

quantity of water is the pressure necessary to overcome friction in the pipes (when horizontal) plus the static pressure when the discharge is higher than the supply.

Table 56, column 1, gives the vertical rise in feet to any fixture up to 150 ft. in height; column 2, gives the static head in lb. per sq. in. corresponding with the vertical rise.

The underlying principle involved in determining the proper pipe sizes for mains, risers and branches is to so regulate the size of these pipes that they will carry the maximum amount of water required of them and absorb by friction and static head, all the pressure at the source and still deliver water at the fixture in sufficient quantity but at a pressure practically equalling zero or slightly above except that due to velocity of flow through the fixture.

Table 53 gives the amount of water in gallons which should flow per minute for the number of fixtures indicated of each different type, together with the branch pipe size necessary to carry this amount of water with a pressure drop of 30 lb. per 100 ft. of run.

The volume of water required per fixture is reduced as the number of fixtures in each group is increased, to take care of the factor of probable use.

In estimating the pipe size for any part of a riser in a building of several stories, take 60 per cent of the water to be used on any floor and all floors above as determined from Table 53 and deduct 10 per cent for each floor above. This reduction in estimated amount is to take care of probable use. Thus, if 100 gallons are used on each floor of a 10-story building the size or pipe will be determined as in Table 54:

TABLE 54. WATER RISERS FOR MANUFACTURING BUILDINGS, LOFT BUILDINGS, APARTMENT HOUSES, HOTELS

	G. P. M.	G. P. M.	PIPE SIZE WITH DROP PER 100 FT. RUN		
			5 lb.	10 lb.	20 lb.
10th Floor	100 x 0.60	60% = 60	2"	2"	1½"
10 and 9	200 x 0.60	90% = 108	2½"	2½"	1½"
10 and 9 and 8	300 x 0.60	80% = 144	3"	2½"	2"
10 to 7 incl.	400 x 0.60	70% = 168	3½"	3"	2½"
10 " 6 "	500 x 0.60	60% = 180	3½"	3"	2½"
10 " 5 "	600 x 0.60	50% = 180	3½"	3"	2½"
10 " 4 "	700 x 0.60	40% = 180	3½"	3"	2½"
10 " 3 "	800 x 0.60	40% = 192	3½"	3"	2½"
10 " 2 "	900 x 0.60	40% = 216	3½"	3"	2½"
10 " 1 "	1000 x 0.60	40% = 240	3½"	3"	2½"

Note.—For residences, use Table 53, and for the main supply use 25 per cent of total of gallons used by fixtures and then take pipe size from Table 55 on a basis of 10 lb. pressure drop per 100 ft. or less if water supply pressure is less than 50 lb.

The pressure drop of 30 lb. per 100 ft. of run will give satisfactory results for branches on the top floor but a higher pressure drop can be used on floors below corresponding with the pressures as given in Table 55 which show that for a building 100 ft. in height, a pressure drop of 100 lb. can be used on the fixture lowest branches and that for a building 50 ft. in height, a pressure drop of 52 lb. can be used on the lowest fixture branches; Table 53, however, can be used with safety on any of the floors

but will give pipe sizes larger than necessary for the lower floors in a very tall building.

Table 55 gives the amount of water in gallons which may be passed through pipes of ¾ in. to 4 in. diameter with pressure drop from 5 lb. to 150 lb. per 100 ft. of run. This table may be used in sizing horizontal and vertical mains.

For example, if the water main pressure available is known, say 90 lb., and the horizontal run from water main to vertical riser is 100 ft., and the vertical riser is 100 ft. to top branch; it will require 43.31 lb. for static head (see Table 56), and 15 lb. pressure at a minimum should be allowed for the uppermost fixture or a total of 58.31 lb. which would leave available for friction 90—58.31=31.69 for friction in 200 ft. run, or 8.34 lb. per 100 ft. The main can thus be sized from the 7 lb. pressure drop of Table 55.

TABLE 54-A. APARTMENT HOUSE SUPPLY RISERS

Based upon One, Two, and Three Baths per Apartment

ONE (1) BATH APARTMENT		TWO (2) BATH APARTMENT		THREE (3) BATH APARTMENT	
1 bath	15 gals.	2 baths	24 gals.	3 baths	30 gals.
1 W. C.	8 gals.	2 W. C.	14 gals.	3 W. C.	18 gals.
1 sink	4 gals.	1 sink	4 gals.	1 sink	4 gals.
1 lav.	4 gals.	2 lavs.	6 gals.	3 lavs.	9 gals.
	31 gals.		48 gals.		61 gals.
50% demand—15 gals. per min.		40%—20 gals. per min.		40%—24 gals. per min.	
	Riser		Riser		Riser
Top Floor	15 gals. 1½"	20 gals. 1½"	24 gals. 1½"		
Next	28 " 1½"	38 " 1½"	43 " 2"		
"	38 " 1½"	54 " 2"	64 " 2"		
"	51 " 2"	68 " 2"	82 " 2"		
"	60 " 2"	80 " 2"	96 " 2½"		
"	67 " 2"	90 " 2"	108 " 2½"		
"	71 " 2"	98 " 2½"	117 " 2½"		
"	78 " 2"	104 " 2½"	124 " 2½"		
"	81 " 2"	108 " 2½"	134 " 2½"		
"	83 " 2"	110 " 2½"	143 " 2½"		
"	84 " 2"	110 " 2½"	143 " 2½"		
"	85 " 2"	110 " 2½"	143 " 2½"		

Note.—The pipe sizes are based upon a drop of 10 lb. water pressure for each 100 ft. run. The size of branch for each Apartment should be not less than 1¼ in.

Example—What is the riser size needed for a six-story apartment house having one bath for each apartment?

Table 54-A gives 2 in. diameter for all from four to twelve stories with 1¼ in. to supply the top floor and next to top and 1½ in. for floor below.

What is the size of riser needed for a twelve-story apartment house with three baths to each apartment?

Table 54-A gives 2½ in. for all floors up to eighth floor, 2 in. for ninth, tenth and eleventh, and 1¼ in. for top floor.

What is the riser size for a two bath apartment six stories high?

Table 54-A gives 2 in. for the first four floors with 1½ in. at fifth floor and 1¼ in. on the top floor.