

large ranges a properly designed hot-water plant and a properly designed steam system would be equally economical, but the first cost of hot water is very much above the first cost of steam. In very large ranges vacuum steam heating is frequently used. This permits the use of smaller mains, smaller return connections and has the advantage of quick circulation, and immediately responds to sudden demands.

CHAPTER V

WATER SUPPLY SYSTEMS AND PIPING

THE lack of data upon which to base water pipe sizes for plumbing fixtures, branches and mains is probably due to the great number of variables which enter into their proper determination.

Plumbing fixtures in common use, having what is known as good water flow, deliver the quantities of water per outlet as given in Table 53.

TABLE 53. COLD WATER BRANCH SUPPLY SIZES FOR FIXTURES AND MAXIMUM FLOW IN GALLONS PER MINUTE

	NUMBER OF FIXTURES									
	1	2	4	8	12	16	24	32	40	
Water Closets—										
Gal. per Min.....	8	16	24	48	60	80	96	128	150	Tanks
Pipe Size.....	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	2	2	2	
Gal. per Min.....	30	50	80	120	140	160	200	250	300	Flush
Pipe Size.....	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	2	2	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	Valves
Urinals—										
Gal. per Min.....	6	12	20	32	42	56	72	90	120	Tanks
Pipe Size.....	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	2	2	2	
Gal. per Min.....	25	37	45	75	85	100	125	150	175	Flush
Pipe Size.....	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{3}{4}$	2	2	2	2	Valves
Lavatories and Wash Sinks—										
Based upon Each Faucet										
Gal. per Min.....	4	8	12	24	30	40	48	64	75	
Pipe Size.....	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{4}$	1	1	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{1}{2}$	
Bath Tubs—										
Gal. per Min.....	15	30	40	80	96	112	144	192	240	
Pipe Size.....	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	2	2	$2\frac{1}{4}$	$2\frac{1}{2}$	
Shower Baths—										
Gal. per Min.....	8	16	32	64	96	128	192	256	320	8" rain
Pipe Size.....	$\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{4}$	$1\frac{1}{2}$	2	2	$2\frac{1}{4}$	$2\frac{1}{2}$	3	Head
Acid and Slop Sinks, Manufacturing,										
Kitchen and Laundry—										
Gal. per Min.....	15	25	40	64	84	96	120	150	200	per bibb
Pipe Size.....	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	2	2	2	$2\frac{1}{4}$	per bibb

Note.—The above sizes are based upon a pressure drop of 30 lb. per 100 ft.

In estimating risers and mains, the number of gallons for W. C. and urinals where flush valves are used are to be as given for tanks when the number of flush valves fed by any one main or riser is 8 or more and below this number the quantity is to be determined by adding 20 per cent to the tabular quantity for one flush valve for each succeeding flush valve, up to the quantity given in this table for 8 tanks.

The hot water faucets are to be disregarded when estimating cold water risers and mains, except for those carrying the cold water supply to hot water generators.

Water flowing in pipes is retarded by friction, the extent of which depends upon the velocity, which is the cause of unsatisfactory service when pipes are too small. The amount of head necessary to overcome this friction is known as the friction head, which is usually expressed in feet. It is also known as pressure drop, usually expressed in lbs. per sq. in. per 100 ft. of pipe. The total pressure needed to discharge a given

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