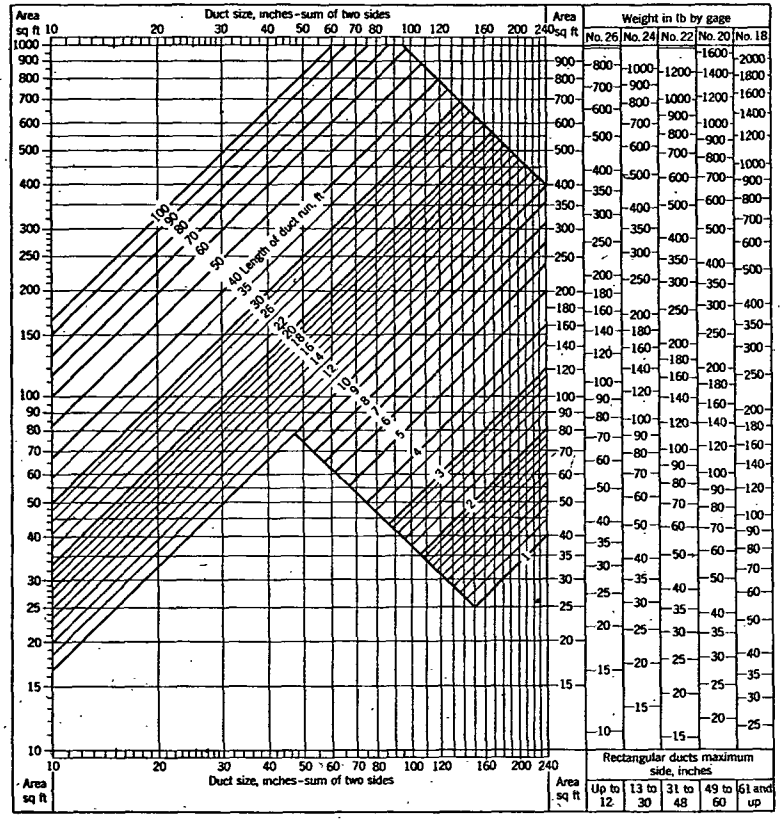

FIG. 8. AREA AND WEIGHT OF RECTANGULAR SHEET METAL DUCTS

Film conductance f_o depends on a number of variables including temperature, diameter, and emissivity of the outer surface and can be calculated from data in Chapter 5. From this explanation, it is seen that it is unwise to recommend a given value of U for all uninsulated metal ducts.

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

$$Q = UPl\left[\left(\frac{t_1 + t_2}{2}\right) - t_s\right] \tag{11}$$

The heat given up by the air in the duct is:

$$Q = 0.24\ W\ (t_1 - t_2) = 14.4\ A\ V_m\ \rho_v\ (t_1 - t_2) \tag{12}$$

Equating (11) and (12):

$$\frac{t_1 + t_2 - 2t_s}{t_1 - t_2} = \frac{28.8\ A\ V_m\ \rho_v}{UPl}$$

Let $y = \dfrac{28.8\ A\ V_m\ \rho_v}{UPl}$ for rectangular ducts, and $\dfrac{7.2DV_m\ \rho_v}{Ul}$ for round

TABLE 6. WEIGHTS OF SHEET METAL USED FOR DUCT CONSTRUCTION

U. S. Std. Gage	Black Sheets: Approximate Thickness, In.		Black Sheets: Weight Per Square Foot		Galvanized Sheets[a]: Approximate Thickness, In.		Galvanized Sheets[a]: 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

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

ducts, and solve for t_1 and t_2:

$$t_1 = \frac{t_2\ (y + 1) - 2t_s}{(y - 1)} \tag{13}$$

$$t_2 = \frac{t_1\ (y - 1) + 2t_s}{(y + 1)} \tag{14}$$

For low velocities and long ducts of small cross-section, a somewhat more accurate formula may be used as follows:

$$t_2 = \frac{t_1 - t_s}{\left(\dfrac{UPl}{14.4\ A\ \rho_v\ V_m}\right)} + t_s \tag{15}$$

Symbols used in these equations are listed at end of chapter.

In using Equations 13, 14 and 15, one of the duct air temperatures will be unknown and will be obtained by substitution of the other known or assumed values.

Heat loss coefficients for insulated ducts with various conductivities are given in Fig. 9. The conductivities of various materials, which are based on mean temperatures, ranging from about 70 to 90 F, will be found in Table 2 of Chapter 6. For cases where the mean temperature

TABLE 7. WEIGHTS AND THICKNESSES OF STANDARD COPPER SHEETS[a]
Rolled to Weight

Weight per Square Foot: Ounces	Weight per Square Foot: Pounds	Thickness, Inches: Decimal Equivalent	Thickness, Inches: Nearest Fraction	Nearest Gage No.: B. & S.	Nearest Gage No.: Stubs	Nearest Gage No.: 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

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