

## CHAPTER 13

# FUEL OIL PIPING AND STORAGE

### SECTION 1301 GENERAL

**1301.1 Scope.** This chapter shall govern the design, installation, construction and repair of fuel-oil storage and piping systems. The storage of fuel oil and flammable and combustible liquids shall be in accordance with Chapters 6 and 34 of the *International Fire Code*.

**1301.2 Storage and piping systems.** Fuel-oil storage systems shall comply with Section 603.3 of the *International Fire Code*. Fuel-oil piping systems shall comply with the requirements of this code.

**1301.3 Fuel type.** An appliance shall be designed for use with the type of fuel to which it will be connected. Such appliance shall not be converted from the fuel specified on the rating plate for use with a different fuel without securing reapproval from the code official.

**1301.4 Fuel tanks, piping and valves.** The tank, piping and valves for appliances burning oil shall be installed in accordance with the requirements of this chapter. When an oil burner is served by a tank, any part of which is above the level of the burner inlet connection and where the fuel supply line is taken from the top of the tank, an approved antisiphon valve or other siphon-breaking device shall be installed in lieu of the shutoff valve.

**1301.5 Tanks abandoned or removed.** All exterior above-grade fill piping shall be removed when tanks are abandoned or removed. Tank abandonment and removal shall be in accordance with Section 3404.2.13 of the *International Fire Code*.

### SECTION 1302 MATERIAL

**1302.1 General.** Piping materials shall conform to the standards cited in this section.

**1302.2 Rated for system.** All materials shall be rated for the operating temperatures and pressures of the system, and shall be compatible with the type of liquid.

**1302.3 Pipe standards.** Fuel oil pipe shall comply with one of the standards listed in Table 1302.3.

**1302.4 Nonmetallic pipe.** All nonmetallic pipe shall be listed and labeled as being acceptable for the intended application for flammable and combustible liquids. Nonmetallic pipe shall be installed only outside, underground.

**1302.5 Fittings and valves.** Fittings and valves shall be approved for the piping systems, and shall be compatible with, or shall be of the same material as, the pipe or tubing.

**1302.6 Bending of pipe.** Pipe shall be approved for bending. Pipe bends shall be made with approved equipment. The bend shall not exceed the structural limitations of the pipe.

**TABLE 1302.3  
FUEL OIL PIPING**

MATERIAL	STANDARD (see Chapter 15)
Brass pipe	ASTM B 43
Brass tubing	ASTM B 135
Copper or copper-alloy pipe	ASTM B 42; ASTM B 302
Copper or copper-alloy tubing (Type K, L or M)	ASTM B 75; ASTM B 88; ASTM B 280
Labeled pipe	(See Section 1302.4)
Nonmetallic pipe	ASTM D 2996
Steel pipe	ASTM A 53; ASTM A 106
Steel tubing	ASTM A 254; ASTM A 539

**1302.7 Pumps.** Pumps that are not part of an appliance shall be of a positive-displacement type. The pump shall automatically shut off the supply when not in operation. Pumps shall be listed and labeled in accordance with UL 343.

**1302.8 Flexible connectors and hoses.** Flexible connectors and hoses shall be listed and labeled in accordance with UL 536.

### SECTION 1303 JOINTS AND CONNECTIONS

**1303.1 Approval.** Joints and connections shall be approved and of a type approved for fuel-oil piping systems. All threaded joints and connections shall be made tight with suitable lubricant or pipe compound. Unions requiring gaskets or packings, right or left couplings, and sweat fittings employing solder having a melting point of less than 1,000°F (538°C) shall not be used in oil lines. Cast-iron fittings shall not be used. Joints and connections shall be tight for the pressure required by test.

**1303.1.1 Joints between different piping materials.** Joints between different piping materials shall be made with approved adapter fittings. Joints between different metallic piping materials shall be made with approved dielectric fittings or brass converter fittings.

**1303.2 Preparation of pipe ends.** All pipe shall be cut square, reamed and chamfered and be free of all burrs and obstructions. Pipe ends shall have full-bore openings and shall not be undercut.

**1303.3 Joint preparation and installation.** Where required by Sections 1303.4 through 1303.10, the preparation and

installation of brazed, mechanical, threaded and welded joints shall comply with Sections 1303.3.1 through 1303.3.4.

**1303.3.1 Brazed joints.** All joint surfaces shall be cleaned. An approved flux shall be applied where required. The joints shall be brazed with a filler metal conforming to AWS A5.8.

**1303.3.2 Mechanical joints.** Mechanical joints shall be installed in accordance with the manufacturer's instructions.

**1303.3.3 Threaded joints.** Threads shall conform to ASME B1.20.1. Pipe-joint compound or tape shall be applied on the male threads only.

**1303.3.4 Welded joints.** All joint surfaces shall be cleaned by an approved procedure. The joint shall be welded with an approved filler metal.

**1303.4 Brass pipe.** Joints between brass pipe or fittings shall be brazed, mechanical, threaded or welded joints complying with Section 1303.3.

**1303.5 Brass tubing.** Joints between brass tubing or fittings shall be brazed or mechanical joints complying with Section 1303.3.

**1303.6 Copper or copper-alloy pipe.** Joints between copper or copper-alloy pipe or fittings shall be brazed, mechanical, threaded or welded joints complying with Section 1303.3.

**1303.7 Copper or copper-alloy tubing.** Joints between copper or copper-alloy tubing or fittings shall be brazed or mechanical joints complying with Section 1303.3 or flared joints. Flared joints shall be made by a tool designed for that operation.

**1303.8 Nonmetallic pipe.** Joints between nonmetallic pipe or fittings shall be installed in accordance with the manufacturer's instructions for the labeled pipe and fittings.

**1303.9 Steel pipe.** Joints between steel pipe or fittings shall be threaded or welded joints complying with Section 1303.3 or mechanical joints complying with Section 1303.9.1.

**1303.9.1 Mechanical joints.** Joints shall be made with an approved elastomeric seal. Mechanical joints shall be installed in accordance with the manufacturer's instructions. Mechanical joints shall be installed outside, underground, unless otherwise approved.

**1303.10 Steel tubing.** Joints between steel tubing or fittings shall be mechanical or welded joints complying with Section 1303.3.

**1303.11 Piping protection.** Proper allowance shall be made for expansion, contraction, jarring and vibration. Piping other than tubing, connected to underground tanks, except straight fill lines and test wells, shall be provided with flexible connectors, or otherwise arranged to permit the tanks to settle without impairing the tightness of the piping connections.

## SECTION 1304 PIPING SUPPORT

**1304.1 General.** Pipe supports shall be in accordance with Section 305.

## SECTION 1305 FUEL OIL SYSTEM INSTALLATION

**1305.1 Size.** The fuel oil system shall be sized for the maximum capacity of fuel oil required. The minimum size of a supply line shall be 3/8-inch (9.5 mm) inside diameter nominal pipe or 3/8-inch (9.5 mm) OD tubing. The minimum size of a return line shall be 1/4-inch (6.4 mm) inside diameter nominal pipe or 5/16-inch (7.9 mm) outside diameter tubing. Copper tubing shall have 0.035-inch (0.9 mm) nominal and 0.032-inch (0.8 mm) minimum wall thickness.

**1305.2 Protection of pipe, equipment and appliances.** All fuel oil pipe, equipment and appliances shall be protected from physical damage.

**1305.2.1 Flood hazard.** All fuel oil pipe, equipment and appliances located in flood hazard areas shall be located above the design flood elevation or 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.

**1305.3 Supply piping.** Supply piping shall connect to the top of the fuel oil tank. Fuel oil shall be supplied by a transfer pump or automatic pump or by other approved means.

**Exception:** This section shall not apply to inside or above-ground fuel oil tanks.

**1305.4 Return piping.** Return piping shall connect to the top of the fuel oil tank. Valves shall not be installed on return piping.

**1305.5 System pressure.** The system shall be designed for the maximum pressure required by the fuel-oil-burning appliance. Air or other gases shall not be used to pressurize tanks.

**1305.6 Fill piping.** A fill pipe shall terminate outside of a building at a point at least 2 feet (610 mm) from any building opening at the same or lower level. A fill pipe shall terminate in a manner designed to minimize spilling when the filling hose is disconnected. Fill opening shall be equipped with a tight metal cover designed to discourage tampering.

**1305.7 Vent piping.** Liquid fuel vent pipes shall terminate outside of buildings at a point not less than 2 feet (610 mm) measured vertically or horizontally from any building opening. Outer ends of vent pipes shall terminate in a weatherproof vent cap or fitting or be provided with a weatherproof hood. All vent caps shall have a minimum free open area equal to the cross-sectional area of the vent pipe and shall not employ screens finer than No. 4 mesh. Vent pipes shall terminate sufficiently above the ground to avoid being obstructed with snow or ice. Vent pipes from tanks containing heaters shall be extended to a location where oil vapors discharging from the vent will be readily diffused. If the static head with a vent pipe filled with oil exceeds 10 pounds per square inch (psi) (69 kPa), the tank shall be designed for the maximum static head that will be imposed.

Liquid fuel vent pipes shall not be cross connected with fill pipes, lines from burners or overflow lines from auxiliary tanks.

## SECTION 1306 OIL GAUGING

**1306.1 Level indication.** All tanks in which a constant oil level is not maintained by an automatic pump shall be equipped with a method of determining the oil level.

**1306.2 Test wells.** Test wells shall not be installed inside buildings. For outside service, test wells shall be equipped with a tight metal cover designed to discourage tampering.

**1306.3 Inside tanks.** The gauging of inside tanks by means of measuring sticks shall not be permitted. An inside tank provided with fill and vent pipes shall be provided with a device to indicate either visually or audibly at the fill point when the oil in the tank has reached a predetermined safe level.

**1306.4 Gauging devices.** Gauging devices such as liquid level indicators or signals shall be designed and installed so that oil vapor will not be discharged into a building from the liquid fuel supply system.

**1306.5 Gauge glass.** A tank used in connection with any oil burner shall not be equipped with a glass gauge or any gauge which, when broken, will permit the escape of oil from the tank.

## SECTION 1307 FUEL OIL VALVES

**1307.1 Building shutoff.** A shutoff valve shall be installed on the fuel-oil supply line at the entrance to the building. Inside or above-ground tanks are permitted to have valves installed at the tank. The valve shall be capable of stopping the flow of fuel oil to the building or to the appliance served where the valve is installed at a tank inside the building.

**1307.2 Appliance shutoff.** A shutoff valve shall be installed at the connection to each appliance where more than one fuel-oil-burning appliance is installed.

**1307.3 Pump relief valve.** A relief valve shall be installed on the pump discharge line where a valve is located downstream of the pump and the pump is capable of exceeding the pressure limitations of the fuel oil system.

**1307.4 Fuel-oil heater relief valve.** A relief valve shall be installed on the discharge line of fuel-oil-heating appliances.

**1307.5 Relief valve operation.** The relief valve shall discharge fuel oil when the pressure exceeds the limitations of the system. The discharge line shall connect to the fuel oil tank.

## SECTION 1308 TESTING

**1308.1 Testing required.** Fuel oil piping shall be tested in accordance with NFPA 31.



## CHAPTER 14

# SOLAR SYSTEMS

### SECTION 1401 GENERAL

**1401.1 Scope.** This chapter shall govern the design, construction, installation, alteration and repair of systems, equipment and appliances intended to utilize solar energy for space heating or cooling, domestic hot water heating, swimming pool heating or process heating.

**1401.2 Potable water supply.** Potable water supplies to solar systems shall be protected against contamination in accordance with the *International Plumbing Code*.

**Exception:** Where all solar system piping is a part of the potable water distribution system, in accordance with the requirements of the *International Plumbing Code*, and all components of the piping system are listed for potable water use, cross-connection protection measures shall not be required.

**1401.3 Heat exchangers.** Heat exchangers used in domestic water-heating systems shall be approved for the intended use. The system shall have adequate protection to ensure that the potability of the water supply and distribution system is properly safeguarded.

**1401.4 Solar energy equipment and appliances.** Solar energy equipment and appliances shall conform to the requirements of this chapter and shall be installed in accordance with the manufacturer's installation instructions.

**1401.5 Ducts.** Ducts utilized in solar heating and cooling systems shall be constructed and installed in accordance with Chapter 6 of this code.

### SECTION 1402 INSTALLATION

**1402.1 Access.** Access shall be provided to solar energy equipment and appliances for maintenance. Solar systems and appurtenances shall not obstruct or interfere with the operation of any doors, windows or other building components requiring operation or access.

**1402.2 Protection of equipment.** Solar equipment exposed to vehicular traffic shall be installed not less than 6 feet (1829 mm) above the finished floor.

**Exception:** This section shall not apply where the equipment is protected from motor vehicle impact.

**1402.3 Controlling condensation.** Where attics or structural spaces are part of a passive solar system, ventilation of such spaces, as required by Section 406, is not required where other approved means of controlling condensation are provided.

**1402.4 Roof-mounted collectors.** Roof-mounted solar collectors that also serve as a roof covering shall conform to the requirements for roof coverings in accordance with the *International Building Code*.

**Exception:** The use of plastic solar collector covers shall be limited to those approved plastics meeting the requirements for plastic roof panels in the *International Building Code*.

**1402.4.1 Collectors mounted above the roof.** When mounted on or above the roof covering, the collector array and supporting construction shall be constructed of noncombustible materials or fire-retardant-treated wood conforming to the *International Building Code* to the extent required for the type of roof construction of the building to which the collectors are accessory.

**Exception:** The use of plastic solar collector covers shall be limited to those approved plastics meeting the requirements for plastic roof panels in the *International Building Code*.

**1402.5 Equipment.** The solar energy system shall be equipped in accordance with the requirements of Sections 1402.5.1 through 1402.5.4.

**1402.5.1 Pressure and temperature.** Solar energy system components containing pressurized fluids shall be protected against pressures and temperatures exceeding design limitations with a pressure and temperature relief valve. Each section of the system in which excessive pressures are capable of developing shall have a relief device located so that a section cannot be valved off or otherwise isolated from a relief device. Relief valves shall comply with the requirements of Section 1006.4 and discharge in accordance with Section 1006.6.

**1402.5.2 Vacuum.** The solar energy system components that are subjected to a vacuum while in operation or during shutdown shall be designed to withstand such vacuum or shall be protected with vacuum relief valves.

**1402.5.3 Protection from freezing.** System components shall be protected from damage by freezing of heat transfer liquids at the lowest ambient temperatures that will be encountered during the operation of the system.

**1402.5.4 Expansion tanks.** Liquid single-phase solar energy systems shall be equipped with expansion tanks sized in accordance with Section 1009.

**1402.6 Penetrations.** Roof and wall penetrations shall be flashed and sealed to prevent entry of water, rodents and insects.

**1402.7 Filtering.** Air transported to occupied spaces through rock or dust-producing materials by means other than natural convection shall be filtered at the outlet from the heat storage system.

### SECTION 1403 HEAT TRANSFER FLUIDS

**1403.1 Flash point.** The flash point of the actual heat transfer fluid utilized in a solar system shall be not less than 50°F