

## APPENDIXES

This appendix has four main sections: The first section presents measured data from the daylight measurement station. The second section contains the data from the simulation of the illuminance on the work plane. The third section presents the measured data from the experiment. The fourth section presents the data of the average daylight illuminance and the useful daylight illuminance from the simulation. The fifth section presents data from simulation of the rectangular light well. The sixth section presents details of the lux meter and the sets of data recorded by the station.

### APPENDIX A

#### A. Measured data from daylight meteorological station

**Note:**  $I_{gloH}$  is Global radiation (Unit:  $W/m^2$ )

$I_{skyH}$  is Diffuse radiation (Unit:  $W/m^2$ )

$I_{sunN}$  is Beam radiation (Unit:  $W/m^2$ )

$E_{gloH}$  is Global illuminance (Unit: klux)

$E_{skyH}$  is Diffuse illuminance (Unit: klux)

$E_{sunN}$  is Beam illuminance (Unit: klux)

$Sal$  is Solar altitude (degree)

**Table A.1** Measured data from station on February 21<sup>st</sup>, 2013

Time	$E_{gloH}$	$E_{skyH}$	$E_{sunN}$	$I_{gloH}$	$I_{skyH}$	$I_{sunN}$	$S_{al}$
6:00	0.36	0.00	0.16	-1.46	-3.94	-13.8	-10.36
7:00	2.08	1.58	0.17	13.83	12.01	26.9	3.89
8:00	12.30	12.07	0.19	107.48	96.73	34.9	17.92
9:00	18.76	18.61	0.18	158.78	150.60	15.7	31.54
10:00	60.72	50.77	6.53	586.87	383.54	290.7	44.39
11:00	16.08	14.79	0.20	106.89	102.15	5.8	55.59
12:00	84.22	61.22	12.77	830.76	431.09	448.7	62.99
13:00	65.18	55.00	5.92	631.12	409.42	248.4	63.22
14:00	76.95	57.15	12.97	746.38	391.81	427.0	56.14
15:00	59.10	49.48	8.49	574.08	337.49	334.2	45.08
16:00	38.19	34.50	5.12	376.21	236.37	197.5	45.08
17:00	13.92	14.00	0.27	124.09	117.64	20.1	18.70
18:00	2.82	2.38	0.19	21.33	19.98	16.5	4.69

**Table A.2** Measured data from station on February 28<sup>th</sup>, 2013

Time	EgloH	EskyH	EsunN	IgloH	IskyH	IsunN	S <sub>al</sub>
6:00	0.42	-0.14	-3.4	-2.04	-3.64	-9.6	-9.5
7:00	4.71	4.17	6.4	38.09	29.77	99.1	4.8
8:00	23.85	18.40	16.7	210.68	114.94	294.3	19.0
9:00	48.44	31.80	30.7	430.46	192.43	439.4	32.8
10:00	70.62	37.30	46.3	641.56	226.29	577.7	46.0
11:00	86.50	38.59	56.7	802.24	234.41	672.5	57.6
12:00	93.36	37.25	61.7	879.13	227.94	715.7	65.5
13:00	91.85	37.03	60.2	878.10	229.15	712.7	65.6
14:00	83.50	36.38	55.7	802.98	221.02	687.4	57.9
15:00	70.23	28.48	57.8	676.84	169.26	702.5	46.3
16:00	50.66	22.25	39.3	480.88	131.94	483.0	46.3
17:00	27.11	15.48	35.2	251.40	90.26	487.2	19.3
18:00	4.30	3.90	4.5	25.89	21.94	44.0	5.2

**Table A.3** Measured data from station on April 4<sup>th</sup>, 2013

Time	EgloH	EskyH	EsunN	IgloH	IskyH	IsunN	S <sub>al</sub>
6:00	0.545	-0.13	-10.8	-2.81	-4.30	-23.9	-3.59
7:00	8.096	7.231	4.6	66.93	56.61	54.8	10.86
8:00	30.758	22.42	19.5	269.22	154.36	268.1	25.37
9:00	48.603	39.842	13.7	446.22	275.34	266.7	39.85
10:00	78.089	40.627	46.2	724.89	266.92	564.6	54.22
11:00	93.206	43.015	54.1	883.60	280.76	649.6	68.14
12:00	97.066	38.136	59.9	941.87	248.86	704.8	79.52
13:00	97.323	37.056	61.9	951.69	245.19	726.0	76.71
14:00	91.593	36.57	61.2	904.71	248.92	730.0	63.96
15:00	75.981	30.264	59.8	745.88	204.08	709.0	49.84
16:00	51.892	28.612	40.2	503.67	206.91	512.1	35.42
17:00	19.504	18.273	3.4	179.19	146.05	92.8	20.92
18:00	6.159	5.827	3.0	55.64	50.05	50.0	6.42

## APPENDIX B

## B. Simulation Results of the illuminance on work plane in Section 4.2

Table B.1 Simulation results of daylight illuminance on the 9<sup>th</sup> floor and 3<sup>rd</sup> floor on February 21<sup>st</sup>, 2013 (Unit:lx)

Time	9fl (2m)	9fl (4m)	9fl (6m)	9fl (8m)	3fl (2m)	3fl (4m)	3fl (6m)	3fl (8m)
6:00	0	0	0	0	0	0	0	0
7:00	0	0	0	0	0	0	0	0
8:00	1265	495	281	198	97	61	41	30
9:00	1968	776	445	315	156	99	67	48
10:00	8520	4219	2634	1872	388	248	170	124
11:00	1529	597	341	240	136	86	58	42
12:00	12942	6717	4102	2788	694	442	302	221
13:00	10017	4898	2962	2030	590	376	254	186
14:00	11061	5755	3562	2474	529	337	231	170
15:00	7738	3879	2433	1735	368	235	161	118
16:00	4273	2015	1267	933	217	139	95	70
17:00	1426	561	319	225	110	70	47	34
18:00	0	0	0	0	0	0	0	0

Table B.2 Simulation results of daylight illuminance on the 9<sup>th</sup> floor and 3<sup>rd</sup> floor on February 28<sup>th</sup>, 2013 (Unit:lx)

Time	9fl (2m)	9fl (4m)	9fl (6m)	9fl (8m)	3fl (2m)	3fl (4m)	3fl (6m)	3fl (8m)
6:00	0	0	0	0	0	0	0	0
7:00	0	0	0	0	0	0	0	0
8:00	1970	833	483	345	98	62	42	31
9:00	4828	2656	1830	1401	187	118	81	59
10:00	8224	4894	3250	2352	255	158	109	80
11:00	11201	6761	4313	3001	412	253	174	128
12:00	12111	7431	4666	3154	1350	964	651	454
13:00	11861	7211	4501	3038	1785	1291	851	581
14:00	10647	6423	4086	2822	403	247	170	124
15:00	7893	4994	3369	2443	207	128	88	65
16:00	4093	2504	1786	1385	114	71	49	36
17:00	1872	860	513	370	70	44	30	22
18:00	402	163	91	64	22	14	9	7



## APPENDIX C

## C. Measured Data from Experiment

**Table C.1** Experimental results on the 9<sup>th</sup> floor and 3<sup>rd</sup> floor on February 21<sup>st</sup>, 2013 (Unit:lx)

Time	9fl (2m)	9fl (4m)	9fl (6m)	9fl (8m)	3fl (2m)	3fl (4m)	3fl (6m)	3fl (8m)
6:00	0	0	0	0	0	0	0	0
7:00	214	108	52	42	13	23	5	0
8:00	1603	724	445	291	55	37	17	12
9:00	2628	1238	753	498	131	87	46	38
10:00	7029	3177	2028	1290	266	166	99	67
11:00	2005	887	537	355	63	47	30	0
12:00	13391	6682	4178	3447	566	347	301	222
13:00	10469	4941	3103	2090	442	282	225	170
14:00	11272	5771	3636	2351	385	246	198	156
15:00	8125	4160	2675	1779	271	172	150	111
16:00	5021	2513	1630	1128	169	125	90	70
17:00	1825	876	534	374	86	68	50	38
18:00	367	183	98	86	23	25	18	13

**Table C.2** Experimental results on the 9<sup>th</sup> floor and 3<sup>rd</sup> floor on February 28<sup>th</sup>, 2013 (Unit:lx)

Time	9fl (2m)	9fl (4m)	9fl (6m)	9fl (8m)	3fl (2m)	3fl (4m)	3fl (6m)	3fl (8m)
6:00	0.2	0	0	0	0	0	0	0
7:00	461	223.0	142.8	93.8	20.6	15.4	7.4	1.6
8:00	2243	1090	690	438	61	39	25	23
9:00	5088	2759	1909	1256	127	68	41	34
10:00	8337	4783	3200	2043	200	108	67	49
11:00	11214	6502	4142	2543	329	193	113	81
12:00	12072	7105	4426	2715	1475	989	586	419
13:00	12140	7262	4536	2820	1731	1177	710	495
14:00	11147	6767	4270	2742	338	197	126	99
15:00	8605	5592	3700	2483	198	112	80	60
16:00	5155	3435	2439	1778	117	77	51	45
17:00	2236	1197	755	504	61	37	32	29
18:00	506	260	165	110	21	8	13	16

**Table C.3** Experimental results on the 9<sup>th</sup> floor and 3<sup>rd</sup> floor on April 4<sup>th</sup>, 2013 (Unit:lx)

Time	9fl (2m)	9fl (4m)	9fl (6m)	9fl (8m)	3fl (2m)	3fl (4m)	3fl (6m)	3fl (8m)
6:00	2	0	0	0	0	0	0	0
7:00	1023	452	263	178	363	40	7	5
8:00	3054	1550	912	645	1016	119	30	5
9:00	6619	3558	2227	1605	2158	283	72	23
10:00	6882	3699	2207	1555	2018	248	76	18
11:00	9062	4807	2757	1884	2559	259	77	18
12:00	8258	4451	2448	1655	2159	182	56	6
13:00	9026	4874	2693	1874	2497	230	65	3
14:00	8123	4863	2749	1995	2041	313	131	29
15:00	7047	4354	2562	1944	1979	312	120	28
16:00	5017	3182	1928	1513	1536	269	93	21
17:00	2129	1089	607	448	691	91	47	26
18:00	1371	645	364	267	479	50	33	23

## APPENDIX D

## D. Average interior daylight illuminance and Average useful daylight illuminance

## Case I : Square light well atrium

Table D.1 The first floor of northern area of atrium building (WI=0.4)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	30	20	14	12	11	18	0	0	0	0	0	0
Feb	29	19	13	11	11	17	0	0	0	0	0	0
Mar	47	30	18	13	11	24	5	5	3	0	0	3
Apr	157	102	61	39	30	78	20	20	18	15	8	16
May	168	115	78	55	49	93	30	23	20	18	15	21
June	104	75	54	44	47	65	28	23	20	5	5	16
July	97	71	52	44	48	62	35	18	10	5	5	15
Aug	206	139	91	67	63	113	33	23	20	20	20	23
Sep	153	100	59	37	28	76	23	20	18	10	8	16
Oct	43	28	18	14	13	23	3	0	0	0	0	1
Nov	24	16	11	10	10	14	0	0	0	0	0	0
Dec	20	14	10	10	11	13	0	0	0	0	0	0
Min	206	139	91	67	63	113	35	23	20	20	20	23
Average	90	61	40	30	28	50	15	11	9	6	5	9
Max	20	14	10	10	10	13	0	0	0	0	0	0

Table D.2 The first floor of southern area of atrium building (WI=0.4)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	32	24	17	13	12	20	0	0	0	0	0	0
Feb	31	24	17	12	12	19	0	0	0	0	0	0
Mar	47	27	17	11	10	22	15	0	0	0	0	3
Apr	92	56	34	22	17	44	20	18	10	15	8	14
May	252	164	100	51	52	124	23	20	20	18	15	19
June	215	143	87	58	44	109	20	20	20	5	5	14
July	160	106	66	46	37	83	25	20	15	5	5	14
Aug	242	155	94	62	47	120	23	20	20	20	20	21
Sep	85	52	32	22	18	42	25	15	3	10	8	12
Oct	48	30	20	13	13	25	5	0	0	0	0	1
Nov	26	20	15	11	10	16	0	0	0	0	0	0
Dec	23	20	16	12	11	16	0	0	0	0	0	0
Min	252	164	100	62	52	124	25	20	20	20	20	21
Average	104	68	43	28	24	53	13	9	7	6	5	8
Max	23	20	15	11	10	16	0	0	0	0	0	0

**Table D.3** The first floor of eastern area of atrium building (WI=0.4)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	25	15	9	6	5	12	0	0	0	0	0	0
Feb	24	15	9	7	5	12	0	0	0	0	0	0
Mar	36	20	11	7	5	16	8	0	0	0	0	2
Apr	127	78	44	26	17	59	23	20	15	10	3	14
May	247	154	88	123	36	130	30	20	20	20	18	22
June	129	79	48	30	22	62	28	20	20	8	3	16
July	111	69	41	26	19	53	23	15	10	8	3	12
Aug	235	146	85	51	35	110	28	20	20	18	15	20
Sep	100	60	35	21	13	46	25	20	13	3	0	12
Oct	37	21	12	10	6	17	3	0	0	0	0	1
Nov	20	12	7	5	5	10	0	0	0	0	0	0
Dec	17	10	6	5	5	9	0	0	0	0	0	0
Min	247	154	88	123	36	130	30	20	20	20	18	22
Average	92	57	33	26	14	45	14	10	8	5	3	8
Max	17	10	6	5	5	9	0	0	0	0	0	0

**Table D.4** The first floor of western area of atrium building (WI=0.4)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	27	18	14	13	16	18	0	0	0	0	0	0
Feb	26	18	13	13	15	17	0	0	0	0	0	0
Mar	37	21	14	10	10	19	8	3	0	3	0	3
Apr	123	78	46	31	25	61	18	18	10	10	5	12
May	208	132	79	52	42	103	18	20	15	13	15	16
June	123	79	50	36	31	64	20	20	10	10	5	13
July	109	70	45	33	30	57	20	15	8	5	3	10
Aug	245	158	95	63	51	123	15	20	20	20	20	19
Sep	96	59	36	24	21	47	20	15	10	5	0	10
Oct	39	24	16	13	14	21	3	0	0	0	0	1
Nov	22	15	11	11	14	15	0	0	0	0	0	0
Dec	19	14	13	15	19	16	0	0	0	0	0	0
Min	245	158	95	63	51	123	20	20	20	20	20	19
Average	90	57	36	26	24	47	10	9	6	5	4	7
Max	19	14	11	10	10	15	0	0	0	0	0	0

**Table D.5** The second floor of northern area of atrium building (WI=0.8)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	27	17	11	8	8	14	0	0	0	0	0	0
Feb	26	16	10	7	7	13	0	0	0	0	0	0
Mar	59	38	22	13	10	28	10	10	8	0	0	6
Apr	116	68	37	23	18	52	20	20	18	3	0	12
May	155	89	50	33	29	71	30	20	20	13	0	17
June	102	60	37	26	24	50	30	20	15	0	0	13
July	90	54	34	25	24	45	23	15	8	3	0	10
Aug	168	98	55	36	32	78	30	20	20	10	5	17
Sep	127	80	45	28	21	60	25	20	20	5	3	15
Oct	40	23	14	10	9	19	3	0	0	0	0	1

Month	Average Daylight Illuminance (lx)					Avg- DL (lx)	Useful daylight illuminance (%)					Avg- UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Nov	22	13	8	6	6	11	0	0	0	0	0	0
Dec	18	11	7	6	5	9	0	0	0	0	0	0
<b>Min</b>	168	98	55	36	32	78	30	20	20	13	5	17
<b>Average</b>	79	47	28	18	16	38	14	10	9	3	1	7
<b>Max</b>	18	11	7	6	5	9	0	0	0	0	0	0

**Table D.6** The second floor of southern area of atrium building (WI=0.8)

Month	Average Daylight Illuminance (lx)					Avg- DL (lx)	Useful daylight illuminance (%)					Avg- UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	26	16	11	9	8	14	0	0	0	0	0	0
Feb	25	15	10	8	8	13	0	0	0	0	0	0
Mar	52	25	14	10	8	22	18	3	0	0	0	4
Apr	91	52	28	16	11	40	20	18	5	0	0	9
May	195	113	60	34	23	85	30	20	20	13	0	17
June	157	96	54	31	20	72	20	20	20	15	0	15
July	121	73	42	25	16	55	20	18	10	8	0	11
Aug	185	107	57	32	20	80	25	20	20	13	3	16
Sep	85	48	28	18	14	39	28	15	3	0	0	9
Oct	49	24	14	10	9	21	5	0	0	0	0	1
Nov	21	13	9	7	7	11	0	0	0	0	0	0
Dec	17	11	9	7	7	10	0	0	0	0	0	0
<b>Min</b>	195	113	60	34	23	85	30	20	20	15	3	17
<b>Average</b>	85	49	28	17	12	38	14	9	6	4	0	7
<b>Max</b>	17	11	9	7	7	10	0	0	0	0	0	0

**Table D.7** The second floor of eastern area of atrium building (WI=0.8)

Month	Average Daylight Illuminance (lx)					Avg- DL (lx)	Useful daylight illuminance (%)					Avg- UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	25	15	9	6	5	12	0	0	0	0	0	0
Feb	24	14	9	6	5	12	0	0	0	0	0	0
Mar	45	23	13	7	5	19	13	0	0	0	0	3
Apr	114	66	35	19	12	49	25	20	13	3	0	12
May	210	127	71	42	29	96	30	25	20	20	5	20
June	129	78	48	31	22	62	30	20	20	8	0	16
July	107	64	40	27	20	52	30	13	10	5	0	12
Aug	206	122	68	40	26	92	30	20	20	13	8	18
Sep	101	58	31	18	11	44	28	20	13	0	0	12
Oct	40	21	12	7	5	17	5	0	0	0	0	1
Nov	20	12	8	5	4	10	0	0	0	0	0	0
Dec	16	10	7	5	5	9	0	0	0	0	0	0
<b>Min</b>	210	127	71	42	29	96	30	25	20	20	8	20
<b>Average</b>	87	51	29	18	12	39	16	10	8	4	1	8
<b>Max</b>	16	10	7	5	4	9	0	0	0	0	0	0

**Table D.8** The second floor of western area of atrium building (WI=0.8)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	26	16	11	9	11	15	0	0	0	0	0	0
Feb	25	15	10	8	10	14	0	0	0	0	0	0
Mar	46	24	14	10	10	21	13	5	0	0	0	4
Apr	107	63	35	22	19	49	20	18	13	5	0	11
May	171	100	55	35	28	78	20	20	20	15	3	16
June	119	71	42	28	25	57	20	20	15	8	0	13
July	104	62	37	26	24	51	23	15	8	3	3	10
Aug	199	119	67	42	34	92	25	20	20	15	10	18
Sep	95	55	31	20	18	44	20	18	10	0	0	10
Oct	41	22	13	10	11	20	3	0	0	0	0	1
Nov	21	12	8	8	9	12	0	0	0	0	0	0
Dec	18	11	8	8	11	11	0	0	0	0	0	0
Min	199	119	67	42	34	92	25	20	20	15	10	18
Average	81	48	28	19	18	39	12	10	7	4	1	7
Max	18	11	8	8	9	11	0	0	0	0	0	0

**Table D.9** The third floor of northern area of atrium building (WI=1.2)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	29	17	11	9	10	15	0	0	0	0	0	0
Feb	29	17	10	9	10	15	0	0	0	0	0	0
Mar	94	61	35	21	16	45	15	15	8	5	3	9
Apr	107	61	35	23	19	49	28	20	15	3	0	13
May	144	74	41	30	28	63	30	28	18	3	3	16
June	110	58	34	25	24	50	30	20	8	0	0	12
July	94	50	30	23	23	44	35	10	5	0	0	10
Aug	150	76	43	31	29	66	35	20	18	10	3	17
Sep	131	82	47	30	23	63	30	23	18	8	3	16
Oct	62	39	23	16	14	31	8	5	3	3	0	4
Nov	25	14	9	7	9	13	0	0	0	0	0	0
Dec	20	12	8	8	10	12	0	0	0	0	0	0
Min	150	82	47	31	29	66	35	28	18	10	3	17
Average	83	47	27	19	18	39	18	12	8	3	1	8
Max	20	12	8	7	9	12	0	0	0	0	0	0

**Table D.10** The third floor of southern area of atrium building (WI=1.2)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	27	16	11	9	8	14	0	0	0	0	0	0
Feb	33	15	10	8	8	15	3	0	0	0	0	1
Mar	67	30	16	11	9	27	23	8	0	0	0	6
Apr	89	45	24	15	11	37	30	18	0	0	0	10
May	183	107	61	42	36	86	30	30	25	20	5	22
June	161	102	60	39	32	79	30	25	20	15	3	19
July	121	74	43	29	26	59	30	18	10	10	3	14
Aug	163	88	48	31	27	71	33	20	18	10	5	17
Sep	92	47	26	17	13	39	30	20	3	0	0	11
Oct	63	28	16	11	9	25	25	5	0	0	0	6

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Nov	28	13	9	7	7	13	0	0	0	0	0	0
Dec	19	11	9	8	7	11	0	0	0	0	0	0
Min	183	107	61	42	36	86	33	30	25	20	5	22
Average	87	48	28	19	16	40	19	12	6	5	1	9
Max	19	11	9	7	7	11	0	0	0	0	0	0

Table D.11 The third floor of eastern area of atrium building (WI=1.2)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	24	12	6	4	2	10	0	0	0	0	0	0
Feb	25	12	6	4	2	10	0	0	0	0	0	0
Mar	62	28	15	9	5	24	18	8	3	0	0	6
Apr	105	57	29	16	10	43	30	20	8	3	0	12
May	182	102	54	30	19	77	30	30	20	10	5	19
June	124	67	35	20	13	52	30	20	15	5	0	14
July	97	51	27	15	10	40	30	13	8	0	0	10
Aug	178	96	49	27	16	73	30	25	18	8	5	17
Sep	103	55	29	16	10	43	30	20	13	0	0	13
Oct	51	23	12	7	4	19	15	3	0	0	0	4
Nov	21	10	5	3	2	8	0	0	0	0	0	0
Dec	16	8	4	3	2	7	0	0	0	0	0	0
Min	182	102	54	30	19	77	30	30	20	10	5	19
Average	82	43	23	13	8	34	18	11	7	2	1	8
Max	16	8	4	3	2	7	0	0	0	0	0	0

Table D.12 The third floor of western area of atrium building (WI=1.2)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	26	14	10	9	11	14	0	0	0	0	0	0
Feb	26	14	9	8	9	13	0	0	0	0	0	0
Mar	63	30	17	12	11	27	18	8	3	0	0	6
Apr	106	59	33	21	18	47	28	20	13	0	0	12
May	226	136	75	45	33	103	40	30	30	20	5	25
June	141	81	46	30	25	65	35	30	15	5	0	17
July	102	56	32	23	22	47	35	13	8	3	0	12
Aug	169	92	51	33	28	75	30	20	18	13	5	17
Sep	106	59	34	22	19	48	30	28	10	0	0	14
Oct	52	25	15	11	12	23	15	3	0	0	0	4
Nov	22	12	8	7	9	11	0	0	0	0	0	0
Dec	18	10	7	7	10	10	0	0	0	0	0	0
Min	226	136	75	45	33	103	40	30	30	20	5	25
Average	88	49	28	19	17	40	19	13	8	3	1	9
Max	18	10	7	7	9	10	0	0	0	0	0	0

**Table D.13** The fourth floor of northern area of atrium building (WI=1.6)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	35	19	11	8	8	16	0	0	0	0	0	0
Feb	35	18	11	8	8	16	0	0	0	0	0	0
Mar	160	105	59	34	22	76	25	20	20	10	10	17
Apr	123	70	40	25	20	55	33	25	10	3	0	14
May	159	79	46	32	30	69	40	30	25	0	0	19
June	132	67	41	33	36	62	40	28	15	0	0	17
July	112	59	38	32	36	55	40	15	5	0	0	12
Aug	168	86	52	40	40	78	40	33	20	10	3	21
Sep	155	95	55	33	24	73	33	28	25	8	3	19
Oct	118	76	44	26	19	56	20	15	13	5	5	12
Nov	31	16	9	7	6	14	0	0	0	0	0	0
Dec	25	13	8	6	6	11	0	0	0	0	0	0
Min	168	105	59	40	40	78	40	33	25	10	10	21
Average	104	59	35	24	21	48	23	16	11	3	2	11
Max	25	13	8	6	6	11	0	0	0	0	0	0

**Table D.14** The fourth floor of southern area of atrium building (WI=1.6)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	44	20	13	11	10	20	0	0	0	0	0	0
Feb	62	22	14	11	11	24	23	0	0	0	0	5
Mar	95	43	24	16	14	38	35	13	5	0	0	11
Apr	101	49	27	17	13	41	38	23	0	0	0	12
May	192	109	61	36	25	84	38	30	30	15	0	23
June	183	113	64	37	24	84	33	30	25	15	0	21
July	137	80	46	27	19	62	40	25	13	8	0	17
Aug	182	96	53	31	21	77	40	30	20	5	0	19
Sep	113	56	32	22	18	48	38	23	3	0	0	13
Oct	92	41	23	16	14	37	30	8	0	0	0	8
Nov	64	19	12	9	9	23	25	0	0	0	0	5
Dec	39	15	10	8	8	16	3	0	0	0	0	1
Min	192	113	64	37	25	84	40	30	30	15	0	23
Average	109	55	32	20	15	46	28	15	8	4	0	11
Max	39	15	10	8	8	16	0	0	0	0	0	0

**Table D.15** The fourth floor of eastern area of atrium building (WI=1.6)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	33	15	8	5	3	13	0	0	0	0	0	0
Feb	40	16	8	5	3	14	5	0	0	0	0	1
Mar	93	45	24	14	9	37	30	13	8	3	0	11
Apr	115	61	32	18	11	47	30	25	8	3	0	13
May	193	105	57	32	20	81	40	30	23	10	5	22
June	144	76	41	23	15	60	35	25	15	5	0	16
July	116	61	33	19	12	48	35	15	8	3	0	12
Aug	185	98	52	29	18	77	35	30	18	5	3	18
Sep	127	67	36	20	13	53	30	25	13	3	0	14
Oct	82	38	20	12	7	32	25	10	0	0	0	7

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Nov	35	14	7	4	3	13	0	0	0	0	0	0
Dec	24	10	6	3	2	9	0	0	0	0	0	0
Min	193	105	57	32	20	81	40	30	23	10	5	22
Average	99	50	27	15	10	40	22	14	8	3	1	9
Max	24	10	6	3	2	9	0	0	0	0	0	0

**Table D.16** The fourth floor of western area of atrium building (WI=1.6)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	35	17	11	9	10	16	0	0	0	0	0	0
Feb	41	18	11	8	9	17	3	0	0	0	0	1
Mar	96	48	27	17	14	40	28	13	5	3	0	10
Apr	155	93	51	30	22	70	38	28	20	5	0	18
May	250	150	82	47	33	112	40	30	30	18	10	26
June	174	100	56	34	26	78	40	30	25	8	0	21
July	143	81	46	30	25	65	40	25	15	5	0	17
Aug	288	178	98	57	40	132	40	35	25	18	13	26
Sep	146	83	47	29	21	65	38	30	18	8	0	19
Oct	85	41	24	16	14	36	25	10	5	0	0	8
Nov	37	15	9	8	8	15	0	0	0	0	0	0
Dec	25	12	8	8	9	12	0	0	0	0	0	0
Min	288	178	98	57	40	132	40	35	30	18	13	26
Average	123	70	39	24	19	55	24	17	12	5	2	12
Max	25	12	8	8	8	12	0	0	0	0	0	0

**Table D.17** The fifth floor of northern area of atrium building (WI=2.0)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	66	38	22	14	10	30	20	0	0	0	0	4
Feb	82	49	29	17	12	38	25	5	5	0	0	7
Mar	251	166	94	53	33	120	40	33	23	18	10	25
Apr	175	102	58	36	25	79	48	38	28	5	0	24
May	207	102	58	39	32	88	53	40	30	3	3	26
June	183	91	52	35	28	78	58	35	18	0	0	22
July	162	83	49	34	29	71	60	35	13	0	0	22
Aug	227	118	68	44	35	99	60	40	33	8	0	28
Sep	221	137	79	47	32	103	53	33	28	18	5	27
Oct	221	147	85	49	31	106	45	30	30	18	8	26
Nov	61	34	20	12	9	27	20	0	0	0	0	4
Dec	49	27	16	10	7	22	0	0	0	0	0	0
Min	251	166	94	53	35	120	60	40	33	18	10	28
Average	159	91	53	32	24	72	40	24	17	6	2	18
Max	49	27	16	10	7	22	0	0	0	0	0	0

**Table D.18** The fifth floor of southern area of atrium building (WI=2.0)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	94	35	21	14	10	35	40	0	0	0	0	8
Feb	119	47	24	15	11	43	40	15	0	0	0	11
Mar	147	68	38	24	17	59	45	23	10	0	0	16
Apr	141	70	39	24	16	58	45	30	3	0	0	16
May	253	143	80	46	30	110	50	40	30	28	0	30
June	244	148	84	48	29	111	53	40	30	23	0	29
July	205	123	70	40	25	92	58	40	25	10	0	27
Aug	250	138	77	45	28	108	55	40	30	15	3	29
Sep	166	82	46	28	20	69	53	30	5	0	0	18
Oct	148	67	38	24	18	59	50	28	5	0	0	17
Nov	139	46	23	14	10	46	50	18	0	0	0	14
Dec	113	29	18	12	9	36	43	0	0	0	0	9
Min	253	148	84	48	30	111	58	40	30	28	3	30
Average	168	83	46	28	19	69	48	25	11	6	0	18
Max	94	29	18	12	9	35	40	0	0	0	0	8

**Table D.19** The fifth floor of eastern area of atrium building (WI=2.0)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	67	30	17	10	6	26	28	0	0	0	0	6
Feb	88	36	19	11	7	32	35	3	0	0	0	8
Mar	167	87	49	28	18	70	48	30	20	5	0	21
Apr	181	101	56	31	19	78	50	40	18	5	0	23
May	289	165	89	49	30	124	50	45	40	18	5	32
June	238	135	74	41	25	102	53	40	28	15	0	27
July	209	119	66	37	22	91	53	35	20	10	0	24
Aug	339	200	110	61	36	149	50	40	35	20	10	31
Sep	194	103	57	32	20	81	53	35	15	8	0	22
Oct	147	72	39	23	15	59	43	28	13	0	0	17
Nov	85	31	16	9	6	29	38	0	0	0	0	8
Dec	59	23	12	7	5	21	20	0	0	0	0	4
Min	339	200	110	61	36	149	53	45	40	20	10	32
Average	172	92	50	28	17	72	43	25	16	7	1	18
Max	59	23	12	7	5	21	20	0	0	0	0	4

**Table D.20** The fifth floor of western area of atrium building (WI=2.0)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	71	35	21	15	14	31	30	0	0	0	0	6
Feb	92	40	23	16	14	37	38	3	0	0	0	8
Mar	177	96	54	33	24	77	50	35	23	8	0	23
Apr	204	120	67	39	28	92	53	35	20	10	3	24
May	302	176	97	57	40	134	58	40	30	20	10	32
June	238	135	76	46	34	106	58	38	30	15	3	29
July	207	116	65	40	31	92	60	35	20	10	3	26
Aug	341	206	114	67	46	155	55	40	33	25	13	33
Sep	216	123	69	41	30	96	60	38	28	10	0	27
Oct	158	83	48	30	23	68	48	28	13	5	0	19

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Nov	88	34	19	13	12	33	38	0	0	0	0	8
Dec	62	26	15	12	12	25	30	0	0	0	0	6
<b>Min</b>	341	206	114	67	46	155	60	40	33	25	13	33
<b>Average</b>	180	99	56	34	26	79	48	24	16	9	3	20
<b>Max</b>	62	26	15	12	12	25	30	0	0	0	0	6

Table D.21 The sixth floor of northern area of atrium building (WI=2.4)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	94	49	28	18	13	40	43	5	0	0	0	10
Feb	213	136	77	44	28	100	50	35	23	15	5	26
Mar	338	214	122	69	43	157	60	40	38	28	15	36
Apr	226	124	70	42	29	98	63	38	35	8	0	29
May	282	134	75	49	38	115	70	50	40	5	0	33
June	251	118	65	41	31	101	75	50	30	0	0	31
July	228	108	60	39	30	93	78	43	15	0	0	27
Aug	301	147	82	51	38	124	73	43	40	20	3	36
Sep	297	172	97	57	38	132	70	45	38	23	5	36
Oct	332	212	121	68	43	155	58	40	30	28	18	35
Nov	167	101	58	33	21	76	45	15	13	8	3	17
Dec	75	37	21	13	9	31	28	0	0	0	0	6
<b>Min</b>	338	214	122	69	43	157	78	50	40	28	18	36
<b>Average</b>	234	129	73	44	30	102	59	34	25	11	4	27
<b>Max</b>	75	37	21	13	9	31	28	0	0	0	0	6

Table D.22 The sixth floor of southern area of atrium building (WI=2.4)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	173	64	32	20	14	61	60	25	0	0	0	17
Feb	198	77	40	25	18	72	60	35	5	0	0	20
Mar	222	99	53	33	23	86	63	35	18	3	0	24
Apr	194	94	51	31	21	78	63	38	15	0	0	23
May	340	187	104	60	38	146	68	50	40	33	0	38
June	326	190	106	60	37	144	68	48	40	30	5	38
July	271	152	85	49	30	117	70	40	35	13	0	32
Aug	327	172	95	55	35	137	68	40	40	20	5	35
Sep	238	111	61	37	26	95	70	45	28	0	0	29
Oct	226	100	54	34	24	88	68	35	20	0	0	25
Nov	246	89	42	25	18	84	70	30	10	0	0	22
Dec	233	74	31	18	12	74	60	30	0	0	0	18
<b>Min</b>	340	190	106	60	38	146	70	50	40	33	5	38
<b>Average</b>	249	117	63	37	24	98	65	38	21	8	1	27
<b>Max</b>	173	64	31	18	12	61	60	25	0	0	0	17

**Table D.23** The sixth floor of eastern area of atrium building (WI=2.4)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	126	48	25	14	9	44	50	3	0	0	0	11
Feb	173	72	38	22	14	64	58	30	5	0	0	19
Mar	262	137	74	42	26	108	60	43	28	10	3	29
Apr	262	145	79	43	26	111	68	45	28	15	3	32
May	424	241	131	72	43	182	68	50	43	23	18	40
June	326	180	98	54	32	138	70	50	38	18	5	36
July	279	152	82	45	27	117	70	45	25	13	5	32
Aug	428	241	131	71	42	183	70	50	40	23	13	39
Sep	308	167	90	50	30	129	68	50	33	18	5	35
Oct	238	116	63	36	23	95	63	45	23	8	0	28
Nov	188	69	35	20	12	65	58	20	8	0	0	17
Dec	137	43	20	11	7	44	45	0	0	0	0	9
Min	428	241	131	72	43	183	70	50	43	23	18	40
Average	263	134	72	40	24	107	62	36	22	10	4	27
Max	126	43	20	11	7	44	45	0	0	0	0	9

**Table D.24** The sixth floor of western area of atrium building (WI=2.4)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	129	53	29	20	17	50	53	8	0	0	0	12
Feb	177	78	43	28	22	70	55	33	10	0	0	20
Mar	267	141	78	46	32	113	65	40	28	13	5	30
Apr	259	145	79	47	32	112	68	40	28	13	5	31
May	373	210	115	67	46	162	68	55	40	23	10	39
June	316	171	94	56	40	136	78	58	35	20	5	39
July	280	148	82	49	36	119	80	50	28	10	3	34
Aug	414	238	131	76	51	182	70	48	40	30	13	40
Sep	288	155	85	51	35	123	73	48	30	10	5	33
Oct	242	123	69	42	31	101	63	40	23	15	0	28
Nov	189	73	39	25	19	69	58	23	10	0	0	18
Dec	139	47	24	17	15	48	50	0	0	0	0	10
Min	414	238	131	76	51	182	80	58	40	30	13	40
Average	256	132	72	44	31	107	65	37	23	11	4	28
Max	129	47	24	17	15	48	50	0	0	0	0	10

**Table D.25** The seventh floor of northern area of atrium building (WI=2.8)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	389	224	128	72	44	171	78	43	38	25	13	39
Feb	546	341	194	108	64	250	73	50	40	38	30	46
Mar	511	301	170	96	59	227	83	60	43	38	25	50
Apr	360	191	106	63	42	153	85	60	45	20	5	43
May	416	198	109	68	51	168	90	68	50	35	0	49
June	382	180	98	61	45	153	95	65	50	18	0	46
July	368	173	95	60	45	148	100	70	48	10	0	46
Aug	462	225	124	76	54	188	95	65	58	35	10	53

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Sep	486	267	150	87	56	209	90	70	50	43	15	54
Oct	546	324	185	105	64	245	90	53	50	45	28	53
Nov	716	468	266	146	86	336	63	48	48	40	30	46
Dec	430	265	150	83	49	195	68	43	30	30	23	39
Min	716	468	266	146	86	336	100	70	58	45	30	54
Average	468	263	148	85	55	204	84	58	46	31	15	47
Max	360	173	95	60	42	148	63	43	30	10	0	39

Table D.26 The seventh floor of southern area of atrium building (WI=2.8)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	292	118	59	36	25	106	80	58	18	0	0	31
Feb	320	134	69	43	31	119	80	60	30	10	0	36
Mar	343	154	82	49	33	132	85	60	33	13	0	38
Apr	308	144	78	46	30	121	85	58	40	3	0	37
May	509	272	151	87	55	215	90	60	50	50	15	53
June	512	281	156	89	54	218	93	63	55	43	13	53
July	455	236	131	75	46	188	95	65	58	33	10	52
Aug	507	258	142	82	51	208	93	63	55	40	15	53
Sep	383	175	94	56	38	149	90	70	48	10	0	44
Oct	359	160	85	52	35	138	90	63	30	15	0	40
Nov	391	157	78	48	35	142	90	50	30	15	3	38
Dec	385	145	68	41	29	133	83	50	30	3	0	33
Min	512	281	156	89	55	218	95	70	58	50	15	53
Average	397	186	99	59	39	156	88	60	40	19	5	42
Max	292	118	59	36	25	106	80	50	18	0	0	31

Table D.27 The seventh floor of eastern area of atrium building (WI=2.8)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	271	114	61	36	23	101	80	50	23	0	0	31
Feb	335	155	85	50	32	131	80	55	33	18	3	38
Mar	1665	220	120	68	42	423	85	63	45	28	10	46
Apr	377	198	107	59	36	156	85	60	38	15	8	41
May	2008	316	171	95	57	529	85	70	58	30	20	53
June	500	270	147	81	49	209	95	70	58	28	13	53
July	467	249	135	75	45	194	100	70	53	33	8	53
Aug	626	346	187	103	62	265	90	70	60	38	18	55
Sep	475	248	133	74	45	195	90	68	48	20	13	48
Oct	420	209	113	64	40	169	90	63	43	30	3	46
Nov	395	180	99	59	38	154	85	58	40	25	8	43
Dec	330	128	66	38	25	117	80	50	23	5	0	32
Min	2008	346	187	103	62	529	100	70	60	38	20	55
Average	656	219	119	67	41	220	87	62	43	22	8	45
Max	271	114	61	36	23	101	80	50	23	0	0	31

**Table D.28** The seventh floor of western area of atrium building (WI=2.8)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	272	116	63	40	31	105	78	53	28	5	0	33
Feb	341	160	90	56	41	137	80	55	28	23	8	39
Mar	440	228	125	73	50	183	93	60	43	28	13	47
Apr	437	240	132	76	51	187	90	58	45	30	13	47
May	661	385	211	119	76	291	88	60	53	45	23	54
June	534	289	158	92	63	227	98	65	50	43	20	55
July	484	251	137	80	56	201	100	75	50	25	13	53
Aug	692	404	222	126	82	305	85	68	55	43	33	57
Sep	527	281	154	90	61	223	90	70	48	40	20	54
Oct	447	231	128	76	53	187	90	58	40	30	15	47
Nov	396	183	102	64	47	159	83	60	38	28	13	44
Dec	325	128	68	43	34	120	78	45	30	10	0	33
Min	692	404	222	126	82	305	100	75	55	45	33	57
Average	463	241	133	78	54	194	88	60	42	29	14	47
Max	272	116	63	40	31	105	78	45	28	5	0	33

**Table D.29** The eighth floor of northern area of atrium building (WI=3.2)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	1931	506	300	174	109	604	60	73	60	60	43	59
Feb	1700	538	316	182	113	570	63	73	60	60	53	62
Mar	1426	458	265	155	98	481	73	80	60	58	45	63
Apr	1130	295	169	102	68	353	95	85	63	53	18	63
May	1016	299	166	104	74	332	100	90	70	60	30	70
June	1039	275	153	96	69	326	100	90	70	60	20	68
July	1171	272	155	98	72	353	100	90	78	58	20	69
Aug	1213	339	191	118	82	389	100	88	73	60	50	74
Sep	1571	411	237	142	94	491	60	88	70	60	48	65
Oct	1742	497	291	170	108	562	58	80	68	55	50	62
Nov	1988	731	427	242	147	707	50	63	70	50	50	57
Dec	2069	802	468	264	158	752	60	58	60	50	50	56
Min	2069	802	468	264	158	752	100	90	78	60	53	74
Average	1500	452	262	154	99	493	76	80	67	60	40	64
Max	1016	272	153	96	68	326	50	58	60	50	18	56

**Table D.30** The eighth floor of southern area of atrium building (WI=3.2)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	750	205	110	70	50	237	100	80	58	30	5	55
Feb	756	227	123	77	54	248	100	80	60	33	10	57
Mar	829	242	132	82	56	268	100	80	60	38	8	57
Apr	971	226	128	78	53	291	100	85	60	38	0	57
May	1290	409	234	139	91	432	95	88	70	70	53	75
June	1507	427	246	144	91	483	73	88	75	60	58	71
July	1558	382	220	131	84	475	68	90	78	60	43	68
Aug	1374	398	226	135	88	444	88	85	73	60	43	70

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Sep	1199	281	159	98	67	361	100	88	70	55	13	65
Oct	954	256	142	88	61	300	100	83	68	48	18	63
Nov	782	270	144	91	64	270	100	73	55	43	25	59
Dec	711	255	129	83	60	248	100	75	53	35	28	58
Min	1558	427	246	144	91	483	100	90	78	70	58	75
Average	1057	298	166	101	68	338	94	83	65	47	25	63
Max	711	205	110	70	50	237	68	73	53	30	0	55

Table D.31 The eighth floor of eastern area of atrium building (WI=3.2)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	1085	246	139	83	55	322	95	75	55	40	10	55
Feb	1156	311	175	102	66	362	93	75	60	48	23	60
Mar	3934	401	223	126	77	952	83	85	58	48	25	60
Apr	2616	338	190	107	66	663	80	85	65	38	23	58
May	3742	524	292	163	99	964	70	90	73	58	38	66
June	1595	433	242	135	83	498	70	90	73	55	30	64
July	1721	414	234	132	81	516	68	90	78	58	28	64
Aug	1767	529	293	164	100	571	68	93	73	60	40	67
Sep	3290	430	243	138	84	837	70	88	70	58	25	62
Oct	2035	366	206	119	74	560	70	85	70	55	30	62
Nov	1186	361	204	121	78	390	85	80	68	53	33	64
Dec	1031	310	173	105	70	338	100	75	60	40	30	61
Min	3934	529	293	164	100	964	100	93	78	60	40	67
Average	2096	389	218	125	78	581	79	84	67	51	28	62
Max	1031	246	139	83	55	322	68	75	55	38	10	55

Table D.32 The eighth floor of western area of atrium building (WI=3.2)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	1070	255	146	91	63	325	98	78	55	40	28	60
Feb	1193	330	188	113	75	380	88	78	60	43	33	60
Mar	1886	402	223	128	82	544	83	83	60	45	33	61
Apr	1953	364	208	120	76	544	73	85	65	53	28	61
May	4910	580	333	189	116	1226	70	85	70	65	38	66
June	2945	446	252	146	94	777	65	93	73	65	43	68
July	2635	402	229	134	87	697	65	95	78	65	33	67
Aug	4758	602	348	198	123	1206	63	88	75	68	55	70
Sep	3153	448	258	149	95	821	63	88	70	58	48	65
Oct	2560	402	231	135	87	683	68	83	68	58	38	63
Nov	1173	371	211	127	85	394	83	80	68	50	35	63
Dec	1003	317	180	112	77	338	100	75	53	43	40	62
Min	4910	602	348	198	123	1226	100	95	78	68	55	70
Average	2437	410	234	137	88	661	76	84	66	54	37	64
Max	1003	255	146	91	63	325	63	75	53	40	28	60

**Table D.33** The ninth floor of northern area of atrium building (WI=3.6)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	4276	1333	515	289	173	1317	25	73	80	78	63	64
Feb	3576	1215	506	285	171	1150	23	80	80	80	68	66
Mar	2902	982	408	232	143	933	33	100	80	80	70	73
Apr	2328	678	256	149	96	702	35	100	85	73	50	69
May	1969	620	246	152	105	618	43	100	90	78	65	75
June	2086	611	228	139	94	632	50	100	90	78	58	75
July	2453	669	234	142	96	719	30	100	90	78	60	72
Aug	2404	733	282	169	114	740	35	100	95	78	73	76
Sep	3304	978	374	216	137	1002	30	100	90	75	68	73
Oct	3647	1142	456	259	159	1133	28	90	90	70	68	69
Nov	4047	1534	676	377	224	1372	30	60	90	70	70	64
Dec	8819	1711	767	427	251	2395	30	53	83	70	70	61
Min	8819	1711	767	427	251	2395	50	100	95	80	73	76
Average	3484	1017	412	236	147	1059	33	88	87	75	65	70
Max	1969	611	228	139	94	618	23	53	80	70	50	61

**Table D.34** The ninth floor of southern area of atrium building (WI=3.6)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	1522	467	179	111	76	471	78	100	80	60	35	71
Feb	1479	479	193	119	81	470	83	100	80	63	35	72
Mar	1637	519	205	124	83	513	85	100	80	70	40	75
Apr	2040	557	200	119	77	599	43	100	85	68	28	65
May	2569	863	362	211	133	828	23	100	90	88	75	75
June	3105	959	381	217	134	959	23	100	95	83	75	75
July	3332	951	356	204	127	994	18	100	95	80	75	74
Aug	2786	885	354	205	130	872	25	100	95	80	75	75
Sep	2514	687	244	146	96	737	30	100	88	73	63	71
Oct	1929	572	216	131	88	587	48	100	85	68	45	69
Nov	1420	511	225	139	95	478	95	100	78	70	53	79
Dec	1252	472	215	135	94	434	100	100	75	65	50	78
Min	3332	959	381	217	134	994	100	100	95	88	75	79
Average	2132	660	261	155	101	662	54	100	85	72	54	73
Max	1252	467	179	111	76	434	18	100	75	60	28	65

**Table D.35** The ninth floor of eastern area of atrium building (WI=3.6)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	2545	786	295	168	105	780	45	100	80	70	55	70
Feb	5423	887	356	200	122	1398	43	100	83	70	58	71
Mar	7047	1026	417	230	137	1771	43	88	88	70	58	69
Apr	5097	888	337	186	111	1324	38	90	88	73	35	65
May	6988	1153	486	270	161	1812	33	85	100	83	70	74
June	4859	1084	429	239	143	1351	30	90	100	88	58	73
July	5136	1672	422	235	140	1521	18	78	100	88	60	69
Aug	5214	1224	497	276	165	1475	30	80	98	85	68	72

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Sep	5874	1097	410	227	136	1549	23	88	93	80	65	70
Oct	5053	1757	384	217	132	1509	30	88	88	80	63	70
Nov	4351	977	419	241	150	1228	43	90	85	78	70	73
Dec	2329	871	376	218	138	786	50	100	80	70	65	73
<b>Min</b>	7047	1757	497	276	165	1812	50	100	100	88	70	74
<b>Average</b>	4993	1118	402	226	137	1375	35	90	90	78	60	71
<b>Max</b>	2329	786	295	168	105	780	18	78	80	70	35	65

**Table D.36** The ninth floor of western area of atrium building (WI=3.6)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	2512	792	307	180	118	782	43	100	80	70	53	69
Feb	6248	931	384	221	139	1585	48	95	80	70	55	70
Mar	5204	1028	740	239	147	1472	43	85	85	73	58	69
Apr	3948	1447	349	202	126	1215	48	88	88	70	55	70
May	8537	3230	571	329	199	2573	38	70	90	83	80	72
June	5768	2176	430	248	155	1756	33	85	90	83	80	74
July	4728	1311	378	218	138	1355	25	88	90	85	75	73
Aug	6677	3030	598	348	212	2173	28	63	90	85	80	69
Sep	5223	1614	441	254	158	1538	23	78	88	80	70	68
Oct	5249	2004	434	253	158	1619	35	75	88	78	73	70
Nov	4621	990	439	259	166	1295	43	90	88	78	68	73
Dec	2281	885	394	233	152	789	48	100	83	70	60	72
<b>Min</b>	8537	3230	740	348	212	2573	48	100	90	85	80	74
<b>Average</b>	5083	1620	455	249	156	1513	38	85	86	77	67	71
<b>Max</b>	2281	792	307	180	118	782	23	63	80	70	53	68

**Table D.37** The tenth floor of northern area of atrium building (WI=4.0)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	12286	2471	1060	519	277	3323	13	35	100	95	83	65
Feb	7033	2123	935	463	251	2161	10	48	100	98	88	69
Mar	4666	1618	704	348	189	1505	3	63	100	100	88	71
Apr	3639	1071	416	195	102	1085	15	100	100	88	55	72
May	3107	1013	421	203	110	971	13	100	100	93	70	75
June	3374	1048	422	202	110	1031	10	100	100	95	60	73
July	4035	1200	466	219	116	1207	5	100	100	100	75	76
Aug	3841	1227	507	247	136	1192	8	100	100	95	80	77
Sep	5221	1575	625	294	154	1574	10	73	100	93	78	71
Oct	5842	1892	788	380	202	1821	10	48	100	90	83	66
Nov	8743	2656	1233	625	344	2720	10	30	100	93	90	65
Dec	19912	3078	1477	758	419	5129	10	30	70	95	90	59
<b>Min</b>	19912	3078	1477	758	419	5129	15	100	100	100	90	77
<b>Average</b>	6808	1748	754	371	201	1977	10	69	98	94	78	70
<b>Max</b>	3107	1013	416	195	102	971	3	30	70	88	55	59

**Table D.38** The tenth floor of southern area of atrium building (WI=4.0)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	2648	903	386	190	107	847	25	100	100	83	58	73
Feb	2492	858	371	184	105	802	23	100	100	88	65	75
Mar	2703	901	384	189	106	857	13	100	100	95	50	72
Apr	3333	971	378	177	94	991	13	100	100	90	55	72
May	4019	1338	572	278	151	1272	3	100	100	98	83	77
June	4936	1537	632	303	160	1514	0	88	100	100	90	76
July	5396	1592	628	293	152	1612	0	88	100	100	83	74
Aug	4438	1427	601	293	160	1384	3	93	100	95	88	76
Sep	4167	1233	484	227	121	1247	10	100	100	93	73	75
Oct	3207	1016	417	201	111	990	10	100	100	90	68	74
Nov	2321	854	385	196	114	774	35	100	100	90	70	79
Dec	2077	806	374	193	114	713	43	100	100	90	73	81
Min	5396	1592	632	303	160	1612	43	100	100	100	90	81
Average	3478	1120	468	227	125	1083	15	97	100	93	71	75
Max	2077	806	371	177	94	713	0	88	100	83	50	72

**Table D.39** The tenth floor of eastern area of atrium building (WI=4.0)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	7417	2495	874	518	199	2301	13	58	93	85	83	66
Feb	8704	2207	1297	413	234	2571	18	65	88	93	88	70
Mar	9504	2559	1606	457	258	2877	13	65	85	98	78	68
Apr	6865	1718	875	305	164	1986	5	75	95	95	68	68
May	9201	2435	1188	443	246	2703	10	55	90	100	88	69
June	7392	2523	814	405	219	2271	3	55	95	100	78	66
July	7778	2479	814	395	210	2335	0	60	100	100	88	70
Aug	7476	2388	886	440	240	2286	8	58	93	100	93	70
Sep	8103	2095	1017	394	215	2365	0	63	93	100	90	69
Oct	7394	2673	917	529	323	2367	8	60	93	95	78	67
Nov	8877	3569	1095	648	436	2925	15	55	85	95	85	67
Dec	8749	3330	897	473	273	2744	18	60	90	100	90	72
Min	9504	3569	1606	648	436	2925	18	75	100	100	93	72
Average	8122	2539	1023	452	251	2477	9	61	91	97	84	68
Max	6865	1718	814	305	164	1986	0	55	85	85	68	66

**Table D.40** The tenth floor of western area of atrium building (WI=4.0)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	8676	2077	1179	380	211	2505	13	60	90	90	80	67
Feb	9713	2301	1360	443	249	2813	15	60	88	100	80	69
Mar	7607	2487	1432	441	242	2442	15	65	90	98	65	67
Apr	6046	2026	625	306	160	1833	10	75	98	93	55	66
May	10210	3943	939	482	261	3167	13	60	88	100	83	69
June	7507	2826	736	361	191	2324	13	63	98	95	78	69
July	6788	2023	703	335	174	2005	10	60	100	100	88	72
Aug	10360	3909	1060	546	295	3234	8	58	90	95	85	67
Sep	7767	2401	816	396	207	2317	13	60	98	85	78	67
Oct	8163	2805	835	418	222	2489	10	60	93	90	78	66

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Nov	9215	3467	955	505	281	2885	18	60	85	90	83	67
Dec	8636	3273	1944	522	299	2935	18	60	83	90	83	67
Min	10360	3943	1944	546	299	3234	18	75	100	100	88	72
Average	8391	2795	1049	428	233	2579	13	62	91	94	78	67
Max	6046	2023	625	306	160	1833	8	58	83	85	55	66

## Case II : Rectangular light well atrium

Table D.41 The first floor of northern area of atrium building (WI=0.3)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	75	50	33	25	21	41	23	5	0	0	0	6
Feb	74	49	32	24	20	40	20	0	0	0	0	4
Mar	126	84	53	37	28	66	40	15	5	5	3	14
Apr	399	272	167	106	74	204	53	38	35	30	25	36
May	372	233	148	101	78	186	53	40	35	30	28	37
June	230	136	86	61	50	113	58	43	30	20	15	33
July	216	132	84	60	49	108	58	40	28	15	5	29
Aug	490	320	202	135	100	250	58	43	40	38	35	43
Sep	393	271	166	105	74	202	60	45	30	30	25	38
Oct	113	73	47	35	28	59	50	23	0	0	0	15
Nov	64	42	28	22	18	35	5	0	0	0	0	1
Dec	50	33	23	19	16	28	0	0	0	0	0	0
Min	490	320	202	135	100	250	60	45	40	38	35	43
Average	217	141	89	61	46	111	40	24	17	14	11	21
Max	50	33	23	19	16	28	0	0	0	0	0	0

Table D.42 The first floor of southern area of atrium building (WI=0.3)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	72	45	29	20	17	37	20	0	0	0	0	4
Feb	72	46	29	20	17	37	18	0	0	0	0	4
Mar	131	67	40	27	21	57	40	15	0	5	3	13
Apr	238	148	92	60	43	116	50	38	25	30	25	34
May	603	410	256	126	115	302	45	40	40	30	28	37
June	512	357	222	141	98	266	50	43	38	20	15	33
July	377	259	163	107	77	196	55	40	40	15	5	31
Aug	590	395	248	160	113	301	50	38	40	38	35	40
Sep	219	128	78	52	39	103	60	43	28	30	25	37
Oct	121	68	43	27	23	56	50	18	0	0	0	14
Nov	62	40	26	18	15	32	3	0	0	0	0	1
Dec	48	31	21	15	13	26	0	0	0	0	0	0
Min	603	410	256	160	115	302	60	43	40	38	35	40
Average	254	166	104	64	49	127	37	23	18	14	11	20
Max	48	31	21	15	13	26	0	0	0	0	0	0

**Table D.43** The first floor of eastern area of atrium building (WI=0.3)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	70	41	27	21	22	36	20	0	0	0	0	4
Feb	72	40	26	19	21	35	20	0	0	0	0	4
Mar	115	58	36	27	27	53	45	13	0	0	0	12
Apr	326	203	118	73	53	155	53	40	28	23	15	32
May	546	344	199	187	86	273	58	50	40	30	30	42
June	299	183	112	76	64	147	58	40	30	28	15	34
July	278	170	104	71	61	137	60	43	30	18	13	33
Aug	612	387	223	135	95	291	58	45	38	30	30	40
Sep	261	154	93	63	55	125	65	43	30	23	15	35
Oct	115	61	39	31	32	56	50	8	0	0	0	12
Nov	62	34	22	17	18	31	3	0	0	0	0	1
Dec	48	28	19	16	18	25	0	0	0	0	0	0
<b>Min</b>	612	387	223	187	95	291	65	50	40	30	30	42
<b>Average</b>	234	142	85	61	46	114	41	23	16	13	10	21
<b>Max</b>	48	28	19	16	18	25	0	0	0	0	0	0

**Table D.44** The first floor of western area of atrium building (WI=0.3)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	73	40	23	14	9	32	23	0	0	0	0	5
Feb	75	40	23	14	9	32	23	0	0	0	0	5
Mar	121	58	32	19	12	48	50	13	3	5	0	14
Apr	336	206	117	68	43	154	58	28	28	20	15	30
May	554	346	199	117	77	259	53	40	30	25	20	34
June	306	183	108	66	45	142	63	35	30	20	15	33
July	277	164	95	58	39	127	60	38	28	15	8	30
Aug	673	426	243	141	89	315	53	35	33	25	25	34
Sep	268	156	89	53	34	120	65	38	25	18	10	31
Oct	117	60	34	20	13	49	50	5	0	0	0	11
Nov	66	34	19	12	8	28	3	0	0	0	0	1
Dec	51	28	16	10	7	22	0	0	0	0	0	0
<b>Min</b>	673	426	243	141	89	315	65	40	33	25	25	34
<b>Average</b>	243	145	83	49	32	111	41	19	15	11	8	19
<b>Max</b>	51	28	16	10	7	22	0	0	0	0	0	0

**Table D.45** The second floor of northern area of atrium building (WI=0.6)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	69	38	21	13	11	30	20	0	0	0	0	4
Feb	68	37	20	13	10	30	15	0	0	0	0	3
Mar	154	97	55	33	23	72	40	15	10	10	5	16
Apr	307	181	98	58	40	137	55	38	30	20	8	30
May	415	242	132	78	57	185	58	50	38	30	23	40
June	276	159	92	56	42	125	60	40	28	18	8	31
July	245	140	79	49	39	111	60	40	20	10	5	27
Aug	465	269	145	85	61	205	60	43	40	35	25	41
Sep	326	202	114	68	47	151	58	40	30	25	13	33
Oct	104	57	31	20	16	46	43	3	0	0	0	9

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Nov	60	32	17	11	8	26	3	0	0	0	0	1
Dec	46	25	13	8	6	20	0	0	0	0	0	0
<b>Min</b>	465	269	145	85	61	205	60	50	40	35	25	41
<b>Average</b>	211	123	68	41	30	95	39	22	16	12	7	19
<b>Max</b>	46	25	13	8	6	20	0	0	0	0	0	0

**Table D.46** The second floor of southern area of atrium building (WI=0.6)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	73	41	23	14	11	33	23	0	0	0	0	5
Feb	75	41	23	14	11	33	30	0	0	0	0	6
Mar	165	75	39	23	16	64	45	20	5	0	0	14
Apr	255	148	82	45	29	112	55	38	23	18	0	27
May	492	293	160	89	55	218	53	40	40	30	23	37
June	379	237	137	79	49	176	55	40	35	28	18	35
July	302	184	105	60	38	138	58	40	38	15	10	32
Aug	494	291	159	87	54	217	58	40	40	35	18	38
Sep	248	139	78	45	31	108	58	38	28	10	0	27
Oct	144	67	36	21	15	57	50	8	0	0	0	12
Nov	65	37	21	12	9	29	5	0	0	0	0	1
Dec	51	29	17	10	7	23	0	0	0	0	0	0
<b>Min</b>	494	293	160	89	55	218	58	40	40	35	23	38
<b>Average</b>	229	132	73	42	27	101	41	22	17	11	6	19
<b>Max</b>	51	29	17	10	7	23	0	0	0	0	0	0

**Table D.47** The second floor of eastern area of atrium building (WI=0.6)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	77	38	24	19	21	36	23	0	0	0	0	5
Feb	84	37	23	17	17	36	30	0	0	0	0	6
Mar	149	68	39	29	27	62	53	20	5	0	0	16
Apr	308	180	101	61	45	139	55	40	30	23	5	31
May	512	306	170	100	69	231	63	50	40	38	30	44
June	311	177	103	67	54	142	65	40	33	28	8	35
July	278	158	91	60	50	127	68	43	25	13	5	31
Aug	551	328	182	106	71	248	63	50	40	38	23	43
Sep	283	156	89	57	46	126	65	45	33	18	3	33
Oct	134	60	35	27	27	57	60	10	0	0	0	14
Nov	75	33	20	16	17	32	20	0	0	0	0	4
Dec	57	26	16	13	15	26	3	0	0	0	0	1
<b>Min</b>	551	328	182	106	71	248	68	50	40	38	30	44
<b>Average</b>	235	131	75	48	38	105	47	25	17	13	6	22
<b>Max</b>	57	26	16	13	15	26	3	0	0	0	0	1

**Table D.48** The second floor of western area of atrium building (WI=0.6)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	79	36	19	10	6	30	25	0	0	0	0	5
Feb	84	36	19	10	6	31	35	0	0	0	0	7
Mar	154	67	35	20	12	58	50	18	5	0	0	15
Apr	309	176	95	52	31	133	60	38	28	23	8	31
May	484	281	151	83	49	210	60	45	30	30	20	37
June	310	170	93	52	32	131	65	35	30	20	5	31
July	275	148	80	45	27	115	68	40	25	10	3	29
Aug	563	331	178	97	57	245	58	40	35	28	25	37
Sep	277	149	81	46	28	116	63	38	30	18	0	30
Oct	134	58	30	16	10	50	58	5	0	0	0	13
Nov	76	31	16	9	5	27	25	0	0	0	0	5
Dec	57	24	12	7	4	21	3	0	0	0	0	1
Min	563	331	178	97	57	245	68	45	35	30	25	37
Average	233	126	68	37	22	97	47	21	15	11	5	20
Max	57	24	12	7	4	21	3	0	0	0	0	1

**Table D.49** The third floor of northern area of atrium building (WI=0.9)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	78	41	23	15	12	34	25	0	0	0	0	5
Feb	79	41	23	15	12	34	25	0	0	0	0	5
Mar	235	153	90	54	36	114	45	25	23	15	5	23
Apr	277	159	91	56	40	125	58	40	33	20	5	31
May	381	196	104	65	49	159	60	50	43	28	8	38
June	304	159	86	55	43	129	63	48	30	18	3	32
July	264	136	74	49	40	113	68	43	23	10	3	29
Aug	407	212	115	74	58	173	63	50	40	33	15	40
Sep	331	206	120	74	52	157	63	50	38	25	15	38
Oct	176	105	61	38	27	81	50	13	8	8	5	17
Nov	71	36	20	12	10	30	15	0	0	0	0	3
Dec	55	28	15	10	7	23	0	0	0	0	0	0
Min	407	212	120	74	58	173	68	50	43	33	15	40
Average	222	123	69	43	32	98	44	26	20	13	5	22
Max	55	28	15	10	7	23	0	0	0	0	0	0

**Table D.50** The third floor of southern area of atrium building (WI=0.9)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	86	44	25	16	12	37	33	0	0	0	0	7
Feb	106	46	26	16	12	41	45	0	0	0	0	9
Mar	214	98	51	32	23	84	60	33	15	5	0	23
Apr	251	130	69	41	28	104	58	40	23	5	0	25
May	422	248	142	84	54	190	60	50	48	33	25	43
June	365	238	142	84	53	177	63	48	38	30	20	40
July	295	183	108	64	41	138	65	43	38	23	10	36
Aug	421	233	129	76	50	182	63	50	40	30	15	40
Sep	277	143	78	47	33	116	68	50	28	8	0	31
Oct	196	83	43	27	20	74	53	23	3	0	0	16

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Nov	91	42	23	14	10	36	40	0	0	0	0	8
Dec	63	34	19	12	8	27	5	0	0	0	0	1
<b>Min</b>	422	248	142	84	54	190	68	50	48	33	25	43
<b>Average</b>	232	127	71	43	29	100	51	28	19	11	6	23
<b>Max</b>	63	34	19	12	8	27	5	0	0	0	0	1

**Table D.51** The third floor of eastern area of atrium building (WI=0.9)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	101	42	25	19	20	41	45	0	0	0	0	9
Feb	115	43	25	19	19	44	53	0	0	0	0	11
Mar	206	92	52	35	31	83	63	28	10	3	0	21
Apr	313	174	95	56	40	135	70	45	33	15	3	33
May	499	284	154	89	61	217	75	50	40	33	20	44
June	342	185	104	65	52	150	73	50	38	25	8	39
July	303	162	91	58	47	132	70	43	25	13	3	31
Aug	531	301	164	94	64	231	73	50	40	35	15	43
Sep	324	171	96	61	50	140	70	50	33	23	3	36
Oct	183	77	43	31	29	73	65	25	5	0	0	19
Nov	109	39	23	18	20	42	55	0	0	0	0	11
Dec	84	30	18	14	16	32	33	0	0	0	3	7
<b>Min</b>	531	301	164	94	64	231	75	50	40	35	20	44
<b>Average</b>	259	133	74	47	37	110	62	28	19	12	4	25
<b>Max</b>	84	30	18	14	16	32	33	0	0	0	0	7

**Table D.52** The third floor of western area of atrium building (WI=0.9)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	101	40	20	11	6	36	50	0	0	0	0	10
Feb	113	41	21	11	7	38	55	0	0	0	0	11
Mar	210	92	49	28	17	79	60	28	13	5	0	21
Apr	339	189	101	55	32	143	65	45	35	18	5	34
May	587	348	187	100	58	256	70	53	40	35	23	44
June	360	194	104	58	35	150	75	50	40	20	3	38
July	314	162	86	48	29	128	80	50	28	10	3	34
Aug	581	337	180	96	56	250	68	58	45	33	18	44
Sep	337	179	96	53	32	140	73	48	40	20	0	36
Oct	183	75	38	21	13	66	60	20	5	0	0	17
Nov	109	36	18	10	5	36	50	0	0	0	0	10
Dec	84	27	14	7	4	27	35	0	0	0	0	7
<b>Min</b>	587	348	187	100	58	256	80	58	45	35	23	44
<b>Average</b>	276	143	76	41	25	112	62	29	20	12	4	25
<b>Max</b>	84	27	14	7	4	27	35	0	0	0	0	7

**Table D.53** The fourth floor of northern area of atrium building (WI=1.2)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	97	49	28	18	14	41	45	3	0	0	0	10
Feb	101	51	29	19	15	43	48	0	0	0	0	10
Mar	387	261	156	92	60	191	63	40	33	30	18	37
Apr	301	173	100	63	45	136	65	50	38	23	5	36
May	392	194	107	69	52	163	73	58	50	35	0	43
June	349	172	94	60	45	144	78	60	38	18	0	39
July	307	150	83	54	42	127	80	58	28	8	0	35
Aug	414	209	117	75	56	174	75	60	48	33	8	45
Sep	377	231	136	84	58	177	68	50	43	30	20	42
Oct	293	185	109	66	45	140	68	35	15	15	15	30
Nov	93	46	25	17	13	39	45	0	0	0	0	9
Dec	73	36	20	12	10	30	18	0	0	0	0	4
Min	414	261	156	92	60	191	80	60	50	35	20	45
Average	265	146	84	52	38	117	60	34	24	16	5	28
Max	73	36	20	12	10	30	18	0	0	0	0	4

**Table D.54** The fourth floor of southern area of atrium building (WI=1.2)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	133	56	31	20	15	51	55	5	0	0	0	12
Feb	191	65	34	22	16	66	60	10	0	0	0	14
Mar	283	134	73	45	32	113	65	45	25	10	3	30
Apr	267	136	74	45	31	111	68	50	28	5	0	30
May	420	249	146	88	58	192	70	55	50	45	20	48
June	408	267	161	96	61	198	70	55	43	38	25	46
July	335	207	124	75	48	158	78	58	43	23	13	43
Aug	429	242	140	85	56	191	73	60	53	33	13	46
Sep	325	163	89	55	38	134	68	53	35	10	0	33
Oct	274	120	62	38	28	104	68	50	18	3	0	28
Nov	195	58	32	20	14	64	58	0	0	0	0	12
Dec	118	45	26	16	11	43	45	0	0	0	0	9
Min	429	267	161	96	61	198	78	60	53	45	25	48
Average	281	145	83	50	34	119	65	37	24	14	6	29
Max	118	45	26	16	11	43	45	0	0	0	0	9

**Table D.55** The fourth floor of eastern area of atrium building (WI=1.2)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	161	57	32	22	21	59	73	5	0	0	0	16
Feb	184	63	34	24	22	65	75	13	0	0	0	18
Mar	311	144	81	52	42	126	80	50	28	13	8	36
Apr	393	193	105	62	46	160	85	50	33	18	5	38
May	2946	312	170	99	68	719	83	65	58	28	20	51
June	447	233	130	80	60	190	90	60	48	28	10	47
July	426	221	123	76	59	181	90	60	38	25	10	45
Aug	653	364	198	113	76	281	88	65	53	40	23	54
Sep	421	209	115	71	54	174	88	55	40	23	5	42
Oct	287	119	66	44	38	111	85	48	20	8	0	32

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Nov	182	57	31	21	19	62	73	0	0	0	0	15
Dec	145	43	25	18	17	50	68	0	0	0	0	14
<b>Min</b>	2946	364	198	113	76	719	90	65	58	40	23	54
<b>Average</b>	546	168	92	57	43	181	81	39	26	15	7	34
<b>Max</b>	145	43	25	18	17	50	68	0	0	0	0	14

**Table D.56** The fourth floor of western area of atrium building (WI=1.2)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	166	57	29	16	10	56	75	5	0	0	0	16
Feb	189	63	31	18	11	62	75	13	0	0	0	18
Mar	328	150	81	47	30	127	80	45	25	8	5	33
Apr	445	239	128	70	42	185	85	53	38	28	8	42
May	656	373	200	108	64	280	83	60	45	30	20	48
June	464	237	127	71	43	189	93	60	40	28	8	46
July	428	209	112	62	38	170	98	60	38	15	8	44
Aug	743	427	229	124	73	319	85	60	50	38	23	51
Sep	477	242	131	72	44	193	88	58	40	28	8	44
Oct	303	125	66	38	24	111	85	45	15	10	0	31
Nov	187	56	28	15	9	59	78	0	0	0	0	16
Dec	146	42	21	11	7	45	68	0	0	0	0	14
<b>Min</b>	743	427	229	124	73	319	98	60	50	38	23	51
<b>Average</b>	378	185	99	54	33	150	83	38	24	15	6	33
<b>Max</b>	146	42	21	11	7	45	68	0	0	0	0	14

**Table D.57** The fifth floor of northern area of atrium building (WI=1.5)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	153	80	45	29	21	65	68	25	0	0	0	19
Feb	192	107	61	38	27	85	70	30	10	8	5	25
Mar	553	372	221	131	84	272	75	60	45	38	33	50
Apr	384	222	129	80	56	174	85	60	48	30	10	47
May	463	227	127	82	64	193	88	70	55	50	3	53
June	442	215	118	76	57	182	90	70	50	33	8	50
July	404	196	108	70	54	167	90	68	48	18	5	46
Aug	493	250	141	91	68	209	88	65	58	45	25	56
Sep	509	310	182	111	75	237	88	65	50	43	30	55
Oct	487	317	187	111	72	235	83	50	45	38	23	48
Nov	149	74	41	26	19	62	65	23	0	0	0	18
Dec	118	59	33	21	15	49	60	5	0	0	0	13
<b>Min</b>	553	372	221	131	84	272	90	70	58	50	33	56
<b>Average</b>	362	202	116	72	51	161	79	49	34	25	12	40
<b>Max</b>	118	59	33	21	15	49	60	5	0	0	0	13

**Table D.58** The fifth floor of southern area of atrium building (WI=1.5)

Month	Average Daylight Illuminance (lx)					Avg- DL (lx)	Useful daylight illuminance (%)					Avg- UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	261	87	46	28	20	88	75	38	0	0	0	23
Feb	332	124	57	34	24	114	78	50	8	0	0	27
Mar	394	189	104	64	45	159	80	60	38	20	10	42
Apr	332	168	93	57	39	138	85	58	45	10	0	40
May	504	302	179	109	71	233	85	60	60	50	33	58
June	523	340	203	120	76	252	88	63	58	45	35	58
July	446	274	161	96	62	208	90	63	58	35	18	53
Aug	518	295	172	104	69	232	83	63	58	48	23	55
Sep	429	212	116	70	48	175	85	68	48	28	5	47
Oct	399	182	96	59	42	156	85	60	38	18	5	41
Nov	384	122	53	32	22	123	70	48	5	0	0	25
Dec	305	73	39	24	17	92	70	25	0	0	0	19
Min	523	340	203	120	76	252	90	68	60	50	35	58
Average	402	197	110	67	45	164	81	54	34	21	11	40
Max	261	73	39	24	17	88	70	25	0	0	0	19

**Table D.59** The fifth floor of eastern area of atrium building (WI=1.5)

Month	Average Daylight Illuminance (lx)					Avg- DL (lx)	Useful daylight illuminance (%)					Avg- UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	393	79	42	29	26	114	100	30	0	0	0	26
Feb	424	96	49	33	28	126	100	43	5	0	0	30
Mar	626	222	125	77	57	221	100	60	43	25	18	49
Apr	2130	270	150	89	62	540	93	65	45	25	18	49
May	3310	412	227	131	87	833	93	70	60	45	30	60
June	796	293	163	100	74	285	100	70	55	45	20	58
July	810	269	149	92	69	278	100	68	50	33	18	54
Aug	1012	428	234	135	90	380	90	70	60	43	33	59
Sep	859	261	146	91	69	285	93	68	58	38	28	57
Oct	619	175	97	63	52	201	100	58	38	25	13	47
Nov	417	89	45	29	26	121	100	38	0	0	0	28
Dec	336	66	34	24	21	96	100	13	0	0	0	23
Min	3310	428	234	135	90	833	100	70	60	45	33	60
Average	978	222	122	74	55	290	97	54	34	23	15	45
Max	336	66	34	24	21	96	90	13	0	0	0	23

**Table D.60** The fifth floor of western area of atrium building (WI=1.5)

Month	Average Daylight Illuminance (lx)					Avg- DL (lx)	Useful daylight illuminance (%)					Avg- UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	393	74	37	21	13	108	98	25	0	0	0	25
Feb	440	92	44	25	15	123	100	38	5	0	0	29
Mar	647	220	121	70	44	220	100	58	43	28	10	48
Apr	731	259	138	76	46	250	100	55	38	30	10	47
May	935	399	215	118	70	347	93	60	50	30	20	51
June	796	276	148	83	51	271	100	65	45	30	10	50
July	795	242	129	72	45	256	98	68	45	20	8	48
Aug	1059	447	241	132	78	391	85	65	53	40	23	53
Sep	889	282	152	85	52	292	98	63	48	30	18	51
Oct	658	183	98	57	36	206	95	58	33	18	3	41

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Nov	418	85	39	21	13	115	90	35	0	0	0	25
Dec	331	62	29	16	10	90	90	5	0	0	0	19
<b>Min</b>	1059	447	241	132	78	391	100	68	53	40	23	53
<b>Average</b>	674	218	116	65	39	223	95	49	30	19	8	40
<b>Max</b>	331	62	29	16	10	90	85	5	0	0	0	19

Table D.61 The sixth floor of northern area of atrium building (WI=1.8)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	222	108	60	38	28	91	80	53	8	0	0	28
Feb	459	289	169	100	65	216	80	50	40	35	23	46
Mar	696	452	268	159	102	335	88	63	60	50	38	60
Apr	480	267	153	94	65	212	95	78	60	45	15	59
May	579	276	154	98	73	236	100	78	68	55	20	64
June	575	271	147	93	68	231	100	80	60	45	18	61
July	539	253	137	88	65	217	100	80	60	40	8	58
Aug	616	303	170	109	81	256	100	78	65	58	35	67
Sep	650	381	221	135	91	296	90	68	60	53	40	62
Oct	737	478	282	168	108	355	90	68	50	50	45	61
Nov	362	214	123	74	48	164	80	50	20	13	13	35
Dec	180	83	46	29	21	72	80	33	0	0	0	23
<b>Min</b>	737	478	282	168	108	355	100	80	68	58	45	67
<b>Average</b>	508	281	161	99	68	223	90	65	46	37	21	52
<b>Max</b>	180	83	46	29	21	72	80	33	0	0	0	23

Table D.62 The sixth floor of southern area of atrium building (WI=1.8)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	444	165	74	43	30	151	80	60	33	0	0	35
Feb	498	204	99	60	43	181	85	63	40	18	0	41
Mar	537	259	140	86	59	216	93	75	50	33	15	53
Apr	418	211	117	72	49	173	95	75	58	18	0	49
May	626	375	223	135	88	289	95	73	70	58	45	68
June	655	419	250	149	94	313	95	78	63	58	43	67
July	585	356	209	125	81	271	100	80	63	55	28	65
Aug	636	364	212	129	85	285	100	78	68	58	33	67
Sep	557	275	150	92	63	227	88	70	63	45	8	55
Oct	557	260	139	86	60	221	90	68	50	30	20	52
Nov	610	233	105	61	43	210	90	70	40	18	3	44
Dec	576	190	74	42	28	182	85	53	30	0	0	34
<b>Min</b>	655	419	250	149	94	313	100	80	70	58	45	68
<b>Average</b>	558	276	149	90	60	227	91	70	52	32	16	52
<b>Max</b>	418	165	74	42	28	151	80	53	30	0	0	34

**Table D.63** The sixth floor of eastern area of atrium building (WI=1.8)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	743	132	67	43	34	204	100	60	18	0	0	36
Feb	794	179	94	58	43	234	100	63	43	10	0	43
Mar	1378	321	180	108	75	412	88	73	55	40	28	57
Apr	2524	325	181	106	71	641	90	83	55	30	23	56
May	3713	483	268	154	100	944	78	88	65	55	38	65
June	1274	382	212	126	88	417	85	80	63	50	33	62
July	1356	366	205	123	87	427	80	83	65	48	30	61
Aug	1472	500	276	159	104	502	75	85	70	55	40	65
Sep	2322	367	206	124	87	621	75	78	60	53	38	61
Oct	1105	285	160	99	72	344	100	78	58	43	35	63
Nov	795	177	89	54	40	231	100	65	33	10	0	42
Dec	645	126	60	36	28	179	100	55	5	0	0	32
Min	3713	500	276	159	104	944	100	88	70	55	40	65
Average	1510	304	167	99	69	430	89	74	49	33	22	53
Max	645	126	60	36	28	179	75	55	5	0	0	32

**Table D.64** The sixth floor of western area of atrium building (WI=1.8)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	743	128	63	36	23	198	100	58	8	0	0	33
Feb	838	181	95	55	35	241	100	63	35	10	3	42
Mar	1085	319	177	102	63	349	93	73	48	38	18	54
Apr	1979	358	203	114	68	544	83	75	58	40	23	56
May	4340	592	338	188	111	1114	70	80	68	45	38	60
June	1308	391	217	123	75	423	85	80	65	48	30	62
July	1352	347	193	110	67	414	85	80	70	38	15	58
Aug	4875	607	351	197	116	1229	68	75	68	50	40	60
Sep	3015	423	241	136	81	779	70	75	65	48	35	59
Oct	1185	306	171	100	63	365	90	73	58	35	18	55
Nov	794	173	85	48	30	226	100	65	23	8	0	39
Dec	634	122	55	31	19	172	100	55	0	0	0	31
Min	4875	607	351	197	116	1229	100	80	70	50	40	62
Average	1846	329	182	103	63	505	87	71	47	30	18	51
Max	634	122	55	31	19	172	68	55	0	0	0	31

**Table D.65** The seventh floor of northern area of atrium building (WI=2.1)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	773	433	250	147	93	339	95	75	50	40	38	60
Feb	1117	711	418	244	151	528	80	73	60	60	58	66
Mar	981	597	352	210	134	455	93	80	70	60	53	71
Apr	698	368	208	128	87	298	100	85	73	58	30	69
May	772	366	201	128	93	312	100	90	78	70	50	78
June	790	367	196	123	89	313	100	95	75	60	38	74
July	778	355	190	120	87	306	100	98	78	60	40	75
Aug	831	398	220	139	100	338	100	95	78	73	58	81

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Sep	970	533	307	186	124	424	100	88	68	65	58	76
Oct	1089	654	384	228	146	500	85	88	68	65	50	71
Nov	1438	956	562	324	198	695	60	58	60	50	50	56
Dec	3292	481	281	163	101	864	85	65	43	43	30	53
<b>Min</b>	3292	956	562	324	198	864	100	98	78	73	58	81
<b>Average</b>	1127	518	297	178	117	448	91	82	66	59	46	69
<b>Max</b>	698	355	190	120	87	298	60	58	43	40	30	53

**Table D.66** The seventh floor of southern area of atrium building (WI=2.1)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	732	287	135	81	57	258	100	80	60	35	5	56
Feb	763	324	165	104	74	286	100	80	60	40	28	62
Mar	769	362	193	118	81	305	100	83	70	48	30	66
Apr	619	294	161	99	67	248	100	85	73	50	5	63
May	894	510	300	181	118	401	100	88	78	70	68	81
June	980	581	344	205	129	448	100	93	80	73	60	81
July	930	519	302	181	115	410	100	95	80	75	55	81
Aug	927	505	293	178	116	404	100	93	78	73	55	80
Sep	828	386	208	127	86	327	100	88	68	65	40	72
Oct	840	384	204	125	86	328	100	90	68	53	35	69
Nov	925	380	187	118	86	339	100	88	70	50	40	70
Dec	929	353	158	94	67	320	100	80	55	43	28	61
<b>Min</b>	980	581	344	205	129	448	100	95	80	75	68	81
<b>Average</b>	845	407	221	134	90	339	100	87	70	56	37	70
<b>Max</b>	619	287	135	81	57	248	100	80	55	35	5	56

**Table D.67** The seventh floor of eastern area of atrium building (WI=2.1)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	1267	247	125	78	59	355	95	80	53	30	13	54
Feb	1331	329	177	109	77	405	90	80	65	50	33	64
Mar	3967	496	280	167	111	1004	65	93	73	63	48	68
Apr	4192	468	267	156	101	1037	68	88	75	55	35	64
May	5516	655	371	214	137	1379	60	95	80	73	55	73
June	1947	541	300	177	120	617	58	95	80	70	58	72
July	2608	526	290	173	118	743	58	100	80	68	55	72
Aug	3993	695	391	225	144	1090	60	95	80	70	58	73
Sep	3132	507	280	167	114	840	55	88	78	68	58	69
Oct	1755	429	233	142	100	532	63	90	70	58	50	66
Nov	1369	363	195	121	87	427	80	90	65	48	33	63
Dec	1132	267	132	79	58	334	100	83	50	33	15	56
<b>Min</b>	5516	695	391	225	144	1379	100	100	80	73	58	73
<b>Average</b>	2684	460	253	151	102	730	71	90	71	57	42	66
<b>Max</b>	1132	247	125	78	58	334	55	80	50	30	13	54

**Table D.68** The seventh floor of western area of atrium building (WI=2.1)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	1269	243	120	70	45	349	95	80	48	28	0	50
Feb	1421	342	185	110	71	426	83	80	63	40	28	59
Mar	2953	512	288	165	101	804	63	90	70	53	40	63
Apr	2943	469	260	147	88	781	63	88	65	45	35	59
May	5723	709	399	223	132	1437	68	90	70	63	40	66
June	3034	511	278	158	97	815	63	95	73	55	40	65
July	2622	471	254	145	89	716	60	98	78	58	30	65
Aug	5643	784	443	248	146	1453	60	88	75	65	43	66
Sep	3849	577	317	179	108	1006	53	88	68	58	40	61
Oct	1902	476	260	150	94	576	60	90	68	48	38	61
Nov	1373	367	197	118	78	427	83	85	58	45	30	60
Dec	1116	262	127	73	47	325	100	80	48	28	5	52
Min	5723	784	443	248	146	1453	100	98	78	65	43	66
Average	2821	477	261	149	91	760	71	88	65	49	31	60
Max	1116	243	120	70	45	325	53	80	48	28	0	50

**Table D.69** The eighth floor of northern area of atrium building (WI=2.4)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	5972	971	578	340	209	1614	40	73	78	65	60	63
Feb	3042	1002	595	350	217	1041	40	78	80	80	63	68
Mar	2486	823	485	290	184	854	43	100	80	80	73	75
Apr	1934	508	287	176	118	605	63	98	85	73	58	75
May	1686	492	266	168	118	546	80	100	90	78	70	84
June	1833	508	270	169	118	580	65	100	90	78	65	80
July	2083	508	270	169	119	630	48	100	93	78	68	77
Aug	1998	541	296	187	130	630	50	100	95	78	75	80
Sep	2797	761	436	265	173	886	33	98	85	73	68	71
Oct	3106	915	539	322	203	1017	33	90	90	70	68	70
Nov	3585	1379	821	478	292	1311	33	58	73	70	70	61
Dec	10046	1541	926	538	325	2675	40	43	70	70	68	58
Min	10046	1541	926	538	325	2675	80	100	95	80	75	84
Average	3381	829	481	288	184	1032	47	86	84	74	67	72
Max	1686	492	266	168	118	546	33	43	70	65	58	58

**Table D.70** The eighth floor of southern area of atrium building (WI=2.4)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	1477	470	222	142	102	482	85	98	80	60	48	74
Feb	1458	508	256	162	114	500	93	100	80	63	55	78
Mar	1528	502	259	161	110	512	88	100	80	73	50	78
Apr	1696	415	222	137	93	513	75	98	85	70	35	73
May	2177	722	416	251	162	746	35	100	90	88	75	78
June	2648	813	469	279	176	877	30	100	90	83	78	76
July	2786	753	427	255	162	877	25	100	93	80	78	75
Aug	2339	710	401	243	158	770	35	100	95	80	75	77

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Sep	2170	545	284	176	119	659	40	98	85	70	65	72
Oct	1816	555	282	175	120	590	63	93	85	68	60	74
Nov	1537	610	307	197	140	558	95	90	78	70	58	78
Dec	1414	580	271	176	131	514	98	90	75	68	50	76
<b>Min</b>	2786	813	469	279	176	877	98	100	95	88	78	78
<b>Average</b>	1920	599	318	196	132	633	63	97	85	73	60	76
<b>Max</b>	1414	415	222	137	93	482	25	90	75	60	35	72

**Table D.71** The eighth floor of eastern area of atrium building (WI=2.4)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	2067	650	252	150	103	644	50	100	78	58	48	67
Feb	2127	747	318	189	126	701	53	100	80	70	63	73
Mar	6820	924	411	237	151	1708	55	93	85	70	63	73
Apr	4958	834	351	201	127	1294	53	95	88	73	45	71
May	6963	1055	477	272	170	1787	55	90	95	80	73	79
June	4505	974	415	239	154	1257	43	98	100	85	68	79
July	4690	999	406	234	151	1296	30	95	98	90	73	77
Aug	4876	1120	491	280	176	1388	45	85	98	85	78	78
Sep	4837	1007	410	237	154	1329	35	90	85	78	65	71
Oct	3404	935	381	223	147	1018	40	100	85	80	65	74
Nov	2222	831	367	220	148	758	50	100	80	68	60	72
Dec	1904	703	305	184	127	645	55	100	80	60	50	69
<b>Min</b>	6963	1120	491	280	176	1787	55	100	100	90	78	79
<b>Average</b>	4114	898	382	222	144	1152	47	95	88	75	62	73
<b>Max</b>	1904	650	252	150	103	644	30	85	78	58	45	67

**Table D.72** The eighth floor of western area of atrium building (WI=2.4)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	2091	666	257	151	97	653	53	100	75	55	40	65
Feb	2296	808	339	198	125	753	55	100	80	68	50	71
Mar	4812	970	773	240	146	1388	50	95	85	68	55	71
Apr	4180	1503	378	218	131	1282	48	90	88	68	45	68
May	8361	2931	605	342	201	2488	48	75	90	80	53	69
June	4420	991	422	240	146	1244	43	100	90	83	60	75
July	4181	955	374	212	130	1170	38	98	90	83	53	72
Aug	8549	3220	642	370	219	2600	38	65	88	83	63	67
Sep	5487	1645	470	269	162	1607	33	83	85	78	65	69
Oct	4383	1292	433	251	154	1303	43	95	85	78	55	71
Nov	2239	854	381	226	145	769	55	100	80	65	55	71
Dec	1896	715	313	188	123	647	58	100	70	60	48	67
<b>Min</b>	8549	3220	773	370	219	2600	58	100	90	83	65	75
<b>Average</b>	4408	1379	449	242	148	1325	46	92	84	72	53	69
<b>Max</b>	1896	666	257	151	97	647	33	65	70	55	40	65

Table D.73 The ninth floor of northern area of atrium building (WI=2.7)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	9951	2173	879	525	324	2770	20	40	85	80	80	61
Feb	5893	1938	829	493	307	1892	20	55	98	85	80	68
Mar	4198	1497	634	382	244	1391	20	73	100	93	80	73
Apr	3263	982	367	229	153	999	15	100	95	85	78	75
May	2772	901	349	225	157	881	20	100	100	90	85	79
June	3017	941	359	230	161	942	20	100	100	95	83	80
July	3542	1032	369	236	164	1069	10	100	100	95	78	77
Aug	3332	1027	380	244	171	1031	18	100	100	95	85	80
Sep	4782	1492	575	352	231	1486	13	85	98	88	78	72
Oct	5360	1792	733	442	280	1721	10	65	90	90	85	68
Nov	7119	2450	1109	657	406	2348	10	35	90	90	90	63
Dec	15980	2786	1299	766	468	4260	18	33	80	88	85	61
Min	15980	2786	1299	766	468	4260	20	100	100	95	90	80
Average	5767	1584	657	398	256	1732	16	74	95	89	82	71
Max	2772	901	349	225	153	881	10	33	80	80	78	61

Table D.74 The ninth floor of southern area of atrium building (WI=2.7)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	2534	879	368	231	162	835	38	100	85	80	68	74
Feb	2430	884	384	239	166	820	33	100	95	80	78	77
Mar	2594	889	365	225	154	845	25	100	100	93	78	79
Apr	3142	914	333	201	134	945	15	100	98	88	75	75
May	3980	1435	616	364	232	1325	10	100	100	98	90	80
June	4882	1655	692	405	254	1578	5	80	100	98	95	76
July	5249	1649	649	380	240	1633	0	88	100	100	90	76
Aug	4290	1449	592	352	227	1382	8	95	100	95	90	78
Sep	3972	1160	420	256	172	1196	13	100	98	88	75	75
Oct	3148	1029	411	253	173	1003	18	100	90	90	78	75
Nov	2409	977	463	291	203	869	35	100	90	90	75	78
Dec	2139	913	455	292	207	801	43	100	90	85	70	78
Min	5249	1655	692	405	254	1633	43	100	100	100	95	80
Average	3397	1153	479	291	194	1103	20	97	95	90	80	77
Max	2139	879	333	201	134	801	0	80	85	80	68	74

Table D.75 The ninth floor of eastern area of atrium building (WI=2.7)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	3328	1252	602	318	186	1137	38	88	100	90	70	77
Feb	6438	1328	657	349	203	1795	28	78	100	90	83	76
Mar	8178	1446	712	374	214	2185	30	65	88	93	85	72
Apr	6020	1273	595	309	176	1675	25	78	95	95	80	75
May	8092	1568	774	406	231	2214	23	60	95	100	90	74
June	5775	1524	726	380	218	1725	20	68	98	100	90	75
July	6130	1599	739	382	218	1813	10	63	100	100	90	73
Aug	6163	1687	815	424	240	1866	20	60	98	100	90	74

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Sep	6263	1609	746	386	220	1845	10	68	93	98	88	71
Oct	6543	2393	741	390	225	2058	23	73	100	100	85	76
Nov	5442	1548	799	437	260	1697	33	65	100	95	80	75
Dec	3120	1381	717	394	238	1170	40	78	100	88	75	76
<b>Min</b>	8178	2393	815	437	260	2214	40	88	100	100	90	77
<b>Average</b>	5958	1550	719	379	219	1765	25	70	97	96	84	74
<b>Max</b>	3120	1252	595	309	176	1137	10	60	88	88	70	71

**Table D.76** The ninth floor of western area of atrium building (WI=2.7)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	3389	1301	629	333	189	1168	28	85	100	90	75	76
Feb	7563	1486	743	400	228	2084	30	70	100	90	80	74
Mar	7199	2402	1482	452	253	2358	30	65	90	90	75	70
Apr	5542	1997	656	345	189	1746	33	78	100	90	63	73
May	10140	4060	958	507	278	3189	33	60	90	90	83	71
June	7007	2835	763	399	219	2244	30	65	100	93	83	74
July	5975	1891	718	369	202	1831	20	68	100	93	88	74
Aug	10026	3924	1054	563	309	3175	23	60	90	95	85	71
Sep	7077	2325	853	443	241	2188	20	60	100	88	78	69
Oct	7618	2755	840	445	247	2381	25	60	98	88	78	70
Nov	5809	1591	828	455	264	1789	33	65	95	90	80	73
Dec	3141	1429	749	415	245	1196	33	70	95	90	80	74
<b>Min</b>	10140	4060	1482	563	309	3189	33	85	100	95	88	76
<b>Average</b>	6707	2333	856	427	239	2112	28	67	96	90	79	72
<b>Max</b>	3141	1301	629	333	189	1168	20	60	90	88	63	69

**Table D.77** The tenth floor of northern area of atrium building (WI=3.0)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	16046	4719	2352	1373	857	5069	0	8	35	93	100	47
Feb	10009	3733	2014	1178	739	3535	0	20	55	100	100	55
Mar	6471	2880	1550	911	577	2478	0	25	80	100	100	61
Apr	5038	2037	1061	622	394	1830	5	58	100	100	100	73
May	4390	1918	1041	630	415	1679	0	58	100	100	100	72
June	4707	1979	1053	629	408	1755	3	58	100	100	100	72
July	5611	2291	1200	709	455	2053	0	38	100	100	100	68
Aug	5351	2287	1228	738	481	2017	0	38	100	100	100	68
Sep	7347	3012	1576	922	583	2688	3	28	85	100	100	63
Oct	8218	3502	1852	1079	677	3066	8	20	68	100	100	59
Nov	14609	4540	2496	1460	913	4804	5	10	33	98	100	49
Dec	26257	5207	2942	1730	1077	7443	0	10	23	78	100	42
<b>Min</b>	26257	5207	2942	1730	1077	7443	8	58	100	100	100	73
<b>Average</b>	9504	3175	1697	998	631	3201	2	31	73	97	100	61
<b>Max</b>	4390	1918	1041	622	394	1679	0	8	23	78	100	42

**Table D.78** The tenth floor of southern area of atrium building (WI=3.0)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	3796	1731	952	578	386	1489	20	78	100	100	100	80
Feb	3532	1617	893	545	365	1390	15	85	100	100	100	80
Mar	3786	1688	921	556	369	1464	0	93	100	100	100	79
Apr	4614	1885	984	577	369	1686	5	60	100	100	100	73
May	5670	2544	1381	816	526	2187	0	15	100	100	100	63
June	6853	2932	1556	906	572	2564	0	8	95	100	100	61
July	7433	3056	1595	925	583	2719	0	15	98	100	100	63
Aug	6192	2697	1449	857	553	2349	0	18	95	100	100	63
Sep	5902	2441	1284	756	487	2174	3	33	100	100	100	67
Oct	4592	1990	1069	639	420	1742	10	55	100	100	100	73
Nov	3370	1611	909	562	382	1367	10	90	100	100	100	80
Dec	3021	1503	864	541	373	1261	13	98	100	100	100	82
<b>Min</b>	7433	3056	1595	925	583	2719	20	98	100	100	100	82
<b>Average</b>	4897	2141	1155	688	449	1866	6	54	99	100	100	72
<b>Max</b>	3021	1503	864	541	365	1261	0	8	95	100	100	61

**Table D.79** The tenth floor of eastern area of atrium building (WI=3.0)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	8423	3034	1147	653	409	2733	13	48	93	93	95	68
Feb	9253	2179	1136	648	406	2724	13	50	80	100	100	69
Mar	9769	2221	1155	655	407	2841	5	53	80	98	100	67
Apr	7599	1997	993	555	339	2297	5	63	90	100	98	71
May	9731	2368	1230	697	431	2892	3	50	85	100	100	68
June	7625	2383	1202	675	414	2460	3	45	90	100	100	68
July	8277	2581	1280	714	437	2658	0	35	88	100	100	65
Aug	8062	2598	1330	751	466	2641	5	40	75	98	100	64
Sep	8392	2593	1291	725	447	2690	0	35	83	100	100	64
Oct	8543	3339	1271	720	446	2864	0	45	75	95	98	63
Nov	10231	4224	1398	814	511	3436	10	53	70	93	95	64
Dec	10039	4086	1320	771	489	3341	10	58	78	100	100	69
<b>Min</b>	10231	4224	1398	814	511	3436	13	63	93	100	100	71
<b>Average</b>	8829	2800	1230	698	434	2798	5	48	82	98	99	66
<b>Max</b>	7599	1997	993	555	339	2297	0	35	70	93	95	63

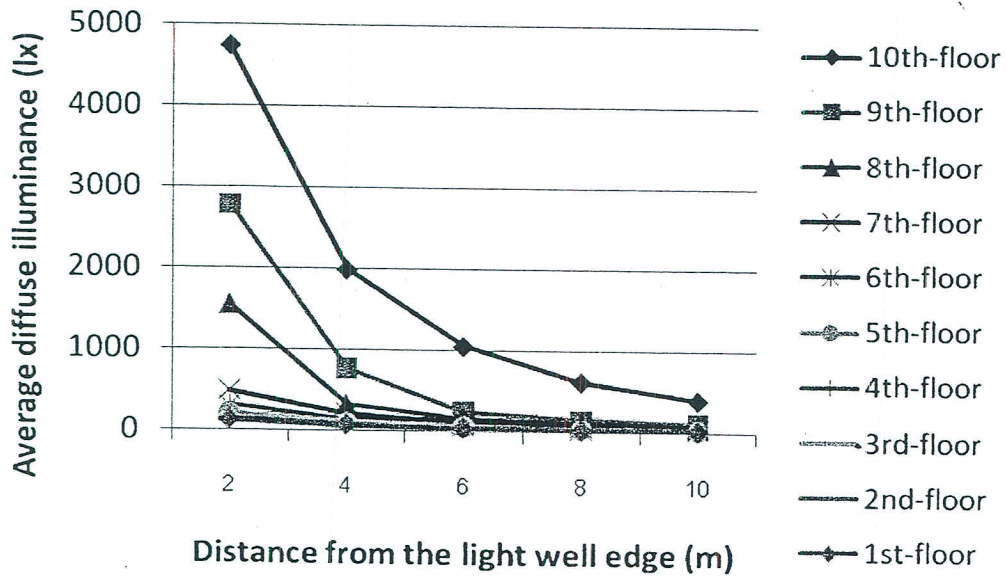
**Table D.80** The tenth floor of western area of atrium building (WI=3.0)

Month	Average Daylight Illuminance (lx)					Avg. DL (lx)	Useful daylight illuminance (%)					Avg. UDI (%)
	2m	4m	6m	8m	10m		2m	4m	6m	8m	10m	
Jan	10174	2861	1729	726	458	3190	10	40	83	100	98	66
Feb	11281	3085	1919	793	499	3515	10	50	78	100	100	68
Mar	8919	3274	1986	783	485	3089	8	53	78	95	100	67
Apr	7184	2764	1078	612	372	2402	8	55	90	100	98	70
May	11891	4960	1481	848	517	3939	10	53	73	95	100	66
June	8896	3729	1259	713	434	3006	5	48	93	100	100	69
July	8164	2908	1274	719	439	2701	3	40	93	100	100	67
Aug	12064	4954	1649	952	581	4040	5	40	68	93	100	61
Sep	9356	3401	1448	822	502	3106	10	40	78	100	98	65
Oct	9705	3758	1403	805	494	3233	10	50	78	100	95	67
Nov	10722	4345	1441	850	531	3578	15	55	73	98	93	67
Dec	10047	4108	2531	863	548	3619	10	53	73	100	95	66
<b>Min</b>	12064	4960	2531	952	581	4040	15	55	93	100	100	70
<b>Average</b>	9867	3679	1600	791	488	3285	9	48	79	98	98	66
<b>Max</b>	7184	2764	1078	612	372	2402	3	40	68	93	93	61

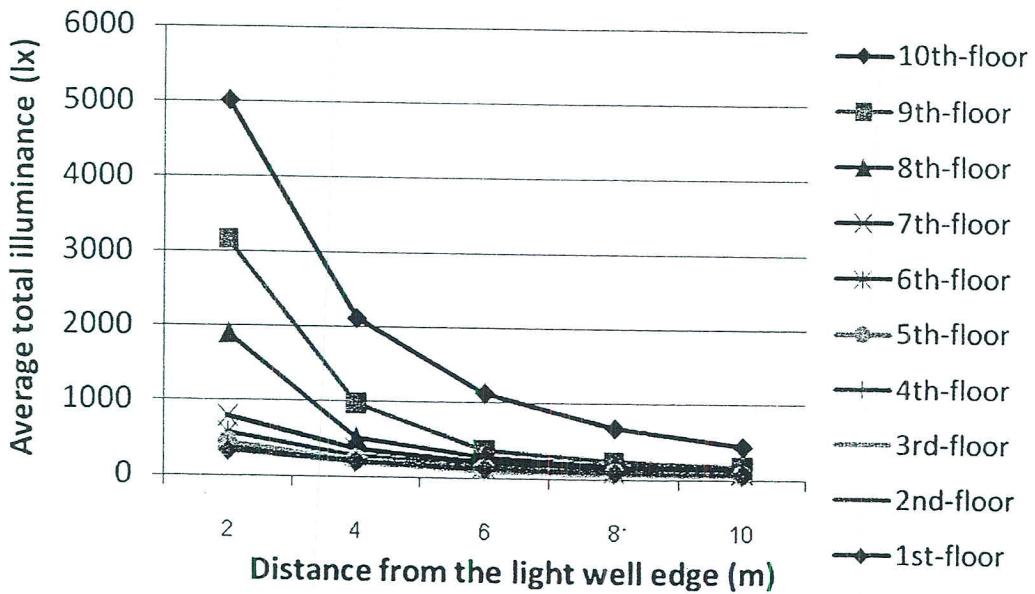
APPENDIX E

E. Results of Simulation Study of Rectangular light well atrium

❖ Daylight in north zone



(a) Average diffuse illuminance (lx)



(b) Average total illuminance (lx)

Figure E.1 Average illuminance on the north zone (the sun stays in the northern hemisphere)

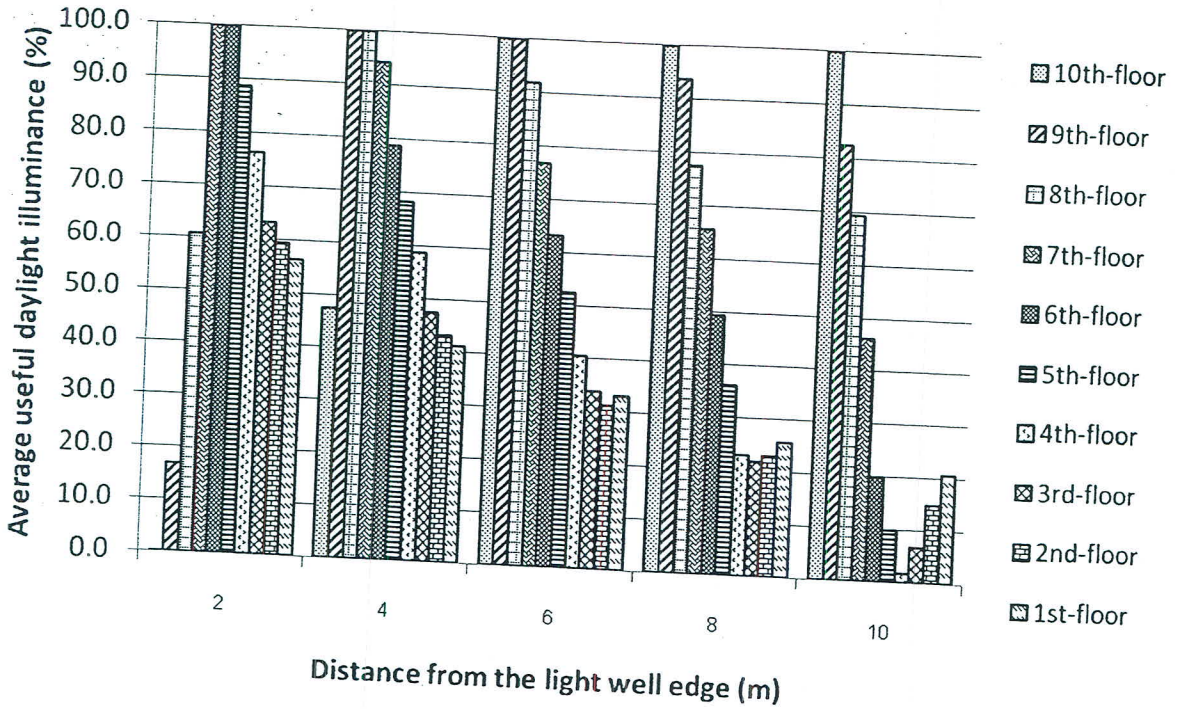
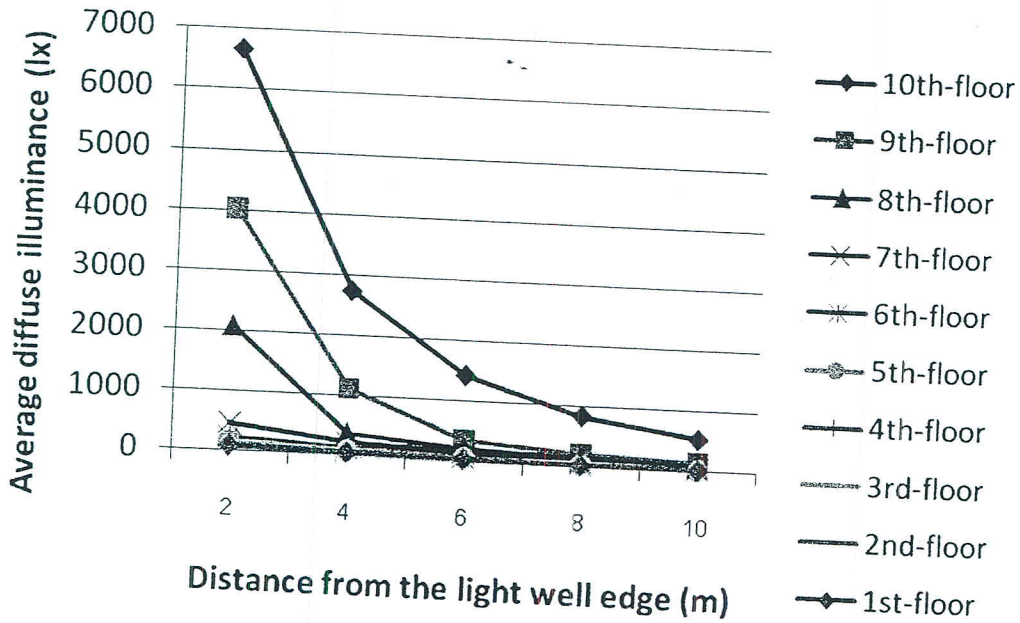
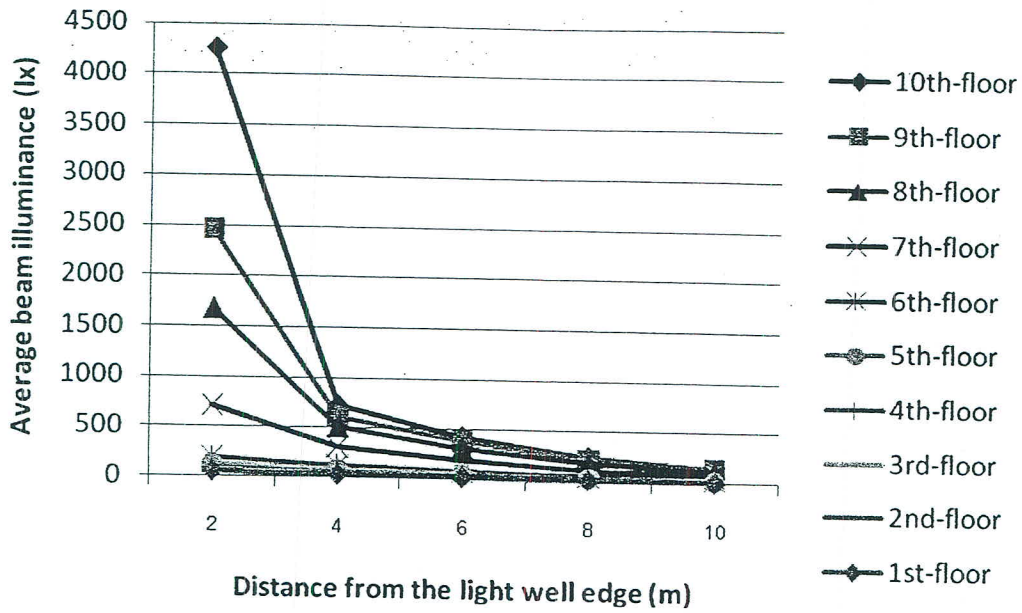


Figure E.2 UDI on the north zone (the sun stays in the northern hemisphere)

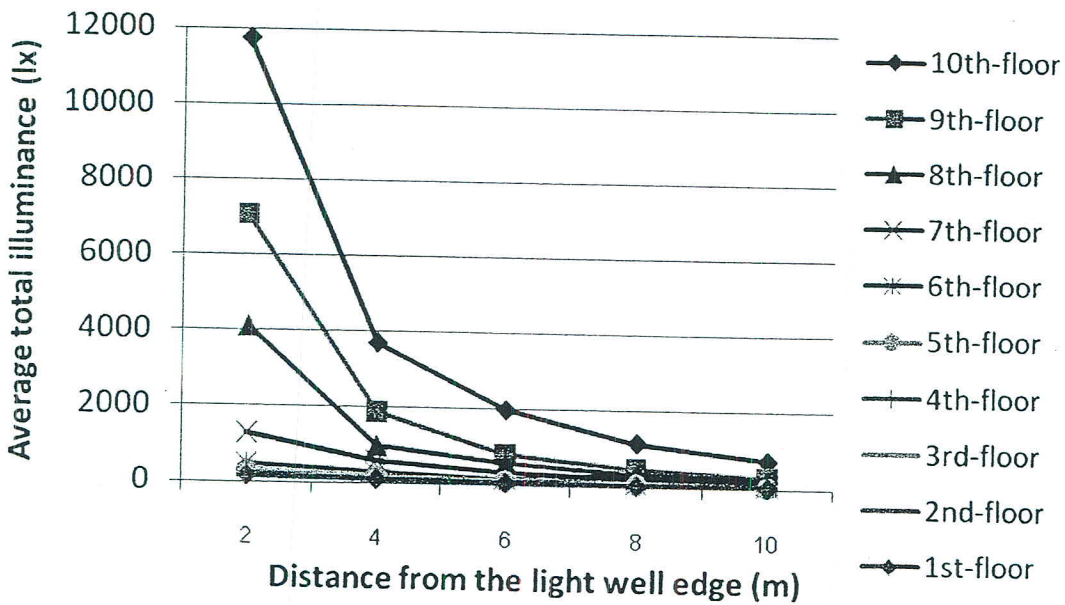


(a) Average diffuse illuminance (lx)

Figure E.3 Average illuminance on the north zone (the sun stays in the southern hemisphere)



(b) Average beam illuminance (lx)



(c) Average total illuminance (lx)

Figure E.3 (Continued)

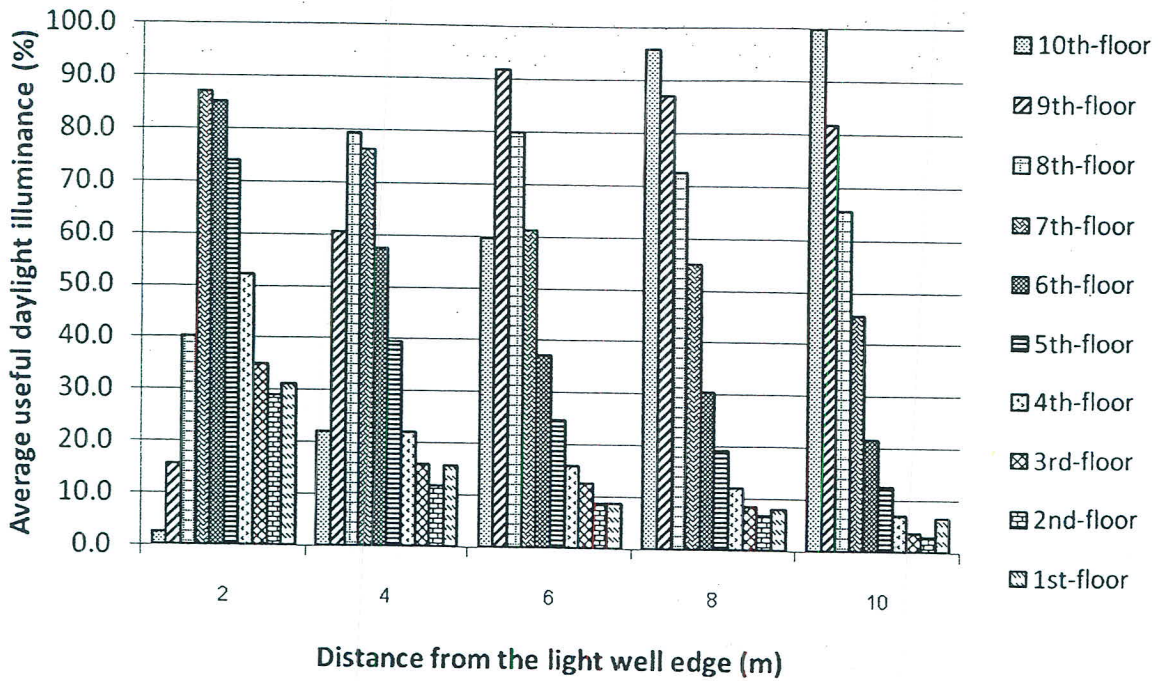
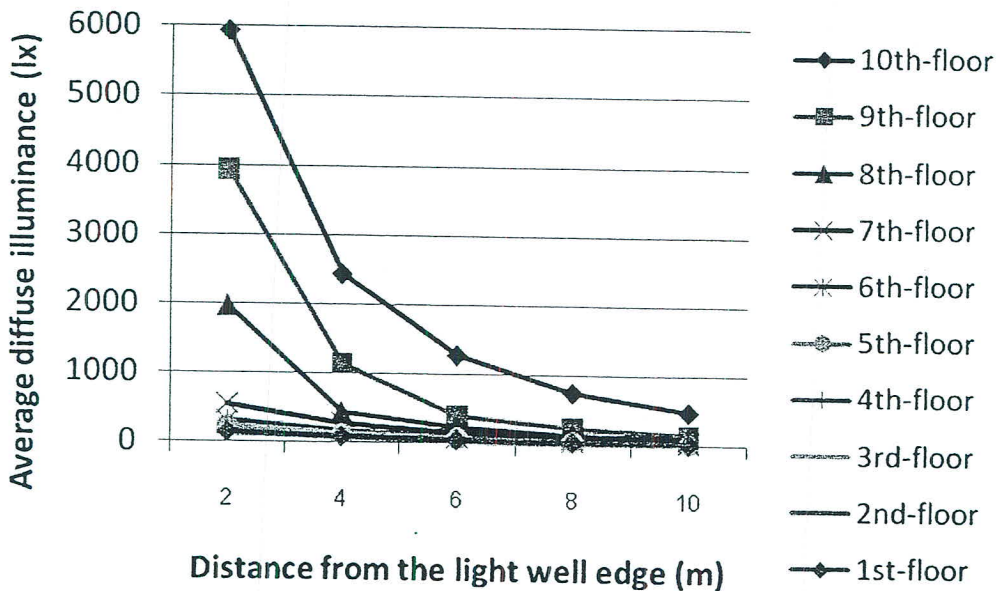


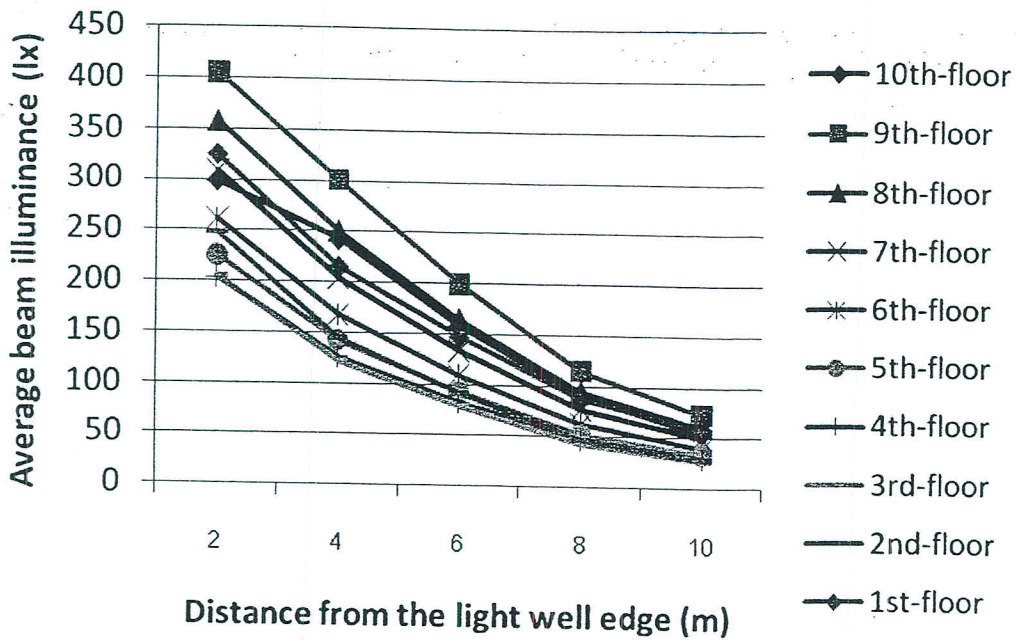
Figure E.4 UDI on the north zone (the sun stays in the southern hemisphere)

❖ Daylight in south zone

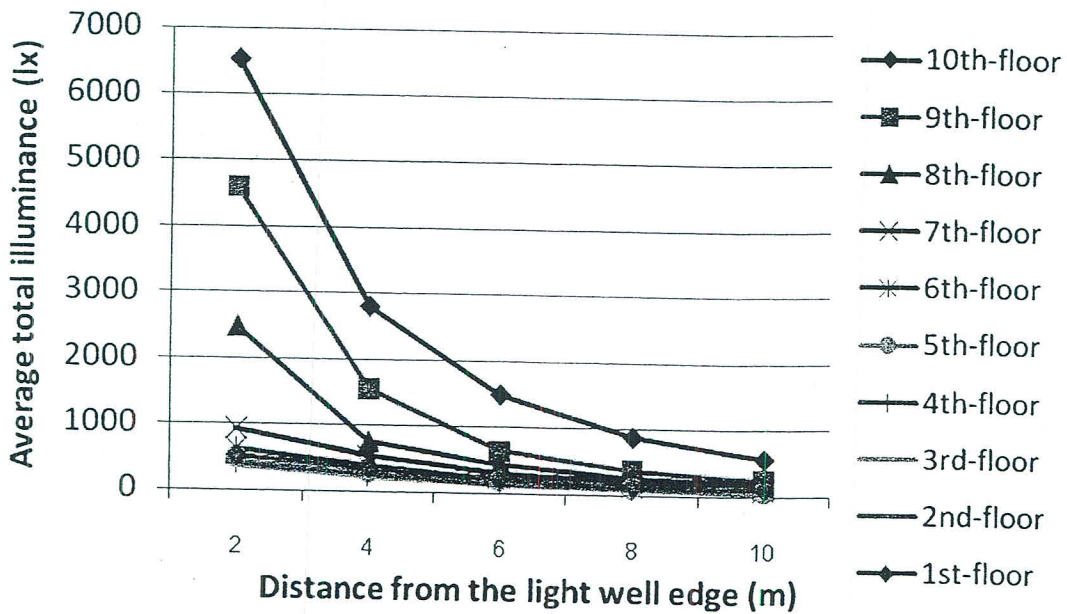


(a) Average diffuse illuminance (lx)

Figure E.5 Average illuminance on the south zone (the sun in the stays northern hemisphere)



(b) Average beam illuminance (lx)



(c) Average total illuminance (lx)

Figure E.5 (Continued)

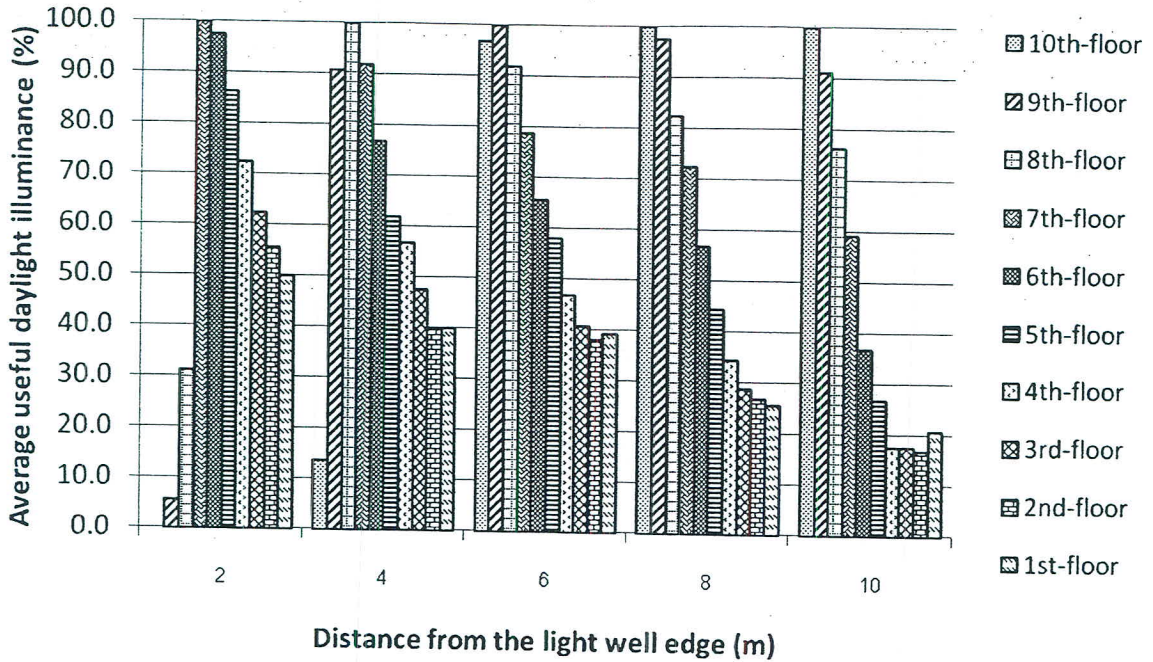
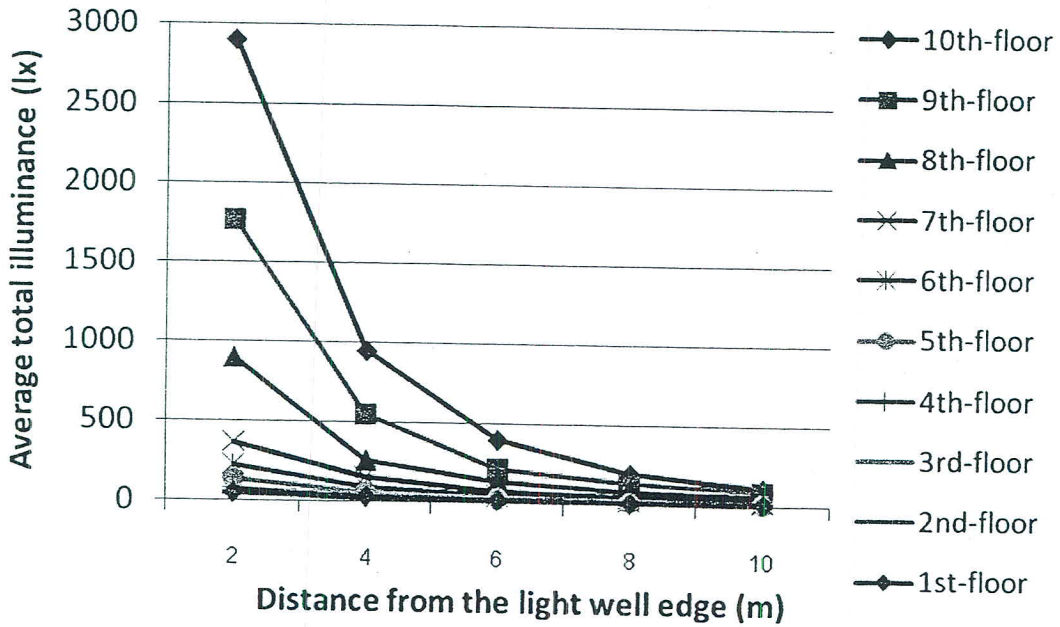


Figure E.6 UDI on the south zone (the sun stays in the northern hemisphere)



(a) Average total illuminance (lx)

Figure E.7 Average illuminance on the south zone (the sun stays in the southern hemisphere)

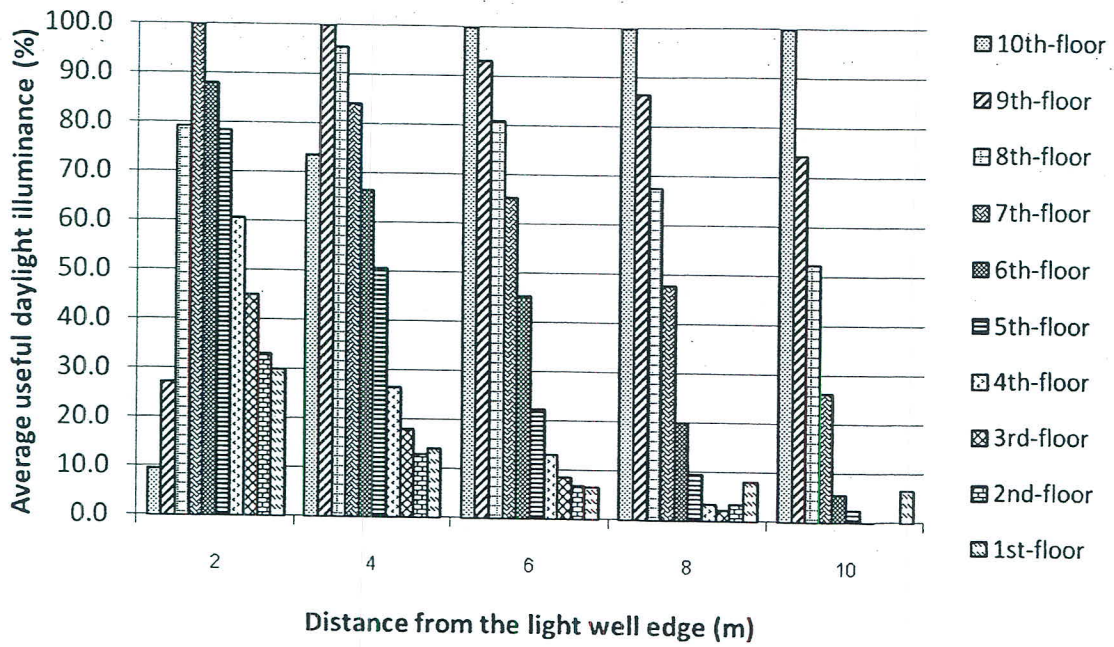
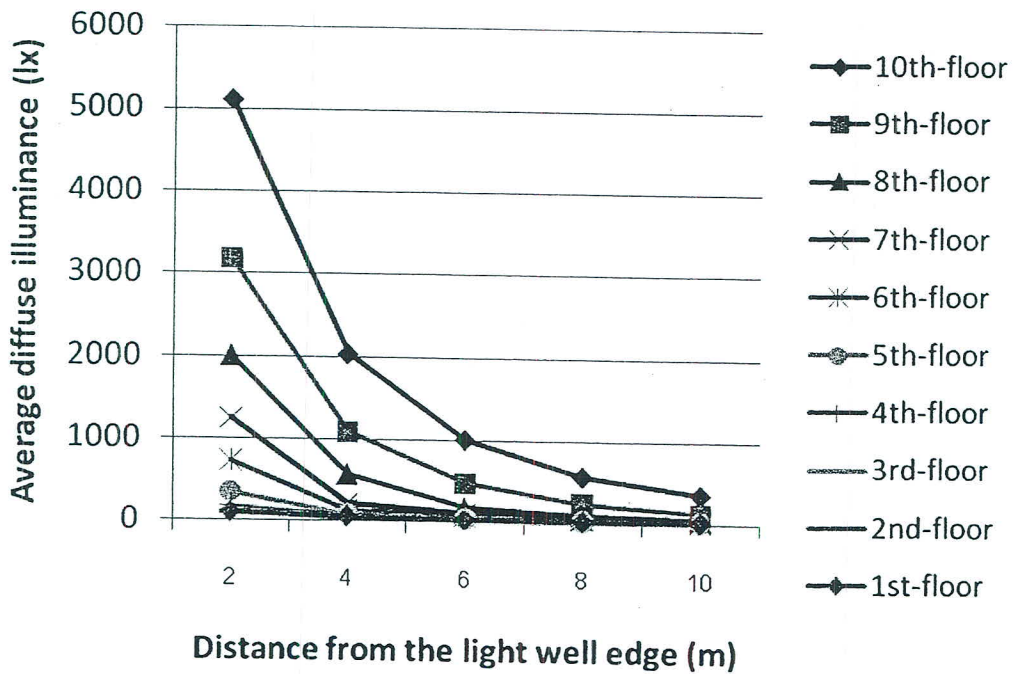


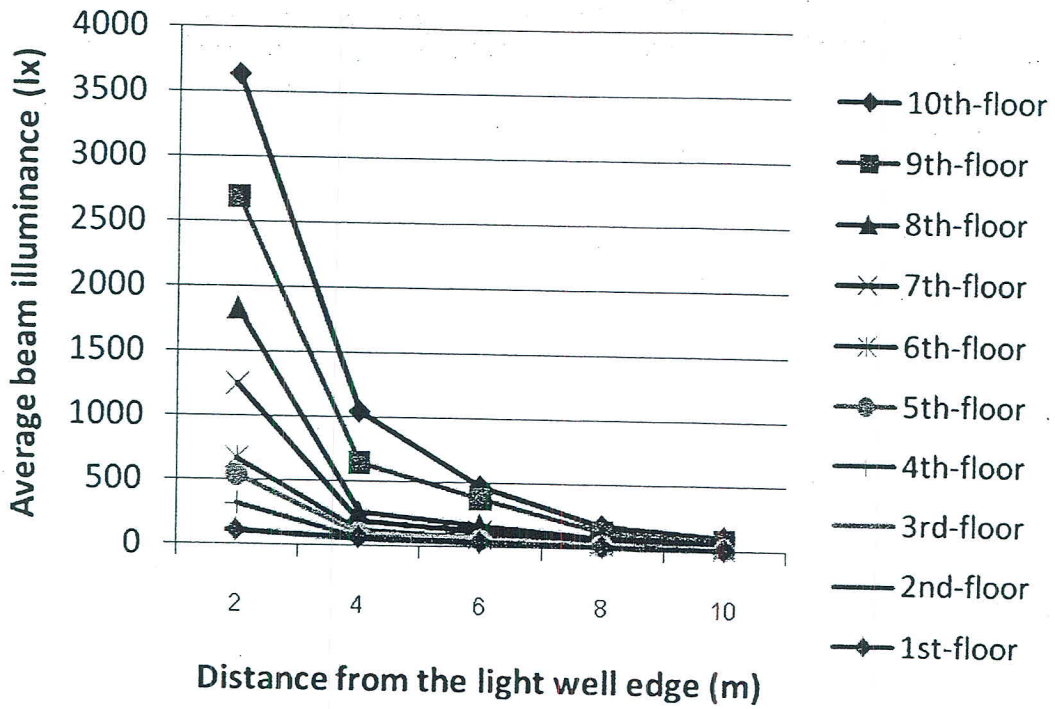
Figure E.8 UDI on the south zone (the sun stays in the southern hemisphere)

❖ Daylight in east zone

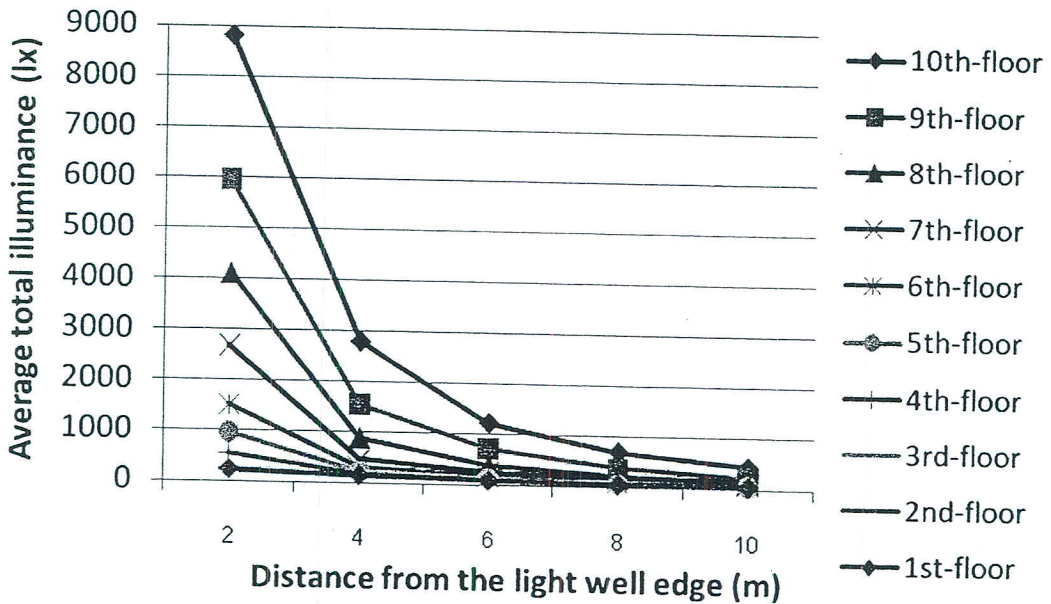


(a) Average diffuse illuminance (lx)

Figure E.9 Yearly average illuminance on the east zone



(b) Average beam illuminance (lx)



(c) Average total illuminance (lx)

Figure E.9 (Continued)

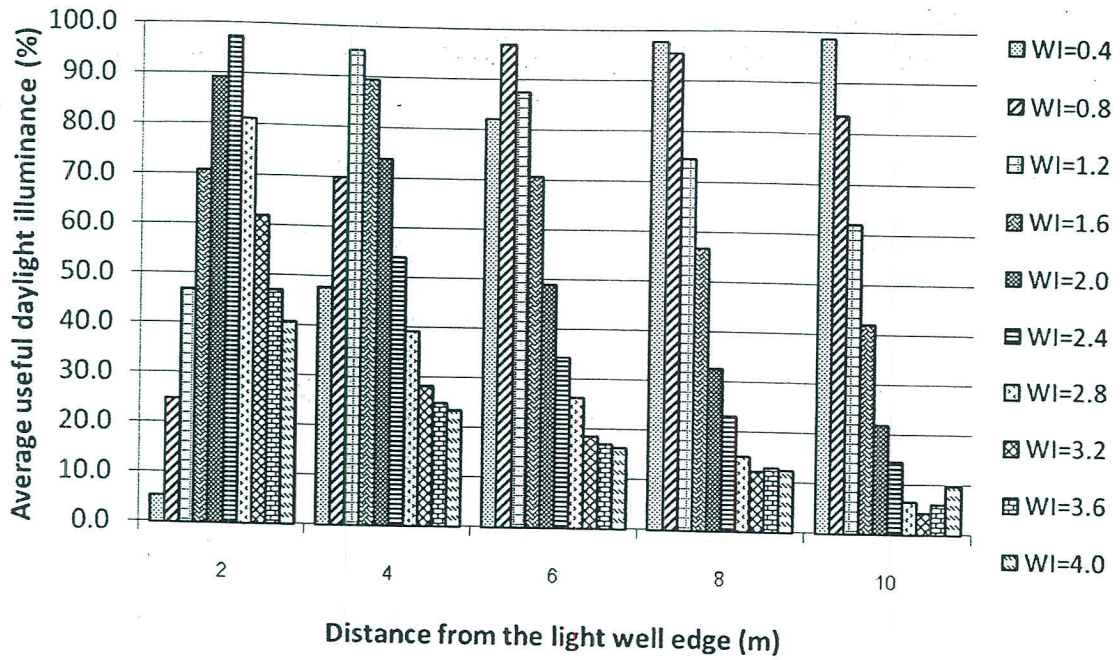
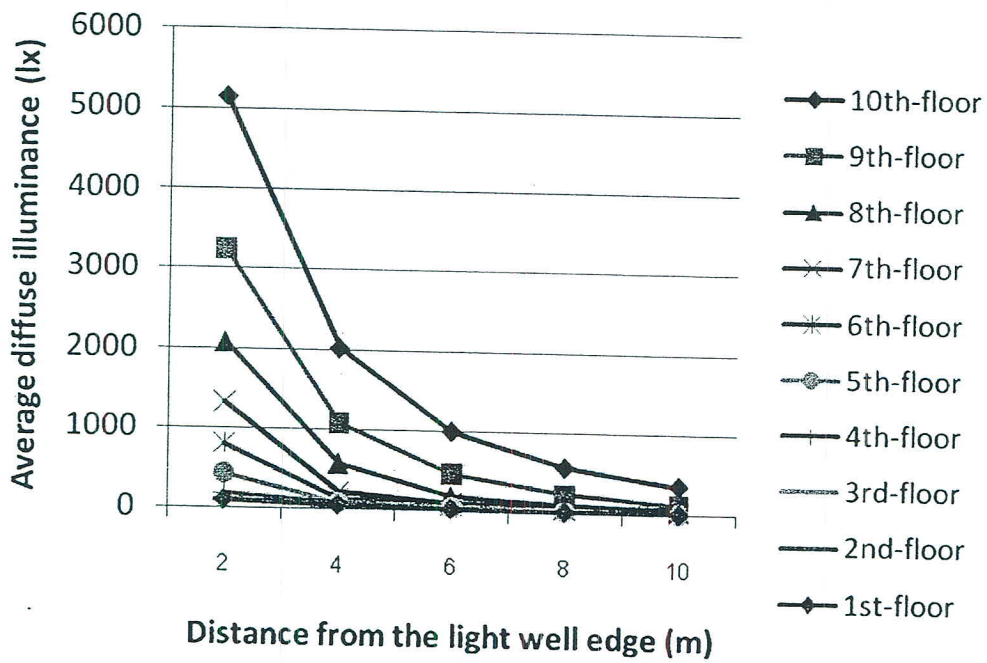


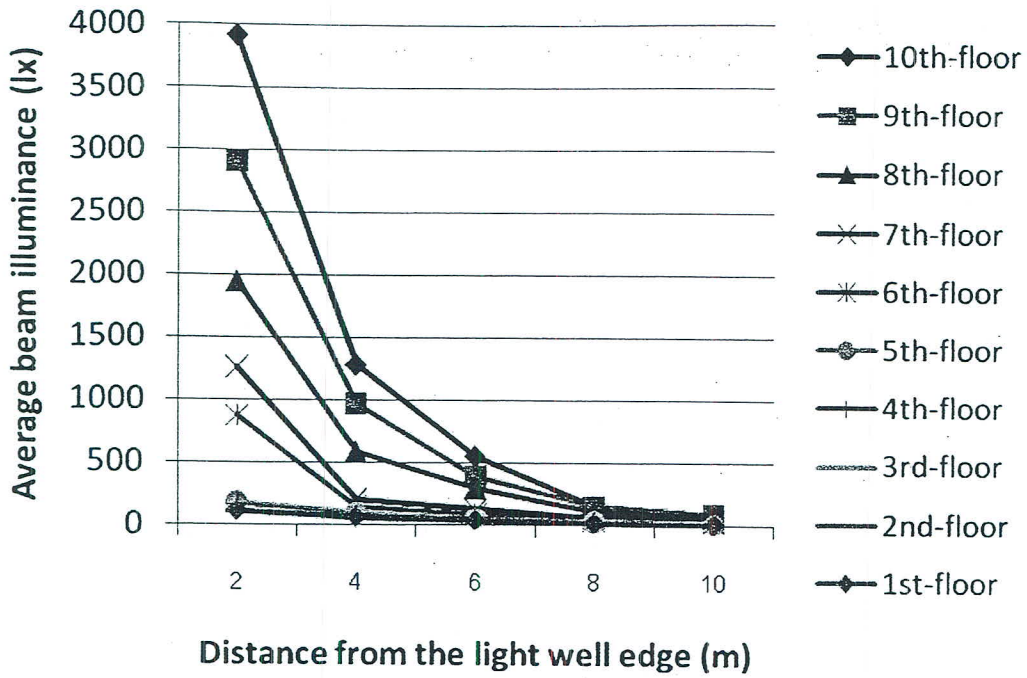
Figure E.10 UDI on the east zone

❖ Daylight in west zone

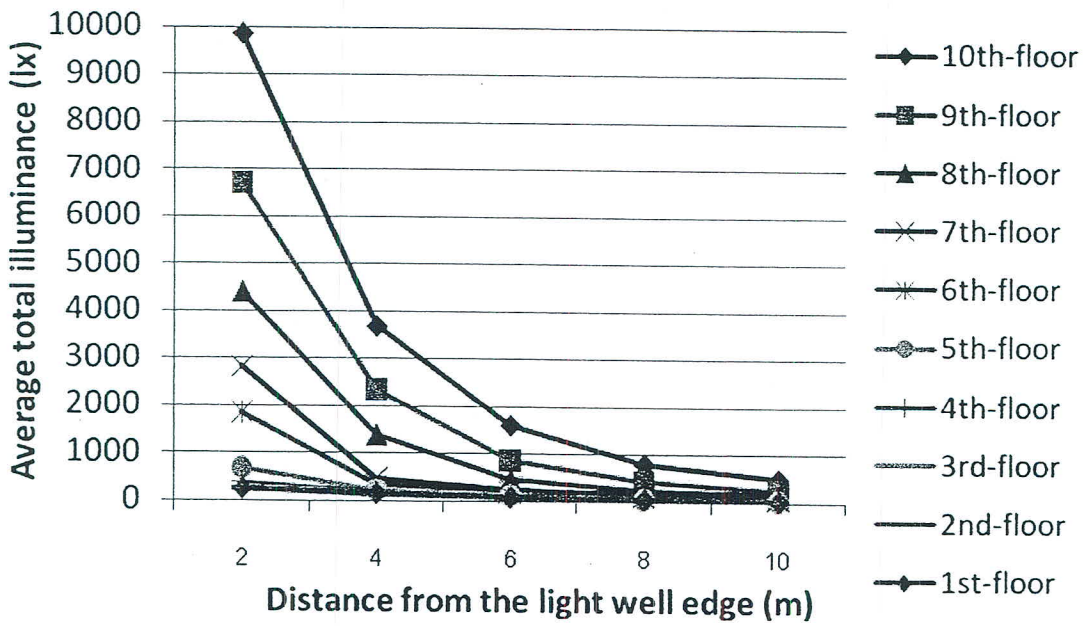


(a) Average diffuse illuminance (lx)

Figure E.11 Yearly average illuminance on the west zone



(b) Average beam illuminance (lx)



(c) Average total illuminance (lx)

Figure E.11 (Continued)

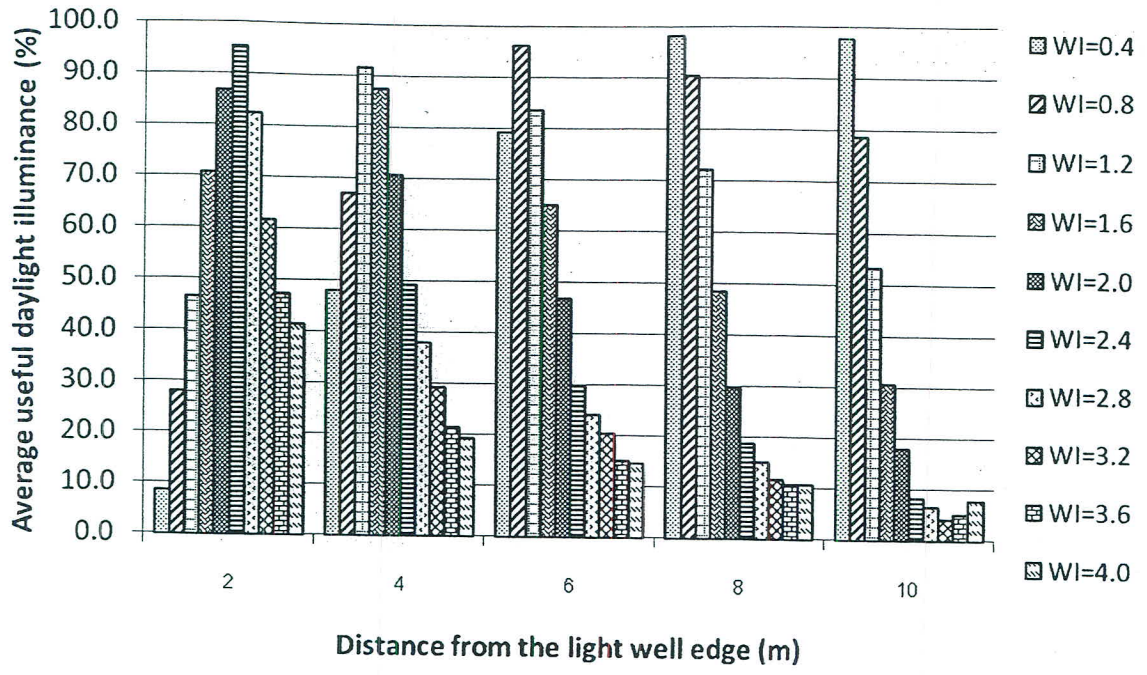



Figure E.12 UDI on the west zone

APPENDIX F

F. Lux Meter



**EKO**  
EKO INSTRUMENTS  
CO., LTD.

Luxmeter (High Illuminance)    Luxmeter (Low Illuminance)    Photon Sensor    Pyranometer

**ML-020S-0   ML-020S-1   ML-020P   ML-020VM**

## ML-020 series Small Sensors

**High performance**

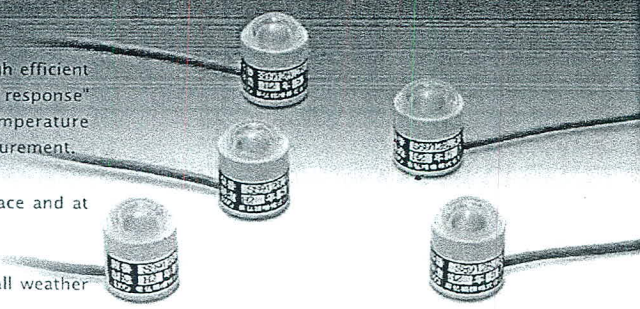
Combining the special designed filters with the high efficient detector makes it possible to characterize "spectral response" which is close to the ideal response. Temperature dependence is quite small, max. 1%, in actual measurement.

**Small and lightweight**

The sensors are suitable for the use in limited space and at multi point measurement.

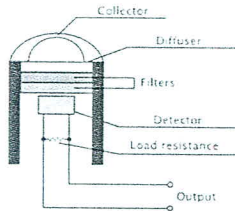
**High durability**

The sensors are designed to use continuously in all weather condition.



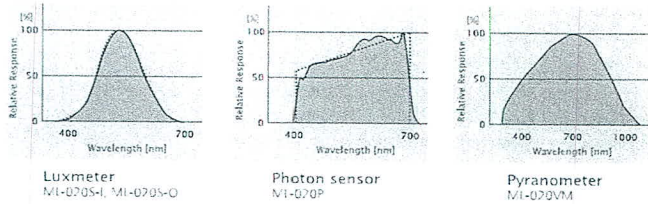
When creatures or plants receive natural and artificial light as illuminance or light energy, reactions are very big difference spectrally depends on the types. Human eye reacts to illuminance and plants react to number of photon. According to this fact, natural and artificial light should be selected very carefully for measurement of fundamental study of applied research. Based on these backgrounds, we have developed three sensors for such individual measuring purpose by taking our advantage of long experience for energy measuring.

**PRINCIPLE OF MEASUREMENT**



Special designed collector and diffuser are mounted on the upper part of the detector. This optical component realizes excellent character for cosine response and sensitivity. The transmitting light flux reached to the filters whose spectral response coincides for individual measuring purpose illuminance, photon number and irradiance, as shown in the following figure, the Si-photodiode detects the flux through the filters and converts accurately to electric signal proportional to the flux.

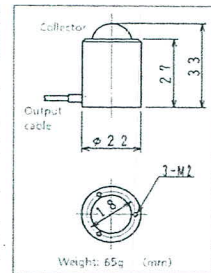
**SPECTRAL CHARACTERISTICS**



with option leveling plate

**Specifications**

	Luxmeter		Photon sensor	Pyranometer
	ML-020S-0	ML-020S-1	ML-020P	ML-020VM
	High illuminance	Low illuminance		
Spectral response	CIE Photopic Curve		Photometrically	Solar Irradiance
Measuring range	~150,000	~30,000	Photon Flux Density	(200 to 1100nm)
Unit	lx	lx	$\mu\text{mol}\cdot\text{s}^{-1}\cdot\text{m}^{-2}$	$\text{kW}\cdot\text{m}^{-2}$
Output	~30mV	~30mV	~10mV	~10mV
Internal resistance	280 $\Omega$	1.3 k $\Omega$	160 $\Omega$	1 $\Omega$
Temperature response (-10 to +50°C)	0.4%	0.4%	1.1%	0.5%
CCS response (at 30/60/80 deg.)	1 / 1.5 / 1.7%			
Spectral error	2.3%	2.3%	7.7%	—
Output cable	5m, standard			



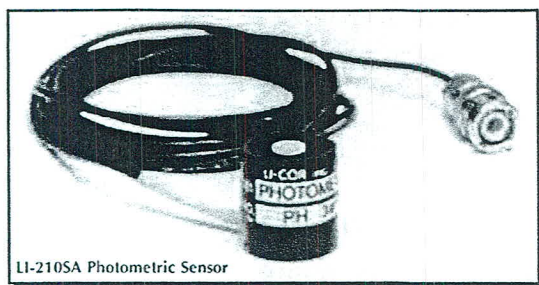
**EKO INSTRUMENTS CO., LTD.**

1-6 Sasazuka Center Bldg., 2-chome Sasazuka, Shibuya-ku Tokyo 151-0073, Japan  
 PHONE: 81-3-5352-2913 FAX: 81-3-5352-2917  
 http://www.eko.co.jp E-mail: info@eko.co.jp

EKO-ML020-07-02E

# LI-210SA PHOTOMETRIC SENSOR

## Measures Illuminance as Related to the CIE Standard Observer Curve



LI-210SA Photometric Sensor

The LI-210SA Photometric Sensor utilizes a filtered silicon photodiode to provide a spectral response that matches the CIE curve within  $\pm 5\%$  with most light sources. This photodiode and filter combination is placed within a fully cosine-corrected sensor head to provide the proper response to radiation at various angles of incidence.

Some of the applications for the LI-210SA Photometric Sensor include interior and industrial lighting, outdoor illuminance, passive solar energy, architecture and lighting models, illumination engineering, and biological sciences that require illuminance measurements. The LI-210SA is a research grade photometric sensor that is very reasonably priced.

## LI-210SA Specification

- Absolute Calibration:**  $\pm 5\%$  traceable to NIST.
- Sensitivity:** Typically 30  $\mu\text{A}$  per 100 klux.
- Linearity:** Maximum deviation of 1% up to 100 klux.
- Stability:**  $< \pm 2\%$  change over a 1 year period.
- Response Time:** 10  $\mu\text{s}$ .
- Temperature Dependence:**  $\pm 0.15\%$  per  $^{\circ}\text{C}$  maximum.
- Cosine Correction:** Cosine corrected up to  $80^{\circ}$  angle of incidence.
- Azimuth:**  $< \pm 1\%$  error over  $360^{\circ}$  at  $45^{\circ}$  elevation.
- Tilt:** No error induced from orientation.
- Operating Temperature:**  $-20$  to  $65^{\circ}\text{C}$ .
- Relative Humidity:** 0 to 100%.
- Detector:** High stability silicon photovoltaic detector (blue enhanced).

**Sensor Housing:** Weatherproof anodized aluminum case with acrylic diffuser and stainless steel hardware.

**Size:** 2.38 Dia.  $\times$  2.54 cm H (0.94"  $\times$  1.0").

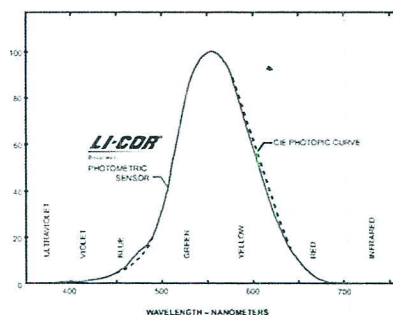
**Weight:** 28 g (1 oz.).

**Cable Length:** 10 ft. standard.

## Photometric Sensors

Photometry refers to the measurement of visible radiation (light) with a sensor having a spectral responsivity curve equal to the average human eye. This curve is known as the CIE Standard Observer Curve (photopic curve).

Photometric sensors are used to measure lighting conditions where the eye is the primary receiver, such as illumination of work areas, interior lighting, television screens, etc. Although photometric measurements have been used in the past in plant science, PPFD and irradiance are the preferred measurements.



## Ordering Information

The LI-210SA Photometric Sensor cable terminates with a BNC connector that connects directly to the LI-250A Light Meter or LI-1400 DataLogger. The 2290 Millivolt Adapter should be ordered if the LI-210SA will be used with a strip chart recorder or datalogger that measures millivolts. The 2290 uses a 604 Ohm precision resistor to convert the LI-210SA output from microamps to millivolts. The Photometric Sensor can also be ordered with bare leads (without the connector) and is designated LI-210SZ. The 2003S Mounting and Leveling Fixture is recommended for each sensor unless other provisions for mounting are made. Other accessories are described on the Accessory Page.

- LI-210SA Photometric Sensor (with BNC connector)
- LI-210SZ Quantum Sensor (with bare leads)
- 2003S Mounting and Leveling Fixture
- 2222SB-50 Extension Cable (50 ft.)
- 2222SB-100 Extension Cable (100 ft.)
- 2290 Millivolt Adapter

**Table F.13** Summary of measured quantities and sensors used at JGSEE station

MEASURED DATA	SENSOR SPECIFICATION
<p><i>Direct irradiance</i></p> <p>Pyheliometer Model: NIP Supplier: EPLAB</p>	<p>Linearity: <math>\pm 0.5\%</math> from 0 to <math>2800 \text{ W.m}^{-2}</math></p> <p>Subtending angle: <math>5^\circ 43' 30''</math></p> <p>Time response: 1 second (1/e signal)</p> <p>Temperature dependence: <math>\pm 1\%</math> over ambient temperature range</p>
<p><i>Global irradiance</i></p> <p>Pyranometer Model: PSP Supplier: EPLAB</p>	<p>Linearity: <math>+0.5\%</math> from 0 to <math>2800 \text{ W.m}^{-2}</math></p> <p>Temperature dependence: <math>+1\%</math> over ambient temperature range <math>-20</math> to <math>+40^\circ\text{C}</math></p> <p>Time response: 1 second (1/e signal)</p> <p>Cosine error: <math>+1\%</math> from <math>0</math> to <math>70^\circ</math> zenith angle: <math>80^\circ</math> zenith angle</p> <p>Receiver: coated with Parsons' black optical lacquer</p> <p>Orientation: no effect on instrument performance</p>
<p><i>Diffuse-horizontal irradiance</i></p> <p>Pyranometer Model: CM11 Supplier: Kipp &amp; Zonen</p>	<p>Linearity: <math>0.0\%</math> in the range of <math>0-500 \text{ W/m}^2</math> and <math>0.7\%</math> at <math>1000 \text{ W/m}^2</math></p> <p>Temperature dependence: <math>+1\%</math> over ambient temperature range <math>10</math> to <math>+40^\circ\text{C}</math></p> <p>Cosine error: less than <math>3\%</math> at <math>10^\circ</math> sun altitude</p> <p>Time response: less than 5 second (1/e), <math>99\%</math> value after 24 s</p> <p>Spectral range: <math>305-2800 \text{ nm}</math>. (<math>50\%</math> transmission points)</p> <p>Material: Anodized Aluminium</p> <p><i>Shadow Band Stand</i> - model SBS (Kipp &amp; Zonen) :</p> <p>Material: Anodized aluminium</p> <p>Height: <math>800 \text{ mm}</math></p> <p>Ring outer diameter: <math>620 \text{ mm}</math></p> <p>Ring width: <math>55 \text{ mm}</math></p> <p>Ring width/ring radius ratio: <math>0.185</math></p> <p>Mounting base diameter: <math>280 \text{ mm}</math></p>
<p><i>Total-vertical irradiance (NESW)</i></p> <p>Pyranometer Model: SBP-801 Supplier: Eko</p>	<p>Linearity: <math>0.3\%</math> (in the range of <math>0</math> to <math>1 \text{ kW.m}^{-2}</math>)</p> <p>Wavelength region: <math>300-2800 \text{ nm}</math>.</p> <p>Accuracy: <math>+1.5\%</math> (at <math>0.25 \text{ kW.m}^{-2}</math> or more)</p> <p>Cosine error: <math>2\%</math> (when the zenith angle is <math>0^\circ</math> to <math>80^\circ</math>)</p> <p>Temperature dependence: <math>1\%</math> (at <math>-20^\circ\text{C}</math> to <math>+40^\circ\text{C}</math>)</p> <p>Time response : Approx. <math>2.5 \text{ sec}</math>. (1/e signal)</p> <p>Azimuthal error: <math>2\%</math> (when the zenith angle is <math>75^\circ</math>)</p>
<p><i>DIRECT ILLUMINANCE</i></p> <p>Light meter</p>	<p>Measuring range: <math>0-200,000 \text{ lux}</math></p> <p>Full opening view angle: <math>5^\circ \pm 0.2^\circ</math></p> <p>Slope angle: <math>1^\circ \pm 0.2^\circ</math></p>

MEASURED DATA	SENSOR SPECIFICATION
Model: ML-010SD1 Supplier: Eko	Temp. dependence: $\pm 1.0\%$ (-20 to +50°C)
<i>Illuminance</i> <i>Global</i> <i>Diffuse-horizontal</i> <i>Total-vertical (NESW)</i>  Light meter Model: ML-010S Supplier: Eko	Measuring range: 0 to 200,000 lx Cosine response at 30/60/80: 2/7/25 % Temperature dependence: 1 % (at 50°C band)
<i>Zenith luminance</i>  Luminance meter Model: ML-010SZ Supplier: Eko	Measuring range: 0-30,000cd Temp. dependence: $\pm 1.0\%$ (-20 to +50°C) Full view angle: 11°
<i>Temperature</i>  Temperature sensor Model: HMP45A Supplier: Vaisala	Measurement range: -32.9 to 60 °C Output scale: -40 to 60 °C equal 0-1 VDC Accuracy at 20 °C: $\pm 0.2$ °C Temperature sensor: Pt 1000 IEC 751 1/3 class B
<i>Humidity</i>  Humidity sensor Model: HMP45A Supplier: Vaisala	Measurement range: 0.8-100 %RH Output scale: 0-100% RH equal 0-1 VDC Typical long term stability: better than 1% RH per year Temperature dependence: $\pm 0.05\%$ RH/C Response time (90%) at 20 °C: 15 s with membrane filter Humidity sensor: HUMICAP 180
<i>Atmospheric turbidity</i>  Turbidity sensor Model: MS-110 Supplier: Eko	Incident part: Full view angle: 2.5° Slope angle: 0.8° Window: Quarts glass Aiming: By means of pin-hole Spectral system (Interference filters): Wavelength: 368 $\pm$ 2nm, 500 $\pm$ 2nm, 675 $\pm$ 2nm, 778 $\pm$ 2nm Half band width: less than 5 nm 1/10 band width: less than 20 nm Transmission: Approx. more than 20% Detecting part: Sensor: Silicone pin-photodiode Temperature coefficient: less than -0.1 %/°C Linearity: less than 1.0 %

