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

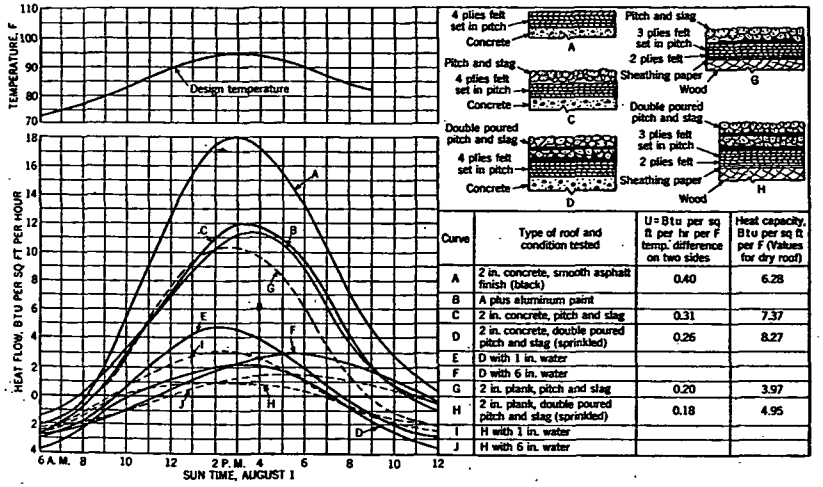
For 45 Deg North Latitude on August 1

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

as given in Fig. 1 and Table 4; outdoor design temperature reaching a maximum of 95 F as shown by the temperature curve in Fig. 2 and an indoor temperature of 75 F.

Curves in Fig. 3 were prepared by the A.S.H.V.E. Laboratory from recent tests made there and show the heat flow through the inside surface of three types of walls for various orientations[5]. The results are given for the following conditions: 90 per cent of the solar radiation given in Fig. 1 and Table 4 for 40 deg north latitude on August 1; outdoor design temperature reaching a maximum of 93 F as shown by the temperature curve in Fig. 3 and an indoor temperature of 78 F and 50 per cent relative humidity.

The heat flow shown in Figs. 2 and 3 is a combination of normal transmission and solar radiation transmission and is the total heat flow through the wall or roof. Due to the heat capacity of walls and roofs there is a



Curve	Type of roof and condition tested	U=Btu per sq ft per hr per F temp. difference on two sides	Heat capacity, Btu per sq ft per F (Values for dry roof)
A	2 in. concrete, smooth asphalt finish (black)	0.40	6.28
B	A plus aluminum paint		
C	2 in. concrete, pitch and slag	0.31	7.37
D	2 in. concrete, double poured pitch and slag (sprinkled)	0.26	8.27
E	D with 1 in. water		
F	D with 6 in. water		
G	2 in. plank, pitch and slag	0.20	3.97
H	2 in. plank, double poured pitch and slag (sprinkled)	0.18	4.95
I	H with 1 in. water		
J	H with 6 in. water		

FIG. 2. RELATION BETWEEN TIME AND HEAT FLOW THROUGH INSIDE SURFACE OF HORIZONTAL ROOFS CORRECTED TO DESIGN DAY OF AUGUST 1

time lag[6] in the transmission of heat through them as shown by the curves. For the types of construction covered in Figs. 2 and 3 and for the conditions indicated, the heat flow through the inside surface at any given time can be read directly. For other types of construction, the curves may be used as a guide in estimating the heat flow. The time lag for other types of construction is included in Table 6 which was prepared by the A.S.H.V.E. Laboratory from data collected by it and by other authorities.

Solar Radiation Transmitted Through Glass

Windows present a problem somewhat different from that of opaque walls, because they permit a large percentage of the solar energy to pass

[5] A.S.H.V.E. RESEARCH REPORT No. 1195—Heat Gain Through Walls and Roofs as Affected by Solar Radiation, by F. C. Houghten, E. C. Hach, S. I. Taimuty and Carl Gutberlet (A.S.H.V.E. TRANSACTIONS, Vol. 48, 1942, p. 91).

[6] Loc. Cit. Note 2.