

Study 26

Appendix C

Building input data as used by Quick

Roof	
Area	11 m ²
Albedo	75 %
Emittance	94 %
Tilt angle	0°
Type	External
Single	No
Layers	
Min. stud	2 mm
Air space depth	100 mm
Max. stud depth	20 mm

Surface 2	
Area	7.41 m ²
Albedo	40 %
Emittance	91 %
Orientation	0°
Tilt angle	0°
Type	Roof
Single	No
Layers	
Min. stud	2 mm
Air space depth	100 mm
Max. stud depth	20 mm
Finish	Plaster

Surface 3	
Area	7.41 m ²
Albedo	40 %
Emittance	91 %
Orientation	0°
Tilt angle	0°
Type	No
Single	No
Layers	
Min. stud	150 mm
Air space depth	20 mm
Max. stud depth	150 mm
Finish	Plaster

Surface 4	
Area	7.41 m ²
Albedo	40 %
Emittance	91 %
Orientation	0°
Tilt angle	0°
Type	Roof
Single	No
Layers	
Min. stud	150 mm
Air space depth	20 mm
Max. stud depth	150 mm
Finish	Plaster

Surface 5	
Area	5.64 m ²
Albedo	31 %
Emittance	91 %
Orientation	45°
Tilt angle	90°
Type	Roof
Single	No
Layers	
Min. stud	150 mm
Air space depth	20 mm
Max. stud depth	150 mm
Finish	Plaster

Surface 6	
Area	2.03 m ²
Albedo	15 %
Emittance	64 %
Orientation	0°
Tilt angle	0°
Type	Roof
Single	No
Layers	
Min. stud	2 mm
Air space depth	100 mm
Max. stud depth	20 mm
Finish	Plaster

Floor	
Area	11.00 m ²
Edge Parameter	15.0 m
Type	Ground contact
Layers	
Layer	8 mm
End concrete (l.w.)	150 mm

Appendix C Building input data as used by Quick

Study 26

Roof	
Area	11 m ²
Absorptance	75 %
Emissivity	90 %
Tilt Angle	0°
Type:	External
Bright:	No
Layers:	
Mild Steel	2 mm
Airspace ceiling	300 mm
Gypsum Plaster Board	20 mm

Surface 2	
Area	9.63 m ²
Absorptance	40 %
Transmittance	0 %
Orientation	45°
Tilt angle	90°
Bright	No
Shading	Specify
Type	Internal
Layers:	
Brickwork	110 mm
Air space resistance	50 mm
Brickwork	110 mm
Plaster	13 mm

Surface 0	
Area	7.60 m ²
Absorptance	40 %
Transmittance	0 %
Orientation	0°
Tilt angle	90°
Bright	No
Shading	Specify
Type	External
Layers:	
Brickwork	110 mm
Air space resistance	50 mm
Brickwork	110 mm
Plaster	13 mm

Surface 3	
Area	8.64 m ²
Absorptance	40 %
Transmittance	0 %
Orientation	45°
Tilt angle	90°
Bright	No
Shading	Specify
Type	Internal
Layers:	
Brickwork	110 mm
Air space resistance	50 mm
Brickwork	110 mm
Plaster	13 mm

Surface 1	
Area	8.64 m ²
Absorptance	40 %
Transmittance	0 %
Orientation	45°
Tilt angle	90°
Bright	No
Shading	Specify
Type	Internal
Layers:	
Brickwork	110 mm
Air space resistance	50 mm
Brickwork	110 mm
Plaster	13 mm

Surface 4	
Area	2.02 m ²
Absorptance	17 %
Transmittance	64 %
Orientation	0°
Tilt angle	90°
Bright	No
Shading	Specify
Type	External
Layers:	
Glass	3 mm

Floor	
Area	11.00 m ²
Exp Perimeter	13.3 m
Type	Ground contact
Layers:	
Carpet	5 mm
Cast concrete (l.w.)	150 mm

Appendix C Building input data as used by Quick

Study 32

Roof	
Area	10.9 m ²
Absorptance	75 %
Emissivity	90 %
Tilt Angle	0°
Type:	External
Bright:	No
Layers:	
Mild Steel	2 mm
Airspace ceiling	300 mm
Gypsum Plaster Board	20 mm

Surface 2	
Area	9.07 m ²
Absorptance	40 %
Transmittance	0 %
Orientation	45°
Tilt angle	90°
Bright	No
Shading	Specify
Type	Internal
Layers:	
Brickwork	110 mm
Air space resistance	50 mm
Brickwork	110 mm
Plaster	13 mm

Surface 0	
Area	5.17 m ²
Absorptance	40 %
Transmittance	0 %
Orientation	0°
Tilt angle	90°
Bright	No
Shading	Specify
Type	External
Layers:	
Brickwork	110 mm
Air space resistance	50 mm
Brickwork	110 mm
Plaster	13 mm

Surface 3	
Area	9.08 m ²
Absorptance	40 %
Transmittance	0 %
Orientation	45°
Tilt angle	90°
Bright	No
Shading	Specify
Type	Internal
Layers:	
Brickwork	110 mm
Air space resistance	50 mm
Brickwork	110 mm
Plaster	13 mm

Surface 1	
Area	9.08 m ²
Absorptance	40 %
Transmittance	0 %
Orientation	45°
Tilt angle	90°
Bright	No
Shading	Specify
Type	Internal
Layers:	
Brickwork	110 mm
Air space resistance	50 mm
Brickwork	110 mm
Plaster	13 mm

Surface 4	
Area	3.90 m ²
Absorptance	17 %
Transmittance	64 %
Orientation	0°
Tilt angle	90°
Bright	No
Shading	Specify
Type	External
Layers:	
Glass	3 mm

Floor	
Area	10.90 m ²
Exp Perimeter	13.2 m
Type	Ground contact
Layers:	
Carpet	5 mm
Cast concrete (l.w.)	150 mm

Appendix C Building input data as used by Quick

Study 33

Roof	
Area	8.40 m ²
Absorptance	75 %
Emissivity	80 %
Tilt Angle	0°
Type:	External
Bright:	No
Layers:	
Asphalt	10 mm
Airspace ceiling	300 mm
Gypsum Plaster Board	20 mm

Surface 0	
Area	8.25 m ²
Absorptance	75 %
Transmittance	0 %
Orientation	45°
Tilt angle	90°
Bright	No
Shading	Specify
Type	Internal
Layers:	
Brickwork	110 mm
Air space resistance	50 mm
Brickwork	110 mm
Plaster	13 mm

Surface 1	
Area	7.70 m ²
Absorptance	75 %
Transmittance	0 %
Orientation	45°
Tilt angle	90°
Bright	No
Shading	Specify
Type	Internal
Layers:	
Brickwork	110 mm
Air space resistance	50 mm
Brickwork	110 mm
Plaster	13 mm

Surface 2	
Area	6.35 m ²
Absorptance	75 %
Transmittance	0 %
Orientation	180°
Tilt angle	90°
Bright	No
Shading	Specify
Type	External
Layers:	
Brickwork	110 mm
Air space resistance	50 mm
Brickwork	110 mm
Plaster	13 mm

Surface 3	
Area	7.70 m ²
Absorptance	75 %
Transmittance	0 %
Orientation	45°
Tilt angle	90°
Bright	No
Shading	Specify
Type	Internal
Layers:	
Brickwork	110 mm
Air space resistance	50 mm
Brickwork	110 mm
Plaster	13 mm

Surface 4	
Area	1.90 m ²
Absorptance	17 %
Transmittance	64 %
Orientation	180°
Tilt angle	90°
Bright	No
Shading	Specify
Type	External
Layers:	
Glass	3 mm

Floor	
Area	8.40 m ²
Exp Perimeter	11.6 m
Type	Ground contact
Layers:	
Carpet	5 mm
Cast concrete (l.w.)	150 mm

Appendix C Building input data as used by Quick

Study 34

Roof	
Area	4.40 m ²
Absorptance	75 %
Emissivity	80 %
Tilt Angle	0°
Type:	External
Bright:	No
Layers:	
Asphalt	10 mm
Airspace ceiling	300 mm
Gypsum Plaster Board	20 mm

Surface 0	
Area	6.32 m ²
Absorptance	75 %
Transmittance	0 %
Orientation	45°
Tilt angle	90°
Bright	No
Shading	Specify
Type	Internal
Layers:	
Brickwork	110 mm
Air space resistance	50 mm
Brickwork	110 mm
Plaster	13 mm

Surface 1	
Area	4.21 m ²
Absorptance	75 %
Transmittance	0 %
Orientation	90°
Tilt angle	90°
Bright	No
Shading	Specify
Type	External
Layers:	
Brickwork	110 mm
Air space resistance	50 mm
Brickwork	110 mm
Plaster	13 mm

Surface 2	
Area	4.43 m ²
Absorptance	75 %
Transmittance	0 %
Orientation	180°
Tilt angle	90°
Bright	No
Shading	Specify
Type	External

Layers:	
Brickwork	110 mm
Air space resistance	50 mm
Brickwork	110 mm
Plaster	13 mm

Surface 3	
Area	5.26 m ²
Absorptance	75 %
Transmittance	0 %
Orientation	45°
Tilt angle	90°
Bright	No
Shading	Specify
Type	Internal
Layers:	
Brickwork	110 mm
Air space resistance	50 mm
Brickwork	110 mm
Plaster	13 mm

Surface 4	
Area	1.05 m ²
Absorptance	17 %
Transmittance	64 %
Orientation	90°
Tilt angle	90°
Bright	No
Shading	Specify
Type	External
Layers:	
Glass	3 mm

Surface 5	
Area	1.90 m ²
Absorptance	17 %
Transmittance	64 %
Orientation	180°
Tilt angle	90°
Bright	No
Shading	Specify
Type	External
Layers:	
Glass	3 mm

Floor	
Area	4.40 m ²
Exp Perimeter	8.4 m
Type	Ground contact
Layers:	
Carpet	5 mm
Cast concrete (l.w.)	150 mm

Appendix D

The two distributions compared here with the Chi-square statistic is in the second and third column of the table. The first column give the temperature for which the occurrence is given. In the fourth column, the area under the distribution obtained by Monte-Carlo method was forced equal to the distribution obtained by the full simulation. This results in the number of degrees of freedom being one less than the total number of bins, or with 23 bins, the number of degrees of freedom is 22. The area of the full simulation curve is 910, or the total number of events. The second and fourth column are used to calculate the Chi-square statistic for each bin. The sum of this give the statistic for the two distributions, given by $\chi^2 = \sum \frac{(R_i - S_i)^2}{R_i + S_i}$ (Press, W.H. et al, 1992)

Chi-square test of two distributions

The value of the Chi-square statistic came to 90.53136. The incomplete gamma function for 22 degrees of freedom give the chance that the two distributions are from the same population as 0.00937, or 0.937 percent.

Temperature	Full	MC	MC Area = Area Full	Chi-square
10	0	0	0	0
10	1	1	0.001136	0.002272
10	2	2	0.004545	0.009091
10	3	3	0.011364	0.022727
10	4	4	0.022727	0.045455
10	5	5	0.034091	0.068182
10	6	6	0.045455	0.090909
10	7	7	0.056818	0.113636
10	8	8	0.068182	0.136364
10	9	9	0.079545	0.159091
10	10	10	0.090909	0.181818
10	11	11	0.102273	0.204545
10	12	12	0.113636	0.227273
10	13	13	0.125000	0.250000
10	14	14	0.136364	0.272727
10	15	15	0.147727	0.295455
10	16	16	0.159091	0.318182
10	17	17	0.170455	0.340909
10	18	18	0.181818	0.363636
10	19	19	0.193182	0.386364
10	20	20	0.204545	0.409091
10	21	21	0.215909	0.431818
10	22	22	0.227273	0.454545
10	23	23	0.238636	0.477273
10	24	24	0.250000	0.500000
10	25	25	0.261364	0.522727
10	26	26	0.272727	0.545455
10	27	27	0.284091	0.568182
10	28	28	0.295455	0.590909
10	29	29	0.306818	0.613636
10	30	30	0.318182	0.636364
10	31	31	0.329545	0.659091
10	32	32	0.340909	0.681818
10	33	33	0.352273	0.704545
10	34	34	0.363636	0.727273
10	35	35	0.375000	0.750000
10	36	36	0.386364	0.772727
10	37	37	0.397727	0.795455
10	38	38	0.409091	0.818182
10	39	39	0.420455	0.840909
10	40	40	0.431818	0.863636
10	41	41	0.443182	0.886364
10	42	42	0.454545	0.909091
10	43	43	0.465909	0.931818
10	44	44	0.477273	0.954545
10	45	45	0.488636	0.977273
10	46	46	0.500000	1.000000
10	47	47	0.511364	1.022727
10	48	48	0.522727	1.045455
10	49	49	0.534091	1.068182
10	50	50	0.545455	1.090909
10	51	51	0.556818	1.113636
10	52	52	0.568182	1.136364
10	53	53	0.579545	1.159091
10	54	54	0.590909	1.181818
10	55	55	0.602273	1.204545
10	56	56	0.613636	1.227273
10	57	57	0.625000	1.250000
10	58	58	0.636364	1.272727
10	59	59	0.647727	1.295455
10	60	60	0.659091	1.318182
10	61	61	0.670455	1.340909
10	62	62	0.681818	1.363636
10	63	63	0.693182	1.386364
10	64	64	0.704545	1.409091
10	65	65	0.715909	1.431818
10	66	66	0.727273	1.454545
10	67	67	0.738636	1.477273
10	68	68	0.750000	1.500000
10	69	69	0.761364	1.522727
10	70	70	0.772727	1.545455
10	71	71	0.784091	1.568182
10	72	72	0.795455	1.590909
10	73	73	0.806818	1.613636
10	74	74	0.818182	1.636364
10	75	75	0.829545	1.659091
10	76	76	0.840909	1.681818
10	77	77	0.852273	1.704545
10	78	78	0.863636	1.727273
10	79	79	0.875000	1.750000
10	80	80	0.886364	1.772727
10	81	81	0.897727	1.795455
10	82	82	0.909091	1.818182
10	83	83	0.920455	1.840909
10	84	84	0.931818	1.863636
10	85	85	0.943182	1.886364
10	86	86	0.954545	1.909091
10	87	87	0.965909	1.931818
10	88	88	0.977273	1.954545
10	89	89	0.988636	1.977273
10	90	90	1.000000	2.000000
10	91	91	1.011364	2.022727
10	92	92	1.022727	2.045455
10	93	93	1.034091	2.068182
10	94	94	1.045455	2.090909
10	95	95	1.056818	2.113636
10	96	96	1.068182	2.136364
10	97	97	1.079545	2.159091
10	98	98	1.090909	2.181818
10	99	99	1.102273	2.204545
10	100	100	1.113636	2.227273
10	101	101	1.125000	2.250000
10	102	102	1.136364	2.272727
10	103	103	1.147727	2.295455
10	104	104	1.159091	2.318182
10	105	105	1.170455	2.340909
10	106	106	1.181818	2.363636
10	107	107	1.193182	2.386364
10	108	108	1.204545	2.409091
10	109	109	1.215909	2.431818
10	110	110	1.227273	2.454545
10	111	111	1.238636	2.477273
10	112	112	1.250000	2.500000
10	113	113	1.261364	2.522727
10	114	114	1.272727	2.545455
10	115	115	1.284091	2.568182
10	116	116	1.295455	2.590909
10	117	117	1.306818	2.613636
10	118	118	1.318182	2.636364
10	119	119	1.329545	2.659091
10	120	120	1.340909	2.681818
10	121	121	1.352273	2.704545
10	122	122	1.363636	2.727273
10	123	123	1.375000	2.750000
10	124	124	1.386364	2.772727
10	125	125	1.397727	2.795455
10	126	126	1.409091	2.818182
10	127	127	1.420455	2.840909
10	128	128	1.431818	2.863636
10	129	129	1.443182	2.886364
10	130	130	1.454545	2.909091
10	131	131	1.465909	2.931818
10	132	132	1.477273	2.954545
10	133	133	1.488636	2.977273
10	134	134	1.500000	3.000000
10	135	135	1.511364	3.022727
10	136	136	1.522727	3.045455
10	137	137	1.534091	3.068182
10	138	138	1.545455	3.090909
10	139	139	1.556818	3.113636
10	140	140	1.568182	3.136364
10	141	141	1.579545	3.159091
10	142	142	1.590909	3.181818
10	143	143	1.602273	3.204545
10	144	144	1.613636	3.227273
10	145	145	1.625000	3.250000
10	146	146	1.636364	3.272727
10	147	147	1.647727	3.295455
10	148	148	1.659091	3.318182
10	149	149	1.670455	3.340909
10	150	150	1.681818	3.363636
10	151	151	1.693182	3.386364
10	152	152	1.704545	3.409091
10	153	153	1.715909	3.431818
10	154	154	1.727273	3.454545
10	155	155	1.738636	3.477273
10	156	156	1.750000	3.500000
10	157	157	1.761364	3.522727
10	158	158	1.772727	3.545455
10	159	159	1.784091	3.568182
10	160	160	1.795455	3.590909
10	161	161	1.806818	3.613636
10	162	162	1.818182	3.636364
10	163	163	1.829545	3.659091
10	164	164	1.840909	3.681818
10	165	165	1.852273	3.704545
10	166	166	1.863636	3.727273
10	167	167	1.875000	3.750000
10	168	168	1.886364	3.772727
10	169	169	1.897727	3.795455
10	170	170	1.909091	3.818182
10	171	171	1.920455	3.840909
10	172	172	1.931818	3.863636
10	173	173	1.943182	3.886364
10	174	174	1.954545	3.909091
10	175	175	1.965909	3.931818
10	176	176	1.977273	3.954545
10	177	177	1.988636	3.977273
10	178	178	1.999999	4.000000
10	179	179	2.011364	4.022727
10	180	180	2.022727	4.045455
10	181	181	2.034091	4.068182
10	182	182	2.045455	4.090909
10	183	183	2.056818	4.113636
10	184	184	2.068182	4.136364
10	185	185	2.079545	4.159091
10	186	186	2.090909	4.181818
10	187	187	2.102273	4.204545
10	188	188	2.113636	4.227273
10	189	189	2.125000	4.250000
10	190	190	2.136364	4.272727
10	191	191	2.147727	4.295455
10	192	192	2.159091	4.318182
10	193	193	2.170455	4.340909
10	194	194	2.181818	4.363636
10	195	195	2.193182	4.386364
10	196	196	2.204545	4.409091
10	197	197	2.215909	4.431818
10	198	198	2.227273	4.454545
10	199	199	2.238636	4.477273
10	200	200	2.250000	4.500000
10	201	201	2.261364	4.522727
10	202	202	2.272727	4.545455
10	203	203	2.284091	4.568182
10	204	204	2.295455	4.590909
10	205	205	2.306818	4.613636
10	206	206	2.318182	4.636364
10	207	207	2.329545	4.659091
10	208	208	2.340909	4.681818
10	209	209	2.352273	4.704545
10	210	210	2.363636	4.727273
10	211	211	2.375000	4.750000
10	212	212	2.386364	4.772727
10	213	213	2.397727	4.795455
10	214	214	2.409091	4.818182
10	215	215	2.420455	4.840909
10	216	216	2.431818	4.863636
10	217	217	2.443182	4.886364
10	218	218	2.454545	4.909091
10	219	219	2.465909	4.931818
10	220	220	2.477273	4.954545
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Appendix D Chi-square test of two distributions

The two distributions compared here with the Chi-square statistic is given in the second and third column of the table. The first column give the temperature for which the occurrence is given. In the fourth column, the area under the distribution obtained by the Monte Carlo method was forced equal to the distribution obtained by the full simulation. This results in the number of degrees of freedom being one less than the total number of bins, or with 23 bins, the number of degrees of freedom is 22. The area of the full simulation curve is 910, or the total number of events. The second and fourth column was used to calculate the Chi-square statistic for each bin. The sum of this give the statistic

for the two distributions, given by
$$X^2 = \sum_i \frac{(R_i - S_i)^2}{R_i + S_i} \quad (\text{Press, W.H., et al, 1992})$$

The value of the Chi-square statistic came to 40.53136. The incomplete gamma function for 22 degrees of freedom give the chance that the two distributions are from the same population as 0.00937, or 0,937 percent.

Temperature	Full	MC	MC, Area = Area Full	Chi-square
11	0	0	0	0
12	1	1.8E-06	0.001638	0.995097
13	1	6.94E-05	0.063154	0.825544
14	7	0.000791	0.719355	5.110077
15	10	0.002752	2.504684	4.492697
16	7	0.006543	5.95413	0.08444
17	26	0.01275	11.602318	5.512778
18	30	0.02196	19.983964	2.007063
19	37	0.034762	31.633784	0.419564
20	47	0.051587	46.943715	3.37E-05
21	44	0.070312	63.983829	3.698271
22	63	0.087495	79.620268	1.936845
23	72	0.101557	92.416688	2.535273
24	82	0.110977	100.98907	1.970526
25	92	0.114235	103.953668	0.729204
26	86	0.109855	99.967595	1.049074
27	95	0.097182	88.435529	0.234918
28	76	0.075629	68.822754	0.355696
29	70	0.051413	46.785921	4.61437
30	37	0.030749	27.981772	1.251558
31	19	0.01473	13.403845	0.966458
32	8	0.004287	3.901534	1.411366
33	0	0.000356	0.323869	0.323869
34	0	7.3E-06	0.006643	0.006643
35	0	0	0	0
Total :				40.53136

Reference

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1992, *Numerical Recipes in C*, Cambridge university press, Cambridge, 0-521-43108-5.