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CHAPTER 14

HEATING LOAD

General Procedure, Design Outdoor Weather Conditions, Inside Temperatures, Attic Temperatures, Temperatures in Unheated Spaces, Ground Temperatures, Basement Temperatures and Heat Loss, Transmission Heat Loss, Infiltration Loss, Selection of Wind Velocities, Auxiliary Heat Sources, Intermittently Heated Buildings, Residence Heat Loss Problems

IN the design of a heating system, an estimate must be made of the maximum probable heat loss of each room or space to be heated, based on maintaining a specified inside air temperature during periods of design outdoor weather conditions. The heat losses may be divided into two groups, namely (1) the transmission losses or heat losses through the confining walls, floor, ceiling, glass or other surfaces and (2) the infiltration losses or heat losses due to air leakage through cracks and crevices, around doors and windows, opening of doors and windows, or heat required by outside air used for ventilation.

GENERAL PROCEDURE

The general procedure for caculating heat losses of a structure is:

1. Select the design outdoor weather conditions: temperature, wind direction and wind velocity. The data on climatic conditions given in Table 1 and the isotherms of average design temperature in Fig. 1 will be useful but should be applied with judgment as suggested in the section Design Outdoor Weather Conditions.

2. Select the inside air temperature, at the 60-in. breathing line or the 30-in. line which is to be maintained in each room during the coldest weather. (See Table 2).

3. Estimate temperatures in adjacent unheated spaces and the attic. The attic temperature need not be estimated if the combined roof and ceiling coefficient is used.

4. Select or compute the heat transmission coefficients for outside walls and glass; also for inside walls, floors, or top-floor ceilings, if these are next to unheated space; include roof if next to heated space. (See Chapter 6).

5. Measure amount of net outside wall, glass and roof next to heated spaces, as well as any cold walls, floors or ceilings next to unheated space. Such measurements are made from building plans, or from the actual building, using inside dimensions.

6. Compute the heat transmission losses for each kind of wall, glass, floor, ceiling and roof in the building by multiplying the heat transmission coefficient in each case by the area of the surface in square feet, and the temperature difference between the inside and outside air. (See Items 1, 2, and 3).

7. Select unit values and compute the heat equivalent of the infiltration of cold air taking place around outside doors and windows. These unit values depend on the kind or width of crack, wind velocity, and the temperature difference between the inside and outside air; the result expresses the heat required to warm up the cold air leaking into the building per hour. (See Chapter 8).

8. When positive ventilation using outdoor air is provided by an air heating or an air conditioning unit, the heat required to raise the outside air to room temperature must be provided by the unit; if mechanical exhaust from the room is provided, in amount equal to the fresh air drawn in by the unit, the natural infiltration losses must also be provided for by the unit. If no mechanical exhaust is used, and the outdoor air quantity equals or exceeds the amount of natural infiltration which would occur without ventilation, the natural infiltration may be neglected.

9. The sum of the heat losses by transmission (Item 6) through the outside walls and glass, as well as through any cold floors, ceilings or roof, plus the heat equivalent