

TABLE 1. CIRCULAR-EQUIVALENTS OF RECTANGULAR DUCTS FOR EQUAL FRICTION—(Continued)

Size Rectangular Duct	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88
50	55.0																			
52	56.1	57.2																		
54	57.2	58.3	59.4																	
56	58.3	59.4	60.5	61.6																
58	59.3	60.5	61.6	62.7	63.8															
60	60.3	61.5	62.7	63.8	64.9	66.0														
62	61.3	62.5	63.7	64.8	66.0	67.1	68.2													
64	62.2	63.5	64.7	65.9	67.1	68.2	69.3	70.4												
66	63.2	64.4	65.7	66.9	68.1	69.3	70.4	71.5	72.6											
68	64.1	65.4	66.6	67.9	69.1	70.3	71.5	72.6	73.7	74.8										
70	65.0	66.3	67.6	68.8	70.1	71.3	72.5	73.7	74.8	75.9	77.0									
72	65.9	67.2	68.5	69.8	71.1	72.3	73.5	74.7	75.9	77.0	78.1	79.2								
74	66.8	68.1	69.4	70.7	72.0	73.3	74.5	75.7	76.9	78.1	79.2	80.3	81.4							
76	67.6	69.0	70.3	71.6	72.9	74.2	75.5	76.7	77.9	79.2	80.3	81.4	82.5	83.6						
78	68.4	69.8	71.2	72.6	73.9	75.2	76.4	77.7	78.9	80.2	81.4	82.5	83.6	84.7	85.8					
80	69.2	70.7	72.1	73.5	74.8	76.1	77.4	78.6	79.9	81.2	82.4	83.6	84.7	85.8	86.9	88.0				
82	70.1	71.5	73.0	74.4	75.7	77.1	78.4	79.6	80.9	82.1	83.4	84.6	85.8	86.9	88.0	89.1	90.2			
84	70.9	72.3	73.8	75.2	76.6	78.0	79.3	80.6	81.9	83.1	84.4	85.6	86.8	88.0	89.1	90.2	91.3	92.4		
86	71.7	73.2	74.6	76.0	77.4	78.9	80.3	81.5	82.9	84.0	85.3	86.6	87.8	89.0	90.2	91.3	92.4	93.5	94.6	95.7
88	72.5	74.0	75.5	76.8	78.3	79.8	81.2	82.5	83.9	85.0	86.3	87.5	88.8	90.0	91.2	92.4	93.5	94.6	95.7	96.8
90	73.3	74.7	76.3	77.7	79.1	80.6	82.0	83.4	84.7	85.9	87.2	88.5	89.7	91.0	92.2	93.4	94.6	95.7	96.8	97.9
92	74.1	75.5	77.1	78.5	79.9	81.4	82.8	84.3	85.6	86.9	88.2	89.5	90.7	92.0	93.2	94.4	95.6	96.7	97.9	99.0
94	74.8	76.3	77.8	79.3	80.7	82.2	83.7	85.1	86.5	87.8	89.1	90.4	91.7	93.0	94.2	95.4	96.6	97.8	99.0	100.1
96	75.5	77.1	78.7	80.2	81.6	83.0	84.5	85.9	87.4	88.7	90.0	91.3	92.6	93.9	95.2	96.4	97.6	98.8	100.0	101.2

Example 3. If the longest run of pipe is 70 ft, the mean of its two dimensions 25 in. and it has 4 elbows, then $F = 2\frac{1}{2} + \frac{70}{100} + 4\frac{1}{5} = 4$ velocity heads loss in the duct.

The velocity which will cause a loss of $\frac{1}{4}$ in. will then be $V = \frac{2000}{\sqrt{F}} = 1000$ fpm.

Main Trunk Ducts with Branches. A main duct with branches is generally used to convey tempered air for ventilation purposes only. In place of individual ducts a comparatively large main duct supplies air by branches to various rooms with a velocity which may be 2000 fpm at the start and reduced to 400 fpm in the risers, these figures varying according to the nature of the installation. This duct system may be designed so that the loss of pressure in the branches is equalized in a manner similar to that previously described. For each branch a factor may be calculated by Formula 6. It is usually desirable that the loss in each branch approximate 0.1 in., or since the velocity corresponding to 0.1 in. is 1260 fpm, the factor F and the velocity V will give a loss of 0.1 in. if $V = \frac{1260}{\sqrt{F}}$.

Example 4. Table 2 is a schedule for an air distribution system of a typical school (see Figs. 6 to 10 inclusive). The volume of air per minute for classrooms is based on the number of pupils, with an allowance of 30 cfm per pupil. Table 2 shows the volume of air to be delivered to each room, and also gives the dimensions of the risers, the size of the diffusers and the velocities through each.

The total air requirement for the building is 24,050 cfm. To provide a margin for some unavoidable leakage, the total volume should be increased 10 per cent, and this increased volume should be used as the basis for determining the size of the main ducts, and branches, although the 10 per cent added may be disregarded in arriving at the size of the risers and diffusers, inasmuch as any leakage will probably have occurred before the air reaches this point.

TABLE 2. AIR SCHEDULE FOR TYPICAL SCHOOL LAYOUT

Room No.	CUBIC CONTENT	DIMENSIONS FEET	Sq. Ft. FLOOR	No. OF PUPILS	AIR REQ. PER MIN.	SIZE RISER INCHES	VELOCITY (FPM)	SIZE DIFFUSER (INCHES)	DIFFUSER VELOCITY (FPM)
1	7000	26½ x 22 x 12	583	40	1200	16 x 20	540	20 x 30	288
2	7000	26½ x 22 x 12	583	40	1200	16 x 20	540	20 x 30	288
3	7000	26½ x 22 x 12	583	40	1200	16 x 20	540	20 x 30	288
4	7000	26½ x 22 x 12	583	40	1200	16 x 20	540	20 x 30	288
5	7000	26½ x 22 x 12	583	40	1200	16 x 20	540	20 x 30	288
6	7000	26½ x 22 x 12	583	40	1200	16 x 20	540	20 x 30	288
7	8720	33 x 22 x 12	726	50	1500	16 x 24	563	24 x 30	300
8	8720	33 x 22 x 12	726	50	1500	16 x 24	563	24 x 30	300
9	7000	26½ x 22 x 12	583	40	1200	16 x 20	540	20 x 30	288
10	7000	26½ x 22 x 12	583	40	1200	16 x 20	540	20 x 30	288
11	5800	22 x 22 x 12	483	33	990	16 x 16	556	16 x 30	297
12	7000	26½ x 22 x 12	583	40	1200	16 x 20	540	20 x 30	288
13	3360	21½ x 13 x 12	280	20	600	12 x 16	450	16 x 20	270
14	3360	21½ x 13 x 12	280	20	600	12 x 16	450	16 x 20	270
15	17500	54 x 27 x 12	1460	100	3000	2-16 x 24	465	24 x 30	300
16	6480	20 x 27 x 12	540	37	1110	16 x 20	503	20 x 26	289
17	7000	26½ x 22 x 12	583	40	1200	16 x 20	540	20 x 30	288
Audi. Office	37600	65 x 34 x 17	2220		2500	2-16 x 20	565	20 x 30	301
	3700	14 x 22 x 12	308		250	8 x 12	375	12 x 12	250