

supply fixtures must have these returns carried down to the basement from the termination of the supply riser at whatever level it may end.

All risers, both hot and cold, should be valved at the main with an extra check valve on the hot water return circulation so that the risers may be cut off and repaired when necessary without disturbing the service in the remainder of the system.

HOT WATER SUPPLY

Having designed the service hot water piping, the next step is to furnish

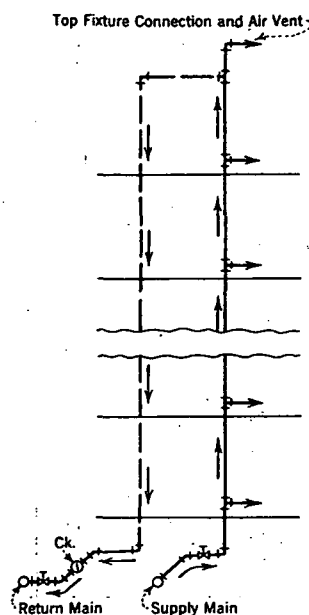


FIG. 7. SUPPLY AND RETURN MAIN CONNECTIONS FOR HOT WATER SUPPLY SYSTEM

some means of heating the water and in this respect it is necessary to pass from the maximum probable flow to the *maximum probable hourly demand*, which is quite different. If an instantaneous heater were used, it would require adequate capacity to provide for the heating of the water as fast as it is drawn and a heater of this type should be sized on the basis of the maximum probable flow with the accompanying heavy drafts on the heating device and with intervals of no draft at all. To balance these inequalities of flow the storage-type heater is often utilized so that the water demand can be heated during periods of light demand and stored up for use during the periods of heavy demand. The total water consumption per person usually varies between 100 and 150 gal per day when

laundry and culinary operations for the occupants are carried out on the same premises. The maximum hourly demand under these conditions will be found to be about one-tenth of the average daily consumption.

If one-third of the total water used is hot water and 125 gal per day is assumed as a fair average of consumption per person, it is apparent that each person uses about 40 gal of hot water per day. If one-tenth of this represents the peak hourly load, then 4 gph must be allowed per person for the heaviest demand. If the average occupancy of apartments is 3 persons, the peak hour demand per apartment will be about 12 gph. It is customary to allow 10 gph of heating capacity per apartment. Water in excess of this heating capacity drawn out during the peak hours is provided for by storage in the hot water tank where this water is heated during hours when the demand is below the average.

HOT WATER STORAGE

The amount of storage provided in the hot water tank or heater is somewhat a matter of choice but is usually made ample to carry over the peak shortage which is likely to occur and is based on the assumption that only 75 per cent of the storage capacity will be available, as it has been found that if more than this amount is withdrawn from storage, the tank is so cooled down as to make the balance useless. The general rule may be cited that the less the heating capacity the greater must be the storage, and the greater the storage the less may be the heating capacity down to a point where the heating capacity will fail to be sufficient to heat up the tank storage during the periods of small load.

Example 5. A heater to supply 500 persons will have an average daily use of about

$$500 \times 40 \text{ gal} = 20,000 \text{ gal}$$

and this is an average of

$$\frac{20,000 \text{ gal}}{24} = 833 \text{ gph}$$

but the peak hour will require

$$\frac{1}{10} \text{ of } 20,000 = 2,000 \text{ gal}$$

and the shortage during the peak hour, if the heating capacity is made to suit the average hourly use of 833 gal, will be

$$2,000 - 833 = 1167 \text{ gal}$$

so that the storage capacity, based on 75 per cent being available from this capacity without cooling the tank excessively, will be

$$\frac{1167}{0.75} = 1556 \text{ gal}$$

Should it be desired to reduce the size of storage tanks and to use a greater heating capacity, it is only necessary to increase the heating capacity to say 1200 gph which then gives

$$2,000 - 1200 = 800 \text{ gal}$$

as the shortage during the peak hour, and the necessary storage will be

$$\frac{800 \text{ gal}}{0.75} = 1067 \text{ gal};$$

or the heating capacity can be increased to 1500 gal, leaving a shortage of

$$2000 - 1500 = 500 \text{ gal}$$