(4.1)The Maximum and Minimum Temperature on May and June:

Date	Kosti	Khartoum
1/5	Max 41- min 26	Max41- min25
2/5	41- 27	42-25
3/5	40-27	39-25
4/5	39- 26	41-26
5/5	40-27	39-27
6/5	41- 25	40-25
7/5	41-26	41-27
8/5	40-27	41-26
9/5	41-23	41-26
10/5	42-24	41-25
11/5	40-25	42-26
12/5	41-29	42-24
13/5	41-26	41-26
14/5	40-23	41-25
15/5	41-27	42-26
16/5	40-28	41- 27
17/5	41-23	40-27
18/5	42-24	39- 26
19/5	41-26	40-27
20/5	41-25	41- 25
21/5	42-26	41-26
22/5	42-24	40-27
23/5	42-25	41-23
24/5	39-25	42-24
25/5	41-26	41- 27
26/5	39-27	40-27
27/5	40-25	39- 26
28/5	41-27	40-27
29/5	41-26	41- 25

Appendix (4.2) Percentage of Daily Range

Time, h	%	Time, h	%	Time, h	%
1	87	9	71	17	10
2	92	10	56	18	21
3	96	11	39	19	34
4	99	12	23	20	47
5	100	13	11	21	58
6	98	14	3	22	68
7	93	15	0	23	76
8	84	16	3	24	82

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Appendix (4.3) Thermal Conductivity of Different Sections

Material	k = {W / m K}
(block brick)	0.77
(Face brick)	0.75
(Concrete)	1.72
(Tiles)	1.39
(Stone)	1.80
(Cement plaster)	0.72
(Gypsum plaster)	0.80
Concrete	1.71

Appendix (4.4) HEAT AND MOSITURE TRASFER THROUGH BUIDING ENVELOPE

Surface Heat- Transfer Cofficients h,Btu.ft ^{2}F^o

Surface emissivity □

0.90 **0.20**

Indoor surface **Indoor surface**

Drection of heat flow ΔT_{sa} =10 F^o **Outdoor surface ΔT_{sa} =10 F^o**

Description	Summer	Winter	ΔT_{sa}= 1 F^o	Summer	Winter	ΔT_{sa}=1 F^o
Forced Convection						
□30 fpm	2.21	2.11	2.16	1.46	1.43	1.44
50fpm	2.37	2.27	2.32	1.62	1.59	1.60
660 fpm(7.5 mph)			4.44			
1320 fpm(15 mph)			7.08			
Free Convection						
Horizontal Surface Upward		1.36	1.27 1.17		0.62	0.60 0.44
Horizontal Surface Downward			1.03			

Note :Assume space temperature T_r=T_{rad} : here T_{rad} indicates the mean radiant temperature of the surroundings

Appendix (4.5) CLTD Correction For Latitude Month Applied to Walls and Roofs,Noth Latitudes

Lat.	Month	N	NNE NNW	NE NW	ENE WNW	E W	ESE WSW	SE SW	SSE SSW	S	HOR
0	Dec	−3	−3	−5	−5	−2	0	3	6	9	−1
	Jan/Nov	−3	−5	−4	−4	−1	0	2	4	7	−1
	Feb/Oct	−3	−2	−2	−2	−1	−1	0	−1	0	0
	Mar/Sept	−3	0	1	−1	−1	−3	−3	−5	−6	0
	Apr/Aug	5	4	3	0	−2	−5	−6	−8	−8	−2
	May/Jul	10	7	5	0	−3	−7	−8	−9	−8	−4
	Jun	12	9	5	0	−3	−7	−9	−10	−8	−5
8	Dec	−4	−6	−6	−6	−3	0	4	8	12	−3
	Jan/Nov	−3	−5	−6	−5	−2	0	3	6	10	−4
	Feb/Oct	−3	−4	−5	−5	−3	−1	1	2	4	−1
	Mar/Sept	−2	−2	−1	−1	−1	−2	−2	−3	−4	0
	Apr/Aug	2	2	2	0	−1	−4	−5	−7	−7	−1
	May/Jul	7	5	4	0	−2	−3	−7	−9	−7	−2
	Jun	9	6	4	0	−2	−6	−8	−9	−7	−2
16	Dec	−4	−6	−8	−8	−4	−1	4	9	13	−9
	Jan/Nov	−4	−6	−7	−7	−4	−1	4	8	12	−7
	Feb/Oct	−3	−5	−5	−4	−2	0	2	5	7	−4
	Mar/Sept	−3	−3	−2	−2	−1	−1	0	0	0	−1
	Apr/Aug	−1	0	−1	−1	−1	−3	−3	−5	−6	0
	May/Jul	4	3	3	0	−1	−4	−5	−7	−7	0
	Jun	6	4	4	1	−1	−4	−6	−8	−7	0
24	Dec	−5	−7	−9	−10	−7	−3	2	9	13	−13
	Jan/Nov	−4	−6	−8	−9	−6	−3	3	9	13	−11
	Feb/Oct	−4	−5	−6	−6	−3	−1	3	7	10	−7
	Mar/Sept	−3	−4	−3	−3	−1	−1	1	2	4	−3
	Apr/Aug	−2	−1	0	−1	−1	−2	−1	−2	−3	0
	May/Jul	1	2	2	0	0	−3	−3	−5	−6	1
	Jun	3	3	3	1	0	−3	−4	−6	−6	1
32	Dec	−5	−7	−10	−11	−8	−5	2	9	12	−17
	Jan/Nov	−5	−7	−9	−11	−8	−4	2	9	12	−15
	Feb/Oct	−4	−6	−7	−8	−4	−2	4	8	11	−10
	Mar/Sept	−3	−4	−4	−4	−2	−1	3	5	7	−5
	Apr/Aug	−2	−2	−1	−2	0	−1	0	1	1	−1
	May/Jul	1	1	1	0	0	−1	−1	−2	−2	1
	Jun	1	2	2	1	0	−2	−3	−4	−4	2
40	Dec	−6	−8	−10	−13	−10	−7	0	7	10	−21
	Jan/Nov	−5	−7	−10	−12	−9	−6	1	8	11	−19
	Feb/Oct	−5	−7	−8	−9	−6	−3	3	8	12	−14
	Mar/Sept	−4	−5	−5	−6	−3	−1	4	7	10	−8
	Apr/Aug	−2	−3	−2	−2	0	0	2	5	4	−3
	May/Jul	0	0	0	0	0	0	0	0	1	1
	Jun	1	1	1	0	1	0	0	−1	−1	2
48	Dec	−6	−8	−11	−14	−13	−10	−3	2	6	−25
	Jan/Nov	−6	−8	−11	−13	−11	−8	−1	5	8	−24
	Feb/Oct	−5	−7	−10	−11	−8	−5	1	8	11	−18
	Mar/Sept	−4	−6	−8	−7	−4	−1	4	8	11	−11
	Apr/Aug	−3	−3	−3	−3	−1	0	4	6	7	−5
	May/Jul	0	−1	0	0	1	1	3	3	4	0
	Jun	1	1	2	1	2	1	2	2	3	2
56	Dec	−5	−9	−12	−16	−16	−14	−9	−5	−3	−28
	Jan/Nov	−6	−8	−11	−15	−14	−12	−8	−1	2	−27
	Feb/Oct	−6	−8	−10	−12	−10	−7	0	6	9	−22
	Mar/Sept	−5	−6	−7	−8	−5	−2	4	8	12	−15
	Apr/Aug	−3	−4	−4	−4	−1	1	5	7	9	−8
	May/Jul	0	0	0	0	2	2	5	6	7	−2
	Jun	2	1	2	1	3	3	4	5	6	1
64	Dec	−7	−9	−12	−16	−17	−18	−16	−14	−12	−30
	Jan/Nov	−7	−9	−12	−16	−16	−16	−13	−10	−8	−29
	Feb/Oct	−6	−8	−11	−14	−13	10	−8	1	4	−26
	Mar/Sept	−5	−7	−9	−10	−7	−4	2	7	11	−20
	Apr/Aug	−3	−4	−4	−4	−1	1	5	9	11	−11
	May/Jul	1	0	1	0	3	4	6	8	10	−3
	Jun	3	3	3	2	4	4	6	7	9	0

Appendix (4.6) (A)

Cooling Load Temperature Differences for Calculating Cooling from Sunlit Walls

	Solar Time, hr																							Hr of Maximum CLTD	Minimum CLTD	Maximum CLTD	Difference CLTD
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
North Latitude Wall Facing																												
Group A Walls																												
N	14	14	14	13	13	13	12	12	11	11	10	10	10	10	10	10	11	11	12	12	13	13	14	14	2	10	14	4
NE	19	19	19	18	17	17	16	15	15	15	15	15	16	16	17	18	18	18	19	19	20	20	20	20	22	15	20	5
E	24	24	23	23	22	21	20	19	19	18	19	19	20	21	22	23	24	24	25	25	25	25	25	25	22	18	25	7
SE	24	23	23	22	21	20	20	19	18	18	18	18	18	19	20	21	22	23	23	24	24	24	24	24	22	18	24	6
S	20	20	19	19	18	18	17	16	16	15	14	14	14	14	14	15	16	17	18	19	19	20	20	20	23	14	20	6
SW	25	25	25	24	24	23	22	21	20	19	19	18	17	17	17	17	18	19	20	22	23	24	25	25	24	17	25	8
W	27	27	26	26	25	24	24	23	22	21	20	19	19	18	18	18	18	19	20	22	23	25	26	26	1	18	27	9
NW	21	21	21	20	20	19	19	18	17	16	16	15	15	14	14	14	15	15	16	17	18	19	20	21	1	14	21	7
Group B Walls																												
N	15	14	14	13	12	11	11	10	9	9	9	8	9	9	9	10	11	12	13	14	14	15	15	15	24	8	15	7
NE	19	18	17	16	15	14	13	12	12	13	14	15	16	17	18	19	19	20	20	21	21	21	20	20	21	12	21	9
E	23	22	21	20	18	17	16	15	15	15	17	19	21	22	24	25	26	26	27	27	26	26	25	24	20	15	27	12
SE	23	22	21	20	18	17	16	15	14	14	15	16	18	20	21	23	24	25	26	26	26	26	25	24	21	14	26	12
S	21	20	19	18	17	15	14	13	12	11	11	11	11	12	14	15	17	19	20	21	22	22	22	21	23	11	22	11
SW	27	26	25	24	22	21	19	18	16	15	14	14	13	13	14	15	17	20	22	25	27	28	28	28	24	13	28	15
W	29	28	27	26	24	23	21	19	18	17	16	15	14	14	14	15	17	19	22	25	27	29	29	30	24	14	30	16
NW	23	22	21	20	19	18	17	15	14	13	12	12	12	11	12	13	13	15	17	19	21	22	23	23	24	11	23	9
Group C Walls																												
N	15	14	13	12	11	10	9	8	8	7	7	8	8	9	10	12	13	14	15	16	17	17	17	16	22	7	17	10
NE	19	17	16	14	13	11	10	10	11	13	15	17	19	20	21	22	22	23	23	23	23	22	21	20	20	10	23	13
E	22	21	19	17	15	14	12	12	14	16	19	22	25	27	29	29	30	30	30	29	28	27	26	24	18	12	30	18
SE	22	21	19	17	15	14	12	12	12	13	16	19	22	24	26	28	29	29	29	29	28	27	26	24	19	12	29	17
S	21	19	18	16	15	13	12	10	9	9	9	10	11	14	17	20	22	24	25	26	25	25	24	22	20	9	26	17
SW	29	27	25	22	20	18	16	15	13	12	11	11	11	13	15	18	22	26	29	32	33	33	32	31	22	11	33	22
W	31	29	27	25	22	20	18	16	14	13	12	12	12	13	14	16	20	24	29	32	35	35	35	33	22	12	35	23
NW	25	23	21	20	18	16	14	13	11	10	10	10	10	11	12	13	15	18	22	25	27	27	27	26	22	10	27	17
Group D Walls																												
N	15	13	12	10	9	7	6	6	6	6	6	7	8	10	12	13	15	17	18	19	19	19	18	16	21	6	19	13
NE	17	15	13	11	10	8	7	8	10	14	17	20	22	23	23	24	24	25	25	24	23	22	20	18	19	7	25	18
E	19	17	15	13	11	9	8	9	12	17	22	27	30	32	33	33	32	32	31	30	28	26	24	22	16	8	33	25
SE	20	17	15	13	11	10	8	8	10	13	17	23	26	29	31	32	33	33	31	30	28	26	24	22	17	8	32	24
S	19	17	15	13	11	9	8	7	6	6	7	9	12	16	20	24	27	29	29	29	27	26	24	22	19	6	29	23
SW	28	25	22	19	16	14	12	10	9	8	8	8	10	12	16	21	27	32	36	38	38	37	34	31	21	8	38	30
W	31	27	24	21	18	15	13	11	10	9	9	9	10	11	14	18	24	30	36	40	41	40	38	34	21	9	41	32
NW	25	22	19	17	14	12	10	9	8	7	7	8	9	10	12	14	18	22	27	31	32	32	30	27	22	7	32	25
Group E Walls																												
N	12	10	8	7	5	4	3	4	5	6	7	9	11	13	15	17	19	20	21	23	20	18	16	14	20	3	23	19
NE	13	11	9	7	6	4	5	9	15	20	24	25	25	26	26	26	26	26	25	24	22	19	17	15	16	4	26	22
E	14	12	10	8	6	5	6	11	18	26	33	36	38	37	36	34	33	32	30	28	25	22	20	17	13	5	38	33
SE	15	12	10	8	7	5	5	8	12	19	25	31	35	37	37	36	34	33	31	28	26	23	20	17	15	5	37	32
S	15	12	10	8	7	5	4	3	4	5	9	13	19	24	29	32	34	33	31	29	26	23	20	17	17	3	34	31
SW	22	18	15	12	10	8	6	3	3	6	7	9	12	18	24	32	38	43	43	44	40	35	30	26	19	5	45	40
W	25	21	17	14	11	9	7	6	6	6	7	9	11	14	20	27	36	43	49	49	45	40	34	29	20	6	49	43
NW	20	17	14	11	9	7	6	5	5	5	6	8	10	13	16	20	26	32	37	38	36	32	28	24	20	5	38	33
Group F Walls																												
N	8	6	5	3	2	1	2	4	6	7	9	11	14	17	19	21	22	23	24	23	20	16	13	11	19	1	23	23
NE	9	7	5	3	2	1	5	14	23	28	30	29	28	27	27	27	27	26	24	22	19	16	13	11	11	1	30	29
E	10	7	6	4	3	2	6	17	28	38	44	45	43	39	36	34	32	30	27	24	21	17	15	12	12	2	45	43
SE	10	7	6	4	3	2	4	10	19	28	36	41	43	42	39	36	34	31	28	25	21	18	15	12	13	2	43	41
S	10	8	6	4	3	2	1	1	3	7	13	20	27	34	38	39	38	35	31	26	22	18	15	12	16	1	39	38
SW	15	11	9	6	5	3	2	2	4	5	8	11	17	26	35	44	50	53	52	45	37	28	23	18	18	2	53	48
W	17	13	10	7	5	4	3	3	4	6	8	11	14	20	28	39	49	57	60	54	45	34	27	21	19	3	60	57
NW	14	10	8	6	4	3	2	2	3	5	8	10	13	15	21	27	35	42	46	43	35	28	22	18	19	2	46	44
Group G Walls																												
N	3	2	1	0	−1	2	7	8	9	12	15	18	21	23	24	24	25	26	22	15	11	9	7	5	18	−1	26	27
NE	3	2	1	0	−1	9	27	36	39	35	30	26	26	27	27	26	25	22	18	14	11	9	7	5	9	−1	39	40
E	4	2	1	0	−1	11	31	47	54	55	50	40	33	31	30	29	27	24	19	15	12	10	8	6	10	−1	55	56
SE	4	2	1	0	−1	5	18	32	42	49	51	48	42	36	32	30	27	24	19	15	12	10	8	6	11	−1	51	52
S	4	2	1	0	−1	0	1	5	12	22	31	39	43	46	43	37	31	25	20	15	12	10	8	5	14	−1	46	47
SW	5	4	3	1	0	0	2	3	8	12	16	21	28	38	50	59	65	61	52	37	24	17	13	10	8	0	65	63
W	6	5	3	2	1	1	2	3	5	8	11	15	19	27	41	56	67	72	67	48	29	20	15	11	8	1	72	71
NW	5	3	2	1	0	0	2	3	5	8	11	15	18	21	27	37	47	55	55	41	25	17	13	10	7	0	55	55

Appendix (4.6) (B)

Cooling Heating Load Calculation Manual

Wall Construction Group Description

Table 6 Wall Construction Group Description

Weight (kg/m^2)	U-Value ($W/m^2 \cdot °C$)	Group No.	Description of Construction	Weight (lb/ft^2)	U-Value ($Btu/h \cdot ft^2 \cdot °F$)	Code Numbers of Layers (see Table 8)
			101.6-mm (4-in.) Face Brick + (*Brick*)			
405	2.033	C	Air Space + 101.6-mm (4-in.) Face Brick	83	0.358	A0, A2, B1, A2, E0
405	2.033	D	101.6-mm (4-in.) Common Brick	90	0.415	A0, A2, C4, E1, E0
439	2.356	C	25.4-mm (1-in.) Insulation or Air Space + 101.6-mm (4-in.) Common Brick	90	0.174-0.301	A0, A2, C4, B1/B2, E1, E0
430	0.630	B	50.8-mm (2-in.) Insulation + 101.6-mm (4-in.) Common Brick	88	0.111	A0, A2, B8, C4, E1, E0
635	1.714	B	203.2-mm (8-in.) Common Brick	130	0.302	A0, A2, C9, E1, E0
635	0.874-1.279	A	Insulation or Air Space + 203.2-mm (8-in.) Common brick	130	0.154-0.245	A0, A2, C9, B1/B2, E1, E0
			101.6-mm (4-in.) Face Brick + (*H.W. Concrete*)			
459	1.987	C	Air Space + 50.8-mm (2-in.) Concrete	94	0.350	A0, A2, B1, C5, E1, E0
474	0.658	B	50.8-mm (2-in.) Insulation + 101.6-mm (4-in.) Concrete	97	0.116	A0, A2, B5, C5, E1, E0
699-928	0.625-0.636	A	Air Space or Insulation + 203.2-mm (8-in.) or more Concrete	143-190	0.110-0.112	A0, A2, B1, C10/11, B1, E0
			101.6-mm (4-in.) Face Brick + (*L.W. or H.W. Concrete Block*)			
303	1.811	E	101.6-mm (4-in.) Block	62	0.319	A0, A2, C2, E1, E0
303	0.868-1.297	D	Air Space or Insulation + 101.6-mm (4-in.) Block	62	0.153-0.246	A0, A2, C2, B1/B2, E1, E0
342	1.555	D	203.2-mm (8-in.) Block	70	0.274	A0, A2, C7, A6, E0
356-434	1.255-1.561	C	Air Space or 25.4-mm (1-in.) Insulation + 152.4-mm (6-in.) or 203.2-mm (8-in.) Block	73-89	0.221-0.275	A0, A2, B1, C7/C8, E1, E0
434	0.545-0.607	B	50.8-mm (2-in.) Insulation + 203.2-mm (8-in.) Block	89	0.096-0.107	A0, A2, B5, C7/C8, E1, E0
			101.6-mm (4-in.) Face Brick + (*Clay Tile*)			
347	2.163	D	101.6-mm (4-in.) Tile	71	0.381	A0, A2, C1, E1, E0
347	1.595	D	Air Space + 101.6-mm (4-in.) Tile	71	0.281	A0, A2, C1, B1, E1, E0
347	0.959	C	Insulation + 101.6-mm (4-in.) Tile	71	0.169	A0, A2, C1, B2, E1, E0
469	1.561	C	203.2-mm (8-in.) Tile	96	0.275	A0, A2, C6, E1, E0
469	0.806-1.255	B	Air Space or 25.4-mm (1-in.) Insulation + 203.2-mm (8-in.) Tile	96	0.142-0.221	A0, A2, C6, B1/B2, E1, E0
474	0.551	A	50.8-mm (2-in.) Insulation + 203.2-mm (8-in.) Tile	97	0.097	A0, A2, B3, C6, E1, E0
			H.W. Concrete Wall + (*Finish*)			
308	3.321	E	101.6-mm (4-in.) Concrete	63	0.585	A0, A1, C5, E1, E0
308	0.675-1.136	D	101.6-mm (4-in.) Concrete + 25.4-mm (1-in.) or 50.8-mm (2-in.) Insulation	63	0.119-0.200	A0, A1, C5, B2/B3, E1, E0
308	0.675	C	50.8-mm (2-in.) Insulation + 101.6-mm (4-in.) Concrete	63	0.119	A0, A1, B6, C5, E1, E0
532	2.782	C	203.2-mm (8-in.) Concrete	109	0.490	A0, A1, C10, E1, E0
537	0.653-1.061	B	203.2-mm (8-in.) Concrete + 25.4-mm (1-in.) or 50.8-mm (2-in.) Insulation	110	0.115-0.187	A0, A1, C10, B5/B6, E1, E0
537	0.653	A	50.8-mm (2-in.) Insulation + 203.2-mm (8-in.) Concrete	110	0.115	A0, A1, B3, C10, E1, E0
862	2.100	B	304.8-mm (12-in.) Concrete	156	0.421	A0, A1, C11, E1, E0
862	0.642	A	304.8-mm (12-in.) Concrete + Insulation	156	0.113	A0, C11, B6, A6, E0
			L.W. and H.W. Concrete Block + (*Finish*)			
142	0.914-1.493	F	101.6-mm (4-in.) Block + Air Space/Insulation	29	0.161-0.263	A0, A1, C2, B1/B2, E1, E0
142-181	0.596-0.647	E	50.8-mm (2-in.) Insulation + 101.6-mm (4-in.) Block	29-37	0.105-0.114	A0, A1, B3, C2/C3, E1, E0
229-249	1.669-2.282	E	203.2-mm (8-in.) Block	47-51	0.294-0.402	A0, A1, C7/C8, E1, E0
200-238	0.846-0982	D	203.2-mm (8-in.) Block + Air Space/Insulation	41-57	0.149-0.173	A0, A1, C7/C8, B1/B2, E1, E0
			Clay Tile + (*Finish*)			
190	2.279	F	101.6-mm (4-in.) Tile	39	0.419	A0, A1, C1, E1, E0
190	1.720	F	101.6-mm (4-in.) Tile + Air Space	39	0.303	A0, A1, C1, B1, E1, E0
190	0.993	E	101.6-mm (4-in.) Tile + 25.4-mm (1-in.) Insulation	39	0.175	A0, A1, C1, B2, E1, E0
195	0.625	D	50.8-mm (2-in.) Insulation + 101.6-mm (4-in.) Tile	40	0.110	A0, A1, B3, C1, E1, E0
308	1.681	D	203.2-mm (8-in.) Tile	63	0.296	A0, A1, C6, B1/B2, E1, E0
308	0.857-1.312	C	203.2-mm (8-in.) Tile + Air Space/25.4-mm (1-in.) Insulation	63	0.151-0.231	A0, A1, C6, B1/B2, E1, E0
308	0.562	B	50.8-mm (2-in.) Insulation + 203.2-mm (8-in.) Tile	63	0.099	A0, A1, B3, C6, E1, E0
			Metal Curtain Wall			
24-29	0.516-1.306	B	With/without air Space + 25.4-mm (1-in.)/50.8-mm (2-in.) 76.2-mm (3-in.) Insulation	5-6	0.091-0.230	A0, A5, B5/B6/B12, A3, E0
			Frame Wall			
78	0.459-1.010	G	25.4-mm (1-in.) to 76.2-mm (3-in.) Insulation	16	0.081-0.178	A0, A1, B1, B2/B3/B4, E1, E0

Appendix (4.6) (C)

Thermal Properties and Code Numbers of Layers Used in Calculation of Coefficients for Roof and Wall

Thickness and Thermal Properties[a]						Description	Code Number	Thickness and Thermal Properties[b]					
L	K	D	SH	R	WT			L	K	D	SH	R	WT
				0.059		Outside surface resistance	A0					0.333	
25.4	0.692	1858	0.233	0.036	47.2	25.4-mm (1-in.) Stucco (asbestos cement or wood siding plaster, etc)	A1	0.0833	0.4	116	0.20	0.208	9.66
101.6	1.298	2082	0.256	0.078	211.4	101.6-mm (4-in.) facebrick (dense concrete)	A2	0.3333	0.75	130	0.22	0.444	43.3
1.5	44.99	7689	0.116	0.00003	11.7	Steel siding (aluminum or other lightweight cladding)	A3	0.0050	26.0	480	0.10	0.000	2.40
				0.059		Outside surface resistance						0.333	
12.7	1.143	881	0.465			12.7-mm-(0.5-in.) slag, membrane	A4	0.0417	0.83	55	0.40		
9.5	0.190	1121	0.465			9.5-mm. (0.375-in.) felt		0.0313	0.11	70	0.40		
12.7	0.415	1249	0.302	0.031	15.9	Finish	A6	0.0417	0.24	78	0.26	0.174	3.25
10.16	1.332	2002	0.256	0.076	203.1	101.6-mm (4-in.) facebrick	A7	0.3333	0.77	125	0.22	0.433	41.6
				0.160		Air Space Resistance	B1					0.91	
25.4	0.043	32	0.233	0.585	0.8	25.4-mm (1-in.) insulation	B2	0.0833	0.025	2.0	0.2	332	0.17
50.8	0.043	32	0.233	1.176	1.6	50.8-mm (2-in.) insulation	B3	0.1667	0.025	2.0	0.2	6.68	0.33
76.2	0.043	32	0.233	1.766	2.4	76.2-mm. (3-in.) insulation	B4	0.2500	0.025	2.0	0.2	10.03	0.50
25.4	0.043	91	0.233	0.586	2.3	25.4 mm. (1-in.) insulation	B5	0.0833	0.025	5.7	0.2	3.33	0.47
50.8	0.043	91	0.233	1.176	4.6	50.8 mm. (2-in.) insulation	B6	0.1667	0.025	5.7	0.2	6.68	0.95
25.4	0.116	592	0.699	0.209	15.0	25.4-mm (1-in.) wood	B7	0.0833	0.067	37.0	0.6	1.19	3.08
62.4	0.116	592	0.699	0.525	37.6	62.5 mm (2.5-in.) wood	B8	0.2083	0.067	37.0	0.6	2.98	7.71
101.6	0.116	592	0.699	0.838	60.0	14.6 mm (4-in.) wood	B9	0.3333	0.067	37.0	0.6	4.76	2.3
50.8	0.116	592	0.699	0.421	30.2	50.8 mm (2-in.) wood	B10	0.1667	0.067	37.0	0.6	2.39	6.18
76.2	0.116	592	0.699	0.631	45.2	76.2 mm (3-in.) wood	B11	0.2500	0.067	37.0	0.6	3.58	9.25
76.2	0.043	91	0.233	1.761	6.9	76.2 mm (3-in.) insulation	B12	0.2500	0.025	5.7	0.2	10.00	1.42
101.6	0.043	91	0.233	2.346	9.3	101.6 mm (4-in.) insulation	B13	0.3333	0.025	5.7	0.2	13.33	1.90
127.0	0.043	91	0.233	2.934	11.6	127.0 mm (5-in.) insulation	B14	0.4167	0.025	5.7	0.2	16.67	2.38
152.4	0.043	91	0.233	3.520	13.9	152.4 mm (6-in.) insulation	B15	0.5000	0.025	5.7	0.2	20.00	2.85
101.6	0.571	1121	0.233	0.178	113.7	101.6 mm (4-in.) clay tile	C1	0.3333	0.33	70.0	0.2	1.01	23.3
101.6	0.381	608	0.233	0.266	62.0	101.6 mm (4-in.) l.w. concrete block	C2	0.3333	0.22	38.0	0.2	1.51	12.7
101.6	0.813	977	0.233	0.125	99.1	101.6-mm (4-in.) l.w. concrete block	C3	0.3333	0.47	61.0	0.2	0.71	20.3
101.6	0.727	1922	0.233	0.139	195.3	101.6-mm (4-in.) common brick	C4	0.3333	0.42	120.0	0.2	0.79	40.0
101.6	1.730	2242	0.233	0.059	227.5	101.6-mm (4-in.) l.w. concrete	C5	0.3333	1.00	140.0	0.2	0.333	46.6
203.2	0.571	1121	0.233	0.356	227.9	203.2-mm (8-in.) clay tile	C6	0.6667	0.33	70.0	0.2	2.02	46.7
203.2	0.571	608	0.233	0.356	124.0	203.2 mm (8-in.) l.w. concrete block	C7	0.6667	0.33	38.0	0.2	2.02	25.4
203.2	1.038	977	0.233	0.195	198.7	203.2-mm (8-in.) l.w. concrete block	C8	0.6667	0.6	61.0	0.2	1.11	40.7
203.2	0.727	1922	0.233	0.280	390.6	203.2-mm. (8-in.) common brick	C9	0.6667	0.42	120.0	0.2	1.59	80.0
203.2	1.730	2242	0.233	0.117	455.9	203.2 mm. (8-in.) l.w. concrete	C10	0.6667	1.00	140.0	0.2	0.667	93.4
304.8	1.730	2242	0.233	0.176	683.5	304.8 mm (12-in.) l.w. concrete	C11	1.0000	1.00	140.0	0.2	1.08	140.0
50.8	1.730	2242	0.233	0.029	114.2	50.8-mm (2-in.) l. w. concrete	C12	1.6667	1.00	140.0	0.2	1.167	23.4
152.4	1.730	2242	0.233	0.088	341.7	151.4-mm (6-in.) l.w. concrete	C13	0.5000	1.00	140.0	0.2	0.500	70.0
101.6	0.173	640	0.233	0.586	64.9	101.6-mm (4-in.) l.w. concrete	C14	0.3333	0.10	40.0	0.2	3.333	13.3
152.4	0.173	640	0.233	0.088	97.6	152.4-mm (6-in.) l.w. concrete	C15	0.5000	0.10	40.0	0.2	5.000	20.0
203.2	0.173	640	0.233	1.174	130.3	203.2-mm (8-in.) l.w. concrete	C16	0.6667	0.10	40.0	0.2	6.667	26.7
203.2	0.138	288	0.233	1.584	58.6	203.2-mm (8-in.) l.w. concrete block (filled insulation)	C17	0.6667	0.08	18.0	0.2	9.00	12.0
203.2	0.588	849	0.233	0.348	172.8	203.2-mm (8-in.) l.w. concrete block (filled insulation)	C18	0.6667	0.34	53.0	0.2	1.98	35.4
304.8	0.138	304	0.233	2.376	92.8	204.8-mm (12-in.) (l. w. concrete (block filled insulation)	C19	1.0000	0.08	19.0	0.2	13.5	19.0
304.8	0.675	897	0.233	0.456	273.4	204.8-mm (12-in.) l.w. concrete block (filled insulation)	C20	1.0000	0.39	56.0	0.2	2.59	56.0
				0.121		Inside surface resistance	E0						
19.0	0.727	1601	0.233	0.026	30.5	19.0-mm (0.75-in.) plaster; 19.0-mm (0.75-in.) gypsum or other similar finishing layer	E1	0.0625	0.42	100	0.2	0.149	6.25
12.7	1.436	881	0.465	0.009	11.2	12.7-mm (0.5-in.) slag or stone	E2	0.0417	0.83	55	0.40	0.050	2.29
9.5	0.190	1121	0.465	0.050	10.7	9.5-mm (0.375-in.) felt & membrane	E3	0.0313	0.11	70	0.40	0.285	2.19
				0.176		Ceiling air space	E4					1.0	
15.9	0.061	480	0.233	0.315	9.2	Acoustic tile	E5	0.0625	0.035	30	0.20	1.786	1.88

Appendix (4.6) (D)

Cooling Load Temperature Differences for Calculating Cooling from Flat Roofs

Roof No	Description of Construction	Weight, kg/m²	U-value, W/m²·°C	Solar Time, h 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Hour of Maximum CLTD	Minimum CLTD	Maximum CLTD	Difference CLTD
Without Suspended Ceiling																															
1	Steel sheet with 25.4-mm (or 50.8-mm) insulation	14 (39)	1.209 (0.704)	0	−1	−2	−2	−3	−2	3	11	19	27	34	40	43	44	43	39	33	25	17	13	7	5	3	1	14	−3	44	47
2	25.4-mm wood with 25.4-mm insulation	39	0.965	3	2	0	−1	−2	−2	−1	2	8	15	22	29	35	39	41	41	39	35	29	21	15	11	8	5	16	−2	41	43
3	101.6-mm l.w concrete	88	1.209	5	3	1	0	−1	−2	−2	1	5	11	18	25	31	36	39	40	40	37	32	25	19	14	10	7	16	−2	40	42
4	50.8-mm h.w. concrete with 25.4-mm (or 50.8-mm) insulation	142	1.170 (0.693)	7	5	3	2	0	−1	0	2	6	11	17	23	28	33	36	37	37	34	30	25	20	16	12	10	16	−1	37	38
5	25.4-mm wood with 50.8-mm insulation	44	0.619	2	0	−2	−3	−4	−4	−4	−2	3	9	15	22	27	33	35	36	35	32	27	20	14	10	6	3	16	−4	36	40
6	152.4-mm l.w. concrete	117	0.897	12	10	7	5	3	2	1	0	2	4	8	13	18	24	29	33	35	36	35	32	28	24	19	16	18	0	36	36
7	63.5-mm wood with 25.4-mm insulation	53	0.738	16	13	11	9	7	6	4	3	4	5	8	11	15	19	23	27	29	31	31	30	27	25	22	19	19	3	31	28
8	203.2-mm l.w. concrete	151	0.715	20	17	14	12	10	8	6	5	4	4	5	7	11	14	18	22	25	28	30	30	29	27	25	22	20	4	30	26
9	101.6-mm h.w. concrete with 25.4-mm (or 50.8-mm) insulation	254 (254)	1.136 (0.661)	14	12	10	8	7	5	4	4	6	8	11	15	18	22	25	28	29	30	29	27	24	21	19	16	18	4	30	26
10	63.5-mm wood with 50.8-mm insulation	63	0.528	18	15	13	11	9	8	6	5	5	5	7	10	13	17	21	24	27	28	29	29	27	25	23	20	19	5	29	24
11	Roof terrace system	166	0.602	19	17	15	14	12	11	9	8	7	8	8	10	12	15	18	20	22	24	25	26	25	24	22	21	20	7	26	19
12	152.4-mm h.w. concrete with 25.4-mm (or 50.8-mm) insulation	166 (166)	(1.090) (0.664)	18	16	14	12	11	10	9	8	8	9	10	12	13	17	20	22	24	25	25	25	24	22	20	19	19	8	25	17
13	101.6-mm wood with 25.4-mm (or 50.8-mm) insulation	93 (93)	0.602 (0.443)	21	20	18	17	15	14	13	11	10	9	9	9	10	12	14	16	18	20	22	23	24	24	23	22	22	9	24	15
With Suspended Ceiling																															
1	Steel Sheet with 25.4-mm (or 50.8-mm) insulation	44 (49)	0.761 (0.532)	1	0	−1	−2	−3	−3	0	5	13	20	28	35	40	43	43	41	37	31	23	15	10	7	5	3	15	−3	43	46
2	25.4-mm wood with 25.4-mm insulation	49	0.653	11	8	6	5	3	2	1	2	4	7	12	17	22	27	31	33	35	34	32	28	24	20	17	14	17	1	35	34
3	101.6-mm l.w. concrete	97	0.761	10	8	6	4	2	1	0	0	2	6	10	16	21	27	31	34	36	36	34	30	26	21	17	13	17	0	36	36
4	50.8-mm h.w. concrete with 25.4-mm insulation	146	0.744	16	14	13	11	10	8	7	7	8	9	11	14	17	19	22	24	25	26	26	25	23	21	20	18	18	7	26	19
5	25.4-mm wood with 50.8-mm insulation	49	0.471	14	11	9	7	5	4	3	3	4	6	10	14	18	23	27	30	31	32	31	29	26	22	19	16	18	3	32	30
6	152.4-mm l.w. concrete	127	0.619	18	15	13	11	9	7	6	4	4	4	6	9	12	16	20	24	27	29	30	30	28	26	23	20	20	4	30	26
7	63.5-mm wood with 25.4-mm insulation	73	0.545	19	18	16	14	13	12	10	9	8	8	9	10	12	14	17	19	21	23	24	25	24	23	22	21	20	8	25	17
8	203.2-mm l.w. concrete	161	0.528	22	20	18	16	15	13	11	10	9	8	8	8	9	11	14	16	19	21	23	25	25	25	24	23	20	8	25	17
9	101.6-mm h.w. concrete with 25.4-mm (or 50.8-mm) insulation	190 (164)	0.727 (0.511)	17	16	15	14	13	13	12	11	11	11	12	13	15	16	18	19	20	21	21	21	21	20	19	18	19	11	21	10
10	63.5-mm wood with 50.8-mm insulation	73	0.409	19	18	17	16	14	13	12	11	10	10	10	11	12	14	16	18	19	21	22	23	23	22	22	21	21	10	23	13
11	Roof terrace system	176	0.466	17	16	16	15	15	14	13	13	13	12	12	13	13	14	15	16	16	17	18	18	19	18	18	18	21	12	19	7
12	152.4-mm h.w. concrete with 25.4-mm (or 50.8-mm) insulation	176 (176)	0.710 0.499	16	16	15	15	14	13	13	12	12	12	12	13	14	15	16	17	18	18	19	19	19	18	18	18	20	13	19	7
13	101.6-mm wood with 25.4-mm (or 50.8-mm) insulation	93 (97)	0.465 (0.363)	20	19	19	18	17	16	15	14	14	13	12	12	12	12	13	14	15	16	18	19	20	20	20	20	23	12	20	8

Appendix (4.6) (E)

Cooling Load Temperature Differences (CLTD) for Conduction through Glass

Solar Time, h	CLTD, °C	Solar Time, h	CLTD, °C
0100	1	1300	7
0200	0	1400	7
0300	−1	1500	8
0400	−1	1600	8
0500	−1	1700	7
0600	−1	1800	7
0700	−1	1900	6
0800	0	2000	4
0900	1	2100	3
1000	2	2200	2
1100	4	2300	2
1200	5	2400	1

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Appendix (4.7) Overall Coefficients of Heat Transmission (U- Factor) or Windows and Skylights ,Btu/ (hr.ft^2·F)

Flat glass	U.W/m^2.K	
	Summer	Winter
Single glass	5.9	6.2
Double glass, 6-mmair space	3.5	3.3
13- mm air space	3.2	2.8
Triple glass 6-mmair space	2.5	2.2
13- mm air space	2.2	1.8
Storm windowns,25 to 100 mm air space	2.8	2.3

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Appendix (4.8)

SHADING COEFFICNTS FOR GLASS WITHOUT OR WITH INTERIOR SHADING DEVICES

Type of Glazing	Nominal Thickness, in (Each light)	Without Shading	With Interior Shading					
			Venetian Blind	Roller Shades				
				Opaque		Translucent	
			Medium	Light	Dark	Light	Light
Single glass							
Clear	1/4	0.94	0.74	0.67	0.81	0.39	0.44
Heat absorbing	1/4	0.69	0.57	0.53	0.45	0.30	0.36
Double glass							
Clear	1/4	0.82	0.62	0.58	0.71	0.35	0.40
Heat absorbing	1/4	0.55	0.39	0.36	0.40	0.22	0.30

Appendix (4.9)

Maximum Solar Heat Gain Factor, W/m² for Sunlit Glass, North Latitudes

0 Deg

	N	NNE/ NNW	NE/ NW	ENE/ WNW	E/ W	ESE/ WSW	SE/ SW	SSE/ SWW	S	HOR
Jan.	107	107	278	558	738	801	741	574	372	934
Feb.	114	123	416	647	773	779	663	445	211	965
Mar.	120	274	536	704	764	704	536	274	120	956
Apr.	224	423	609	707	697	581	372	120	117	896
May	357	517	640	688	634	486	252	117	117	836
June	407	546	650	669	603	441	208	117	117	805
July	363	517	634	672	615	470	243	120	120	820
Aug.	237	423	590	681	669	552	353	123	120	871
Sep.	126	265	514	672	729	672	514	265	126	924
Oct.	117	126	407	628	745	751	637	426	208	943
Nov.	110	110	278	552	726	789	726	565	369	924
Dec.	107	107	224	517	713	798	757	618	435	909

4 Deg

	N	NNE/ NNW	NE NW	ENE/ WNW	E/ W	ESE/ WSW	SE/ SW	SSE/ SSW	S	HOR
Jan.	104	104	249	536	722	795	514	609	445	902
Feb.	110	110	388	628	764	782	678	480	278	550
Mar.	120	243	514	691	764	716	558	303	136	953
Apr.	174	394	596	704	704	599	398	136	120	905
May	293	486	631	694	650	508	281	120	120	858
June	347	517	637	678	618	464	230	120	120	830
July	303	486	622	678	631	492	268	123	120	842
Aug.	186	391	581	678	675	571	379	133	126	880
Sep.	123	237	492	659	729	681	536	293	139	924
Oct.	114	114	379	609	738	754	653	467	271	928
Nov.	107	107	249	530	713	782	732	599	439	896
Dec.	104	104	196	495	697	789	764	650	505	874

8 Deg

	N	NNE/ NNW	NE/ NW	ENE/ WNW	E/ W/	ESE/ WSW	SE/ SW	SSE/ SSW	S	HOR
Jan.	101	101	224	514	707	789	764	640	511	868
Feb.	107	107	360	609	754	782	691	521	347	928
Mar.	117	211	492	678	760	726	581	347	174	947
Apr.	139	369	581	697	710	615	423	167	123	912
May	233	461	625	694	659	527	306	123	120	874
June	284	489	631	685	631	445	259	123	123	849
July	243	457	615	678	644	511	294	126	123	858
Aug.	148	369	565	675	681	587	404	161	129	890
Sep	120	208	470	647	726	691	555	338	177	915
Oct.	110	110	353	590	729	754	666	505	341	909
Nov.	104	104	224	508	694	773	735	631	505	861
Dec.	98	98	174	470	678	776	779	678	565	836

12 Deg

	N	NNE/ NNW	NE/ NW	ENE/ WNW	E/ W	ESE/ WSW	SE/ SW	SSE/ SSW	S	HOR
Jan.	98	98	199	489	685	776	779	669	574	827
Feb.	107	107	331	587	741	782	713	558	420	902
Mar.	114	183	467	663	757	735	599	391	230	937
Apr.	126	341	562	691	716	631	448	202	126	915
May	189	439	612	694	669	546	334	126	126	883
June	237	470	625	685	644	508	284	126	126	864
July	199	439	603	678	653	530	322	129	129	868
Aug.	133	344	549	669	688	603	426	196	448	890
Sep.	117	180	448	634	722	700	574	382	230	905
Oct.	107	107	325	568	716	751	691	543	410	883
Nov.	101	101	199	483	675	760	767	659	565	820
Dec.	95	95	148	445	653	764	792	704	622	789

16 Deg

	N	NNE/ NNW	NE/ NW	ENE/ WNW	E/ W	ESE/ WSW	SE/ SW	SSE/ SSW	S	HOR
Jan.	95	95	174	464	663	770	792	704	628	782
Feb.	104	104	303	568	729	779	735	593	486	868
Mar.	110	167	441	647	745	741	622	435	293	918
Apr.	123	312	543	681	716	644	473	243	142	912
May	164	416	596	688	678	565	363	142	129	890
June	208	448	612	685	653	527	312	129	129	874
July	174	416	590	675	663	549	350	139	133	874
Aug.	129	316	530	659	691	644	451	233	145	890
Sep.	114	158	423	618	716	707	603	423	293	890
Oct.	104	104	300	549	704	748	710	577	473	852
Nov.	95	95	174	457	650	760	779	694	618	776
Dec.	91	91	159	414	636	760	801	735	668	738

20 Deg

	N	NNE/ NNW	NE/ NW	ENE/ WNW	E/ W	ESE/ WSW	SE/ SW	SSE/ SSW	S	HOR
Jan.	91	91	151	435	634	767	798	735	675	732
Feb.	98	98	278	546	713	770	751	634	549	830
Mar.	107	155	416	631	748	745	650	480	363	896
Apr.	120	290	524	672	719	656	498	287	183	905
May	148	388	581	685	685	581	391	170	133	893
June	186	426	596	681	663	546	341	142	133	880
July	151	391	574	672	669	565	375	167	136	877
Aug.	126	287	511	650	694	631	480	278	180	883
Sep.	114	145	401	603	710	710	628	467	360	868
Oct.	101	101	274	527	685	745	729	618	536	814
Nov.	91	91	151	429	622	754	786	722	666	726
Dec.	85	85	110	385	590	751	801	760	713	685

24 Deg

	N	NNE/ NNW	NE/ NW	ENE/ WNW	E/ W	ESE/ WSW	SE/ SW	SSE/ SSW	S	HOR
Jan.	85	85	129	404	599	757	798	760	716	675
Feb.	95	95	252	521	694	770	767	672	606	786
Mar.	107	142	391	615	738	748	675	530	432	868
Apr.	117	278	502	659	719	669	533	338	237	893
May	136	369	562	675	688	599	416	211	145	890
June	174	401	581	675	669	565	369	174	136	880
July	142	366	555	663	672	584	407	205	145	877
Aug.	120	274	492	640	694	644	511	325	227	874
Sep.	110	133	375	584	700	710	650	514	423	839
Oct.	98	98	249	502	666	748	741	653	590	770
Nov.	85	85	133	398	590	745	786	748	707	672
Dec.	82	82	91	353	568	738	779	779	748	628

28 Deg

	N (Shade)	NNE/ NNW	NE/ NW	ENE/ WNW	E/ W	ESE/ WSW	SE/ SW	SSE SSW	S	HOR
Jan.	79	79	110	369	577	741	792	779	751	618
Feb.	91	91	227	495	672	770	776	707	653	738
Mar.	104	129	366	596	729	748	697	574	495	836
Apr.	114	265	476	647	719	681	562	391	297	877
May	126	363	543	666	691	615	454	262	183	883
June	161	394	562	666	672	581	404	707	155	877
July	129	360	536	656	678	599	442	252	180	870
Aug.	120	262	470	628	694	653	543	379	287	858
Sep.	107	120	350	565	691	713	672	558	486	808
Oct.	95	95	224	476	644	745	751	685	637	722
Nov.	82	82	110	363	571	732	779	767	741	615
Dec.	75	76	76	312	543	716	782	792	776	565

32 Deg

	N (Shade)	NNE/ NNW	NE/ NW	ENE/ WNW	E/ W	ESE/ WSW	SE/ SW	SSE/ SSW	S	HOR
June	76	76	91	331	552	722	786	789	776	555
Feb.	85	85	205	470	647	764	782	732	697	685
Mar.	101	117	338	577	716	748	716	615	555	795
Apr.	114	252	461	631	716	691	590	445	363	855
May	120	350	536	656	694	628	489	312	233	874
June	139	385	555	656	675	596	439	262	189	871
July	126	350	527	643	678	612	473	303	227	861
Aug.	117	249	445	615	691	663	571	429	350	836
Sep.	104	110	325	546	678	716	688	596	540	770
Oct.	88	88	199	451	615	738	754	710	678	672
Nov.	76	76	91	325	546	710	773	776	767	552
Dec.	69	69	69	265	511	688	776	795	795	498

36 Deg

	N (Shade)	NNE/ NNW	NE/ NW	ENE/ WNW	E/ W	ESE/ WSW	SE/ SW	SSE SSW	S	HOR
Jan.	69	69	76	284	524	691	779	795	795	489
Feb.	82	82	180	439	615	754	782	754	732	628
Mar.	95	104	312	555	704	751	732	650	606	751
Apr.	110	240	454	618	710	697	618	492	426	827
May	120	338	530	644	694	644	521	366	293	858
June	148	372	552	647	678	612	473	312	243	861
July	123	338	521	634	681	628	508	357	284	846
Aug.	114	237	435	599	688	669	596	476	413	811
Sep.	98	98	300	527	663	719	704	631	590	726
Oct.	85	85	177	420	590	726	754	729	710	615
Nov.	69	69	76	274	514	678	767	782	782	486
Dec.	63	63	63	218	476	644	760	788	801	438

40 Deg

	N (Shade)	NNE/ NNW	NE/ NW	ENE/ WNW	E/ W	ESE/ WSW	SE/ SW	SSE SSW	S	HOR
Jan.	63	63	63	233	486	647	760	795	801	420
Feb.	76	76	158	407	587	738	776	770	760	568
Mar.	91	91	293	539	688	751	745	681	650	704
Apr.	107	224	441	599	707	704	640	536	486	795
May	119	322	521	637	694	656	552	420	357	836
June	151	357	543	647	681	628	508	366	300	842
July	120	322	514	625	681	641	536	681	344	827
Aug.	110	224	426	584	681	675	618	536	470	779
Sep.	93	93	274	505	640	716	713	659	631	678
Oct.	79	79	154	388	568	710	751	745	708	558
Nov.	63	63	63	230	476	634	748	782	789	416
Dec.	57	57	57	189	476	593	732	786	798	357

44 Deg

	N (Shade)	NNE/ NNW	NE/ NW	ENE/ WNW	E/ W	ESE/ WSW	SE/ SW	SSE/ SSW	S	HOR
Jan.	54	57	54	202	640	596	732	782	795	344
Feb.	69	69	156	369	562	716	776	782	779	505
Mar.	83	83	274	511	666	745	751	707	688	650
Apr.	104	208	429	57	697	707	663	577	540	757
May	114	303	511	534	691	666	577	467	416	811
June	148	341	533	647	678	640	540	416	363	823
July	117	303	502	624	678	690	565	454	404	801
Aug.	107	208	416	568	675	678	637	558	521	745
Sep.	88	88	252	480	625	713	716	681	666	628
Oct.	73	73	133	350	540	685	748	757	754	695
Nov.	57	57	57	202	426	587	716	770	782	344
Dec.	47	47	47	155	363	552	685	757	776	281

48 Deg

	N (Shade)	NNE/ NNW	NE/ NW	ENE/ WNW	E/ W	ESE/ WSW	SE/ SW	SSE/ SSW	S	HOR
Jan.	0	0	0	0	47	143	211	281	303	25
Feb.	35	35	35	136	281	454	558	627	663	142
Mar.	57	57	148	317	502	640	713	745	734	331
Apr.	79	186	357	514	634	698	710	710	707	505
May	151	306	473	596	666	694	678	653	614	606
June	196	340	511	609	672	681	656	618	609	640
July	155	309	467	587	653	678	666	637	618	606
Aug.	85	185	344	493	609	666	685	685	685	502
Sep.	60	60	136	325	467	596	692	707	716	319
Oct.	35	35	35	126	262	426	527	603	628	145
Nov.	13	13	13	13	47	139	208	274	293	25
Dec.	0	0	0	0	3	15	35	44	47	3

52 Deg

	N (Shade)	NNE/ NNW	NE/ NW	ENE/ WNW	E/ W	ESE/ WSW	SE/ SW	SSE/ SSW	S	HOR
Jan.	22	22	22	22	145	278	410	480	517	66
Feb.	41	41	41	183	372	530	644	710	729	215
Mar.	63	63	177	364	586	678	738	760	764	404
Apr.	85	186	372	530	650	700	710	694	688	562
May	136	309	470	606	669	694	666	625	612	656
June	183	347	511	622	672	678	637	587	571	685
July	139	306	464	596	656	678	630	609	599	653
Aug.	88	180	360	508	628	675	685	672	666	555
Sep.	66	66	158	363	505	637	700	722	729	388
Oct.	44	44	44	177	350	502	609	678	697	21
Nov.	22	22	22	22	142	271	401	467	505	69
Dec.	13	13	13	13	50	161	340	316	338	28

56 Deg

	N (Shade)	NNE/ NNW	NE/ NW	ENE/ WNW	E/ W	ESE/ WSW	SE/ SW	SSE/ SSW	S	HOR
Jan.	9	9	9	9	47	143	211	281	303	25
Feb.	35	35	35	136	281	454	558	627	663	142
Mar.	57	57	148	317	502	640	713	745	734	331
Apr.	79	186	357	514	634	698	710	710	707	505
May	151	306	473	596	666	694	678	653	614	606
June	196	340	511	609	672	681	656	618	609	640
July	155	309	467	587	653	678	666	637	618	606
Aug.	85	185	344	493	609	666	685	685	685	502
Sep.	60	60	136	325	467	596	692	707	716	319
Oct.	35	35	35	126	262	426	527	603	628	145
Nov.	13	13	13	13	47	139	208	274	293	25
Dec.	0	0	0	0	3	15	35	44	47	3

Appendix (4.10)

Cooing Load Factors for Glass with Interior Shading, North Latitudes (All Room Constructions)

Fenestration Facing	Solar Time, h																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
N	0.08	0.07	0.06	0.06	0.07	0.33	0.66	0.63	0.73	0.80	0.86	0.89	0.89	0.86	0.82	0.75	0.78	0.91	0.24	0.18	0.15	0.13	0.11	0.10
NNE	0.01	0.01	0.02	0.02	0.03	0.64	0.77	0.62	0.42	0.37	0.37	0.37	0.36	0.35	0.32	0.28	0.23	0.17	0.08	0.07	0.06	0.05	0.04	0.04
NE	0.03	0.02	0.02	0.02	0.02	0.56	0.76	0.74	0.58	0.37	0.29	0.27	0.26	0.24	0.22	0.20	0.16	0.12	0.06	0.05	0.04	0.04	0.03	0.03
ENE	0.01	0.02	0.02	0.02	0.02	0.52	0.76	0.80	0.71	0.52	0.31	0.26	0.24	0.22	0.20	0.18	0.15	0.11	0.06	0.05	0.04	0.04	0.03	0.03
E	0.03	0.02	0.02	0.02	0.02	0.47	0.72	0.80	0.76	0.62	0.41	0.27	0.24	0.22	0.20	0.17	0.14	0.11	0.06	0.05	0.05	0.04	0.03	0.03
ESE	0.03	0.03	0.02	0.02	0.02	0.41	0.67	0.79	0.80	0.72	0.54	0.34	0.27	0.24	0.21	0.19	0.15	0.12	0.07	0.06	0.05	0.04	0.04	0.03
SE	0.03	0.03	0.02	0.02	0.02	0.30	0.57	0.74	0.81	0.79	0.63	0.49	0.33	0.28	0.25	0.22	0.18	0.13	0.08	0.07	0.06	0.05	0.04	0.04
SSE	0.04	0.03	0.03	0.03	0.02	0.12	0.31	0.54	0.72	0.81	0.81	0.71	0.54	0.38	0.32	0.27	0.22	0.16	0.09	0.08	0.07	0.06	0.05	0.04
S	0.04	0.04	0.03	0.03	0.03	0.09	0.16	0.23	0.38	0.58	0.75	0.83	0.80	0.68	0.50	0.35	0.27	0.19	0.11	0.09	0.08	0.07	0.05	0.05
SSW	0.05	0.04	0.04	0.03	0.03	0.09	0.14	0.18	0.22	0.27	0.43	0.63	0.78	0.84	0.80	0.66	0.46	0.25	0.13	0.11	0.09	0.08	0.07	0.06
SW	0.05	0.05	0.04	0.04	0.03	0.07	0.11	0.14	0.16	0.19	0.22	0.30	0.59	0.75	0.83	0.81	0.69	0.45	0.16	0.12	0.10	0.09	0.07	0.06
WSW	0.05	0.05	0.04	0.04	0.03	0.07	0.10	0.12	0.14	0.16	0.17	0.23	0.44	0.64	0.78	0.84	0.78	0.55	0.16	0.12	0.10	0.09	0.07	0.06
W	0.05	0.05	0.04	0.04	0.03	0.06	0.09	0.11	0.13	0.15	0.16	0.17	0.31	0.53	0.72	0.82	0.81	0.61	0.16	0.12	0.10	0.08	0.07	0.06
WNW	0.05	0.05	0.04	0.03	0.03	0.07	0.10	0.12	0.14	0.16	0.17	0.18	0.22	0.43	0.65	0.80	0.84	0.66	0.16	0.12	0.10	0.08	0.07	0.06
NW	0.05	0.04	0.04	0.03	0.03	0.07	0.11	0.14	0.17	0.19	0.20	0.21	0.22	0.30	0.52	0.73	0.82	0.69	0.16	0.12	0.10	0.08	0.07	0.06
NNW	0.05	0.05	0.04	0.03	0.03	0.11	0.17	0.22	0.26	0.30	0.32	0.33	0.34	0.34	0.39	0.61	0.82	0.76	0.17	0.12	0.10	0.08	0.07	0.06
HOR.	0.06	0.05	0.04	0.04	0.03	0.12	0.27	0.44	0.59	0.72	0.81	0.85	0.85	0.81	0.71	0.58	0.42	0.25	0.14	0.12	0.10	0.08	0.07	0.06

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Appendix (4.11) Rates of Heat Gain from Occupants of Conditioned Spaces

Degree of Activity		Total Heat, W		Sensible Heat, W	Latent Heat, W	% Sensible Heat that is Radiant[b]	
		Adult Male	Adjusted, M/F[a]			Low *V*	High *V*
Seated at theater	Theater, matinee	115	95	65	30		
Seated at theater, night	Theater, night	115	105	70	35	60	27
Seated, very light work	Offices, hotels, apartments	130	115	70	45		
Moderately active office work	Offices, hotels, apartments	140	130	75	55		
Standing, light work; walking	Department store; retail store	160	130	75	55	58	38
Walking, standing	Drug store, bank	160	145	75	70		
Sedentary work	Restaurant[c]	145	160	80	80		
Light bench work	Factory	235	220	80	140		
Moderate dancing	Dance hall	265	250	90	160	49	35
Walking 4.8 km/h; light machine work	Factory	295	295	110	185		
Bowling[d]	Bowling alley	440	425	170	255		
Heavy work	Factory	440	425	170	255	54	19
Heavy machine work; lifting	Factory	470	470	185	285		
Athletics	Gymnasium	585	525	210	315		

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Appendix (4.12) Typical Diversity Factors for Occupants in Large Buildings

Application	Diversity Factor(DF)	
	People	Lighting
General offices	0.90-0.70	0.85-0.70
Apartment-Hotel	0.60-0.40	0.50-0.30
Retail	0.80-0.90	1.00-0.90
Factories	0.85-0.95	0.90-0.80

Source : Adapted from McQuistion , F.and Spitier , J(1992)

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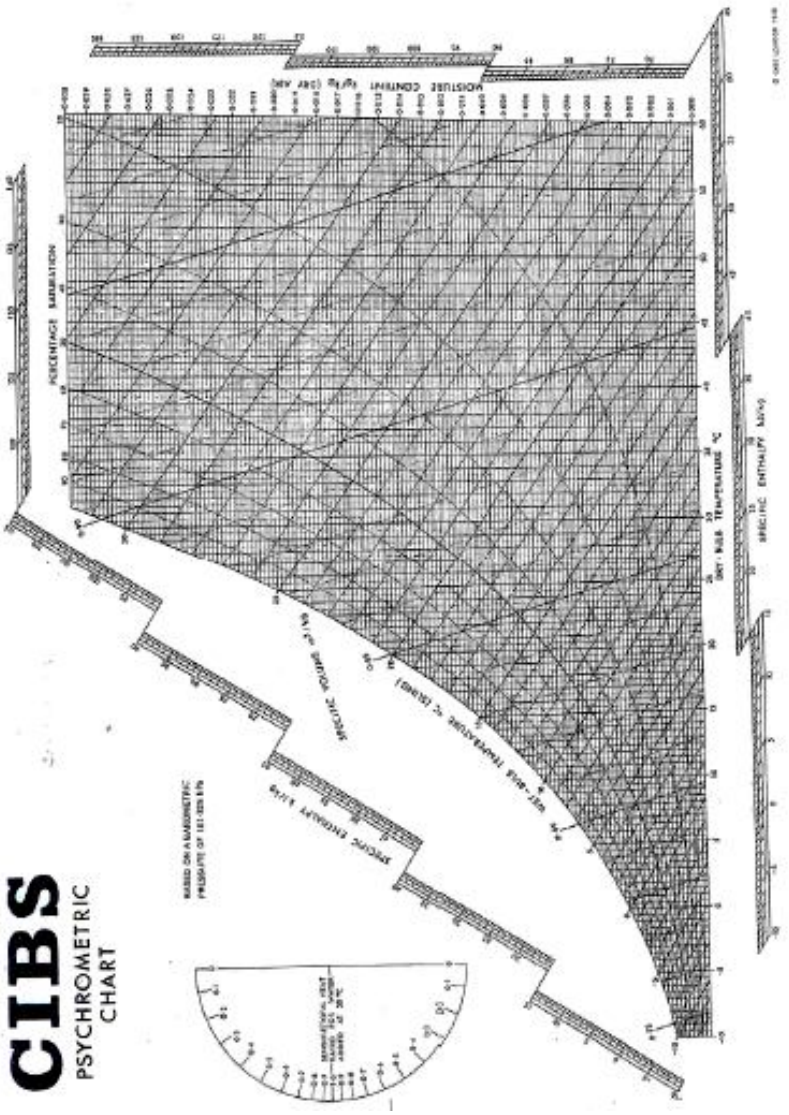
Appendix(4.13) **the Intensity of the Lighting in Large Building**

Application Type	light intensity (watt/m²)
offices	60
Factories	45
University،Classroom	40
Theater, hotels, apartments	20
Restaurant	17
Hospital-	15

Appendix (4.14) ASHRAE Psychrometric Chart No.

Normal Temperature Barometric Perssure:29.21 Inches of Summary



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Appendix (4.15) Air Changes Per Hour in Large Building

Application	Air Changes Per Hour (ACH)
Theater, cinema	6-10
Libraries	3-4
General offices	4-6
Laboratory	4-6
Kitchens	6

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Appendix (4.16) Typical Heat Gain Rates for Several Kinds of Equipment:

Equipment	Heat Gain		Usage Factor (FU)	Efficiency %
	Btu/h	W		
Refrigerator	340-680	100- 200		0.67
Personal computer	170- 680	50 -200		0.77
Impact Printer	34-100	10-30		0.77
Laser Printer	510	150		0.89
Copier	500-1000	150-300		0.85
Coffee maker	-	1500		0.88
Fan				50-70