plastic pipe	ASTM F 2389
Polyvinyl chloride (PVC) plastic pipe	ASTM D 1785; ASTM D 2241
Raised temperature polyethylene (PE-RT)	ASTM F 2623; ASTM F 2769
Steel pipe	ASTM A 53/A 53M; ASTM A 106
Steel tubing	ASTM A 254

1202.5 Pipe fittings. Hydronic pipe fittings shall conform to the respective pipe standards or to the standards listed in Table 1202.5.

**TABLE 1202.5
HYDRONIC PIPE FITTINGS**

MATERIAL	STANDARD (see Chapter 15)
Copper, brass, and copper alloys	ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.24; ASME B16.26; ASME B16.51; ASTM F 1974
Ductile iron and gray iron	ANSI/AWWA C110/A21.10; AWWA C153/A21.53; ASTM A 126; ASTM A 395; ASTM A 536; ASTM F 1476; ASTM F 1548
Malleable iron	ASME B16.3
PE-RT fittings	ASTM F 1807; ASTM F 2098; ASTM F 2159; ASTM F 2735; ASTM F 2769
PEX fittings	ASTM F 877; ASTM F 1807; ASTM F 2159
Plastic	ASTM D 2466; ASTM D 2467; ASTM F 438; ASTM F 439; ASTM F 877; ASTM F 2389; ASTM F 2735

Steel	ASME B16.5; ASME B16.9; ASME B16.11; ASME B16.28; ASTM A 53/A 53M; ASTM A 106; ASTM A 234; ASTM A 420; ASTM A 536; ASTM A 395; ASTM F 1476; ASTM F 1548
-------	---

1202.6 Valves. Valves shall be constructed of materials that are compatible with the type of piping material and fluids in the system. Valves shall be rated for the temperatures and pressures of the systems in which the valves are installed.

1202.7 Flexible connectors, expansion and vibration compensators. Flexible connectors, expansion and vibration control devices and fittings, when used, shall protect the components of the hydronic system from damage caused by expansion, contraction, transverse movement, angular deflection and vibration, shall be rated for the temperatures and pressures of the systems in which the devices are installed, and shall be compatible with the fluid and all materials provided.

SECTION MC 1203 JOINTS AND CONNECTIONS

1203.1 Approval. Joints and connections, other than those contained in Section 1203 and conforming to the ASTM standards listed in Section 1203, shall be of an approved type. Joints and connections shall be tight for the pressure of the hydronic system.

1203.1.1 Joints between different piping materials. Joints between different piping materials shall be rated for the temperatures and pressures of the systems in which the devices are installed and shall be compatible with the fluid and all materials provided.

1203.1.2 Joints between dissimilar metallic piping materials. Joints between dissimilar metallic piping materials shall be provided to protect against galvanic corrosion. Such joints shall be made with dielectric fittings conforming to ANSI B16.39 or ASTM F 492, as applicable, shall be rated for the temperatures and pressures of the systems in which the devices are installed and shall be compatible with the fluid and all materials provided.

Exception: Dielectric fittings shall not be required for joints between dissimilar metal piping used within heat transfer appliances or equipment when such joints are provided by the appliance or equipment manufacturer, and such appliance or equipment is connected with isolation valves that are accessible.

1203.2 Preparation of pipe ends. Pipe shall be cut square, reamed and chamfered, and shall be free of burrs and obstructions. Pipe ends shall have full-bore openings and shall not be undercut.

1203.3 Joint preparation and installation. Where required by Sections 1203.4 through 1203.14, the preparation and installation of brazed, mechanical, soldered, solvent-cemented, threaded and welded joints shall comply with Sections 1203.3.1 through 1203.3.8.

1203.3.1 Brazed joints. All joints shall be brazed with a brazing procedure developed and qualified in accordance with the ASME *Boiler and Pressure Vessel Code*, Section IX (Welding and Brazing Qualifications) or in accordance with AWS B2.2 Standard for Brazing Procedure and Performance Qualification.

1203.3.2 Mechanical joints. Mechanical joints shall be installed in accordance with the manufacturer's instructions.

1203.3.3 Soldered joints. Joint surfaces shall be cleaned. A flux conforming to ASTM B 813 shall be applied. The joint shall be soldered with a solder conforming to ASTM B 32.

1203.3.4 Solvent-cemented joints. Joint surfaces shall be clean and free of moisture. A primer, compatible with both the piping material and the cement shall be applied to pipe-joint surfaces, in accordance with the manufacturer's requirements. Joints shall be made while the cement is wet. Solvent cement conforming to the following standards shall be applied to all joint surfaces:

1. ASTM D 2235 for ABS joints.
2. ASTM F 493 for CPVC joints.

HYDRONIC PIPING

3. ASTM D 2564 for PVC joints.

1203.3.5 Threaded joints. Threads shall conform to ASME B1.20.1. Schedule 80 or heavier plastic pipe shall be threaded with dies specifically designed for plastic pipe. Thread lubricant, pipe-joint compound or tape shall be applied on the male threads only and shall be compatible for application on the piping material and fluid.

1203.3.6 Welded joints. All joints shall be welded with a welding procedure developed and qualified in accordance with the *ASME Boiler and Pressure Vessel Code*, Section IX (Welding and Brazing Qualifications) or in accordance with AWS B2.1 Specifications for Welding Procedure and Performance Qualification.

1203.3.7 Grooved and shouldered mechanical joints. Grooved and shouldered mechanical joints shall conform to the requirements of ASTM F 1476 and shall be installed in accordance with the manufacturer's instructions.

1203.3.8 Mechanically formed tee fittings. Mechanically extracted outlets shall have a height not less than three times the thickness of the branch tube wall.

1203.3.8.1 Full flow assurance. Branch tubes shall not restrict the flow in the run tube. A dimple/depth stop shall be formed in the branch tube to ensure that penetration into the outlet is of the correct depth. For inspection purposes, a second dimple shall be placed $\frac{1}{4}$ inch (6.4 mm) above the first dimple. Dimples shall be aligned with the tube run.

1203.3.8.2 Brazed joints. Mechanically formed tee fittings shall be brazed in accordance with Section 1203.3.1.

1203.4 ABS plastic pipe. Joints between ABS plastic pipe or fittings shall be solvent-cemented or threaded joints conforming to Section 1203.3.

1203.5 Brass pipe. Joints between brass pipe or fittings shall be brazed, mechanical, threaded or welded joints conforming to Section 1203.3.

1203.6 Brass tubing. Joints between brass tubing or fittings shall be brazed, mechanical or soldered joints conforming to Section 1203.3.

1203.7 Copper or copper-alloy pipe. Joints between copper or copper-alloy pipe or fittings shall be brazed, mechanical, soldered, threaded or welded joints conforming to Section 1203.3.

1203.8 Copper or copper-alloy tubing. Joints between copper or copper-alloy tubing or fittings shall be brazed, mechanical or soldered joints conforming to Section 1203.3, flared joints conforming to Section 1203.8.1 or push-fit joints conforming to Section 1203.8.2.

1203.8.1 Flared joints. Flared joints shall be made by a tool designed for that operation.

1203.8.2 Push-fit joints. Push-fit joints shall be installed in accordance with the manufacturer's instructions.

1203.9 CPVC plastic pipe. Joints between CPVC plastic pipe or fittings shall be solvent-cemented or threaded joints conforming to Section 1203.3.

1203.10 Reserved.

1203.11 Cross-linked polyethylene (PEX) plastic tubing. Joints between cross-linked polyethylene plastic tubing and fittings shall conform to Sections 1203.11.1 and 1203.11.2. Mechanical joints shall conform to Section 1203.3.

1203.11.1 Compression-type fittings. Where compression-type fittings include inserts and ferrules or O-rings, the fittings shall be installed without omitting the inserts and ferrules or O-rings.

1203.11.2 Plastic-to-metal connections. Soldering on the metal portion of the system shall be performed not less than 18 inches (457.2 mm) from a plastic-to-metal adapter in the same water line.

1203.12 PVC plastic pipe. Joints between PVC plastic pipe and fittings shall be solvent-cemented or threaded joints conforming to Section 1203.3.

1203.13 Steel pipe. Joints between steel pipe or fittings shall be mechanical, threaded or welded joints conforming to Section 1203.3.

1203.14 Steel tubing. Joints between steel tubing or fittings shall be mechanical or welded joints conforming to Section 1203.3.

1203.15 Polypropylene (PP) plastic. Joints between PP plastic pipe and fittings shall comply with Sections 1203.15.1 and 1203.15.2.

1203.15.1 Heat-fusion joints. Heat-fusion joints for polypropylene (PP) pipe and tubing joints shall be installed with socket-type heat-fused polypropylene fittings, electro-fusion polypropylene fittings or by butt fusion. Joint surfaces shall be clean and free from moisture. The joint shall be undisturbed until cool. Joints shall be made in accordance with ASTM F 2389.

1203.15.2 Mechanical and compression sleeve joints. Mechanical and compression sleeve joints shall be installed in accordance with the manufacturer's instructions.

1203.16 Raised temperature polyethylene (PE-RT) plastic tubing. Joints between raised temperature polyethylene tubing and fittings shall conform to Sections 1203.16.1 and 1203.16.2. Mechanical joints shall conform to Section 1203.3.

1203.16.1 Compression-type fittings. Where compression-type fittings include inserts and ferrules or O-rings, the fittings shall be installed without omitting the inserts and ferrules or O-rings.

1203.16.2 PE-RT-to-metal connections. Solder joints in a metal pipe shall not occur within 18 inches (457.2 mm) of a transition from such metal pipe to PE-RT pipe.

1203.17 Polyethylene/aluminum/polyethylene (PE-AL-PE) pressure pipe. Joints between polyethylene/aluminum/polyethylene pressure pipe and fittings shall conform to Sections 1203.17.1 and 1203.17.2. Mechanical joints shall comply with Section 1203.3.

1203.17.1 Compression-type fittings. Where compression-type fittings include inserts and ferrules or O-rings, the fittings shall be installed without omitting the inserts and ferrules or O-rings.

1203.17.2 PE-AL-PE-to-metal connections. Solder joints in a metal pipe shall not occur within 18 inches (457.2 mm) of a transition from such metal pipe to PE-AL-PE pipe.

1203.18 Cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pressure pipe. Joints between cross-linked polyethylene/aluminum/cross-linked polyethylene pressure pipe and fittings shall conform to Sections 1203.18.1 and 1203.18.2. Mechanical joints shall comply with Section 1203.3.

1203.18.1 Compression-type fittings. Where compression-type fittings include inserts and ferrules or O-rings, the fittings shall be installed without omitting the inserts and ferrules or O-rings.

1203.18.2 PEX-AL-PEX-to-metal connections. Solder joints in a metal pipe shall not occur within 18 inches (457.2 mm) of a transition from such metal pipe to PEX-AL-PEX pipe.

SECTION MC 1204 PIPE INSULATION

1204.1 Insulation characteristics. Pipe insulation installed in buildings shall conform to the requirements of the *New York City Energy Conservation Code*, shall be tested in accordance with ASTM E 84 or UL 723, using the specimen preparation and mounting procedures of ASTM E 2231; and shall have a maximum flame spread index of 25 and a smoke-developed index not exceeding 450. Insulation installed in an air plenum shall comply with Section 602.2.1.

1204.2 Required thickness. Hydronic piping shall be insulated to the thickness required by the *New York City Energy Conservation Code*.

SECTION MC 1205 VALVES

1205.1 Where required. Shutoff valves shall be installed in hydronic piping systems in the locations indicated in Sections 1205.1.1 through 1205.1.6.

1205.1.1 Heat exchangers. Shutoff valves shall be installed on the supply and return side of a heat exchanger.

HYDRONIC PIPING

Exception: Shutoff valves shall not be required where heat exchangers are integral with a boiler; or are a component of a manufacturer's boiler and heat exchanger packaged unit and are capable of being isolated from the hydronic system by the supply and return valves required by Section 1005.1.

1205.1.2 Central systems. Shutoff valves shall be installed on the building supply and return of central utility systems, and district heating and cooling systems.

1205.1.3 Pressure vessels. Shutoff valves shall be installed on the connection to any pressure vessel.

1205.1.4 Pressure-reducing valves. Shutoff valves shall be installed on both sides of a pressure-reducing valve.

1205.1.5 Equipment and appliances. Shutoff valves shall be installed on connections to mechanical equipment and appliances. This requirement does not apply to components of a hydronic system such as pumps, air separators, metering devices and similar equipment.

1205.1.6 Expansion tanks. Lockable shutoff valves shall be installed at connections to all expansion tanks. Valves shall be locked in the open position.

1205.2 Reduced pressure. A pressure relief valve shall be installed on the low-pressure side of a hydronic piping system that has been reduced in pressure. The relief valve shall be set at the maximum pressure of the system design. The valve shall be installed in accordance with Section 1006.

SECTION MC 1206 PIPING INSTALLATION

1206.1 General. Piping, valves, fittings and connections shall be installed in accordance with the conditions of approval.

1206.2 System drain down. Hydronic piping systems shall be designed and installed to permit the system to be drained. Where the system drains to the plumbing drainage system, the installation shall conform to the requirements of the *New York City Plumbing Code*.

Exception: The buried portions of systems embedded underground.

1206.3 Protection of potable water. The potable water system shall be protected from backflow in accordance with the *New York City Plumbing Code*.

1206.4 Pipe penetrations. Openings for pipe penetrations in walls, floors or ceilings shall be larger than the penetrating pipe. Openings through concrete or masonry building elements shall be sleeved. The annular space surrounding pipe penetrations shall be protected in accordance with the *New York City Building Code*.

1206.5 Clearance to combustibles. A pipe in a hydronic piping system in which the exterior temperature exceeds 250°F (121.1°C) shall have a minimum clearance of 1 inch (25.4 mm) to combustible materials.

1206.6 Contact with building material. A hydronic piping system shall not be in direct contact with building materials that cause the piping material to degrade or corrode, or that interfere with the operation of the system.

1206.7 Water hammer. The flow velocity of the hydronic piping system shall be controlled to reduce the possibility of water hammer. Where a quick-closing valve creates water hammer, an engineered water-hammer arrestor shall be installed. The arrestor shall be located within a range as specified by the manufacturer of the quick-closing valve.

1206.8 Steam piping pitch. Steam piping shall be installed to drain to the boiler or the steam trap. Steam systems shall not have drip pockets that reduce the capacity of the steam piping.

1206.9 Strains and stresses. Piping shall be installed so as to prevent detrimental strains and stresses in the pipe. Provisions shall be made to protect piping from damage resulting from expansion, contraction and structural settlement. Piping shall be installed so as to avoid structural stresses or strains within building components.

1206.9.1 Flood hazard. Piping located in flood hazard areas shall comply with Appendix G of the *New York City Building Code*.

1206.10 Pipe support. Pipe shall be supported in accordance with Section 305. Seismic supports shall be provided where required by the *New York City Building Code*.

1206.11 Condensation. Provisions shall be made to prevent the formation of condensation on the exterior of piping.

SECTION MC 1207 TRANSFER FLUID

1207.1 Flash point. The flash point of transfer fluid in a hydronic piping system shall be not less than 50°F (10°C) above the maximum system operating temperature.

1207.2 Makeup water. The transfer fluid shall be compatible with the makeup water supplied to the system.

SECTION MC 1208 TESTS

1208.1 General. Hydronic piping systems other than ground-source heat pump loop systems shall be tested hydrostatically at one and one half times the system design operating pressure, but not less than 100 psi (689 kPa). The duration of each test shall be not less than 2 hours. Ground-source heat pump loop systems shall be tested in accordance with Section 1210.10.

SECTION MC 1209 EMBEDDED PIPING

1209.1 Materials. Embedded piping shall be plastic pipe or tubing, in accordance with Section 1202, rated at 100 psi (689.5 kPa) at 180°F (82.2°C).

1209.2 Pressurizing during installation. Piping to be embedded in concrete shall be pressure tested prior to pouring concrete. During pouring, the pipe shall be maintained at the proposed operating pressure.

1209.3 Embedded joints. Joints of pipe or tubing that are embedded in a portion of the building, such as concrete or plaster, shall be thermally-fused.

1209.4 Not embedded related piping. Joints of other piping in cavities or running exposed shall be joined in accordance with manufacturer's instructions and related sections of this code.

1209.5 Thermal barrier required. Radiant floor heating systems shall be provided with a thermal barrier in accordance with Sections 1209.5.1 through 1209.5.4.

Exception: Insulation shall not be required in engineered systems where it can be demonstrated that the insulation will decrease the efficiency or have a negative effect on the installation.

1209.5.1 Slab-on-grade installation. Radiant piping utilized in slab-on-grade applications shall be provided with insulating materials installed beneath the piping having a minimum R-value of 5.

1209.5.2 Suspended floor installation. In suspended floor applications, insulation shall be installed in the joist bay cavity serving the heating space above and shall consist of materials having a minimum R-value of 11.

1209.5.3 Thermal break required. A thermal break shall be provided consisting of asphalt expansion joint materials or similar insulating materials at a point where a heated slab meets a foundation wall or other conductive slab.

1209.5.4 Thermal barrier material marking. Insulating materials utilized in thermal barriers shall be installed such that the manufacturer's R-value mark is readily observable upon inspection.

SECTION MC 1210 PLASTIC PIPE GROUND-SOURCE HEAT PUMP LOOP SYSTEMS

HYDRONIC PIPING

1210.1 Ground-source heat pump-loop water piping. Ground-source heat pump ground-loop piping and tubing material for water-based systems shall conform to the standards cited in this section.

1210.2 Used materials. Reused pipe, fittings, valves, and other materials shall not be permitted in ground-source heat pump loop systems.

1210.3 Material rating. Pipe and tubing shall be rated for the operating temperature and pressure of the ground-source heat pump loop system. Fittings shall be suitable for the pressure applications and recommended by the manufacturer for installation with the pipe and tubing material installed. Where used underground, materials shall be suitable for burial.

1210.4 Piping and tubing materials standards. Ground-source heat pump ground-loop pipe and tubing shall conform to the standards listed in Table 1210.4.

**TABLE 1210.4
GROUND-SOURCE LOOP PIPE**

MATERIAL	STANDARD (see Chapter 15)
Chlorinated polyvinyl chloride (CPVC)	ASTM D 2846; ASTM F 441; ASTM F 442
Cross-linked polyethylene (PEX)	ASTM F 876; ASTM F 877; CSA B137.5
Polyethylene/aluminum/polyethylene (PE-AL-PE) pressure pipe	ASTM F 1282; CSA B137.9
High-density polyethylene (HDPE)	ASTM D 2737; ASTM D 3035; ASTM F 714; AWWA C901; CSA B137.1; CSA C448; NSF 358-1
Polypropylene (PP-R)	ASTM F 2389; CSA B137.11
Polyvinyl chloride (PVC)	ASTM D 1785; ASTM D 2241
Raised temperature polyethylene (PE-RT)	ASTM F 2623

1210.5 Fittings. Ground-source heat pump pipe fittings shall conform to the standards listed in Table 1210.5 and, if installed underground, shall be suitable for burial.

**TABLE 1210.5
GROUND-SOURCE LOOP PIPE FITTINGS**

PIPE MATERIAL	STANDARD (see Chapter 15)
Chlorinated polyvinyl chloride (CPVC)	ASTM D 2846; ASTM F 437; ASTM F 438; ASTM F 439; CSA B137.6
Cross-linked polyethylene (PEX)	ASTM F 877; ASTM F 1807; ASTM F 1960; ASTM F 2080; ASTM F 2159; ASTM F 2434; CSA B137.5
Polyethylene/aluminum/polyethylene (PE-AL-PE)	ASTM F 1282; ASTM F 2434; CSA B137.9

High Density Polyethylene (HDPE)	ASTM D 2683; ASTM D 3261; ASTM F 1055; CSA B137.1; CSA C448; NSF 358-1
Polypropylene (PP-R)	ASTM F 2389; CSA B137.11
Polyvinyl chloride (PVC)	ASTM D 2464; ASTM D 2466; ASTM D 2467; CSA B137.2; CSA B137.3
Raised temperature polyethylene (PE-RT)	ASTM D 3261; ASTM F 1807; ASTM F 2159; CSA B137.1

1210.6 Joints. Joints and connections, other than those covered by Section 1210 and conforming to the ASTM standards listed therein, shall be of an approved type. Joints and connections shall be tight for the pressure of the ground-source loop system. Joints used underground shall be in accordance with manufacturer's instructions for buried applications.

1210.6.1 Joints between different piping materials. Joints between different piping materials shall be made with transition fittings compatible with both materials and the fluid contained within the system. Transition fittings must be used in accordance with manufacturer's instructions.

1210.6.1.1 Plastic-to-metal connections. Soldering on the metal portion of the system shall be performed not less than 18 inches (457.2 mm) from a plastic-to-metal adapter in the same water line.

1210.6.2 Preparation of pipe ends. Pipe shall be cut square, be reamed, and be free of burrs and obstructions. CPVC, PE, and PVC pipe shall be chamfered. Pipe ends shall have full-bore openings and shall not be undercut.

1210.6.3 Joint preparation and installation. Where required by Sections 1210.6.4 through 1210.6.6, the preparation and installation of mechanical and thermoplastic-welded joints shall comply with Sections 1210.6.3.1 and 1210.6.3.2.

1210.6.3.1 Mechanical joints. Mechanical joints shall be installed in accordance with the manufacturer's instructions.

1210.6.3.2 Thermoplastic-welded joints. Joint surfaces for thermoplastic-welded joints shall be cleaned by a procedure in accordance with the manufacturer's instructions. Joints shall be welded in accordance with the manufacturer's instructions.

1210.6.4 CPVC plastic pipe. Joints between CPVC plastic pipe or fittings shall be solvent-cemented or threaded joints complying with Section 1203.3.

†††**1210.6.5 Cross-linked polyethylene (PEX) plastic tubing.** Joints between cross-linked polyethylene plastic tubing and fittings shall comply with Section 1210.6.5.1. Mechanical joints shall comply with Section 1210.6.3.

1210.6.5.1 Compression-type fittings. Where compression-type fittings include inserts and ferrules or O-rings, the fittings shall be installed without omitting the inserts and ferrules or O-rings.

1210.6.6 Polyethylene plastic pipe and tubing for ground-source heat pump loop systems. Joints between polyethylene plastic pipe and tubing or fittings for ground-source heat pump loop systems shall be heat fusion joints complying with Section 1210.6.6.1, electrofusion joints complying with Section 1210.6.6.2, or stab-type insertion joints complying with Section 1210.6.6.3.

1210.6.6.1 Heat-fusion joints. Joints shall be of the socket-fusion, saddle-fusion or butt-fusion type, joined in accordance with ASTM D 2657. Joint surfaces shall be clean and free from moisture. Joint surfaces shall be heated to melt temperatures and joined. The joint shall be undisturbed until cool. Fittings shall be manufactured in accordance with ASTM D 2683 or ASTM D 3261.

1210.6.6.2 Electrofusion joints. Joints shall be of the electrofusion type. Joint surfaces shall be clean and free from moisture, and scoured to expose virgin resin. Joint surfaces shall be heated to melt temperatures for the

HYDRONIC PIPING

period of time specified by the manufacturer. The joint shall be undisturbed until cool. Fittings shall be manufactured in accordance with ASTM F 1055.

1210.6.6.3 Stab-type insert fittings. Joint surfaces shall be clean and free from moisture. Pipe ends shall be chamfered and inserted into the fittings to full depth. Fittings shall be manufactured in accordance with ASTM F 1924.

1210.6.7 Polypropylene (PP) plastic. Joints between PP plastic pipe and fittings shall comply with Sections 1210.6.7.1 and 1210.6.7.2.

1210.6.7.1 Heat-fusion joints. Heat-fusion joints for polypropylene (PP) pipe and tubing joints shall be installed with socket-type heat-fused polypropylene fittings, electrofusion polypropylene fittings or by butt fusion. Joint surfaces shall be clean and free from moisture. The joint shall be undisturbed until cool. Joints shall be made in accordance with ASTM F 2389.

1210.6.7.2 Mechanical and compression sleeve joints. Mechanical and compression sleeve joints shall be installed in accordance with the manufacturer's instructions.

1210.6.8 Raised temperature polyethylene (PE-RT) plastic tubing. Joints between raised temperature polyethylene tubing and fittings shall comply with Sections 1210.6.8.1 and 1210.6.8.2. Mechanical joints shall comply with Section 1210.6.3.

1210.6.8.1 Compression-type fittings. Where compression-type fittings include inserts and ferrules or O-rings, the fittings shall be installed without omitting the inserts and ferrules or O-rings.

1210.6.9 PVC plastic pipe. Joints between PVC plastic pipe and fittings shall be solvent-cemented or threaded joints comply with Section 1203.3.

1210.7 Shutoff valves. Shutoff valves shall be installed in ground-source loop piping systems in the locations indicated in Sections 1210.7.1 through 1210.7.7.

1210.7.1 Heat exchangers. Shutoff valves shall be installed on the supply and return side of a heat exchanger.

Exception: Shutoff valves shall not be required where heat exchangers are integral with a boiler; or are a component of a manufacturer's boiler and heat exchanger packaged unit and are capable of being isolated from the hydronic system by the supply and return valves required by Section 1005.1.

1210.7.2 Central systems. Shutoff valves shall be installed on the building supply and return of a central utility system.

1210.7.3 Pressure vessels. Shutoff valves shall be installed on the connection to any pressure vessel.

1210.7.4 Pressure-reducing valves. Shutoff valves shall be installed on both sides of a pressure-reducing valve.

1210.7.5 Equipment and appliances. Shutoff valves shall be installed on connections to mechanical equipment and appliances. This requirement does not apply to components of a ground-source loop system such as pumps, air separators, metering devices, and similar equipment.

1210.7.6 Expansion tanks. Shutoff valves shall be installed at connections to nondiaphragm-type expansion tanks.

1210.7.7 Reduced pressure. A pressure relief valve shall be installed on the low-pressure side of a hydronic piping system that has been reduced in pressure. The relief valve shall be set at the maximum pressure of the system design. The valve shall be installed in accordance with Section 1006.

1210.8 Installation. Piping, valves, fittings, and connections shall be installed in accordance with the conditions of approval.

1210.8.1 Protection of potable water. Where ground-source heat pump ground-loop systems have a connection to a potable water supply, the potable water system shall be protected from backflow in accordance with the *New York City Plumbing Code*.

1210.8.2 Pipe penetrations. Openings for pipe penetrations in walls, floors and ceilings shall be larger than the penetrating pipe. Openings through concrete or masonry building elements shall be sleeved. The annular space surrounding pipe penetrations shall be protected in accordance with the *New York City Building Code*.

1210.8.3 Clearance from combustibles. A pipe in a ground-source heat pump piping system having an exterior surface temperature exceeding 250°F (121.1°C) shall have a minimum clearance of 1 inch (25.4 mm) from combustible materials.

1210.8.4 Contact with building material. A ground-source heat pump ground-loop piping system shall not be in direct contact with building materials that cause the piping or fitting material to degrade or corrode, or that interfere with the operation of the system.

1210.8.5 Strains and stresses. Piping shall be installed so as to prevent detrimental strains and stresses in the pipe. Provisions shall be made to protect piping from damage resulting from expansion, contraction and structural settlement. Piping shall be installed so as to avoid structural stresses or strains within building components.

1210.8.6 Flood hazard. Piping located in a flood hazard area shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation.

1210.8.7 Pipe support. Pipe shall be supported in accordance with Section 305.

1210.8.8 Velocities. Ground-source heat pump ground-loop systems shall be designed so that the flow velocities do not exceed the maximum flow velocity recommended by the pipe and fittings manufacturer and shall be controlled to reduce the possibility of water hammer.

1210.8.9 Labeling and marking. Ground-source heat pump ground-loop system piping shall be marked with tape, metal tags or other method where it enters a building indicating "GROUND-SOURCE HEAT PUMP LOOP SYSTEM." The marking shall indicate any antifreeze used in the system by name and concentration.

1210.8.10 Chemical compatibility. Antifreeze and other materials used in the system shall be chemically compatible with the pipe, tubing, fittings, and mechanical systems.

1210.9 Makeup water. The transfer fluid shall be compatible with the makeup water supplied to the system.

1210.10 Tests. Before connection header trenches are backfilled, the assembled loop system shall be pressure tested with water at 100 psi (689.5 kPa) for 15 minutes, in which time there shall not be observed leaks. Flow and pressure loss testing shall be performed and the actual flow rates and pressure drops shall be compared to the calculated design values. If actual flow rate or pressure drop values differ from calculated design values by more than 10 percent, the cause shall be identified and corrective action taken.

1210.11 Embedded piping. Ground-source heat pump ground-loop piping to be embedded in concrete shall be pressure tested prior to pouring concrete. During pouring, the pipe shall be maintained at the proposed operating pressure. Embedded piping shall comply with Section 1209.

SECTION MC 1211 HIGH-PRESSURE STEAM AND HIGH TEMPERATURE HOT WATER PIPING SYSTEMS

1211.1 Scope. The provisions of this section shall apply to high-pressure steam piping system, which is defined as a system operating at a steam pressure of more than 15 psi (103.4 kPa), and high temperature water intended for operation at pressures in excess of 160 psi (1103.2 kPa) and temperatures in excess of 250°F (121.1°C). For purposes of this section, loops, bends or offsets of the piping shall not be considered expansion joints.

1211.2 New systems. For purposes of this section, the replacement of existing steam piping systems, the installation of a new system in existing buildings, as well as installations in buildings hereafter constructed, shall be considered to be new high-pressure steam piping systems. The following requirements are applicable:

1211.2.1 Design. The design of new steam piping systems shall be conducted as follows:

1. The system shall be designed by an engineer. An application and plans shall be filed and the approval of the department obtained. The plans and application shall contain, but not be limited to, the following information:
 - 1.1. Size and location of all steam piping.

HYDRONIC PIPING

- 1.2. The operating pressures and temperatures.
- 1.3. The location, type, specifications and details of all expansion joints.
- 1.4. The design, size, material and location of all anchors, guides and auxiliary steel, and the stresses thereon.
2. Systems using utility street steam shall be designed for a pressure of 200 psig (1379 kPa) and 413°F (211.7°C) up to and including the steam pressure reducing valve or valves which reduce the pressure of 90 psig (620.5 kPa) or below. For steam pressures between 90 psig (620.5 kPa) and 16 psig (110.3 kPa), the system shall be designed for 125 psig (861.8 kPa).
3. Steam distribution systems utilizing pressure reducing valves.
 - 3.1. Safety Shutoff Valves (SSO) to protect downstream piping from overpressure shall be allowed in lieu of a safety relief valve vented to the outdoors as required by Section 1006.6.
 - 3.2. SSO shall be designed to automatically close at or below the design pressure of the downstream piping system that is being protected, to provide positive shutoff against full upstream pressure. Manual reset shall be required to reopen the SSO.
 - 3.3. SSO shall be designed in accordance with the Steam Distribution Utility System requirements of the utility company having jurisdiction and ASME B31.1.
4. Bellows expansion joints shall not be utilized on high pressure steam piping.

Exception: Bellows expansion joints shall be permitted for final connection to equipment where readily accessible for inspection and service and within Mechanical Equipment Rooms.

1211.2.2 Installation. The installation of new steam piping systems shall be conducted as follows:

1. Installations, including any welding, shall be subject to special inspection.
2. Welders shall be qualified for all required pipe sizes, wall thicknesses and positions in accordance with the ASME *Boiler and Pressure Vessel Code*, Section IX. Requalification is required every five years or sooner if the commissioner has a specific reason to doubt a welder's ability to make acceptable welds.
3. Welder qualification testing shall be performed by an approved agency listed with the department, and the inspector witnessing the test shall be an authorized AWS Certified Welding Inspector. If the testing is by radiography, the test specimen shall be evaluated by personnel having a minimum radiography qualification of Level II in accordance with the ASNT, Document No. SNT-TC-1A, Supplement A. A successful radiographic test of a production weld made within the 6 months prior to requalification may be considered as an acceptable requalification test.
4. Copies of the certified welder qualification reports shall be maintained by the responsible welding agency and the company performing the welding, and shall be made available upon request to the department.
5. No reports from any welding inspection agency shall be accepted unless such agency has first requested and obtained approval from the department in accordance with rules of the department.
6. Pipe welding shall conform to the following:
 - 6.1. All piping over 2 inches (50.8 mm) shall be butt-welded. Piping 2 inches (50.8 mm) and under may be socket-welded or threaded, providing Schedule 80 piping is utilized.
 - 6.2. Threaded piping may continue to be used for existing construction in size of 6 inches (152.4 mm) and under.
 - 6.3. Where welding is not feasible, the commissioner may allow an acceptable alternative.
7. Radiographic examination, when required, shall be performed on butt-welds in accordance with ASME B31.1 based on the piping system design pressure and shall be as follows:

Piping System Design Pressure

Percentage

90 psig (620.5 kPa) or below

Not Required

91 psig (627.4 kPa) to

150 psig (1034.2 kPa)

10 at Random

Over 150 psig (1034.2 kPa)

100

However, if, in the opinion of the engineer responsible for special inspection, radiographic examination is not required for piping at pressure between 90 psig (620.5 kPa) and 150 psig (1034.2 kPa), the engineer shall so specify in writing, and the final report on the installation may omit the foregoing, and be predicated on all of the other requirements noted in this section, and a hydrostatic test.

1211.2.3 Testing. Hydrostatic testing shall be conducted on the completed installation at 150 percent of the design pressure for all piping pressure. Where the changes in an existing steam system involve less than 30 percent of the piping in the system, the testing may be in accordance with ASME B31.1.

1211.2.4 Relocation. The commissioner, where deemed necessary, shall require the replacement or relocation of any expansion joints, guides or anchors. The commissioner shall cause the expansion joints in potentially hazardous locations, such as those that are located adjacent to tenant occupied spaces, to be relocated, unless means exist or are provided for eliminating the hazard.

1211.3 Existing systems. Existing steam piping systems shall be in accordance with Sections 1211.3.1 through 1211.3.2. Upon the completion of a new high-pressure steam piping system and department approval of same, the rules relating to maintenance requirements and the keeping of records for existing high-pressure steam piping systems shall apply.

1211.3.1 Maintenance inspections. Expansion joints, anchorage and guides shall be inspected as follows:

1. Expansion joints shall be visually inspected monthly.
2. The anchorage and guides shall be visually inspected annually. Exposure of the structural attachments to the buildings of the anchorages or guides shall not be required.
3. A record of such inspections shall be kept by the person in charge of the mechanical equipment of the building or other qualified person designated by the owner and acceptable to the commissioner. The records shall be available at the premises and subject to inspection by the commissioner.

1211.3.2 Work approval. No joint, anchorage or guides shall be repaired, replaced or relocated without a work permit issued by the department. The application for the permit shall contain all pertinent information and shall be filed by an engineer knowledgeable as to high-pressure steam piping systems. The engineer shall be responsible for the special inspection of the proposed work in accordance with the approved application. This provision shall not apply to the repacking of a slip or ball joint; however, records of such repacking shall be kept in the inspection records as provided in Section 1211.3.1, Item 3. When, in the opinion of the engineer, the requirement for prior department approval would create an imminent health or safety hazard, the engineer may permit the work to proceed without prior approval. In such cases, the engineer shall, prior to the repair, replacement or relocation, notify by telephone the borough commissioner of the borough in which the building is located; and, if the emergency occurs at other than normal working hours, he or she shall notify the department in a manner prescribed by the commissioner. This shall be followed by the filing of the application for department approval as specified in Section 28-105.4.1 of the *Administrative Code*.