the importance of the sun load, cooling systems should be zoned so that the side of the building on which the sun is shining can be controlled separately from the other sides of the building. If buildings are provided with awnings so that the window glass is shielded from sunshine, the amount of cooling required will be reduced and there will also be less difference in the cooling requirements of different sides of the building. The total cooling load for a building exposed to the sun on more than one side is of course less than the sum of the maximum cooling loads in the individual rooms since the maximum solar radiation load on the different sides occurs at different times. In determining the total cooling load for a building if the time when the maximum load occurs is not obvious, the

TABLE 8. HEAT GAIN THROUGH GLASS BLOCKS[a]

		Solar Radiation Heat Gain (Direct plus Sky) Btu per Sq Ft per Hour						Total Heat Gain[b] (Solar Radiation plus Normal Transmission) Btu per Sq Ft per Hour					
Side		East[c]	West[c]	South				East[c]	West[c]	South			
N. Latitude Degrees		40	40	30	35	40	45	40	40	30	35	40	45
Sun Time	Outside Temp F												
7:00	74	65.0		1.0	2.8	3.0	5.0	61.0		−4.5	−2.0	−0.5	1.0
8:00	76	63.0	0.0	3.0	4.4	6.5	11.0	77.5		0.0	2.0	4.0	5.0
9:00	79	40.0	5.0	5.5	7.1	10.2	13.4	73.5	5.0	5.0	7.0	10.0	12.0
10:00	83	24.0	6.0	8.5	11.3	14.7	17.1	57.5	6.5	11.0	15.0	18.0	20.8
11:00	87	15.5	7.0	12.0	15.2	18.7	21.8	45.0	7.5	16.5	22.0	25.5	32.0
12:00	90	10.0	10.0	14.0	17.4	21.0	24.8	36.5	10.5	21.5	28.0	33.8	40.8
1:00	93	7.0	15.5	12.0	15.2	18.7	21.8	30.0	22.0	25.0	31.8	38.5	46.0
2:00	94	6.0	24.0	8.5	11.3	14.7	17.1	24.0	35.0	26.0	32.0	39.0	47.0
3:00	95	5.0	40.0	5.5	7.1	10.2	13.4	19.5	55.0	24.0	29.8	36.5	45.0
4:00	95	4.5	65.0	3.0	4.4	6.5	11.0	15.5	77.0	20.0	25.5	31.5	40.5
5:00	93	4.0	63.0	1.0	2.8	3.0	5.0	12.5	85.5	15.0	20.0	25.2	33.5
6:00	91	2.5	23.5	0.0	0.7	0.7	3.0	10.5	55.0	9.5	13.5	18.0	25.5
7:00	89	1.5	0.0			0.0	0.7	8.0	18.5	3.5	7.0	11.0	18.0

[a]For August 1.

[b]Inside temperature, 78 F.

[c]For east and west walls these values can be applied to all latitudes between 30 and 45 deg N without excessive errors.

load should be calculated for various times of day to determine the times at which the sum of the loads on the different sides of the building is a maximum.

The direct solar and scattered sky radiation penetration through glass block panels is given in Table 8 for various times of the day for south, east and west exposures for different latitudes on August 1. This table also gives the total heat gain into an air conditioned space when 78 F is maintained indoors, resulting from the effect of both radiation and air to air transmission. These values result from A.S.H.V.E. Laboratory data[10] and apply for expected design radiation intensity, and for a design day having a maximum temperature of 95 F. The resulting heat gains are averages for four typical glass block designs, two having smooth exterior faces, and the other two having exterior ribbed faces.

[10]Loc. Cit. Note 1.

Heat Emission of Occupants

The heat and moisture given off by human beings under different states of activity are shown in various tables and figures of Chapter 2 which covers the physical and physiological principles of air conditioning. It will be observed from these data that the rate of sensible and latent heat emission by human beings varies greatly depending upon state of activity. In many applications this component becomes a large percentage of total load. Metabolic rates are markedly variable for some extreme environmental conditions and this is another important factor which must be considered in cooling load computations.

Heat Introduced by Outside Air

An allowance must be made for the heat and moisture in the outside air introduced for ventilation purposes and entering the building through cracks, doors, and other places where infiltration might occur.

The volume of air entering due to infiltration may be estimated from data given in Chapters 5 and 6. Information on the amount of outside air required for ventilation will be found in Chapter 2.

The possible peak load caused by infiltration and ventilation requirements must be carefully considered. In general, as the ventilation increases the infiltration will tend to decrease. The external pressure on the windward side of the building is often greater than the pressure within and under this condition there will still be infiltration even with large ventilation quantities. Frequently this does not appreciably affect the refrigeration calculation as infiltration can frequently be compensated for by decreasing ventilation. Infiltration, however, does affect the required apparatus dew-point, particularly in rooms of one exposure.

The heat gain resulting from outside air introduced may be determined by Equation 3:

$$H = \frac{Q}{v}\,(h_o - h_i) \tag{3}$$

where

H = heat to be removed from outside air entering the building, Btu per hour.
Q = volume of outside air entering building, cubic feet per hour.
v = cubic feet of outside air per pound of dry air.
h_o = enthalpy of outside air, Btu per pound of dry air.
h_i = enthalpy of inside air, Btu per pound of dry air.

The latent heat gain resulting from outside air introduced may be determined by Equation 4:

$$H_l = \frac{Q}{v}\,h_{fg}\,(W_o - W_i) \tag{4}$$

where

H_l = latent heat to be removed, Btu per hour.
h_{fg} = latent heat of evaporation at temperature at which water is condensed, Btu per pound.
W_o = humidity ratio of outside air, pounds water per pound dry air.
W_i = humidity ratio of inside air, pounds water per pound dry air.

Heat Emission of Appliances

Heat generating appliances which give off either sensible heat or both sensible and latent heat in an air conditioned enclosure may be divided