having excessive vapor pressure and all doors must have gaskets applied to them to make the barrier effective.

ILLUSTRATION

From the foregoing discussion it is obvious that the determination of the maximum cooling load is rather complicated by reason of the variable nature of contributing load components. An illustrative example will explain the method presented in the foregoing text.

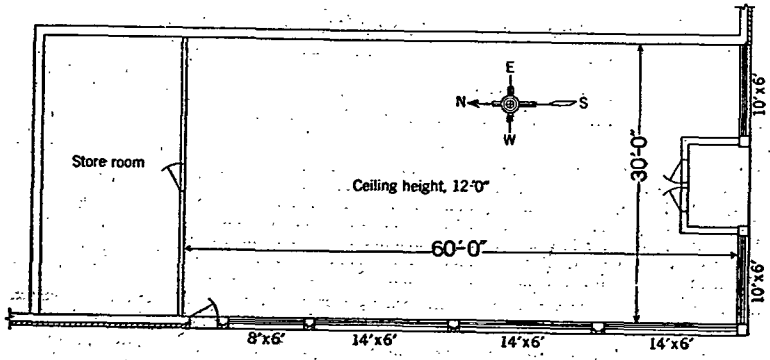

FIG. 9. PLAN DIAGRAM OF CLOTHING STORE

Example 1. Determine cooling load requirements for a clothing store illustrated in Fig. 9 and located in Pittsburgh, Pa., Latitude 40 deg. This is a one-story building located on a corner and it faces south and west. Assume building on east and north sides conditioned.

Wall construction, 8 in. concrete block, 4 in. brick veneer, plaster on walls, $U = 0.33$ (Table 8, Chapter 6, No. 93 B).

Roof construction, 2 in. concrete, ½ in. insulating board, metal lath and plaster ceiling, $U = 0.26$ (Table 15, Chapter 6, No. 14 B).

Floor, maple flooring on yellow pine, no ceiling below, $U = 0.34$ (Table 11, Chapter 6, No. 1-N).

Partition, wood lath and plaster on both sides of studding, $U = 0.34$ (Table 9, Chapter 6, No. 3 B).

Windows, provided with awnings.

Front doors, 2 ft 6 in. x 7 ft (glass paneled).

Side door, 3 ft x 7 ft (glass paneled), $U = 1.13$ (Table 18 A, Chapter 6).

Occupancy, 10 clerks, 40 patrons.

Lights, 4200 w.

Outside design conditions, dry-bulb 95 F; wet-bulb 75 F.

Inside design conditions, dry-bulb 80 F; wet-bulb 67 F.

Basement temperature, 85 F.

Store room temperature, 88 F.

Solution. It is obvious from the shape and exposure of this store and the large glass area on the west side that the maximum cooling load will occur during the afternoon when the sun is shining on the west wall. From Fig. 1, the peak load may be expected at 4:00 p.m.

The combined normal transmission and solar radiation transmission through the roof at 4:00 p.m. is obtained from Fig. 2. While none of the roofs in Fig. 2 is exactly like this one, roof 4 is similar. A heat flow of 8½ Btu per (square foot) (hour) was assumed, 20 per cent more than for roof 4. The combined normal transmission and solar radiation transmission through the south and west walls at 4:00 p.m. is obtained from curves in Figs. 7 and 8. Note that the curve values for combined wall transmission have been increased by a judgment factor of 20 per cent. Also, that the values are still only about half what would be obtained due to normal transmission taking the instantaneous temperature difference.

The normal heat transmission through the south and west glass, floor and partition is determined by application of Equation 1. The solar radiation effect passing through bare south and west glass is determined from Table 7 as being 18 and 193 Btu per (square foot) (hour) respectively. This is multiplied by a haze factor of 0.9 (10 per cent reduction) and by a factor of 0.25 to take account of the awning (Table 10). It will be seen that the sun effect on the south glass might well have been neglected.

To determine the load imposed by occupants, it will be found from Chapter 12 that the average person standing at rest will dissipate 431 Btu per hour, and that the moisture dissipated is 0.198 lb per hour.

The amount of infiltration through a swinging door is determined from Table 3, Chapter 8 as being 3½ cfm per person for 40 patrons or 140 cfm total. Since the windows are sealed it can be assumed that this is the only infiltration which will occur. The infiltration affects both the sensible and latent load of the room and, therefore, must be considered separately from the outside air passed through the apparatus for ventilation purposes which affects the room conditions little or none. (See Chapter 7 and 43 for treatment of "by-passed" outside air as a part of the room load.)

The ventilation requirements as given in Table 1, Chapter 12 would indicate the need of about 9 cfm per person based on a volume of the store of 21,600 cu ft and 50 persons making a total volume of 450 cu ft. However, the ventilation requirements in the summer are somewhat greater than those in the winter and, therefore, 10 cfm per person or 500 cfm total will be chosen. From this should be subtracted the estimated infiltration of 140 cfm, making a net amount of outside air to be drawn through the apparatus of 360 cfm.

The total heat addition due to the infiltration and outside air is determined from Equation 3, and the moisture addition is determined from Equation 4.

The room total load is then made up of normal transmission, combined normal and sun radiation transmission, solar radiation through glass, heat from occupants, total heat addition due to infiltrations, and heat from lights.

It is necessary to determine only the amount of water condensed from the air (not the latent heat). In considering the room load this consists of the water evaporated from the people plus the excess water in the infiltration air.

The excess heat and moisture load due to the outside air tends to raise the return air temperature and moisture content, but if the dehumidifier is 100 per cent effective and fully saturates the leaving air, the outside air load has no direct effect upon the room. It, therefore, should be determined separately and added only in connection with the determination of the refrigeration requirements.

NORMAL TRANSMISSION:

SURFACE	DIMENSIONS	AREA SQ FT	U	TEMP DIFF F DEG	BTU PER HOUR
S Glass	2 (2 ft 6 in. x 7 ft) + 2 (10 ft x 6 ft)	155	1.13	15	2,627
W Glass	3 (14 ft x 6 ft) + (8 ft x 6 ft) + (3 ft x 7 ft)	321	1.13	15	5,445
Floor	26 ft x 54 ft	1404	0.34	5	2,387
N Partition	30 ft x 12 ft	360	0.34	8	979
Total					11,438