TABLE 5-2

Expansion Tank Capacities for Gravity Hot Water Systems

Based on a two-pipe system with an average operating water temperature of 77ºC, using cast-iron column radiation with a heat emission rate of 473W/m^2 equivalent direct radiation.

m^2 of Installed Expansion Direct Radiation[1]	Tank Capacity, L
Up to 33	68
Up to 42	80
Up to 60	91
Up to 84	114
Up to 102	133
Up to 130	151
Up to 149	8 to 134
Up to 167	8 to 134
Up to 186	8 to 133
Up to 223	8 to 151

Note:

[1] For systems with more than 223m^2 of installed equivalent direct water radiation, the required capacity of the cushion tank shall be increased on the basis of 3.8L tank capacity per 3m^2 of additional equivalent direct radiation.

SI: 1m^2 = 10.8 $ft.^2$; 1L= 0.23 gal.; 1.8ºC + 32 = ºF

1W/m^2 = 150 Btu/$ft.^2$; 1m^2 = 10.76 $ft.^2$

TABLE 5-3

Expansion Tank Capacities for Forced Hot Water Systems

Based on an average operating water temperature of 91ºC, a fill pressure of 0.8bar, and a maximum operating pressure of 2bar.

System Volume,[1] L	Tank Capacity, L
379	57
757	114
1,136	170
1,514	227
1,893	284
3,785	568
7,570	1,136

Note:

[1] Includes volume of water in boiler, radiation, and piping, not including expansion tank.

SI: 1L = 0.22 gal.; 1bar = 14.5 psi; 1.8ºC + 32 = ºF

509.0 Thermal Insulation.

509.1 General. Piping and storage tanks shall be insulated according to this chapter to minimize heat loss. Piping need not be insulated when exposed in conditioned spaces, and the heat loss from such piping does not otherwise contribute to the heating or cooling load within such space. Minimum pipe insulation shall be provided in accordance with Table 5-4.

509.2 Finish. Insulation shall be finished with a jacket or facing with the laps sealed with adhesives or staples so as to secure the insulation on the pipe. Insulation exposed to the weather shall be weather-proofed in accordance with standard practices acceptable to the Authority Having Jurisdiction. In lieu of jackets, molded insulation shall be permitted to be secured with 16 gauge galvanized wire ties not exceeding 23cm (9 in.) on center.

509.3 Tanks. Tanks shall have a minimum thickness of insulation not less than values shown in Table 5-5 or equivalent.

509.4 Temperature Difference. Temperature difference shall be calculated as the difference between the design operating temperature of the tank and the design temperature of the surrounding air or soil during the operating season. When engineering data is not available, assume 38°C (100°F) indoors and 66°C (150°F) outdoors for water and space heating and 66°C (150°F) for air-conditioning.

509.5 Insulation. Coverings and insulation used for hot water pipes shall be of material suitable for the operating temperature of the system. The insulation, jackets, and lap-seal adhesives, including pipe coverings and linings, shall have a flame spread index not exceeding 25 and a smoke-developed index not exceeding 50 when tested in accordance with NFPA 255, *Method of Test of Burning Characteristics of Building Materials*; ASTM E 84, *Surface Burning Characteristics of Building Materials*; UL 723, *Test for Surface Burning Characteristics of Building Materials* or equivalent International Standard(s) approved by the Authority Having Jurisdiction. The specimen preparation and mounting procedures of ASTM E 2231, *Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics* or equivalent International Standard(s) approved by the Authority Having Jurisdiction shall be used. Alternately, materials used for pipe coverings and insulation (including the insulation, jacket, and lap-seal adhesives) shall have a maximum peak heat release rate of 300kW (47,390 Btu), a maximum total heat release of 14kWh (1,024,000 Btu), a maximum total smoke release of 500m^2 (5,382 $ft.^2$) and shall not generate flames that extend 30cm (1 ft.) or more above the top of the vertical portion of the apparatus at any time during the test when tested in accordance with NFPA 274, *Standard Test Method to Evaluate Fire Performance Characteristics of Pipe*