

mission heat losses of 20.9 per cent are relatively small. The infiltration losses (12.8 per cent) are also comparatively small in this case because the storm windows serve substantially the same purpose as weatherstripping. In this problem, the wall, ceiling and floor transmission losses comprise 66.3 per cent of the total. If the building is insulated, the relative heat loss percentages will materially change. (See Example 6 and Table 5.)

Example 6. Calculate the heat loss of residence shown in Fig. 2 based on the same conditions as in Example 5 but insulated throughout as follows (coefficients in parentheses):

Walls: Brick veneer, $2\frac{1}{2}$ in. insulation board sheathing, studding, 1 in. insulation board lath and plaster (0.14). Walls of dormer over garage same except wood siding in place of brick veneer (0.13).

Attic Walls: Brick veneer, $2\frac{1}{2}$ in. insulation board sheathing on studding (0.28).

Walls Adjoining Garage: Plaster on 1 in. insulation board, studding, metal lath and plaster (0.18).

Basement Walls (Recreation Room): 10 in. concrete (0.10).

Roof: Asphalt shingles on wood sheathing on rafters (0.56).

Ceiling (Second floor): 1 in. insulation board and plaster; $\frac{1}{2}$ in. insulation board on top of ceiling joists (0.15).

Windows: Same as Example 5.

Floor (Bedroom D): Maple finish flooring on yellow pine sub-flooring; $\frac{1}{2}$ in. insulation board and plaster ceiling below (0.18).

Solution: The procedure for calculating the heat losses is similar to that for Example 5. A summary of the results is given in Table 5.

Chapter 7

COOLING LOAD

Design Outside Temperatures, Components of Heat Gain, Normal Heat Transmission, Solar Heat Transmission, Solar Radiation Through Glass, Heat Introduced by Outside Air, Heat Emission of Appliances

LOAD calculations for summer air conditioning are more complicated than heating load calculations because there are more factors to be considered. Due to the variable nature of some of the contributing load components and the fact that they do not necessarily impose their maximum effect simultaneously, considerable care must be used in determining their phase relationship so that equipment of proper capacity may be selected to maintain specified indoor conditions.

The conditions to be maintained in an enclosure are variable and depend upon several factors, especially the outside design conditions, duration of occupancy and relationship between air motion, dry-bulb and wet-bulb temperatures. Information concerning the proper indoor effective temperature to be maintained is given in Chapter 2, for different geographical locations and for various age groups of individuals.

Summer dry-bulb and wet-bulb temperatures of various cities are given in Table 1. The temperatures are not the maximums but the design temperatures which should be used in air conditioning calculations. The maximum outside wet-bulb temperatures as given in Weather Bureau reports usually occur only from 1 to 4 per cent of the time, and they are therefore of such short duration that it is not practical to design a cooling system for them. The temperatures shown in Table 1 are based on available design conditions known to be successfully applied.

COMPONENTS OF HEAT GAIN

A cooling load determination is composed of five components which are classified in the following manner:

1. Normal heat transfer through windows, walls, partitions, doors, floors, ceilings, etc.
2. Transfer of solar radiation through windows, walls, doors, skylights, or roof.
3. Heat emission of occupants within enclosures.
4. Heat introduced by infiltration of outside air or controlled ventilation.
5. Heat emission of mechanical, chemical, gas, steam, hot water and electrical appliances located within enclosures.