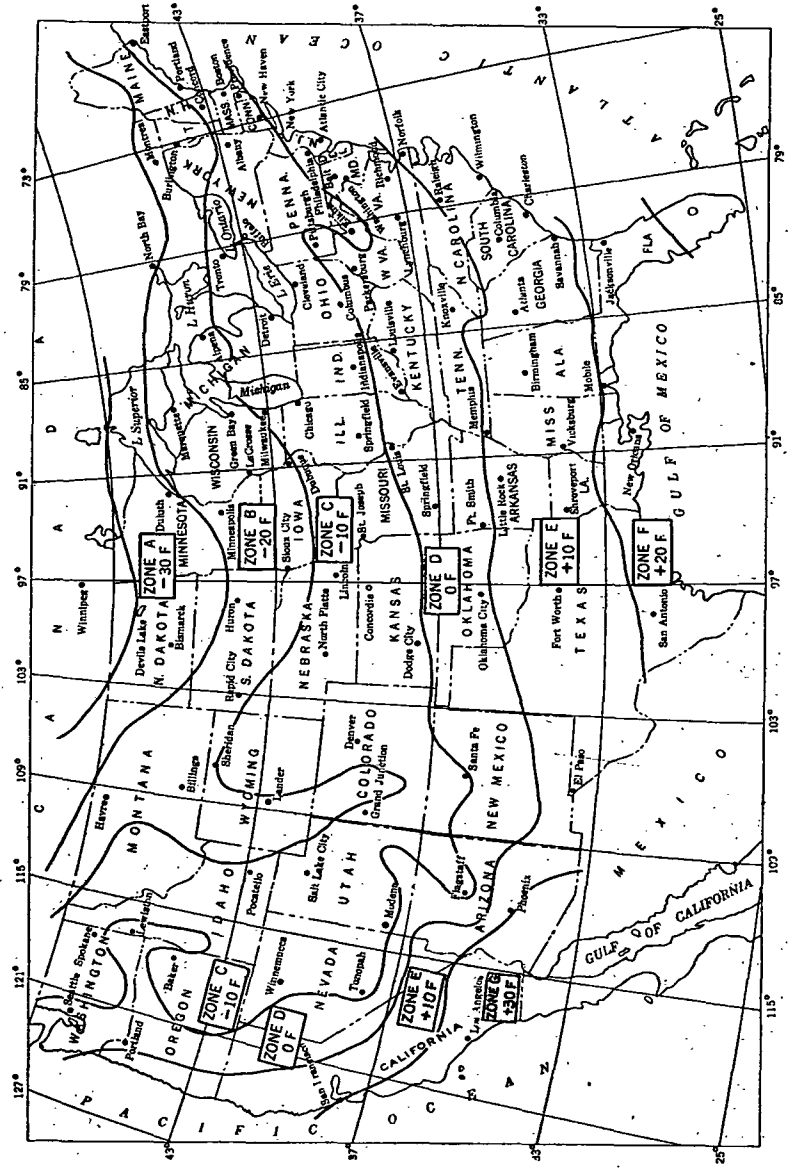

FIG. 1. DESIGN TEMPERATURE ZONE MAP

temperature may be calculated in the usual manner by means of Equation 4, allowing the full value of the roof. The error resulting from this assumption will generally be considerably less than if the roof were neglected (as is sometimes the practice) and the attic temperature assumed to be the same as the outside temperature.

TEMPERATURES IN UNHEATED SPACES

The heat loss from heated rooms into unheated rooms or spaces must be based on the estimated or assumed temperature in such unheated spaces. This temperature will generally range between the inside and outside temperatures, depending on the relative areas of the surfaces adjacent to the heated room and exposed to the outside. If the respective surface areas adjacent to the heated room and exposed to the outside are approximately the same, and if the coefficients of transmission are approximately equal, the temperature in the unheated space may be assumed to be the mean of the inside and outside design temperatures. If, however, the surface areas and coefficients are unequal, the temperature in the unheated space should be estimated by means of Equation 5.

$$t_u = \frac{t(A_1U_1 + A_2U_2 + A_3U_3 + \text{etc.}) + t_o\,(A_aU_a + A_bU_b + A_cU_c + \text{etc.})}{A_1U_1 + A_2U_2 + A_3U_3 + \text{etc.} + A_aU_a + A_bU_b + A_cU_c + \text{etc.}} \quad (5)$$

where

t_u = temperature in unheated space, degrees Fahrenheit.
t = inside design temperature of heated room, degrees Fahrenheit.
t_o = outside design temperature, degrees Fahrenheit.
A_1, A_2, A_3, etc. = areas of surface of unheated space adjacent to heated space, square feet.
A_a, A_b, A_c, etc. = areas of surface of unheated space exposed to outside, square feet.
U_1, U_2, U_3, etc. = coefficients of transmission of surfaces of A_1, A_2, A_3, etc.
U_a, U_b, U_c, etc. = coefficients of transmission of surfaces A_a, A_b, A_c, etc.

Example 4. Calculate the temperature in an unheated space adjacent to a heated room having surface areas (A_1, A_2, and A_3) in contact therewith of 100, 120 and 140 sq ft and coefficients (U_1, U_2, and U_3) of 0.15, 0.20 and 0.25 respectively. The surface areas of the unheated space exposed to the outside (A_a and A_b) are respectively 100 and 140 sq ft and the corresponding coefficients are 0.10 and 0.30. The sixth surface is on the ground and is neglected in this example. Assume $t = 70$ and $t_o = -10$.

Solution. Substituting in Equation 5:

$$t_u = \frac{70[(100\times0.15)+(120\times0.20)+(140\times0.25)]+-10[(100\times0.10)+(140\times0.30)]}{(100\times0.15)+(120\times0.20)+(140\times0.25)+(100\times0.10)+(140\times0.30)}$$

$$t_u = \frac{4660}{126} = 37 \text{ F.}$$

The temperature in unheated spaces having large glass areas and with two or more surfaces exposed to the outside (such as sleeping porches and sun parlors), are generally assumed to be the same as the outside temperature.

GROUND TEMPERATURES

Ground temperatures to be assumed for estimating basement heat losses will usually differ in the case of basement walls and floors, the