

Table 9.... Recommended Construction for Rectangular Sheet-Metal Ducts

High Pressure	Medium Pressure	Low Pressure			Duct Dimension in Inches	Recommended Construction	
		Steel U.S. Std. Gage	Aluminum 8 & 5 Gage	Copper Cold Rolled		Transverse Joints and Bracing	
22	24	26	24 (0.020)	16 oz	Up thru 12	S slip, drive slip, 1 in. pocket lock on 8 ft centers.	
20	22	24	22 (0.025)	24 oz	13 thru 18	S slip, drive slip, 1 in. pocket lock on 8 ft centers.	
					19 thru 30	S slip, 1 in. pocket lock on 4 ft centers. S slip, 1 in. pocket lock on 8 ft centers with 1 X 1 X 1/4 angles 4 ft from joint. S slip, 1 in. pocket lock on 8 ft centers with cross break 1 in. standing seam on 5 ft centers.	
18	20	22	20 (0.032)	32 oz	31 thru 42	1 in. standing S cleat, bar slip, pocket lock on 4 ft centers. 1 in. standing S cleat, bar slip, pocket lock on 8 ft centers with 1 X 1 X 1/4 in. angle 4 ft from joint. 1 in. standing seam on 4 ft centers. Longitudinal standing seam with 1 X 1 X 1/4 in. angles on 4 ft centers.	
					43 thru 54	1 1/4 in. standing S cleat, bar slip, pocket lock on 4 ft centers. 1 1/4 in. standing S cleat, bar slip, pocket lock on 8 ft centers with 1 1/4 X 1 1/4 X 1/4 in. angles 4 ft from joint. 1 1/4 in. standing seam on 3 ft centers. Longitudinal standing seam inside with 1 1/4 X 1 1/4 X 1/4 in. angles on 4 ft centers.	
16	18	20	18 (0.040)	36 oz	55 thru 60	1 1/4 in. standing S cleat, bar slip, pocket lock on 4 ft centers with 1 1/4 X 1 1/4 X 1/4 in. angles 4 ft from joint. 1 1/4 in. standing S cleat, bar slip, pocket lock on 8 ft centers with 1 1/4 X 1 1/4 X 1/4 in. angles on 2 ft centers. 1 1/4 in. standing seam on 3 ft centers. Longitudinal standing seams inside with 1 1/4 X 1 1/4 X 1/4 in. angles on 2 ft centers.	
					61 thru 84	1 1/4 in. standing S cleat, bar slip, pocket lock on 4 ft centers with 1 1/4 X 1 1/4 X 1/4 in. angles 4 ft from joint. 1 1/4 in. standing S cleat, bar slip, pocket lock on 8 ft centers with 1 1/4 X 1 1/4 X 1/4 in. angles on 2 ft centers. 1 1/4 in. standing seam on 3 ft centers. Longitudinal standing seams inside with 1 1/4 X 1 1/4 X 1/4 in. angles on 2 ft centers.	
14	16	18	16 (0.051)	48 oz	85 thru 96	1 1/4 in. standing S cleat, bar slip, pocket lock reinforced with 1 1/4 X 1 1/4 X 1/4 in., or companion angles on 4 ft centers. 1 1/4 in. standing S cleat, bar slip, pocket lock reinforced with 1 1/4 X 1 1/4 X 1/4 in. or companion angles on 8 ft centers with 1 1/4 X 1 1/4 X 1/4 in. angles on 2 ft centers. Longitudinal standing seams inside with 1 1/4 X 1 1/4 X 1/4 in. angles on 2 ft centers.	
					Over 96	1 1/4 in. standing S cleat, bar slip, pocket lock reinforced with 2 X 2 X 1/4 in. angles, or companion angles on 4 ft centers. 1 1/4 in. standing S cleat, bar slip, pocket lock reinforced with 2 X 2 X 1/4 in. angles, or companion angles on 8 ft centers with 2 X 2 X 1/4 in. angles on 2 ft centers. 1 1/4 in. standing seams with 2 X 2 X 1/4 in. angles on 2 ft centers. Longitudinal standing seams inside with 2 X 2 X 1/4 in. angles on 2 ft centers.	

Note: When special rigidity or stiffness is required, ducts should be constructed of metal two gage numbers heavier e.g., use 22 gage instead of 24 gage. Ducts larger than 96 in. require special field study for hanging and supporting methods. Other joint construction of equivalent mechanical strength and airtightness may be used. Recommended methods of fastening bracing to ductwork include riveting, bolting, and tack welding. Bracing, stiffening members, or angle connections for copper ductwork, where exposed to the weather, should be of brass or aluminum, of suitable thickness for strength.

DUCT CONSTRUCTION DETAILS

The recommended gages for steel (or iron), aluminum, and copper sheet-metal rectangular ducts are given in Table 9. No general agreement has yet been reached as to the exact limits of the classifications *high pressure*, *medium pressure*, and *low pressure* shown in Table 9. Suggested ranges of static

pressures in the duct system for these classifications are:

Low Pressure = up to 1 1/4 in. water.
Medium Pressure = 1 1/4 in. to 4 in. water.
High Pressure = 4 in. to 8 in. water.

It should be noted that these values are the pressures existing in the duct, not the total pressure at the fan.

Air Duct Design

Table 10.... Recommended Duct Construction for Round and Flat-Oval Ducts^{a, b}

Steel U.S. Std. Gage	Size Dia or Max Width	Bracing on Flat Surface	
		Round	Flat-oval
24	22	To 10 in.	None
22	20	11 to 20 in.	1 1/4 X 1 1/4 X 1/4 in. angle or 1 1/4 X 1/4 X 1/4 in. channel on 4 ft centers.
20	18	21 to 40 in.	1 1/4 X 1 1/4 X 1/4 in. angle or 2 X 1/4 X 1/4 in. channel on 4 ft centers.
18	16	41 to 60 in.	2 X 2 X 1/4 in. angle or 2 1/4 X 1/4 X 1/4 in. channel on 2 ft centers.
16	14	61 in. and over	2 X 2 X 1/4 in. angle or 2 1/4 X 1/4 X 1/4 in. channel on 2 ft centers.

^a All fittings should be of same gage as pipe or heavier.

^b Satisfactory for pressure in duct up to 10 in. water.

The recommended gages for steel (or iron) sheet-metal round or flat-oval ducts are given in Table 10.

Steel or iron sheets are specified according to the manufacturers or U. S. Standard Gage System. Aluminum sheets are specified according to the American or Brown & Sharpe Gage System. Copper sheets are usually specified by the weight in ounces per square foot. Weights of black and galvanized-steel and -iron sheets per square foot of surface for various gages are given in Table 11. Similar data for 2S aluminum sheets will be found in Table 12. Weights of standard copper sheets are given in Table 13. In calculating the total weight of a given length of ductwork from these tables, it is customary to add 15 percent to the weight to cover hangers, slips, and scrap. Duct bracing or stiffening members should be calculated separately.

Rectangular ducts are generally constructed by breaking the corners and grooving the longitudinal seam, although some fabricators still use the standing seam. Elbows and transformation sections are generally formed with Pittsburgh corner seams because this seam is easier to lock in place than the double seam, but double seams are equally acceptable. The constructions of these various seams, as well as the types of girth connections, are shown in Fig. 16. The application of the various slips, connections, and bracing is outlined in Table 9. The end slip may be used wherever S slips are recommended.

Designs M to P of Fig. 16 are for flush-type seams on ductwork where joints are to be concealed. For smooth external appearance the seams may be filled with suitable filler. Screws or rivets used should be of oven-head type.

Round and flat-oval ducts should be fabricated in accordance with the recommendations given in Table 10. Sections may be assembled using beaded couplings, swaged ends, or beaded or crimped small ends. Sections are held in place, using suitable sealers, with sheet-metal screws or rivets, or are welded together.

Spiral conduit is acceptable in place of round or flat-oval duct, with recommended gages shown in the following table:

Diameter, Inches	Recommended U. S. Std. Gage
3 to 8	Not lighter than 26 gage
9 to 24	Not lighter than 24 gage

Table 11.... Weights of Black and Galvanized Sheets

U. S. Std. Gage	Approximate Thickness, In.		Weight Per Square Foot	
	Steel	Iron	Ounces	Pounds
30	0.0123	0.0125	8	0.500
28	0.0153	0.0156	10	0.625
26	0.0184	0.0188	12	0.750
24	0.0245	0.0250	16	1.000
22	0.0306	0.0313	20	1.250
20	0.0368	0.0375	24	1.500
18	0.0490	0.0500	32	2.000
16	0.0613	0.0625	40	2.500
14	0.0786	0.0781	50	3.125
12	0.1072	0.1094	70	4.375
11	0.1225	0.1250	80	5.000
10	0.1379	0.1406	90	5.625
30	0.0163	0.0165	10.5	0.656
28	0.0193	0.0196	12.5	0.781
26	0.0224	0.0228	14.5	0.906
24	0.0285	0.0290	18.5	1.156
22	0.0346	0.0353	22.5	1.406
20	0.0408	0.0415	26.5	1.656
18	0.0530	0.0540	34.5	2.156
16	0.0653	0.0665	42.5	2.656
14	0.0806	0.0821	52.5	3.281
12	0.1112	0.1134	72.5	4.531
11	0.1265	0.1290	82.5	5.156
10	0.1419	0.1446	92.5	5.781

^a Galvanized sheets are gaged before galvanizing and are therefore approximately 0.004 in. thicker.

Table 12.... Weights and Thicknesses of 2S Aluminum (Density 0.098 lb/cu in.)

A. & S. Gage	Thickness, Inches		Weight per Square Foot	
	Decimal	Nearest Fraction	Ounces	Pounds
28	0.012	1/64	2.7	0.169
26	0.016	1/64	3.6	0.226
24	0.020	1/64	4.5	0.282
22	0.025	1/32	5.4	0.333
20	0.032	1/16	7.2	0.452
18	0.040	1/16	9.0	0.563
16	0.051	1/16	11.5	0.720
14	0.064	1/8	14.4	0.903

Aluminum sheets of the 2S- and 3S-type alloy and 1/4 hard temper are readily workable, and can be used for practically all ductwork. The 2S type (commercially pure aluminum) is suitable for all, except very large ducts. For large ducts, where more strength is desired, the 3S alloy with 1/4 or 1/2 hard temper is frequently used. The higher tempers, particularly full hard, do not have the formability of the lower tempers. Joints can be of any of the standard designs, and can be fabricated in the same manner as iron. Repeated sharp bending and rebending should be avoided, as aluminum has a tendency to crack under such treatment. Aluminum of 16 B. & S. gage or heavier can readily be welded by the metallic arc or acetylene process. Riveting is done in the same manner as in iron or steel sheet. Self-tapping screws tend to loosen because of the softness of aluminum.

The construction of elbows and changes of shape cannot be definitely outlined, because of the varied conditions en-