

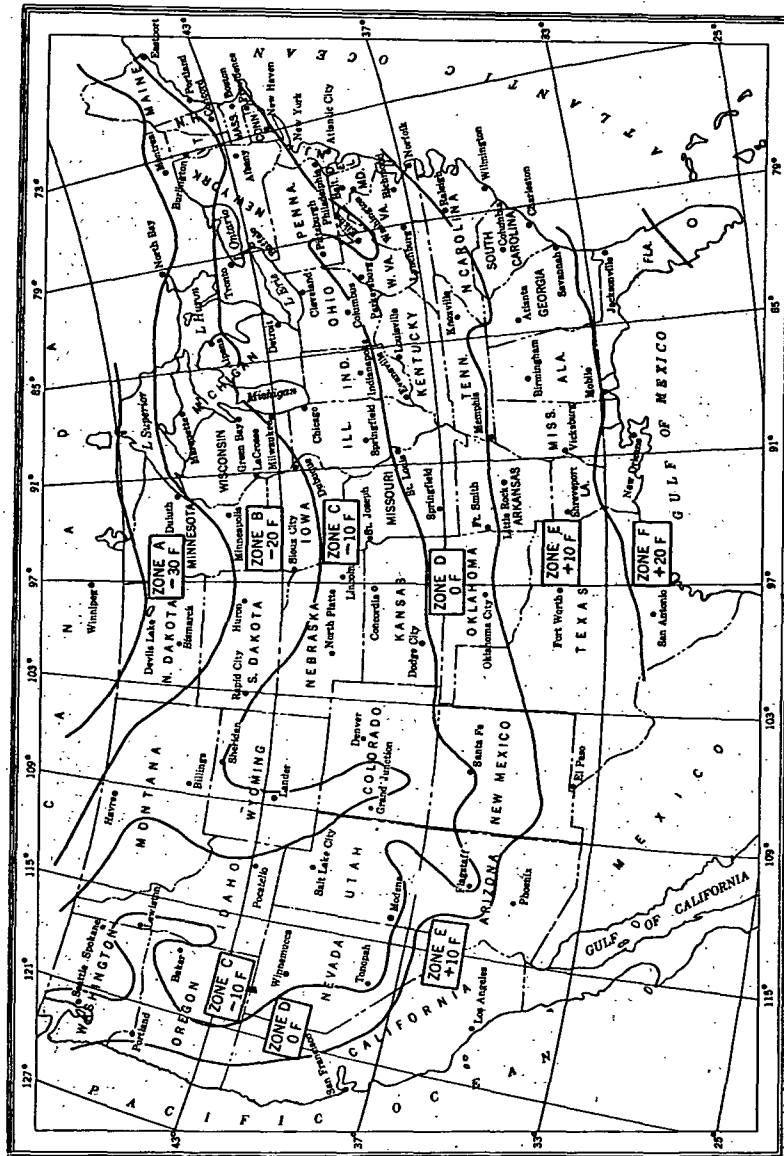


FIG. 1. DESIGN TEMPERATURE ZONE MAP

CHAPTER 6. HEATING LOAD

ATTIC TEMPERATURES

Frequently it is necessary to estimate the attic temperature, and in such cases Equation 4 can be used for this purpose.

$$t_a = \frac{A_c U_c h + t_o (A_r U_r + A_w U_w + A_g U_g)}{A_r U_r + A_w U_w + A_g U_g + A_c U_c} \quad (4)$$

where

t_a = attic temperature, degrees Fahrenheit.

t_i = inside temperature near top floor ceiling, degrees Fahrenheit.

t_o = outside temperature, degrees Fahrenheit.

A_c = area of ceiling, square feet.

A_r = area of roof, square feet.

A_w = area of net vertical wall surface, square feet.

A_g = area of glass, square feet.

U_c = coefficient of transmission of ceiling, based on surface coefficient of 2.20 (upper surface, see Chapter 4).

U_r = coefficient of transmission of roof, based on surface coefficient of 2.20 (lower surface, see Chapter 4).

U_w = coefficient of transmission of vertical wall surface.

U_g = coefficient of transmission of glass.

Example 3. Calculate the temperature in an unheated attic, assuming the following conditions: $t_i = 70$; $t_o = 10$; $A_c = 1000$; $A_r = 1200$; $A_w = 100$; $A_g = 10$; $U_r = 0.50$; $U_c = 0.40$; $U_w = 0.30$; $U_g = 1.13$.

Solution: Substituting these values in Equation 4:

$$t_a = \frac{(1000 \times 0.40 \times 70) + 10 [(1200 \times 0.50) + (100 \times 0.30) + (10 \times 1.13)]}{(1200 \times 0.50) + (100 \times 0.30) + (10 \times 1.13) + (1000 \times 0.40)}$$

$$t_a = \frac{34,413}{1041} = 33.1 \text{ F.}$$

Equation 4 neglects the effect of any interchange of air such as would take place through attic vents or louvers intended to preclude attic condensation. However, according to tests², such venting of attics by means of louvers or other small openings does not appreciably reduce the attic temperature and may be neglected without serious error. The attic 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

²Methods of Moisture Control and Their Application to Building Construction, by F. B. Rowley, A. B. Algren and C. E. Lund. (University of Minnesota, Engineering Experiment Station Bulletin, No. 17).