carried away and 50 per cent dissipated in the space to be conditioned. Where latent as well as sensible heat is given off, it is usually safe to assume that all latent heat will be removed by a properly designed and operated vent or hood.

GENERAL

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.

Application of the foregoing data in determining cooling load requirements is illustrated in Example 1.

Example 1. Determine cooling load requirements for a clothing store illustrated in Fig. 3 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. hollow tile, 4 in. brick veneer, plaster on walls, $U = 0.33$ (Table 4, Chapter 5, No. 38 B).

Roof construction, 2 in. concrete, ½ in. rigid insulation, metal lath and plaster ceiling, $U = 0.26$ (Table 11, Chapter 5, No. 2 J).

Floor, maple flooring on yellow pine, no ceiling below, $U = 0.34$ (Table 8, Chapter 5, No. 1 D).

Partition, wood lath and plaster on both sides of studding, $U = 0.34$ (Table 6, Chapter 5, No. 77 B).

Show windows, provided with awnings and thin panel partition at rear.

Front doors, 2 ft 6 in. x 7 ft (glass paneled), $U = 1.13$ (Table 13 A, Chapter 5).

Side doors, 3 ft x 7 ft (solid, 1¾ in. thick), $U = 0.51$ (Table 13 B, Chapter 5).

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.

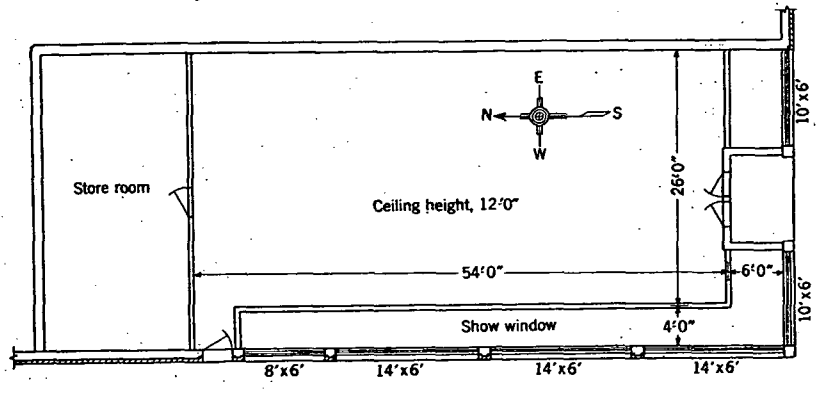

FIG. 3. PLAN DIAGRAM OF CLOTHING STORE

Solution. The normal heat transmission through various surfaces shown in load calculations are determined by application of Formula 1.

It is quite obvious from the shape and exposure of this store that the maximum sun load will exist on the west wall. Since the west wall has a large glass area with a negligible time lag, the peak load may be expected at 4:00 p.m. at which time, from Table 4, $I = 211$. As explained in the text, the normal transmission load through these windows is omitted because it is small in comparison with the sun load. I for the south side at 4:00 p.m. is 8. Because of the small amount of solar radiation transmitted through the south glass, it can be neglected and the total heat gain taken as that due to normal transmission. Assuming time lag in roof and walls to be 2 hr, the corresponding values for I for south and west walls and roof will be those shown in Table 4 for 2:00 p.m. They are respectively 77, 143 and 258. A time lag of 1 hr was assumed for the west door amounting to $I = 192$. By substituting these values in Equations 2 and 3 the solar heat load is determined.

To determine the heat gain from the outside air it is necessary first to determine the volume of the outside air to be introduced. Since the show windows are sealed so as not to permit infiltration and since there are only three doors in this store through which infiltration can take place, it is obvious that infiltration of air will be a negligible quantity. The volume of the store is 21,600 cu ft. Good practice indicates that in a store of this character there should be a minimum of from 1 to 1½ outside air changes per hour. On a basis of 1½ air changes the volume of outside air to be introduced would be 32,400 cfh. The minimum ventilation requirements as given in the CODE OF MINIMUM REQUIREMENTS for COMFORT AIR CONDITIONING[9] are 10 cfm per person. On this basis the ventilation requirements would be 30,000 cfh. Since this will produce approximately 1½ outside air changes per hour, 30,000 cfh will be considered in this application.

To determine load imposed by occupants it will be found from Table 4, Chapter 3 that the average person standing at rest will dissipate 225 Btu sensible heat and 206 Btu latent heat per hour.

NORMAL TRANSMISSION LOAD:

SURFACE	DIMENSIONS	AREA SQ FT	U	TEMP. DIFF.* DEG F	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
S Wall	(30 ft x 12 ft) − 155	205	0.33	15	1,015
W Wall	(60 ft x 12 ft) − 321	399	0.33	15	1,975
W Door	3 ft x 7 ft	21	0.51	15	161
Roof	60 ft x 30 ft	1800	0.26	15	7,020
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					16,164

SUN LOAD:

SURFACE	DIMENSIONS	AREA SQ FT	F	a	I	SHADE FACTOR	BTU PER HOUR
S Wall		205	0.078	0.7	77		862
W Glass	3(14 ft x 6 ft)+ (8 ft x 6 ft)	300			211	0.28	17,724
W Door		21	0.118	0.7	192		333
W Wall		399	0.078	0.7	143		3,113
Roof		1800	0.062	0.9	258		25,914
Total							47,946

OUTSIDE AIR HEAT GAIN:

Sensible heat, $H_s = 0.24 \times 60\, d_o\, Q\, (t_o - t)$ (Formula 4).

$Q = 50 \times 10 = 500$ cfm.

[9]Code of Minimum Requirements for Comfort Air Conditioning (A.S.H.V.E. TRANSACTIONS, Vol. 44, 1938, p. 27). Reprints of this code are available at $.10 a copy.