Warringtonfire Holmesfield Road Warrington Cheshire WA1 2DS United Kingdom T: +44 (0)1925 655116 W: www.warringtonfire.com



Title:

Fire Resistance Test In Accordance With BS EN 1365-2: 2014, On A Loadbearing Timber Floor Construction Protected By A Plasterboard Ceiling When Incorporating Twelve Downlighter Light Fitting Assemblies.

Date of Test:

03 July 2023

Issue 1

23 November 2023

WF Report No.

527453/R



Prepared for:

JCC Lighting Products Ltd

Lux Park, Chrichester Business Park, City Fields Way, Tangmere, Chichester, West Sussex.



Test Assembly

Summary of

The timber floor had overall nominal dimensions of 4278 mm long by 3000 mm **Tested Assembly** wide by 257 mm deep. The floor comprised 220 mm high Wolf Systems metal web joists referenced 'Easi-Joist WS200' at 600 mm centres. The unexposed face of the floor comprised nominally 22 mm thick tongue and groove chipboard. The floor assembly was protected by one layer of 15 mm thick 'Gyproc Wallboard', through fixed to the timber framework with screws.

> The ceiling incorporated twelve specimen downlighter light fittings. The lights were referenced as follows:

Test Ref.	Model Ref.	Cut Out Diameter.
1	JC1001	70 mm
2	JC10010	70 mm
3	JC1101	68 mm
4	JC1102	82 mm
5	JC1020	70 mm
6	JC010036	68 mm
7	JC010037	90 mm
8	JC010038	125 mm
9	JC010039	157 mm
10	JC010040	90 mm
11	JC010041	125 mm
12	JC010042	157 mm

The floor supported a uniformly distributed load of 1.3kN/m². This load was provided by the test sponsor as to represent the expected working load for the floor construction in practice.

Detailed drawings of the test specimen(s) and a comprehensive description of the test construction based on a detailed survey of the specimen(s) and information supplied by the sponsor of the test are included in the Test Specimen and Schedule of Components sections of this report.

Performance Criteria and Test Results

Loadbearing Capacity	This is the time in completed minutes for which the test specimen continues to maintain its ability to support the test load during the test. Support of the test load is determined by both the amount and the rate of Deflection. The limiting deflection and the limiting rate of deflection for the specimen, as specified by the Standard, are calculated as:							
	Criteria	Value						
	L: Clear span - in mm	4100						
	d: Depth of structral section - in mm							
	Limiting deflection ($l^{2}/400d$) - in mm	191 9						
	Limiting rate of deflection $(1^{2}/9000d)$ - in mm/min	85						
	$M_{\text{absoluted}} = M_{\text{absoluted}} = M_{absolu$	297.9						
		207.0						
	Failure to support the load is deemed to have occurred when a Deflection' greater than or equal to ' 1.5 x Limiting Deflection' is obs	a ' Measured erved						
	<u>Or</u>							
	Both the 'Limiting rate of deflection' and 'Limiting deflection' are e	xceeded.						
	The criterion was satisfied for 41 minutes after which time t discontinued.	he test was						
Integrity	It is required that the specimen retains its separating function, without:							
	 causing ignition of a cotton pad when applied permitting the penetration of a gap gauge as specified in BS EN 1363-1: 2020 sustained flaming on the unexposed surface subsequent failure of loadbearing capacity 							
	These requirements were satisfied for the periods shown below:							
Sustained flaming	41 minutes							
Gap gauge	41 minutes Due to loadbearing failure							
Cotton pad	41 minutes							
Insulation	It is required that the mean temperature rise of the unexposed surface greater than 140°C and that the maximum temperature rise shall no than 180°C. Insulation failure also occurs simultaneously with inter These requirements were satisfied for the period shown below:	e shall not be ot be greater egrity failure.						
Specimen	40 minutes Exceeded maximum TC 221 temperature criteria							
	*Test was discontinued after a period of 42 minutes.							

Date of Test

03 July 2023

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Signatories

Responsible Officer **K. Brennan** Technical Officer

G.A.Eong

Approved G. Edmonds Senior Technical Officer

* For and on behalf of Warringtonfire.

Report Issued: 23 November 2023

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Revision History

Issue No:	Re-issue Date:
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Reason for Revision:	

Issue No:	Re-issue Date:
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Test Conditions

Standard	BS EN 1365-2: 2014, 'Fire resistance tests for loadbearing elements – Part 2: Floors and Roofs'
	The purpose of the test was to evaluate the performance of a timber floor construction protected by a ceiling of known fire resistance, when incorporating down lighter light fitting assemblies.
Sampling	Warringtonfire was not involved in the sampling or selection of the tested specimen or any of the components.
	The results obtained during the test only apply to the test samples as received and tested by Warringtonfire.
Installation	Representatives of Warringtonfire assembled the floor construction and installed the downlighters between the 28 June and the 02 July 2023
Conditioning	The specimen's storage, construction, and test preparation took place in the test laboratory over a total, combined time of 5 days. Throughout this period of time both the temperature and the humidity of the laboratory were measured and recorded as being within a range of from 18.5° C to 27.5° C and 41% to 71% respectively.
Instruction to Test	The test was conducted on the 03 July 2023 at the request of JCC Lighting Products Ltd, the test sponsor.
Ambient Temperature	The ambient air temperature in the vicinity of the test construction was 22°C at the start of the test with a maximum variation of -1°C during the test.
Furnace	The furnace was controlled so that its mean temperature complied with the requirements of BS EN 1363-1: 2020 Clause 5.1 using eight plate thermometers, distributed over a plane 100 mm from the underside of test assembly.
Thermocouples	Thermocouples were provided to monitor the unexposed surface of the specimen. The output of all instrumentation was recorded at no less than one minute intervals. The locations and reference numbers of the various unexposed surface and internal thermocouples are shown in Figure 1.
Application of the load	The full test load was applied via dead load and hydraulic rams uniformly distributed over the test Specimen 90 minutes before the commencement of the test.
Loadbearing Capacity Criteria	A linear deflection transducer was provided at the approximate centre on the unexposed surface of the specimen to record its vertical deflection.
Furnace Pressure	After the first five minutes of testing and for the remainder of the test, the furnace atmospheric pressure was controlled so that it complied with the requirements of BS EN 1363-1: 2020, clause 5.2.1 The calculated pressure differential relative to the laboratory atmosphere 100 mm below the soffit of the specimen was 18 (\pm 5) Pa between 5 and 10 minutes and 18 (\pm 3) Pa thereafter.

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Test Construction

Figure 1 – General plan view of test specimen showing thermocouple positions- unexposed face and Transverse (A-A) and Longitudinal (B-B) section through test specimen



TRANSVERSE (A-A) AND LONGITUDINAL (B-B) SECTION THROUGH TEST SPECIMEN

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Figure 2 – General plan view of test specimen showing exposed face



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Figure 3 – Downlight 1 JC1001







Do not scale. All dimensions are in mm

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Figure 4 – Downlight 2 JC10010



Do not scale. All dimensions are in mm

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Figure 5 – Downlight 3 JC1101









Do not scale. All dimensions are in mm

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Figure 6 – Downlight 4 JC1102









Do not scale. All dimensions are in mm

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Figure 8 – Downlight 6 JC010036





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Figure 9 – Downlight 7 JC010037







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Figure 10 – Downlight 8 JC010038







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Figure 11 – Downlight 9 JC010039







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Figure 12 – Downlight 10 JC010040









Do not scale. All dimensions are in mm

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Figure 13 – Downlight 11 JC010041







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Figure 14 – Downlight 12 010042







Schedule of Components

(Refer to Figures 1 to 14) (All values are nominal unless stated otherwise) (All other details are as stated by the sponsor)

<u>Item</u>

Description

Timber framework (comprising items 1		
- 3) 1 End beams & noggins		
Material		C16 softwood
Section size	:	220 mm deen x 45 mm wide
Density	:	475 kg/m ³ (stated)
Fixing method	:	End beams through fixed with six nails to each joist
	•	ioint. Noggins fixed to joists with two nails per joint.
Fixings		,
i. type	:	Ring shank nails
ii. size	:	100 mm long x 3.8 mm diameter
2. Metal web joist		
Manufacturer	:	Wolf Systems
Reference	:	Easi-Joist WS200
Assembled joist size	:	72 mm wide (nominal,) x 220 mm deep x 4200mm long
Top and bottom chords		
i. material	:	TR26 grade European whitewood
ii. density	:	444 kg/m ^o (stated)
iii. cross section	:	72 mm horizontal (nominal,) x 47 mm vertical x 4200 mm long
End and Internal Blocks		
i. material	:	TR26 grade European whitewood
ii. density	:	444 kg/m [°] (stated)
iii. cross section	:	72 mm horizontal (nominal) x 45 mm vertical x 130 mm
		long
		WO000 webs
I. reference	-	WS200 webs
II. Indienal	:	125 mm high x 200 mm long x 1.0 mm thick, 12 off each
III. Section size	•	side of joist
iv fixing method		Fitted between top and bottom chords and fixed via
IV. Inking method	•	integral nailplate
Centres	:	600 mm
3. Strongback		
Material	:	Softwood (Grade TR26)
Section size	:	97 mm deep x 35 mm wide
Density	:	444 kg/m ³ (nominal)
Fixing method	:	Through fixed to joists with 2 nails at each joint with nails
Fixings		
i. type	:	Stainless steel nails
ii. size	:	60 mm long x 4.0 mm diameter

Item

4. Floorboards Manufacturer Norbord : Reference : Caberfloor P5 Material Chipboard (tongue & groove) : Thickness 22 mm Density 669 kg/m³ (stated) Through fixed to timber framework with screws. Fixing method : Adhesive was applied to the top of joists and to tongue and groove joints Fixings Reisser i. manufacturer **Cutter High Performance Wood Screws** ii. reference Yellow tropicalised steel screws iii. type 60 mm long x 4.0 mm diameter iv. size v. centres 200 mm Adhesive : Caberfix i. reference ii. type D4 grade adhesive 5. Ceiling boards Manufacturer British Gypsum : Reference : Gyproc WallBoard Aerated high-density gypsum core encased in strong Material : paper liners Thickness : 15 mm Density 660 kg/m³ (stated) Through fixed to internal framework with screws. Board Fixing method joints were taped and filled Fixings i. manufacturer : British Gypsum ii. reference : 55 mm Collated Drywall Screws iii. type : Black phosphate coated steel screws 55 mm long x 3.5 mm diameter iv. size : v. centres : 150 mm (edge), 150 mm (field) Tape i. manufacturer : British Gypsum ii. reference : 48mm FibaTape Filler i. manufacturer : British Gypsum Gyproc Ready Mix Joint Cement ii. reference : 6. Downlight 1 Manufacturer JCC Lighting : JC1001 Reference : Description Fixed LED recessed downlight : Material Mild steel (can), aluminium (bezel), steel (spring clip), : polycarbonate (connection block) Overall sizes 48mm (can), 58 mm (overall)

Description

- i. height
- ii. overall diameter
- iii. cut-out diameter

84mm 70 mm

<u>ltem</u>

Description

7. Downlight 2	
Manufacturer :	JCC Lighting
Reference :	JC10010
Description :	Fixed LED Recessed Downlight
Material :	Mild steel (can), aluminium (bezel), steel (spring clip),
	polycarbonate (connection block)
Overall sizes :	
i. heiaht :	46 mm
ii overall diameter	80 mm
iii cut-out diameter	70 mm
8. Downlight 3	
Manufacturer	JCC Lighting
Reference :	
Description :	X50 Fire Rated Downlight
Meterial .	Mild steel (con) aluminium (bezel) steel (corring alin)
Material	Mild Steel (can), aluminium (bezel), steel (spring clip),
Overall sizes	polycarbonate (connection block)
i. neight :	58 mm (can), 60 mm (overall)
II. overall diameter :	83 mm
iii. cut-out diameter :	68 mm
9. Downlight 4	
Manufacturer :	JCC Lighting
Reference :	JC1102
Description :	X50 Tilt Fire Rated Downlight
Material :	Mild steel (can), aluminium (bezel), steel (spring clip),
	polycarbonate (connection block)
Overall sizes :	
i. height :	62 mm
ii. overall diameter :	100 mm
iii. cut-out diameter :	82 mm
10. Downlight 5	
Manufacturer :	JCC Lighting
Reference :	JC1020
Description :	LED Recessed Plaster in Downlight
Material	Mild steel (can) aluminium (bezel) polycarbonate
	(connection block)
Overall sizes :	
i, height :	80mm
ii overall diameter	121
iii cut-out diameter	70 mm
	70 mm
11. Downlight 6	
Manufacturer	JCC Lighting
Reference	JC010036
Description :	CI 110 Recessed Plaster in downlight
Matorial .	Mild stool (oop) aluminium (bazal) stool (opring alia)
ויומוכוומו	ivinu sieer (can), auriminium (bezer), sieer (spring clip),
Overall sizes	
i hoight	120mm
i. neight :	100mm
ii. overall diameter :	
III. cut-out diameter :	тт оо

<u>ltem</u>

Description

12. Downlight 7			
Manufacturer	:	JCC Lighting	
Reference	:	JC010037	
Description	:	GU10 Recessed 100mm Converter Downlight	
Material	:	Mild steel (can), aluminium (bezel), steel (spring clip),	
	-	polycarbonate (connection block)	
Overall sizes	:		
i, height		86 mm	
ii overall diameter		100 mm	
iii cut-out diameter		90 mm	
	•	56 mm	
13 Downlight 8			
Manufacturer		ICC Lighting	
Peference	:		
Description	:	CU10 Decessed 125mm Converter Develight	
Description	:	GUTO Recessed Toomin Convener Downinght	
Material	•	Mild steel (can), aluminium (bezel), steel (spring clip)	
		polycarbonate (connection block)	
	•	<u></u>	
i. height	•	86 mm	
ii. overall diameter	:	135 mm	
iii. cut-out diameter	:	125 mm	
14. Downlight 9			
Manufacturer	:	JCC Lighting	
Reference	:	JC010039	
Description	:	GU10 Recessed 170mm Converter Downlight	
Material	:	Mild steel (can), aluminium (bezel), steel (spring clip),	
		polycarbonate connection block)	
Overall sizes	:	, ,	
i, height	:	86 mm	
ii. overall diameter		170 mm	
iii cut-out diameter		157 mm	
	-		
15. Downlight 10			
Manufacturer	:	JCC Lighting	
Reference	:	JC010040	
Description		GU10 Recessed 100mm Converter Downlight	
Material		Mild steel (can) aluminium (bezel) steel (spring clip)	
	•	polycarbonate (connection block)	
Overall sizes	:	· · · · · · · · · · · · · · · · · · ·	
i. height	:	86 mm	
ii overall diameter		100 mm	
iii cut-out diameter	:	90 mm	
	•	30 mm	
16. Downlight 11			
Manufacturer	:	JCC Liahtina	
Reference		JC010041	
Description	:	GU10 Recessed 135mm Converter Downlight	
Material	:	Mild steel (can) aluminium (bozol) steel (opring alin)	
ויומנכוומו	•	null steel (car), aluminium (bezel), steel (spilly clip),	
Overall sizes			
i height	:	86 mm	
ii overall diametor	:	135 mm	
ii. out out diameter	:	105 mm	
	•	123 11111	

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Description

17. Downlight 12

Manufacturer Reference Description Material

<u>Item</u>

Overall sizes

- i. height
- ii. overall diameter
- iii. cut-out diameter

- JCC Lighting
- JC010042
- GU10 Recessed 170mm Converter Downlight
- : Steel (can), aluminium (bezel), steel (spring clip),
 - polycarbonate (connection block)
- : : 86 mm

:

:

:

- : 170 mm
- : 157 mm

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Test Observations

Tim	e	All observations are from the exposed face unless noted otherwise.
- 90	00	Load applied
00	00	The test commences.
05	00	Smoke/Steam release around the perimeter of the specimen.
15	00	When viewed from the exposed face, jointing compound has detached and joints in boards begin to open.
29	00	When viewed from the exposed face, sections of plasterboard have begun to detach.
30	00	Specimen maintaining performance criteria.
33	00	Smoke and steam release through the joints in the floorboards.
42	00	Test discontinued owing to load bearing failure.

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Test Photographs

The exposed face of the floor assembly prior to test



The unexposed face of the floor assembly prior to test

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The unexposed face of the floor assembly after 15 minutes of testing



The unexposed face of the floor assembly after 30 minutes of testing

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The unexposed face of the floor assembly after 41 minutes of testing



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Temperature, Pressure and Deflection Data

Mean Furnace Temperature, Together With The Temperature/Time Relationship Specified In The Standard BS EN 1363-1: 2020

-			
Time	Specified	Actual	
	Furnace	Furnace	
Mins	Temperature	Temperature	
	Deg. C	Deg. C	
0	20	33	
2	445	386	
4	544	543	
6	603	589	
8	646	641	
10	678	660	
12	706	698	
14	728	729	
16	748	745	
18	766	768	
20	781	782	
22	796	797	
24	809	812	
26	820	821	
28	832	832	
30	842	843	
32	852	842	
34	860	858	
36	869	867	
38	877	879	
40	885	888	
42	892	892	

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Time	T/C	T/C	T/C	T/C	T/C	Mean
	Number	Number	Number	Number	Number	Mean
Mins	211	212	213	214	215	Temp
	Dea. C					
0	25	26	25	26	26	26
2	25	26	25	26	26	26
4	25	26	25	26	26	26
6	25	26	25	26	26	26
8	26	26	25	26	26	26
10	26	27	26	27	27	27
12	27	28	26	28	28	27
14	29	30	28	30	30	29
16	31	32	29	31	31	31
18	32	34	30	33	33	32
20	34	36	31	35	35	34
22	36	38	33	37	37	36
24	38	42	34	40	38	38
26	42	47	36	44	41	42
28	47	54	39	49	44	47
30	55	64	44	57	48	54
32	63	74	51	76	54	64
34	74	89	66	84	70	77
36	88	92	73	87	83	85
38	88	92	78	88	88	87
40	89	93	84	90	90	89
42	92	94	89	112	93	96

Individual Temperatures And Mean Recorded On The Unexposed Surface Of The Specimen

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Individual Temperatures Recorded On The Unexposed Surface Of The Specimen Adjacent to Joints

Time	T/C	T/C	T/C	T/C	T/C	T/C
	Number	Number	Number	Number	Number	Number
Mins	216	217	219	220	221	222
	Deg. C					
0	25	25	25	25	25	21
2	25	25	25	25	25	21
4	25	25	25	25	25	21
6	25	25	25	25	25	21
8	25	26	26	25	25	21
10	26	26	26	26	26	22
12	27	28	28	27	27	23
14	29	29	29	28	28	24
16	30	31	31	30	29	26
18	32	33	33	32	31	27
20	34	35	35	34	32	29
22	36	37	37	36	34	31
24	37	40	39	37	36	32
26	40	44	42	40	38	35
28	43	48	46	43	41	38
30	47	54	51	47	46	43
32	53	60	57	59	56	57
34	59	68	64	72	70	69
36	74	80	74	79	79	75
38	84	82	81	85	86	79
40	86	84	84	95	118	85
41	87	85	86	111	246	95
42	87	86	86	253	400	109

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Individual Temperatures Recorded At Mid-Height Of The Cavity Coincidental With The Light Fittings

Time	T/C	T/C	T/C	T/C	T/C	T/C
	Number	Number	Number	Number	Number	Number
Mins	223	224	225	226	227	229
	Deg. C					
0	26	28	28	28	28	30
2	31	38	34	45	32	36
4	58	60	62	72	62	65
6	80	71	84	82	71	72
8	94	86	95	92	83	83
10	105	95	119	131	95	94
12	116	108	123	270	102	102
14	116	121	127	232	109	109
16	120	132	136	249	120	123
18	137	144	182	247	145	159
20	162	187	217	264	180	197
22	187	212	239	319	219	223
24	208	224	264	363	239	249
26	228	248	287	384	263	273
28	245	263	310	410	284	296
30	260	287	342	419	304	317
32	278	446	751	389	535	329
34	447	769	802	677	749	515
36	564	808	834	807	807	731
38	611	829	853	834	830	810
40	637	840	868	865	845	845
42	810	852	878	866	863	854

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Time	T/C	T/C	T/C	T/C	T/C	T/C
	Number	Number	Number	Number	Number	Number
Mins	230	231	232	233	234	235
	Deg. C					
0	18	30	30	32	31	32
2	12	38	39	39	36	42
4	*	63	62	69	61	76
6	*	78	90	83	74	96
8	*	90	102	93	89	106
10	*	101	119	106	104	109
12	*	106	123	110	109	114
14	*	114	139	120	127	119
16	*	130	142	144	131	128
18	*	171	143	175	147	147
20	*	210	165	224	184	188
22	*	241	187	279	209	230
24	*	266	207	289	234	254
26	*	293	224	309	255	270
28	*	317	233	324	280	296
30	*	343	253	328	299	367
32	*	391	277	341	351	694
34	*	777	360	524	719	713
36	*	812	504	707	760	757
38	*	838	646	793	783	776
40	*	864	695	817	811	806
42	*	872	726	838	819	819

Individual Temperatures Recorded At Mid-Height Of The Cavity Coincidental With The Light Fittings

*Indicates thermocouple malfunction

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Time	Central	Rate			
	Vertical	Of			
Mins	Deflection	Deflection			
	mm	mm/min			
0	0.0	0.0			
2	0.7	0.3			
4	1.1	0.2			
6	1.7	0.3			
8	2.4	0.3			
10	3.2	0.3			
12	3.8	0.3			
14	4.5	0.4			
16	5.2	0.4			
18	5.8	0.3			
20	6.5	0.3			
22	7.6	0.5			
24	8.5	0.6			
26	9.6	0.5			
28	10.9	0.7			
30	12.2	0.7			
32	19.0	5.6			
34	48.0	18.8			
36	83.5	21.2			
38	123.1	18.8			
40	161.8	17.9			
41	184.8	23.0			
42	210.3	25.5			

Central Vertical Deflection Of The Specimen

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Graph Showing Mean Furnace Temperature, Together With The Temperature/Time Relationship Specified In The Standard



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Graph Showing Mean Temperature Recorded On The Unexposed Surface Of The Specimen

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250.0 200.0 150.0 **Deflection - mm** - 100.0 50.0 0.0 5 10 15 0 20 25 30 35 40 45 **Time - Minutes**

Graph Showing The Recorded Vertical Deflection Of The Specimen

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On-going Implications

Limitations This report details the method of construction, the test conditions and the results obtained when the specific elements of construction described herein were tested following the procedure outlined in BS EN 1363-1: 2020, and where appropriate BS EN 1363-2: 1999. Any significant deviation with respect to size, constructional details, loads, stresses, edge or end conditions other than those allowed under the field of direct application in the relevant test method is not covered by this report. Annex A of BS EN 1363-1: 2020, provides guidance information on the application of fire resistance tests and the interpretation of test data.

EGOLF Certain aspects of some fire test specifications are open to different interpretations. EGOLF have identified a number of such areas and have agreed Resolutions which define common agreement of interpretations between fire test laboratories which are members of the Groups. Where such Resolutions are applicable to this test they have been followed

provide a stated degree of accuracy of the result.

Field of Direct Application

The results are directly applicable to a similar untested floor construction provided the following is true:

a) With respect to the structural building member:

The maximum moments and shear forces, which when calculated on the same basis as the test load, shall not be greater than those tested.

b) With respect to the ceiling system:

The size of panels of the ceiling lining may be increased by a maximum of 5 % but limited to a maximum of 50 mm. The length of the grid members can be increased accordingly.

The total area occupied by fixtures and fittings relative to the area of the ceiling lining is not increased and the maximum tested opening in the lining is not exceeded.

c) With respect to the cavity:

The height of the cavity 'h' and the minimum distance 'd' between the ceiling and the structural members (see Figure below) are equal to or greater than those tested.



KEY

- a) suspended ceiling
- b) self-supported ceiling
- c) and d) direct fixed ceiling with insulation in cavity
- 1 supporting construction (joist)
- 2 ceiling lining
- 3 supporting frame

- 4 insulation
- 5 pressure reference line
- d distance between ceiling and structural members h height of cavity