

of hot water made is overhead, where it is not required, and in order to heat the floor coils from end to end, and it is impossible to heat them evenly from end to end, a little larger fire must be maintained than would be necessary if the coils were in two rows, i.e., going and coming, flows and returns under the benches.

With gravity hot water heating, boilers should always be in pits. The use of overhead mains never makes up for lack of depth of boiler pit.

CHAPTER VI

PIPING FOR WATER SUPPLY SYSTEMS

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 1.

TABLE 1. 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	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{1}{2}$	2	2		
Gal. per Min.....	25	37	45	75	85	100	125	150	175	Flush	
Pipe Size.....	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{1}{2}$	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	$2\frac{1}{2}$	$2\frac{1}{2}$		
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	$2\frac{1}{2}$	$2\frac{1}{2}$	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	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{1}{2}$	2	2	2	$2\frac{1}{2}$	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.

The hot water faucets are to be disregarded when estimating cold water risers and mains.

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 lb. per sq. in. per 100 ft. of pipe. The total pressure needed to discharge a given

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