TABLE 4. RECOMMENDED SHEET METAL GAGES FOR DUCTS[a]

U. S. Std. Gage	Round Ducts Diameter, Inches	Rectangular Ducts: Maximum Side, Inches	Type of Joint Connections	Bracing
26	Up to 18	Up to 12	*S* or Drive Slips	None
24	19 to 30	13 to 24	*S* or Drive Slips	None
24		25 to 30	*S* or Drive Slips	1 in. Angle 4 ft from Slips
22	31 to 45	31 to 48	Bar or Drive Slips	1¼ in. Angle 4 ft on Centers
20	46 to 60	49 to 60	1¼ in. Angle Bar Slips or 1¼ in. Angle Connections	1¼ in. Angle 2 ft 8 in. on Centers
18	61 and up	61 to 90	1½ in. Angle Connections	1½ in. Angle 2 ft 8 in. on Centers
18		91 and up	2 in. Angle Connections	2 in. Angle 2 ft 8 in. on Centers

[a]If flat sides are not cross-broken two gages heavier material should be used.

TABLE 5. WEIGHTS OF SHEET METAL USED FOR DUCT CONSTRUCTION

U. S. Std. Gage	Black Sheets				Galvanized Sheets[b]			
	Approximate Thickness, In.		Weight Per Square Foot		Approximate Thickness, In.		Weight Per Square Foot	
	Steel	Iron	Ounces	Pounds	Steel	Iron	Ounces	Pounds
30	0.0123	0.0125	8	0.500	0.0163	0.0165	10.5	0.656
28	0.0153	0.0156	10	0.625	0.0193	0.0196	12.5	0.781
26	0.0184	0.0188	12	0.750	0.0224	0.0228	14.5	0.906
24	0.0245	0.0250	16	1.000	0.0285	0.0290	18.5	1.156
22	0.0306	0.0313	20	1.250	0.0346	0.0353	22.5	1.406
20	0.0368	0.0375	24	1.500	0.0408	0.0415	26.5	1.656
18	0.0490	0.0500	32	2.000	0.0530	0.0540	34.5	2.156
16	0.0613	0.0625	40	2.500	0.0653	0.0665	42.5	2.656
14	0.0766	0.0781	50	3.125	0.0806	0.0821	52.5	3.281
12	0.1072	0.1094	70	4.375	0.1112	0.1134	72.5	4.531
11	0.1225	0.1250	80	5.000	0.1265	0.1290	82.5	5.156
10	0.1379	0.1406	90	5.625	0.1419	0.1446	92.5	5.781

[b]Galvanized sheets are gaged before galvanizing and are therefore approximately 0.004 in. thicker.

TABLE 6. WEIGHTS AND THICKNESSES OF STANDARD COPPER SHEETS[c]
Rolled to Weight

Weight per Square Foot		Thickness, Inches		Nearest Gage No.		
Ounces	Pounds	Decimal Equivalent	Nearest Fraction	B. & S.	Stubs	U. S. Std.
10	0.625	0.0135	1/64	27	29	29
12	0.750	0.0162	1/64	26	27	28
14	0.875	0.0189	1/64	25	26	26
16	1.000	0.0216	1/32	23	24	25
18	1.125	0.0243	1/32	22	23	24
20	1.250	0.0270	1/32	21	22	23
24	1.500	0.0324	1/32	20	21	22
28	1.750	0.0378	1/32	19	20	20
32	2.000	0.0432	3/64	17	19	19
36	2.250	0.0486	3/64	16	18	18
40	2.500	0.0540	3/64	15	17	17
44	2.750	0.0594	1/16	15	17	17
48	3.000	0.0648	1/16	14	16	16
56	3.500	0.0756	5/64	13	15	14
64	4.000	0.0864	5/64	11	14	13

[c]Variations from these weights must be expected in practice.

Example 3. If the rooms and offices of the hotel building of Example 2 are to be served from a manufactured unit with a capacity of 22,935 cfm against an external resistance of 0.35 in., the known resistances are calculated as:

(1) Outdoor air inlet .... 0.094 in.
(2) Allowance for damper adjustment .... 0.033 in.
(3) Supply grille resistance (from manufacturer's tables) .... 0.036 in.

Total known resistance .... 0.163 in.

Subtracting this from the total available resistance: 0.35 in. − 0.163 in. = 0.187 in. available for duct resistance.

Known length of run .... 150 ft

The duct width is then estimated for the following elbow calculations:

Four 150% ratio elbows, 4 x 13 x 3.5 ft .... 182 ft
Three 75% ratio elbows, 3 x 35 x 1.5 ft .... 158 ft

Total estimated length .... 490 ft

The duct friction per 100 ft is then 0.187 ÷ 4.90 = 0.0382 in. and the mains and branches are sized from the 0.038 in. friction line in Fig. 2.

If it is desired to size each branch for equal resistance, the total resistance back to the point of juncture is calculated and the branch is then sized in a manner similar to that outlined in Example 3.

SOUND CONTROL

Frequently the problem of sound prevention in a heating, ventilating or air conditioning system imposes more severe restrictions than the prevention of excessive pressure drop. Tendencies toward higher duct velocities have produced noise control problems which require consideration of enumerable factors in air duct design. Naturally some types of occupancy and application permit relatively higher sound levels to be maintained than others, but the design trend is progressively directed towards noise reduction wherever possible. Sound absorbent materials have been successfully applied to duct construction to reduce noise. The basis used for the selection of the proper amounts of absorbent materials will be found in Chapter 33.

DUCT CONSTRUCTION DETAILS

Straight sections of round duct are usually formed by rolling the sheets to the proper radius and grooving the longitudinal seam. Rectangular ducts are generally constructed by breaking the corners and grooving the longitudinal seam, although some fabricators still use the standing seam due to lack of equipment. 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 complicated fittings such as double compounded elbows are usually constructed with double seam corners.

The construction of these various seams as well as the types of girth connections are shown in Fig. 8. The application of the various slips and connections are outlined in Table 4. The end slip may be used wherever *S* slips are recommended. Where drive slips are used the end slip may be applied on the narrow side of the duct and only the drive slips on the