

them extra heavy galvanized pipe, since corrosion is very rapid. A 2-in. vent line will carry several sterilizers. In climates where freezing weather often occurs it is necessary to make the vents at least 4 in. in size through the roof to avoid frosting over.

Care must be taken to see that the bases or heels of vent lines from sterilizer equipment are drained through suitable traps into the waste lines of the plumbing system, to take care of condensation which might otherwise cause a nuisance by draining back into the sterilizer.

Closed, or pressure-type sterilizers, both jacketed and otherwise, each require a vent to the atmosphere connected to the chamber and provided with a valve. The relief valve, with which every closed sterilizer must be provided, usually is connected to this vent line on the line-side of the control valve. These vents are generally $\frac{3}{4}$ in. from each sterilizer, but the vent lines, after the wall or floor is reached, are made $1\frac{1}{4}$ in.; the bases or heels of the vent pipes must be dripped into the plumbing system and the vents should be carried through the roof separately just as described for open sterilizers.

Some sterilizers are provided with exhaust condensers, which use cold water to condense the surplus steam. They should never be connected with the plumbing system without an air break, usually a funnel, with a $1\frac{1}{4}$ -in. outlet and a trap.

The water connection to the exhaust condenser usually is $\frac{1}{2}$ in.

REFERENCE

Selecting and Operating Laundry, Kitchen and Hospital Equipment, By H. C. Russell (JOURNAL, A. S. H. V. E., December, 1928, p. 847).

CHAPTER 23

WATER SUPPLY PIPING FOR BUILDINGS

Hot and Cold Water Supply; Riser, Main, and Connection Sizes.

THE water supply formulae herewith make it possible accurately to compute the flow of water in gallons or cubic feet through any pipe with any friction head. The formula is also given for the additional head due to water entering the main. If extremely accurate calculations are necessary, this head should be added to the head required for friction; generally, however, it can be neglected as it is comparatively small.

WATER SUPPLY FORMULAE

CF = cubic feet per minute discharged.

G = gallons per minute discharged.

H = friction head of water in feet = pressure $\times 2.31$; if water is raised vertically, deduct number of feet raised, from head due to pressure.

L = length of pipe in feet—including horizontal and vertical runs.

$$CF = 0.16 \sqrt{\frac{(3d)^5 \times 3 \cdot H}{L}} \quad (1) \quad G = 1.2 \sqrt{\frac{(3d)^5 \times 3 \cdot H}{L}} \quad (2)$$

$$H = \frac{(CF)^2 \times L}{0.0768 (3d)^5} \quad (3) \quad H = \frac{(G)^2 \times L}{4.32 (3d)^5} \quad (4)$$

These formulae neglect the head due to entry, which need not be computed except when L is very short. H_1 = head due to entry in feet.

$$H_1 = \left(\frac{0.83 G}{d^5 \times 13} \right)^2 \text{ or } H_1 = \left(\frac{6.25 CF}{d^5 \times 13} \right)^2$$

Example: Required the discharge of a 2-in. main with pressure 30 lb. 100 ft. horizontal run and 30 ft. vertical run.

$$H = 30 \times 2.31 - 30 = 39.3. \quad \text{Formula (2) } G = 1.2 \sqrt{\frac{(3 \times 2)^5 \times 3 \times 39.3}{100 + 30}} = 100.8 \text{ gallons per minute.}$$

$$\text{In this case the head due to entry would be } H_1 = \left(\frac{0.83 \times 100.8}{2 \times 2 \times 13} \right)^2 = 2.56 \text{ ft.}$$

Usually this can be neglected except for very close calculations.

Friction caused by elbows should be added to straight pipe friction. Each elbow in a line will add friction equal to a length of straight pipe forty times the diameter of the pipe:

Pipe Size.....	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4
Equivalent length of straight pipe in feet.....	2.5	3.3	4.1	5	6.7	8.3	10	11.7	13.3