

TABLE 2. PIPE SIZES FOR EXAMPLE 3

VOLUME OF AIR (CFM)	PER CENT OF TOTAL VOLUME	DIAMETER OF PIPE (INCHES)	EQUIVALENT SIZE OF RECTANGULAR DUCT (INCHES)
22,935	100.0	56	60 x 44
12,510	54.6	45	58 x 30
10,425	45.4	42	50 x 30
8,340	36.3	39	42 x 30
6,255	27.2	35	42 x 24
4,170	18.2	29½	30 x 24
2,085	9.1	23	30 x 15

[Velocity through diffusers (not shown) to be approximately 300 fpm].

The main pipe size should be selected to give a velocity equal to or less than the velocity at the fan outlet. Choosing a 56-in. pipe with a cross-sectional area of 17.1 sq ft, the velocity in the main pipe will be 1340 fpm. Using the friction pressure loss method this 56-in. main pipe will be taken as the basis of calculation.

Fig. 6 shows the amount of air to be handled by each section of pipe. Expressing the volume handled by each section as a percentage of the total volume and using the charts, Figs. 4 and 5, the pipe sizes are as shown in Table 2.

The pressure at the outlets nearest the fan will be greater than at the pipes farther along the run so that the former will tend to deliver more than the calculated amount of air. To remedy this condition, volume regulating dampers should be located at the base of each riser and adjusted for proper distribution. At points where branches leave the main it may be advisable, depending upon the nature of the installation, to install adjustable splitters similar to that shown in Fig. 6 where the main duct divides into the 58 in.-by-30 in. and 50 in.-by-30 in. branches.

The rectangular equivalents are selected from Table 1; the width to depth proportion will be determined by construction requirements and ease of fabrication. The calculation of the friction is as follows:

The longest run from the fan outlet to diffuser is 150 ft, 0 in.; 150 ft of 56-in. pipe is equivalent to $\frac{150 \times 12}{56}$ 32.2 dia.

Two 45-in., 90-deg elbows ($2 \times \frac{45}{56} \times 10$) 16.1 dia.

Two 23-in., 90-deg elbows ($2 \times \frac{23}{56} \times 10$) 8.2 dia.

Two 23-in., 90-deg elbows in riser ($2 \times \frac{23}{56} \times 30$) 24.7 dia.

(Two bad elbows in riser, each equivalent to 30 diameters of duct).

Total diameter of 56-in. pipe 81.2

The velocity head corresponding to a velocity of 1340 fpm is $\left(\frac{1340}{4005}\right)^2 = 0.112$ in.

Taking 50 diameters as one head loss, then $\frac{81.2}{50} \times 0.112 = 0.182$ in. static loss in duct.

Where the connection pieces are made with long easy slopes and the general workmanship is good, a regain in static pressure may be deducted from the foregoing pressure loss. This can be taken as approximately two-thirds the difference in velocity pressures at the fan outlet and the last run of pipe. The velocity in the riser is 667 fpm with a corresponding velocity pressure of 0.033 in. The fan outlet velocity is 1400 fpm with a corresponding velocity pressure of 0.122 in. The regain equals two-thirds (0.122 - 0.033) = 0.059 in.

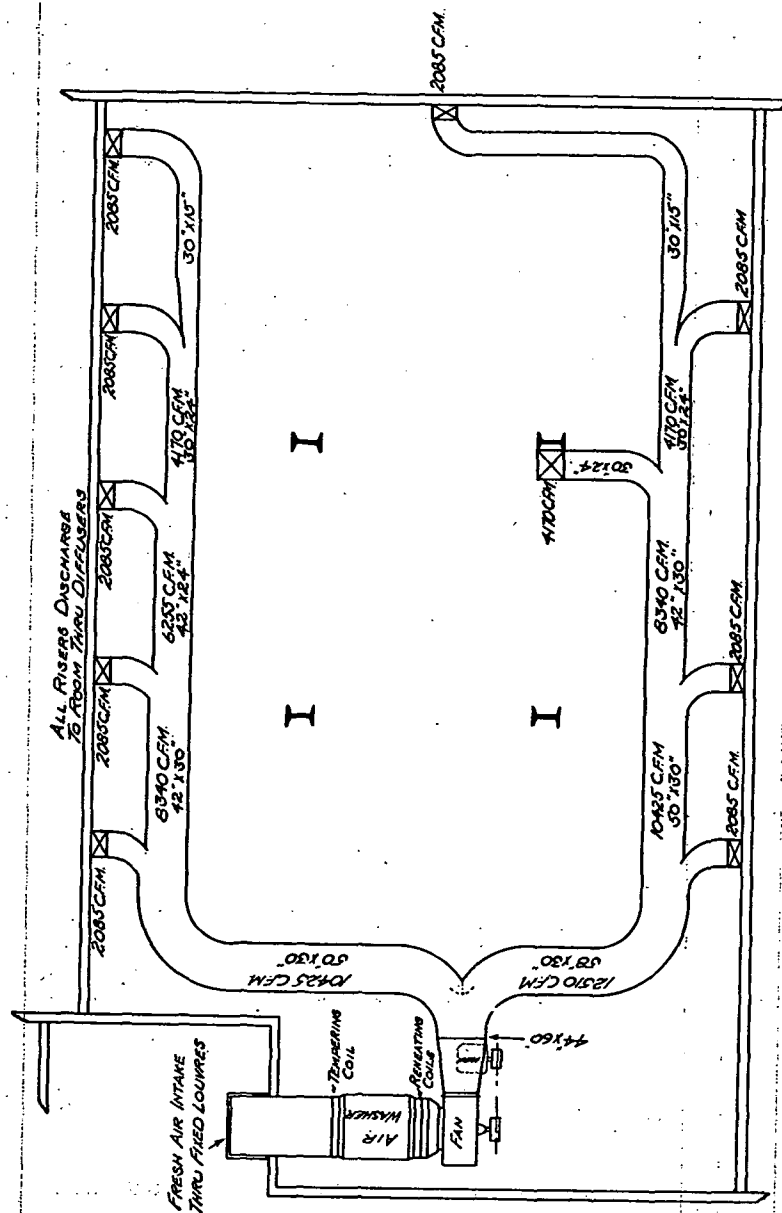


FIG. 6. TYPICAL LAYOUT OF AIR DISTRIBUTION SYSTEM