

the main is equivalent to a 22.2-in. diameter round pipe. From Fig. 3, 30 per cent of this is a pipe 13.5 in. in diameter, and referring again to Table 3, the rectangular equivalent branch is a 12 x 13-in., 10 x 15-in. or any other desirable combination.

Exhaust Systems

In the design of piping for an exhaust system where no dampers are provided, it is considered good practice to make the area of the main pipe approximately 20 per cent greater than the sum of the areas of the branch pipes at that point. This method gives greater uniformity of distribution than where the increase in area is not made.

INSTALLATION OF AIR DUCTS

The following suggestions will be found helpful in the installation of air ducts:

1. For heating and ventilating work, ducts 6 x 6 in. represent a minimum size. In any place where other considerations do not outweigh, round pipe for small flues is recommended.

2. Abrupt turns or sharp bends should never be made. Elbows should have a throat radius equal to the depth of the duct.

3. Transformations and offsets should not be made abruptly. Angles greater than 45 deg. should be avoided. In any case, care should be taken not to restrict the true cross-sectional area.

4. Tees or branches from main ducts should make curved connections. Accessible and operative volume dampers should be used. Adjustable dampers should be provided with a means of indicating from the outside, the true position of the damper.

5. Access doors to ducts should be hinged and tightly fastened. Fire dampers in supply and vent ducts should be $\frac{1}{8}$ in. steel plate, held by a fusible link for release at 160 deg. Fahr.

6. Air intake should be screened with 1 in. mesh or less, at least No. 10 wire galvanized.

7. Final exit for exhaust discharges should be protected from the weather and pointed away from prevailing wind where possible.

8. Underground ducts should be water-proofed, provided with means of access for inspection and cleaning; also a drain connection trapped to sewer.

9. The use of varied metals and special finishes for different conditions encountered is of prime importance. The present day metal market affords wide range of choice, and a study of requirements for the individual application should be made.

10. Wherever water is present or condensation is likely to occur, galvanized iron sheets should be used.

11. When service encountered is severe and the material used may be subjected to rapid deterioration, either from abrasion or excessive corrosion, heavier gages of materials than ordinarily used are recommended.

12. In exposed work the same method of formation should be used throughout. All visible work should present a neat and workmanlike appearance.

13. The following table gives recommended gages of galvanized iron or steel sheets used for ducts, both rectangular and round:

ROUND DUCTS DIAMETER, IN.	GAGE U. S. STANDARD	RECTANGULAR DUCTS WIDTH, IN.
6 in. to 19 in.	No. 26 gage	4 in. to 18 in.
20 in. to 29 in.	No. 24 gage	19 in. to 30 in.
30 in. to 39 in.	No. 22 gage	31 in. to 60 in.
40 in. to 49 in.	No. 20 gage	61 in. to 118 in.
50 in. and above	No. 18 gage	120 in. and above

TABLE 3. CIRCULAR EQUIVALENTS OF RECTANGULAR DUCTS FOR EQUAL FRICTION

TABLE 8. CIRCULAR EQUIVALENTS OF RECTANGULAR DUCTS																				
Side Rectangular Duct	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
8	6.9	7.6	8.2	8.8	9.9															
9	7.3	8.0	8.7	9.3	10.4	11.0	12.1													
10	7.7	8.4	9.2	9.8	10.9	11.5	12.1	13.2	14.3											
11	8.0	8.8	9.6	10.2	10.9	11.5	12.1	13.0	14.0	15.4	16.5									
12	8.3	9.2	10.0	10.7	11.4	12.0	12.6	13.2	14.3	15.4	16.5	17.6	18.7	19.8	20.9	21.5	22.0	23.6	24.2	25.9
13	8.7	9.6	10.4	11.1	11.8	12.5	13.1	13.7	14.9	16.0	17.1	18.2	19.2	20.4	21.5	22.5	23.1	24.7	25.2	26.9
14	8.9	9.9	10.8	11.5	12.3	12.9	13.6	14.3	15.0	15.7	16.3	17.0	17.6	18.2	18.8	19.4	20.0	21.3	21.8	23.5
15	9.2	10.2	11.1	11.9	12.7	13.4	14.1	14.7	15.3	16.0	16.7	17.4	18.0	18.6	19.2	19.8	20.4	21.7	22.2	23.9
16	9.5	10.5	11.4	12.3	13.1	13.8	14.5	15.2	15.8	16.5	17.2	17.9	18.5	19.1	19.7	20.3	20.9	22.2	22.7	24.4
17	9.8	10.8	11.8	12.8	13.5	14.2	15.0	15.7	16.3	17.0	17.6	18.2	18.7	19.3	19.9	20.5	21.1	22.3	22.8	24.5
18	10.0	11.1	12.1	13.2	13.8	14.6	15.4	16.1	16.8	17.4	18.1	18.7	19.2	19.8	20.4	21.0	21.6	22.8	23.3	25.0
19	10.3	11.4	12.4	13.5	14.2	15.0	15.8	16.5	17.2	17.9	18.6	19.2	19.8	20.4	21.0	21.6	22.2	23.4	23.9	25.6
20	10.5	11.6	12.7	13.8	14.5	15.4	16.2	17.0	17.6	18.4	19.0	19.7	20.3	20.9	21.5	22.0	22.6	23.8	24.3	26.0
21	10.8	11.9	13.0	14.1	14.9	15.7	16.4	17.1	17.8	18.5	19.2	19.9	20.6	21.3	21.9	22.5	23.1	24.3	24.8	26.5
22	11.0	12.1	13.2	14.3	15.2	16.1	16.9	17.8	18.5	19.2	20.0	20.8	21.5	22.2	22.8	23.4	24.0	25.2	25.7	27.3
23	11.3	12.4	13.5	14.6	15.5	16.4	17.3	18.2	19.0	19.8	20.6	21.4	22.2	22.9	23.5	24.1	24.7	25.9	26.4	28.0
24	11.6	12.6	13.8	14.8	15.8	16.8	17.6	18.5	19.3	20.0	20.8	21.6	22.3	23.0	23.6	24.2	24.8	26.0	26.5	28.1
25	11.8	13.1	14.3	15.4	16.4	17.3	18.3	19.2	20.0	20.7	21.6	22.3	23.0	23.7	24.3	24.9	25.5	26.7	27.2	28.7
26	12.2	13.5	14.8	15.9	17.0	18.0	19.0	19.8	20.7	21.5	22.4	23.1	23.9	24.6	25.3	25.9	26.5	27.7	28.2	29.7
28	12.9	14.3	15.6	16.7	17.5	18.5	19.5	20.5	21.4	22.2	23.0	23.8	24.5	25.2	25.9	26.5	27.1	28.3	28.8	30.3
30	13.6	15.1	16.4	17.2	18.0	19.1	20.1	21.1	22.0	22.8	23.6	24.3	25.0	25.7	26.4	27.0	27.6	28.8	29.3	30.8
32	14.3	15.7	17.2	18.6	19.8	20.6	21.7	22.6	23.4	24.1	24.9	25.6	26.3	27.0	27.7	28.3	28.9	30.1	30.6	32.1
34	14.5	16.1	17.6	19.0	20.3	21.6	22.7	23.8	24.9	25.9	26.9	27.9	28.8	29.8	30.7	31.4	32.2	33.0	33.8	35.3
36	13.6	15.1	16.4	17.2	18.0	19.1	20.1	21.1	22.0	22.8	23.6	24.3	25.0	25.7	26.4	27.0	27.6	28.8	29.3	30.8
38	14.8	16.4	18.0	19.4	20.7	22.0	23.1	24.3	25.4	26.5	27.5	28.5	29.5	30.3	31.2	32.1	32.9	33.7	34.5	35.3
40	15.1	16.8	18.4	19.8	21.1	22.4	23.6	24.8	25.8	26.8	27.8	28.8	29.8	30.5	31.0	31.9	32.8	33.8	34.6	36.2
42	15.7	17.2	18.7	20.1	21.5	22.8	24.1	25.2	26.4	27.5	28.6	29.6	30.5	31.6	32.5	33.4	34.3	35.2	36.1	37.0
44	16.4	18.0	19.5	21.0	22.3	23.6	24.9	26.0	27.1	28.2	29.2	30.2	31.1	32.1	33.1	34.1	35.0	35.9	36.8	37.6
46	17.1	18.7	20.2	21.7	23.0	24.3	25.6	26.7	27.8	28.9	29.9	30.9	31.8	32.7	33.6	34.5	35.4	36.3	37.2	38.0
48	17.3	19.0	20.4	21.9	23.2	24.5	25.7	26.9	27.9	28.9	29.9	30.9	31.8	32.7	33.6	34.5	35.4	36.3	37.2	38.0
50	17.9	19.6	21.1	22.6	23.9	25.2	26.4	27.6	28.6	29.6	30.6	31.6	32.5	33.4	34.3	35.2	36.1	37.0	37.9	38.8
52	18.8	20.5	22.0	23.5	24.8	26.1	27.3	28.5	29.5	30.5	31.5	32.4	33.3	34.2	35.1	36.0	36.9	37.8	38.7	39.6
54	19.1	20.9	22.4	23.9	25.2	26.5	27.7	28.9	29.9	30.9	31.9	32.8	33.7	34.6	35.5	36.4	37.3	38.2	39.1	40.0
56	19.3	21.2	22.7	24.2	25.5	26.8	28.0	29.2	30.2	31.2	32.1	33.0	33.9	34.8	35.7	36.6	37.5	38.4	39.3	40.2
58	19.6	21.5	23.0	24.5	25.8	27.1	28.3	29.5	30.5	31.5	32.4	33.3	34.2	35.1	36.0	36.9	37.8	38.7	39.6	40.5
60	19.9	21.8	23.3	24.8	26.1	27.4	28.6	29.8	30.8	31.8	32.7	33.6	34.5	35.4	36.3	37.2	38.1	39.0	39.9	40.8
62	20.2	22.1	23.6	25.1	26.4	27.7	28.9	30.1	31.1	32.1	33.0	33.9	34.8	35.7	36.6	37.5	38.4	39.3	40.2	41.1
64	20.5	22.4	23.9	25.4	26.7	28.0	29.2	30.4	31.4	32.3	33.2	34.1	35.0	35.9	36.8	37.7	38.6	39.5	40.4	41.3
66	20.8	22.7	24.2	25.7	27.0	28.3	29.5	30.7	31.7	32.6	33.5	34.4	35.3	36.2	37.1	38.0	38.9	39.8	40.7	41.6
68	21.1	23.0	24.5	26.0	27.3	28.6	29.8	31.0	32.0	32.9	33.8	34.7	35.6	36.5	37.4	38.3	39.2	40.1	41.0	41.9
70	21.4	23.3	24.8	26.3	27.6	28.9	30.1	31.3	32.3	33.2	34.1	35.0	35.9	36.8	37.7	38.6	39.5	40.4	41.3	42.2