

monoxide in the occupied portion of a garage than is had with complete mixing of the exhaust gases and the air supplied. However, the variations in concentration from point to point, together with the possible failure of the advantages of upward ventilation to accrue, suggest the basing of garage ventilation on complete mixing and an air change sufficient to dilute the exhaust gases to the allowable concentration of carbon monoxide.

4. The rate of carbon monoxide production by an idling car is shown to vary from 25 to 50 cfh, with an average rate of 35 cfh.

5. An air change of 350,000 cfh per idling car is required to keep the carbon monoxide concentration down to one part in 10,000 parts of air.

Chapter 5

HEAT TRANSMISSION

Heat Transfer Through Walls, Areas Where Transmission Losses Occur, Calculations for Transmission Losses, Coefficients of Transmission and Tables, Temperatures and Coefficients, Air Spaces, Surface Conductances, Conductivities of Materials

THIS chapter concerns the transmission losses of a building which, in conjunction with the infiltration losses, must always be considered in arriving at the size of the heating (or cooling) plant required for the maintenance of certain specified inside temperature conditions.

HEAT TRANSFER

Whenever a difference in temperature exists between the two sides of any structural material, such as a wall or roof of a building, a transfer of heat takes place through that material. When the inside temperature is the higher, heat reaches or enters the inside surface of the wall by radiation and convection, because the air and objects within the building are always warmer than the inside surface of the wall when the inside air temperature t is greater than the outside air temperature t_o . This heat must then pass through the material of the wall from the inside to the outside surface by conduction, and is finally given off from the outside surface by radiation and convection, provided, of course, that equilibrium has been established and all four temperatures are constant. If the outside temperature is the higher, the reverse process takes place.

CALCULATIONS FOR TRANSMISSION LOSSES

The calculations for heat transmission losses are made by multiplying the area A in square feet of wall, glass, roof, floor, or material through which the loss takes place, by the proper coefficient U for such construction or material and by the temperature difference between the inside air temperature t at the proper level (in many cases not the *breathing-line*) and the outside air temperature t_o . Therefore,

$$H_t = AU(t - t_o) \quad (1)$$

where

H_t = Btu per hour transmitted through the material of the wall, glass, roof or floor.

A = area in square feet of wall, glass, roof, floor, or material, taken from building plans or actually measured. (Use the net inside or heated surface dimensions in all cases).

$t - t_o$ = temperature difference between inside and outside air, in which t must always be taken at the proper level. Note that t may not be the *breathing-line* temperature in many cases.