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CHAPTER 50

Hot Water Supply

Hot Water Supply Piping, Storage Capacity and Heating Load, Methods of Heating Water, Computing Grate and Coil Surface Areas, Controls, Solar Water Heaters, Friction Loss

IN computing the total heating load for a building, it is important to allow ample boiler capacity for heating the hot water supply. The amount of warm water used in any large building is variable, depending on the type of structure, usage, occupancy and time of day. It is necessary to provide the piping, water heating and storage facilities of sufficient capacity to meet the peak demand without wasteful excess in equipment cost.

The determination of the amount of water used in residences has been well established over a period of time and as a result, reliable factors for water consumption are available. Tests have been made of the amount of water required by standard fixtures in normal use with water at ordinary pressures so that this information permits a fairly correct basis of design.

HOT WATER SUPPLY PIPING

As a result of investigations conducted at the *National Bureau of Standards*, basic design principles have been outlined for the design of the hot and cold water supply piping requirements in a plumbing system[1].

It is common practice to provide circulating piping in all hot water supply systems in which it is desirable to have hot water available continuously at the fixtures. In average sized and small residences and systems, in which the piping from the heater to the fixtures is short, return circulating piping is generally omitted in order to reduce installation cost and to reduce heat loss from the piping, particularly during periods of no water demand.

The hot water supply may be distributed by either an up-feed or down-feed piping system. Three common methods of arranging the circulating lines are shown in Fig. 1. Although the diagrams apply to multi-story buildings the arrangements (*a*) and (*b*) are sometimes used in residential designs.

A check valve should be provided in the run-out from each return riser to prevent temporary reversal of flow in the piping when a faucet is open. Proper air venting of a circulating system is extremely important, particularly if gravity circulation is employed. In Fig. 1 (*a*) and (*b*) this is accomplished by connecting the circulating line below the top fixture supply. With this arrangement, air is eliminated from the system each time the top fixture is opened.

Where an overhead supply main is located above the highest fixture as in Fig. 1 (*c*), an automatic float type air vent is installed at the highest point of the system or a fixture branch is connected to the top of the main where air venting is desired and then dropped to the fixture outlet.

It is sometimes necessary to make an allowance for pressure drop through the heater when sizing hot water lines, particularly where instantaneous hot water heaters are used and the available pressure is low.