TABLE 4. SOLAR RADIATION (DIRECT PLUS SKY) IMPINGING AGAINST WALLS HAVING SEVERAL ORIENTATIONS AND A HORIZONTAL SURFACE
For 40 Deg North Latitude on August 1

SUN TIME	INTENSITY OF SOLAR RADIATION, BTU PER SQ FT PER HOUR							
	Northeast	East	Southeast	South	Southwest	West	Northwest	Horizontal Surface
4:50	0	0	0	0	0	0	0	0
5:00	5	6	4	2.5	2.5	2.5	2.5	5
6:00	49	56	32	4.5	4.5	4.5	4.5	20
7:00	123	162	109	11	11	11	11	85
8:00	137	211	166	29	17	17	17	160
9:00	102	195	181	74	21	21	21	212
10:00	54	152	171	103	23.5	23.5	23.5	244
11:00	28	94	144	124	41	25.5	25.5	281
12:00	26	26	98	128	98	26	26	290
1:00	25.5	25.5	41	124	144	94	28	281
2:00	23.5	23.5	23.5	103	171	152	54	244
3:00	21	21	21	74	181	195	102	212
4:00	17	17	17	29	166	211	137	160
5:00	11	11	11	11	109	162	123	85
6:00	4.5	4.5	4.5	4.5	32	56	49	20
7:00	2.5	2.5	2.5	2.5	4	6	5	5
7:10	0	0	0	0	0	0	0	0

TABLE 5. SOLAR RADIATION (DIRECT PLUS SKY) IMPINGING AGAINST WALLS HAVING SEVERAL ORIENTATIONS AND A HORIZONTAL SURFACE
For 45 Deg North Latitude on August 1

SUN TIME	INTENSITY OF SOLAR RADIATION, BTU PER SQ FT PER HOUR							
	Northeast	East	Southeast	South	Southwest	West	Northwest	Horizontal Surface
4:25	0	0	0	0	0	0	0	0
5:00	22	20	17	3.5	3.5	3.5	3.5	9
6:00	87	99	56	5.5	5.5	5.5	5.5	27
7:00	151	192	134	12	12	12	12	89
8:00	144	237	188	48	17	17	17	156
9:00	100	199	197	93	21	21	21	205
10:00	46	153	184	121	23.5	23.5	23.5	243
11:00	28	94	158	146	63	25.5	25.5	259
12:00	26	26	116	156	116	26	26	281
1:00	25.5	25.5	63	146	158	94	28	259
2:00	23.5	23.5	23.5	121	184	153	46	243
3:00	21	21	21	93	197	199	100	205
4:00	17	17	17	48	188	237	144	156
5:00	12	12	12	12	134	192	151	89
6:00	5.5	5.5	5.5	5.5	56	99	87	27
7:00	3.5	3.5	3.5	3.5	17	20	22	9
7:35	0	0	0	0	0	0	0	0

The variation in radiation intensity on differently oriented surfaces is given in Fig. 1, and in Tables 2, 3, 4 and 5. The greater part of the radiation intensity is always direct radiation from the sun. However, during the time when the sun is shining, any surface receives radiation of a lower intensity coming from all parts of the sky due to reflection and refraction. This scattered radiation intensity was found to vary from a very low value to values as high as 20 per cent of the total radiation observed on certain days in Pittsburgh. The curves and tables are for combined direct solar and scattered sky radiation, and are given to represent expected design radiation intensity for August 1. They were prepared by the A.S.H.V.E. Laboratory from data[1] obtained by pyrheliometer observations.

A study of these curves discloses the periodic relationship and wide variation in solar intensity on various surfaces. It will be observed that

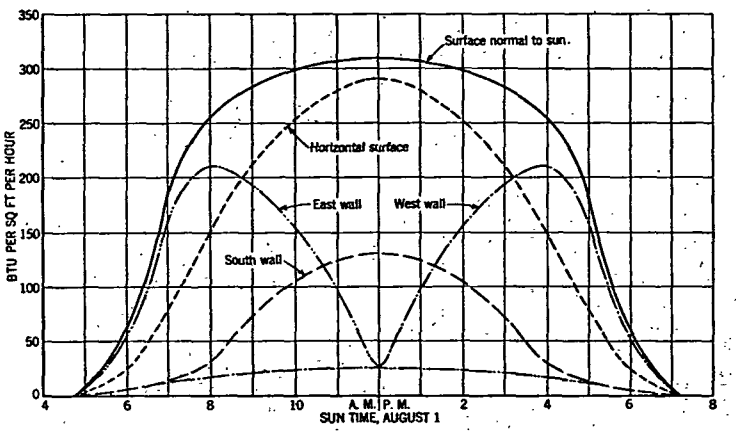

FIG. 1. SOLAR INTENSITY NORMAL TO SUN ON HORIZONTAL SURFACE AND ON WALLS FOR AUGUST 1 AT 40 DEG NORTH LATITUDE

both the roof (horizontal surface) and south wall radiation curves are in exact phase relationship with each other, while those for the east and west walls overlap each other due to scattered sky radiation on the west wall during the forenoon and on the east wall during the afternoon. This phase relationship has an important bearing on the cooling load. Failure to consider the periodic character of heat flow resulting from diurnal movement of the sun and the lag due to heat capacity of the structure, which determine the timing and magnitude of the heat wave flowing through the wall, may result in a large error in load calculations.

The values of solar intensity appearing in Fig. 1 must not be confused with the actual heat transmission through the wall for much of the solar radiation impinging against the outer surface fails to pass through the wall. Instead it is delivered to the outside air by reflection, radiation,

[1]A.S.H.V.E. RESEARCH REPORT NO. 1147—Heat Gain Through Glass Blocks by Solar Radiation and Transmittance, by F. C. Houghten, David Shore, H. T. Olson and Burt Gunst (A.S.H.V.E. TRANSACTIONS, Vol. 46, 1940, p. 83).