

SIZING AN UP-FEED RISER

When the riser is an up-feed, the opposite condition occurs; that is, there is a drop in pressure as the top of the riser is approached, due to the natural reduction in the gravity pressure, and to this must be added the pipe friction plus that introduced by the pipe fittings, all of which produce an excessive drop when compared to the conditions existing with a down-feed riser.

To size an up-feed riser the minimum pressure of the street main, or other source of supply, should be ascertained and from this should be subtracted the pressure to be maintained at the highest fixture, namely, 15 lb per square inch, plus the height in feet above the source of water pressure, multiplied by 0.43 to change from feet of head to pounds of pressure. The total length of run from the source of pressure to the farthest and highest fixture should be ascertained, and this should be changed to equivalent length of run to allow for the loss occasioned by

TABLE 3. APPROXIMATE ALLOWANCES FOR FITTINGS AND VALVES IN FEET OF STRAIGHT PIPE

SIZE OF PIPE (INCHES)	TYPE OF FITTING OR VALVE					
	90-Deg Elbow	45-Deg Elbow	Return Bend	Gate Valve	Globe Valve	Angle Valve
1/2	4	3	8	2	48	8
3/4	5	3	10	3	60	10
1	5	3	10	3	60	10
1 1/4	6	4	12	3	72	12
1 1/2	7	5	14	4	84	14
2	7	5	14	4	84	14
2 1/2	10	7	20	5	120	20
3	12	8	24	6	144	24
4	18	13	36	9	216	36
5	25	18	50	13	300	50
6	30	21	60	15	360	60

the pipe fittings. Table 3 gives the additional lengths necessary to allow for the various fittings and valves. The drop allowable in pressure per 100 ft of run may then be obtained by multiplying the surplus pressure (over that required for the gravity head and to supply 15 lb at the fixture) by 100 and by dividing this by the equivalent length of run to the farthest or highest fixture.

Where street water pressures are available the pressure drop through the meter and service pipe must be taken into consideration. Table 4 shows the pressure loss through meters. It also gives the minimum sizes of recommended service and maximum meter deliveries.

Example 2. Assume a street pressure of 60 lb, the height of the highest fixture 50 ft, and the length of the longest run 200 ft. Without knowing the additional length of pipe to be added for the fittings it will be assumed that this is about 100 ft. The surplus pressure which will be available for pressure drop will then be 60 lb - (15 lb + 50 ft × 0.43 lb) = 60 lb - (15 lb + 21.5 lb) = 23.5 lb.

To change this into drop per 100 ft: $\frac{23.5 \text{ lb} \times 100}{200 \text{ ft} + 100 \text{ ft}} = 7.8 \text{ lb per 100 ft.}$

The pipe may then be sized from the maximum probable flow by selecting a size that does not give a drop in excess of 7.8 lb per 100 ft.

It will be seen from Example 2 that it is impossible to size up-feed risers without determining the drop allowable in both the horizontal feed mains and the toilet room branches. Having once ascertained this allowable drop, it is simply a matter of applying it throughout the system.

TABLE 4. PRESSURE LOSS THROUGH WATER DISC METERS^a
A. W. W. A. Standards

RATE OF FLOW GPM	APPROX. PRESSURE LOSS THROUGH METERS, LB PER SQ IN. PIPE SIZE (IN.)						
	1/2	3/4	1	1 1/4	2	3	4
5	1.5	0.5	0.2				
10	6.0	2.0	1.0	0.2			
15	14.0	5.0	2.0	0.6	0.2		
20	25.0	9.0	3.5	1.0	0.4		
25		13.5	5.5	1.5	0.6		
30		19.5	8.0	2.0	0.9		
35			11.0	3.0	1.0		
40			14.0	4.0	1.5		
45			18.0	5.0	2.0		
50			22.0	6.0	2.5	0.7	
75				14.0	5.5	1.5	
100				25.0	10.0	2.8	1.0
125					15.0	4.0	1.5
150					22.0	6.0	2.2
175						8.0	3.0
200						10.4	4.0
250							16.0
300							23.0
350							
400							
500							6.5
600							9.0
800							16.0
1000							25.0

MINIMUM SIZE OF SERVICE RECOMMENDED						SAFE MAXIMUM DELIVERY OF METERS	
RATE OF FLOW GPM	APPROX. MINIMUM PIPE SIZE OF SERVICE, MAIN TO METER (IN.) MAXIMUM LENGTH (FT)					METER SIZE IN.	CAPACITY, GPM BASED ON 25 LB LOSS THROUGH METER
	30	75	100	150	200		
1-20	3/4	3/4	1	1	1	3/8	20
20-30	3/4	1	1	1 1/2	1 1/2	3/4	34
30-50	1	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	53
50-100	1 1/2	1 1/2	2	2	2	2	100
100-150	1 1/2	2	2	2 1/2	2 1/2	3	160
						6	315
						8	500
							1000

^aPressure loss through compound and current meters are less than shown in table. For exact information consult manufacturers.