closets and smaller fixtures, the probability of a given rate of flow is greater for the system composed of water closets than for the mixed

TABLE 2. SCHEDULE OF SIZES FOR DOWN-FEED RISER (SEE FIG. 2)

Portion of Riser	Allowable Drop per Lb per 100 Ft	Maximum Probable Flow, Gallons per Minute: 5	10	15	20	25	30	40	50	60	70	80	90	100	125	150	200	250
T	3.5	¾	1	1¼	1¼	1½	1½	2	2	2	2½	2½	2½	3	3	3	3½	3½
S	20	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	2	2	2	2	2	2½	3
R	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
Q	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
P	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
O	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
N	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
M	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
L	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
K	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
J	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
I	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
H	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
G	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
F	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
E	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
D	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
C	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
B	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½
A	30	¾	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2	2½	2½

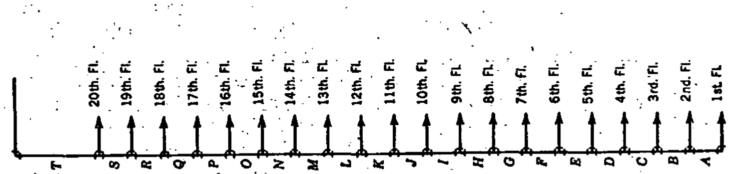

FIG. 2. TYPICAL RISER FOR 20-STORY BUILDING

system. The use of this chart then would produce results which would be on the safe side for mixed systems.

For systems composed entirely of fixtures other than flush valve fixtures the curve has been extended for smaller maximum possible flow values.

This chart applies to a normal building and not to installations where the inmates may all be required, for instance to bathe on certain days of the week and at certain hours of those days; or in schools for example where all the showers in the gymnasium may be used simultaneously after instruction periods. In such special cases a new factor of usage must be developed based on the maximum probable usage under the conditions involved.

Example 1. Assume that in a normal building, such as a residential hotel or an apartment house, there are 50 flush valve water-closets, 50 lavatories, 50 sinks and 50 baths, and that it is desired to determine the maximum probable flow in a line supplying all of these fixtures with both hot and cold water.

Cold Water

50 W. C. x 45 gpm	2250 gpm
50 Lavs. x 3 gpm	150 gpm
50 Sinks x 4 gpm	200 gpm
50 Baths x 5 gpm	250 gpm
Maximum possible flow	2850 gpm

Fig. 1 shows a factor of usage of 9 per cent.

Maximum probable flow of cold water is 2850 × 0.09 .... 257 gpm

Hot Water

50 Lavs. x 3 gpm	150 gpm
50 Sinks x 4 gpm	200 gpm
50 Baths x 5 gpm	250 gpm
Maximum possible flow	600 gpm

Fig. 1 shows a factor of usage of 23 per cent.

Maximum probable flow of hot water is 600 × 0.23 .... 138 gpm

Total for main supplying cold and hot water (2850 + 600) × 0.08 .... 276 gpm

It should be noted that this is a *rate of flow* or an *instantaneous demand.*

KIND OF PIPE USED

Before entering into the actual sizing of pipe, it is necessary to consider the kind of pipe to be used, and to make suitable allowance for corrosion and fouling during the lifetime of the system. For example, if brass, copper or alloy pipe is contemplated, it is probable that the quantities indicated in Example 1 are ample; if galvanized pipe is to be used, then it is quite likely that after a period of say 15 years the area may be decreased as much as 25 per cent and the quantitities of water assumed should be increased by 35 per cent to allow for this reduction of area; if the water contains lime it is possible that 50 per cent of the area may be lost and in such cases the flow should be doubled and no branch pipe connected to fixtures should be less than ¾ in. In all of the following calculations, the assumption is made that the water is fairly good and that a corrosion resistant type of pipe is to be used.

SIZING A DOWN-FEED RISER

Down-feed systems are commonly used for tall buildings. In sizing a riser arranged for down-feed, the gravity head permits a pressure drop that is almost prohibitive in an up-feed riser. There is a gain in riser head of 0.43 × 100 or 43 lb per 100 ft of run and hence it is quite permissible to size such a riser on the basis of a pressure drop of 30 lb per 100 ft of run, as the difference between the 43 lb generated and the 30 lb drop under maximum probable demand is ample to take care of the friction caused by the fittings. This method applied to the typical riser shown in Fig. 2 gives the schedule of sizes indicated in Table 2 for any flow from 5 to 250 gal.