

TABLE 10. WEIGHTS OF BLACK AND GALVANIZED SHEETS

U. S. Std. GAGE	BLACK SHEETS				GALVANIZED SHEETS*			
	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	0.1124	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

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

TABLE 11. WEIGHTS AND THICKNESSES OF 2S ALUMINUM (DENSITY 0.098 LB/CU IN.)

B. & 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	0.353
20	0.032	1/32	7.2	0.452
18	0.040	3/64	9.0	0.563
16	0.051	3/64	11.5	0.720
14	0.064	1/16	14.4	0.903

TABLE 12. WEIGHTS AND THICKNESSES OF STANDARD COPPER SHEETS*
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	1/64	23	24	25
18	1.125	0.0243	1/64	22	23	24
20	1.250	0.0270	1/64	21	22	23
24	1.500	0.0324	1/64	20	21	22
28	1.750	0.0378	1/64	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	1/6	15	17	17
48	3.000	0.0648	1/6	14	16	16
56	3.500	0.0756	3/64	13	15	14
64	4.000	0.0864	3/64	11	14	13

* Variations from these weights must be expected in practice.

adhesive tapes are available for this purpose and for sealing joints in duct work. The fan discharge connections shown in Fig. 16 are marked *good*, *fair*, and *poor* in the order of the amount of turbulence produced. An inspection of the heater connections shown in Fig. 16 will readily show that uniform velocity through the heater cannot be expected in the diagram noted *poor*. When obstructions cannot be avoided, the duct area should never be decreased more than 10 percent, and then a *streamlined* collar should be used. Larger obstructions require an increase in the duct size in order to maintain as nearly uniform velocity as possible. Branch take-offs should always be arranged to cut or slice into the air stream in order to reduce as far as possible the losses in velocity head.

Wherever ducts pass through fire walls or connect two fire areas of a building, automatic fire dampers should be provided. For design of such dampers and other fire-protective details, see Pamphlet No. 90 of the *National Board of Fire Underwriters*.²³

The recommended gages for steel (or iron) and aluminum sheet-metal rectangular ducts are given in Table 9. 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. Weights of black and galvanized steel and iron sheets per square foot of surface for various gages are given in Table 10. Similar data for 2S aluminum sheets will be found in Table 11. Weights of standard copper sheets are given in Table 12. In calculating the total weight of a given length of duct work from these tables, it is customary to add 20 percent for the weight of joints and bracings.

Aluminum sheets of the 2S and 3S type alloy and 3/4 hard temper are readily workable, and can be used for practically all duct work. 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 3/4 or 1/2 hard temper is frequently used. The higher tempers, particularly full hard, do not have the formability of the lower tempers. For very large ducts, where considerable strength is required, aluminum sheets should be 2 gages heavier than indicated in Table 9, and should be amply stiffened. 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. Soldering is difficult and is not generally recommended. 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.

HEAT LOSSES FROM DUCTS

In designing duct systems, the heat gains or losses of the ducts can be quite considerable, not only if the duct passes through unconditioned space, but also on long duct runs within conditioned space. Proper insulation will remedy this situation considerably, but sometimes a redistribution of the supply air is necessary in order to compensate for the heat exchanges that occur.

The heat loss from a given length of duct can be expressed by:

$$Q_w = UPl \left[\left(\frac{t_1 + t_2}{2} \right) - t_3 \right] \quad (14)$$