TABLE 11. WEIGHTS AND THICKNESSES OF STANDARD COPPER SHEETS[a]
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

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

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 ducts should not be neglected. Heat gains in large duct systems 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 to the various supply outlets is necessary in order to compensate for the heating effect of the duct surface.

The thermal transmittance U for ducts can be found as follows:

For uninsulated metal duct, $U = \dfrac{1}{\dfrac{1}{f_i} + \dfrac{1}{f_o}}$ (20)

For uninsulated non-metallic ducts,

$$U = \frac{1}{\dfrac{1}{f_i} + \dfrac{x}{k} + \dfrac{1}{f_o}} \tag{21}$$

where

U = overall coefficient of heat transfer, Btu per (hour) (square foot) (Fahrenheit degree).

f_i = surface conductance (inside) Btu per (hour) (square foot) (Fahrenheit degree).

f_o = surface conductance (outside) Btu per (hour) (square foot) (Fahrenheit degree).

x = thickness, inches.

k = unit conductivity of material, Btu per (hour) (square foot) (Fahrenheit degree per inch thickness).

Where x is small and k is large, however, the factor $\dfrac{x}{k}$ is of little importance and may be neglected.

Film conductance f_i for air flowing in ducts apparently depends only on the velocity of the air and the diameter of the duct. A fairly reliable inside coefficient can be calculated from Schultz's modified equation:

$$f_i = \frac{0.32v^{0.8}}{D^{0.25}} \tag{22}$$

where

v = velocity of air in duct, feet per second.

D = insi de diameter of duct, feet.

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:

$$Q_w = UPl\left[\left(\frac{t_1 + t_2}{2}\right) - t_3\right] \tag{23}$$

where

Q_w = heat loss through duct walls, Btu per hour.
P = perimeter of duct, feet.
l = length of duct, feet.
t_1 = temperature of air entering duct, Fahrenheit degrees.
t_2 = temperature of air leaving duct, Fahrenheit degrees.
t_3 = temperature of air surrounding duct, Fahrenheit degrees.

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

$$Q_w = 0.24w(t_1 - t_2) = 14.4AV_m\rho_v(t_1 - t_2) \tag{24}$$

where

w = weight of air through duct, pounds per hour.
A = cross-sectional area of duct, square feet.
V_m = mean velocity of fluid, feet per minute.
ρ_v = density of air at specified temperature at which velocity V_m, is measured pounds per cubic foot.

Equating (23) and (24):

$$\frac{t_1 + t_2 - 2t_3}{t_1 + t_2} = \frac{28.8AV_m\rho_v}{UPl}$$