

Test Report

No. AJFS1904003042FF

Date: MAY 29, 2019

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LED GROUP

NANGOR ROAD, DUBLIN 12, D12 E7VP, IRELAND

The following sample(s) was / were submitted and identified on behalf of the client. SGS is not responsible for the authenticity, integrity and results of the data and information and / or the validity of the conclusion. results apply to the sample as received.

Sample Description: LED FIRE RATED DOWNLIGHT

Test Style/Item No.: RRA083060-01;RRA084060-01; RUL07X0-01; RATR0113060-01; RATR0114060-01

Other Info: RUL05X0-01; RUL0530-01; RUL0540-01; RUL0730-01; RUL0740-01;

RUL070WIFI-01;2755312;2755313; 2755314; STLEDDL5CWV2; STLEDDL5WWV2; STLEDDL7WIFI (5W/7W ULTIMUM); RATR6P03038-01; RATR6P04038-01; RATR6P03038NC-01; RATR6P04038NC-01; RATR8P03038-01; RATR8P04038-01; RATR8P03038NC-01; RATR8P04038NC-01

Test Requested:

Fire Resistance Test of the Loadbearing Timber Floor Assembly Sample, Incorporating Twelve Fire Rated Downlights Fittings, in accordance with BS EN 1365-2-2014 Fire resistance tests for loadbearing elements Part 2: Floors and roofs.

Test Results: -- See attached sheet --

Test Period:

Sample Receiving Date : APR.11, 2019

Test Performing Date : APR.11, 2019 TO APR.13, 2019

Signed for and on behalf of
SGS-CSTC Co., Ltd. Anji Branch

Allen Zou
Lab Manager



1. Introduction

Determine the fire resistance performance of 4600mm*3300mm floor sample in accordance with BS EN 1365-2:2014 Fire resistance tests for loadbearing elements Part 2: Floors and roofs. And the Conditions of Acceptance in accordance with BS EN 1363-1:2012 Fire resistance tests Part 1: General Requirements The specified side of submitted sample was exposed to elevated temperatures as dictated by the BS EN 1363-1 time-temperature curve for a period of 91 minutes under loaded condition.

This test report should be read in conjunction with BS EN 1365-2:2014 Fire resistance tests for loadbearing elements Part 2: Floors and roofs and with BS EN 1363-1:2012 Fire resistance tests Part 1: General Requirements.

The test was conducted on APR.13, 2019.

2. Test Sample

The timber floor had overall nominal dimensions of 4600 mm long by 3300 mm wide and comprised softwood timber joists at 550 mm centres. The upper surface of the floor comprised one layer nominally 18 mm thick Egger chipboard flooring.

The floor assembly was protected on its underside by a direct fixed ceiling, formed from two layers of 15mm thick Knauf plasterboard, the layers were screw fixed to the underside of the floor joists.

One layer of 50mm thick rock wool was filled within the cavity between the floor and the ceiling.

The floor supported an evenly distributed load of 50 kg/m².

The ceiling incorporated twelve downlights referenced as follows:

To be continued....



Specimen No.	Model	Description
A	RRA083060-01	Size: 85.4mm Ø by 92.7mm Round, fixed downlight, 70 mm cut-out
B	RRA084060-01	Size: 85.4mm Ø by 92.7mm Round, fixed downlight, 70 mm cut-out
C	RUL07X0-01	Size: 84.3mm Ø by 60.2mm Round, fixed downlight, 72 mm cut-out
D	RUL07X0-01	Size: 84.3mm Ø by 60.2mm Round, fixed downlight, 72 mm cut-out
E	RATR0113060-01	Size: 91.2mm Ø by 106.4mm Round, fixed downlight, 70 mm cut-out
F	RATR0114060-01	Size: 91.2mm Ø by 106.4mm Round, fixed downlight, 70 mm cut-out

Schedule of Components

(Refer to Figures 1 to 3)

Timber floor assembly (items 1 to 4)

1. Floor Joists

Materials : Softwood Timber Joists

Over section size : 50 mm thick by 200 mm deep

Density of Joist : About 600 kg/m³

Joint centres : 550 mm

2. Floor boards

Manufacturer : Egger

Materials : Egger Chipboard, E1

Thick : 1 layer, 18 mm thick

Size : About 700 kg/m³

Fixing method : All board screw fixed to all joists using drywall steel screws 55 mm long by 3.9 mm diameter screws, at 200 mm centres along joints and 150 mm centres align perimeter of floor.

To be continued....



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3. Ceiling boards

Manufacturer : Knauf

Materials : Gypsum plasterboard

Thick : 2 layers, each 15 mm thick

Size : About 720 kg/m³

Fixing method : All board joints staggered with respect to adjacent layer and screw fixed to all joists using drywall steel screws, 35 mm long by 3.9 mm diameter screws for first layer and 55 mm long by 3.9 mm diameter screws for second layer, at 200 mm centres along joints and 150 mm centres align perimeter of ceiling.

4. Rockwool

Materials : Rockwool

Thick : 50mm

Size : About 68 kg/m³

Fixing method : Filled into the cavity between the floor and the ceiling

5. Specimen "A"

Product Name : LED FIRE RATED DOWNLIGHT

Model : RRA083060-01

Type : Round, fixed downlight

Overall dimensions and construction : See Figure 2

Hole size in ceiling boards : 70 mm diameter

To be continued....



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6. Specimen "B"

Product Name : LED FIRE RATED DOWNLIGHT
 Model : RRA084060-01
 Type : Round, fixed downlight
 Overall dimensions and construction : See Figure 2
 Hole size in ceiling boards : 70 mm diameter

7. Specimen "C"

Product Name : LED FIRE RATED DOWNLIGHT
 Model : RUL07X0-01
 Type : Round, fixed downlight
 Overall dimensions and construction : See Figure 3
 Hole size in ceiling boards : 72 mm diameter

8. Specimen "D"

Product Name : LED FIRE RATED DOWNLIGHT
 Model : RUL07X0-01
 Type : Round, fixed downlight
 Overall dimensions and construction : See Figure 3
 Hole size in ceiling boards : 72 mm diameter

9. Specimen "E"

Product Name : LED FIRE RATED DOWNLIGHT
 Model : RATR0113060-01
 Type : Round, fixed downlight
 Overall dimensions and construction : See Figure 4 and 5
 Hole size in ceiling boards : 70 mm diameter

To be continued....



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10. Specimen "F"

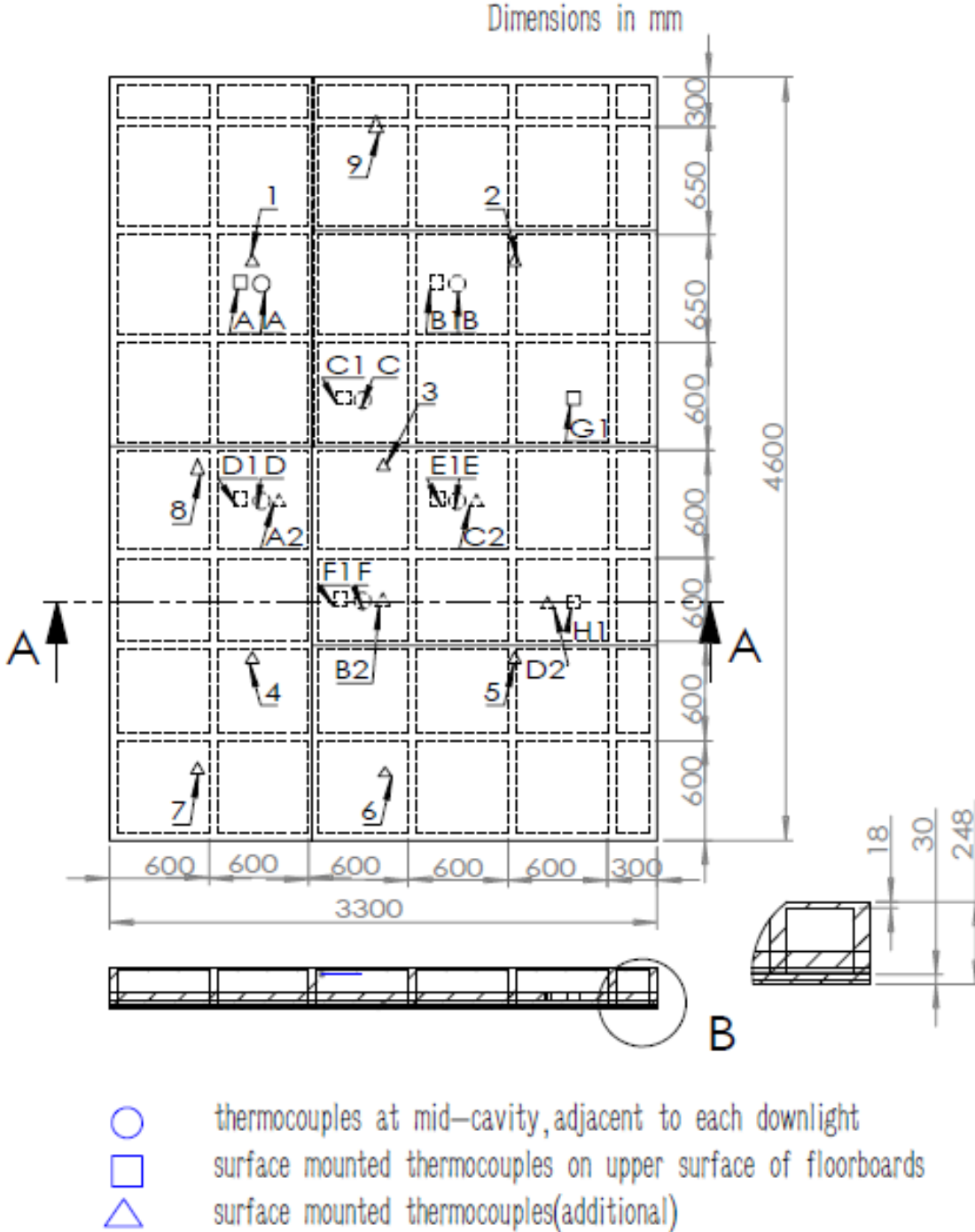
Product Name : LED FIRE RATED DOWNLIGHT
Model : RATR0114060-01
Type : Round, fixed downlight
Overall dimensions and construction : See Figure 4 and 5
Hole size in ceiling boards : 70 mm diameter

The preparation of tested assembly took place in the test laboratory over a total combined time of 3 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 14°C to 23°C and 52% to 67% respectively. The tested sample was supported on the horizontal furnace with an opening of the 3000mm by 4200mm. The all around of the furnace wall was covered by ceramic fibre cotton. The tested sample was asymmetrical. At the request of client, the sample was mounted such that underside (plasterboard ceiling) towards to the heating conditions of the test.

To be continued....



Figure 1 - General Plan of Test Sample from Unexposed Face and Thermocouple Positions

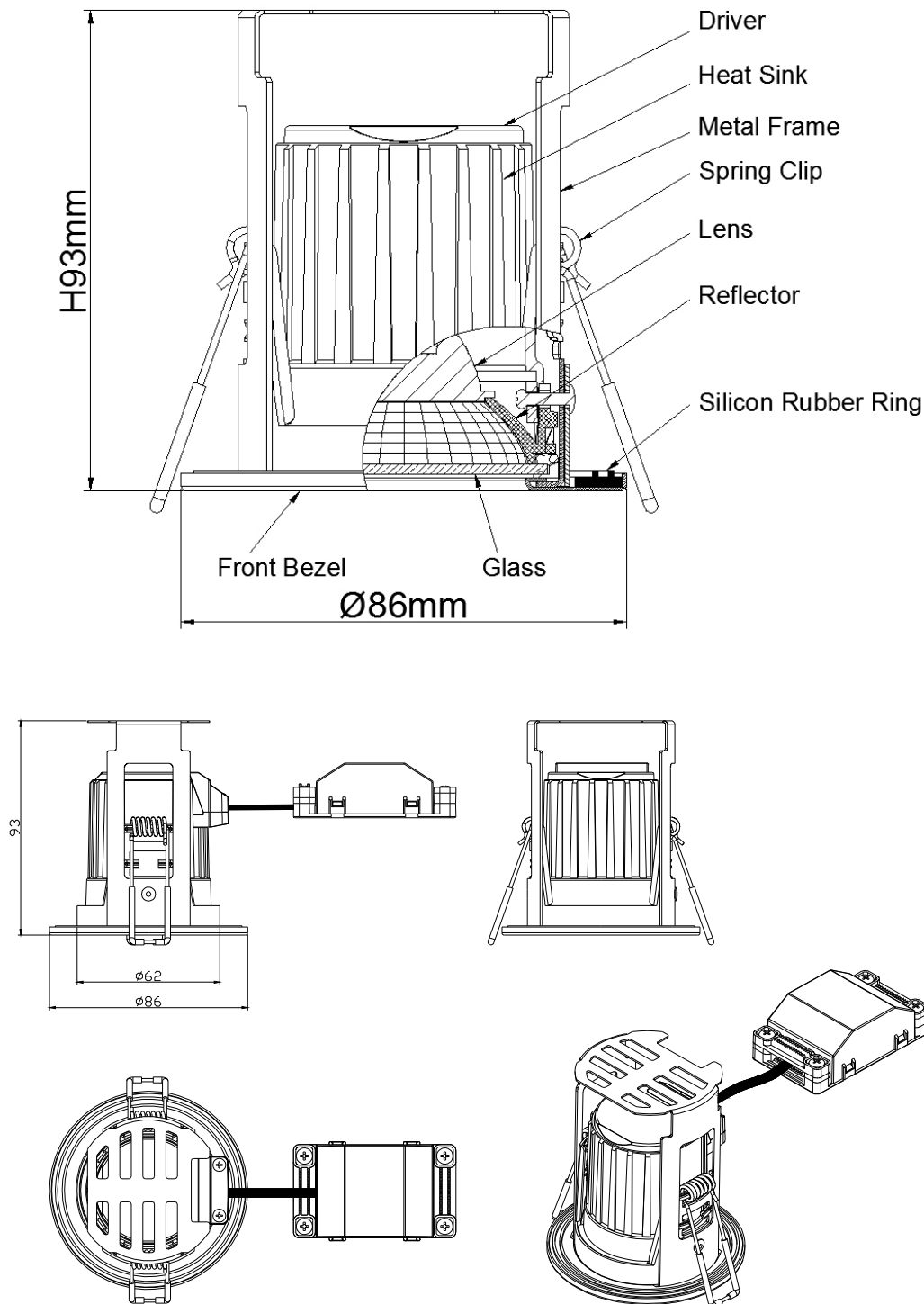


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Figure 2 - Details of Specimens 'A' (RRA083060-01) & 'B'(RRA084060-01) Downlights

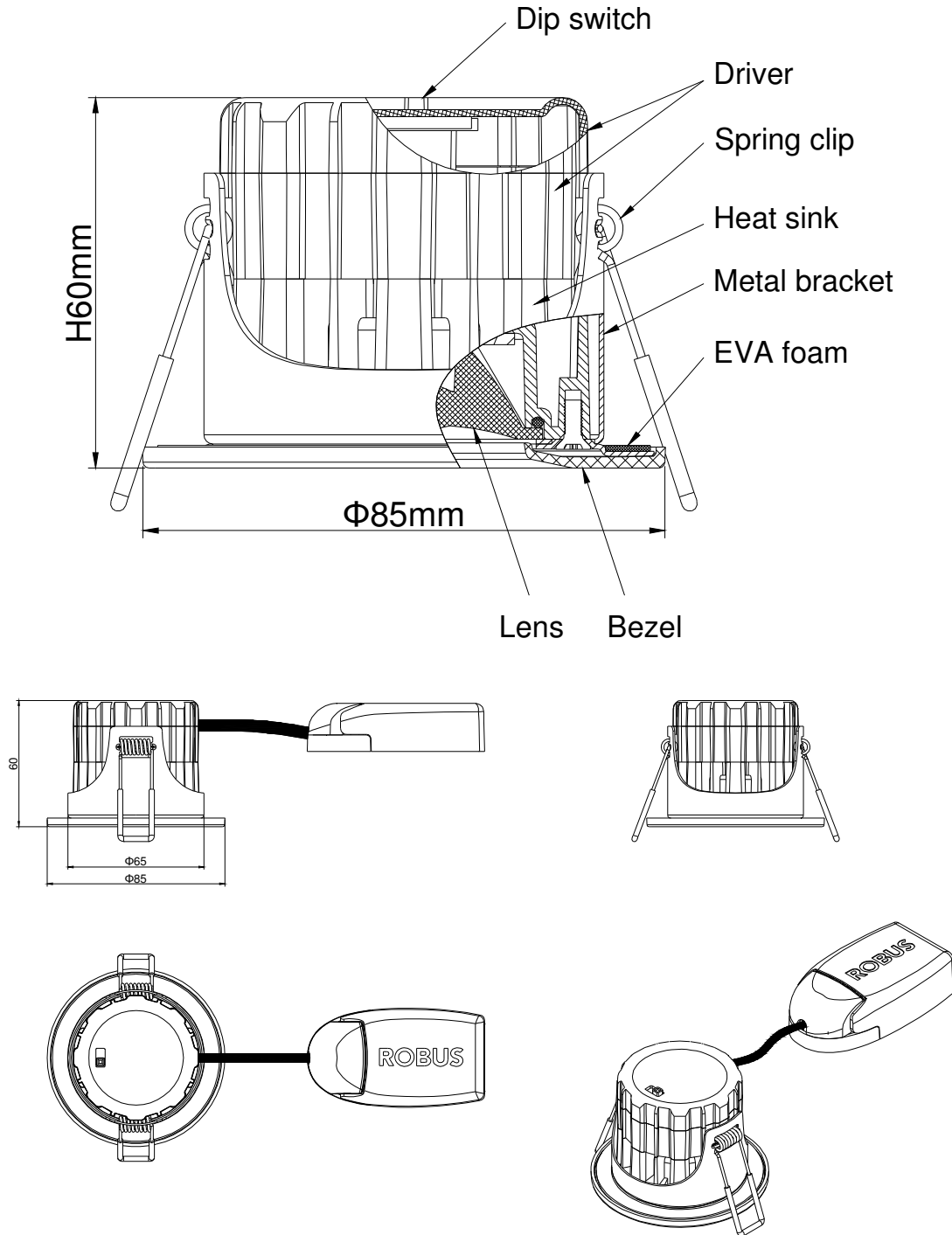


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Figure 3 - Details of Specimens 'C' & 'D' Downlights (RUL07X0-01)



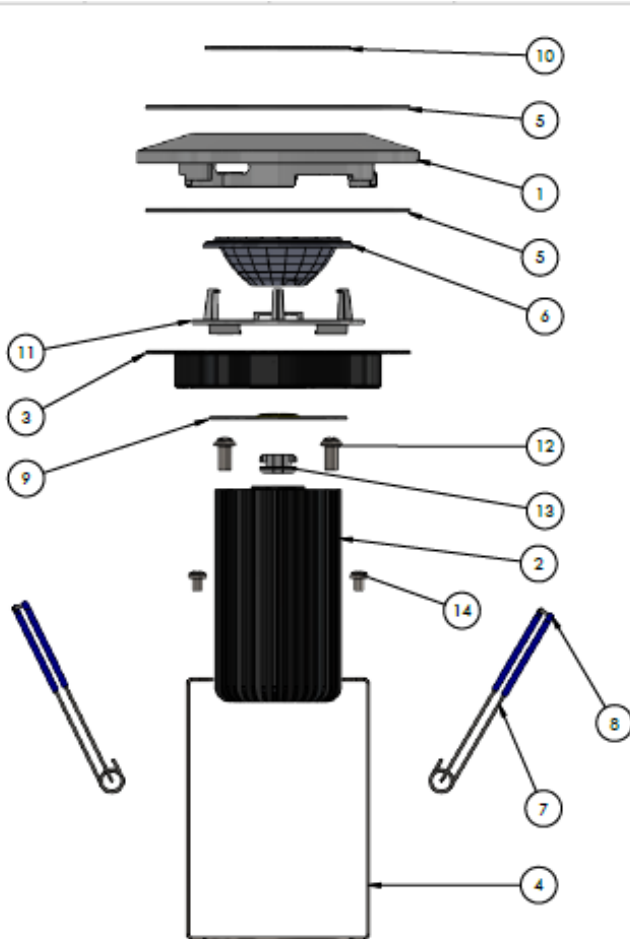
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Figure 4 - Details of Specimens 'E' (RATR0113060-01) & 'F' (RATR0114060-01) Downlights



ITEM NO.	PART NUMBER	DESCRIPTION	11W/QTY.
1	RATR.001.000.001	Bevel	1
2	RATR.001.000.023	Heat Sink 11W	1
3	RATR.001.000.002	LED Holding Platform	1
4	RATR.001.000.022	Clamp Plate 11W	1
5	RATR.001.000.009	Outter Seal	2
6	RATR.001.000.006	LEDChroic 38/60 Degree lens	1
7	RATR.001.000.007	Spring Clamp	2
8	RATR.001.000.011	Spring Clamp Grip	4
9	RATR.001.000.021	DOB Light Engine 11W	1
10	RATR.001.000.008	Flat Seal	1
11	RATR.001.000.010	Board Protector	1
12	round cross head screw_ks	M4 Cross Head	2
13	RATR.001.000.012	Wire Gromet	1
14	B18.6.7M - M3 x 0.5 x 4 Type I Cross Recessed PHMS -4N	M3 Cross Head	2

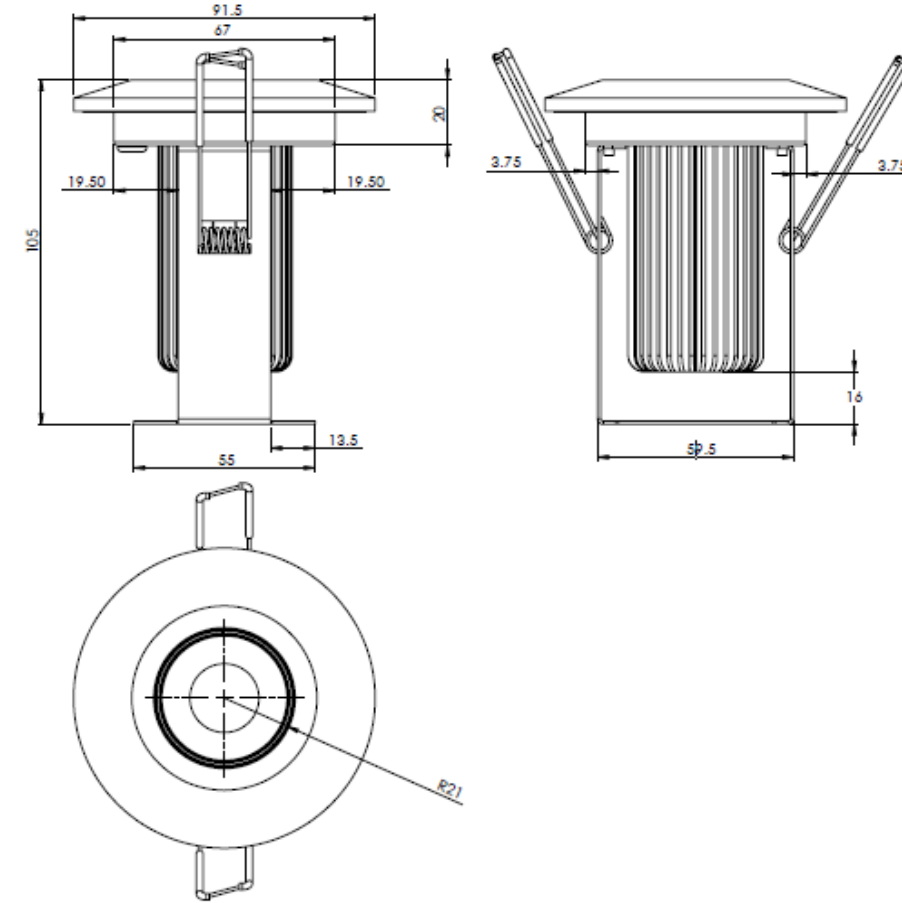
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Figure 5 - Details of Specimens 'E' (RATR0113060-01) & 'F' (RATR0114060-01) Downlights



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3. Test Procedure

The test was conducted in accordance with the procedure specified in BS EN 1363-1:2012, Clause 10.

The furnace was controlled so that the mean furnace temperature, deviation from the mean furnace temperature and uniformity of temperature distribution complied with the requirement of EN 1365-2. Fourteen furnace thermocouples were used to determine the mean furnace temperature.

The temperature of the unexposed face was monitored by means of 9 thermocouples fixed to the unexposed surface of the sample. No.1, 2, 3, 4, 5 thermocouples will be used to calculate the mean temperature rise of the sample. No.1-9 thermocouples were used to determine the maximum temperature of the unexposed surface of the sample.

The locations and reference numbers of the various unexposed surface and internal thermocouples are shown in Figure 1.

A roving thermocouple was available to measure temperatures on the unexposed surface of the sample at any position which might appear to be hotter than the temperatures indicated by the fixed thermocouples.

Cotton pads and gap gauges were available to evaluate the compliance with the integrity criterion of the sample to hot gases. The occurrence of sustaining flaming on the unexposed surface was also checked to determine compliance with the integrity criterion.

Based on the requested of client, the total load 760 kg was applied by weights (Frame and Weights), uniformly distributed over the unexposed surface of test sample.

The deflection, D, was measured from the commencement of heating by distance meter recorded at least one reading per minute, which placed in the centre of the unexposed surface of the tested sample.

During the test, the temperatures, pressures and deflection were continuously monitored and were recorded at one minute intervals.

To be continued....



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4. Test Results

The following data were recorded during the test:

- a) The actual mean furnace temperature/time curve as well as the standard furnace temperature/ time curve, which were shown in Figure 6. The mean temperatures recorded within the furnace were shown in Table 1.
 - b) The mean and maximum temperature rise of the unexposed surface of the sample was shown in Figure 7. The individual temperatures recorded on the unexposed surface of the sample were shown in Table 2.
 - c) The individual temperatures recorded adjacent to the downlight fittings at the mid-height of the cavity were shown in Table 3.
 - d) The deflection of the centre of the unexposed surface of the tested sample was shown in Figure 8. The individual deflections recorded on the unexposed surface of the sample were shown in Table 4.
- The ambient air temperature in the vicinity of the test construction was 20°C at the start of the test with variation of 1°C during the test.

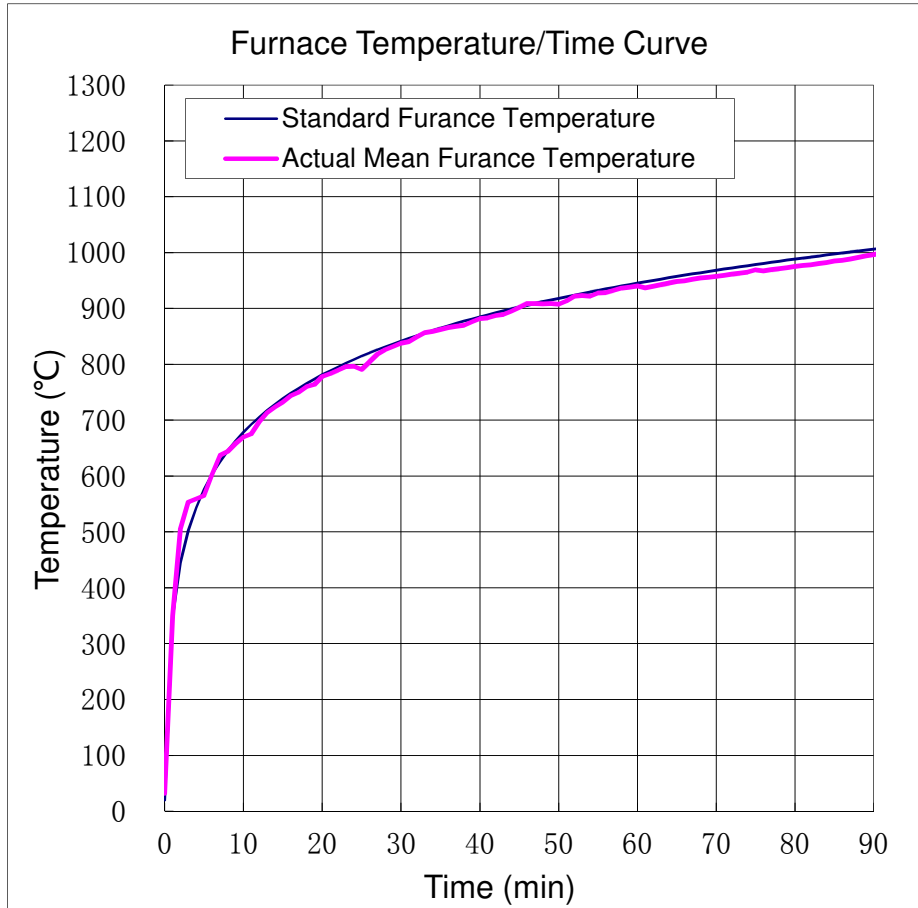
A summary of the observations made on the general behavior of the sample was given in Table 5.

To be continued....



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Figure 6 - Standard and actual Mean Furnace Temperature/Time Curve

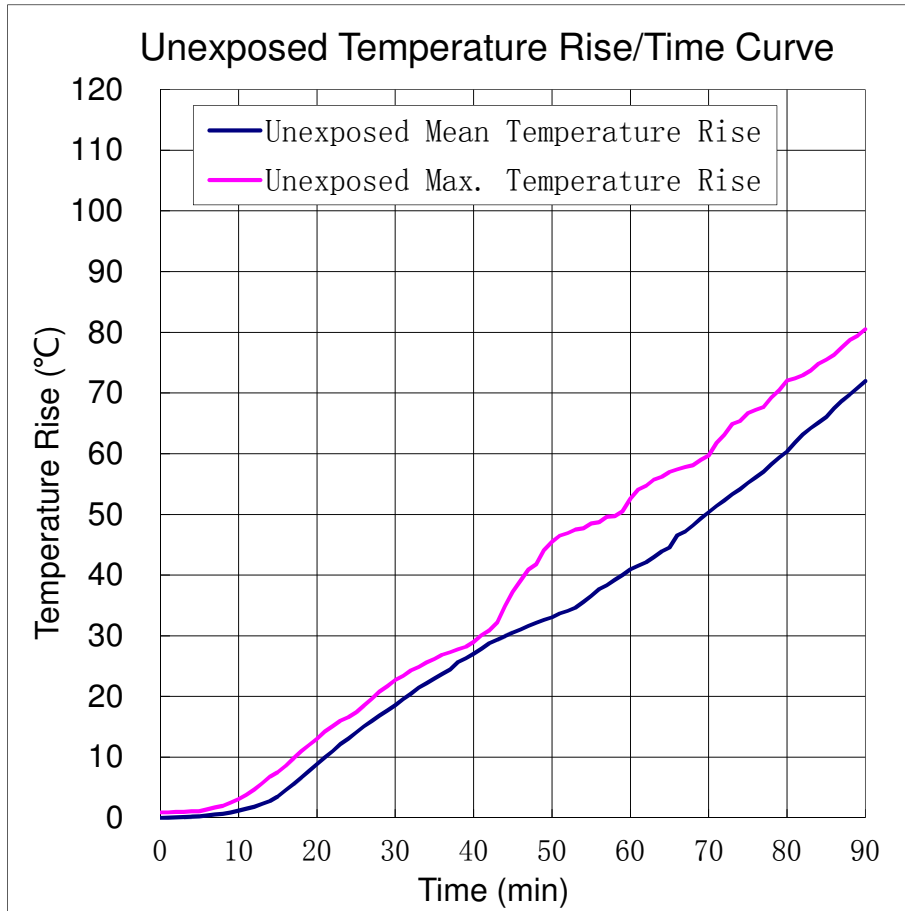


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Figure 9 – Unexposed Surface Mean and Maximum Temperature Rise / Time Curve

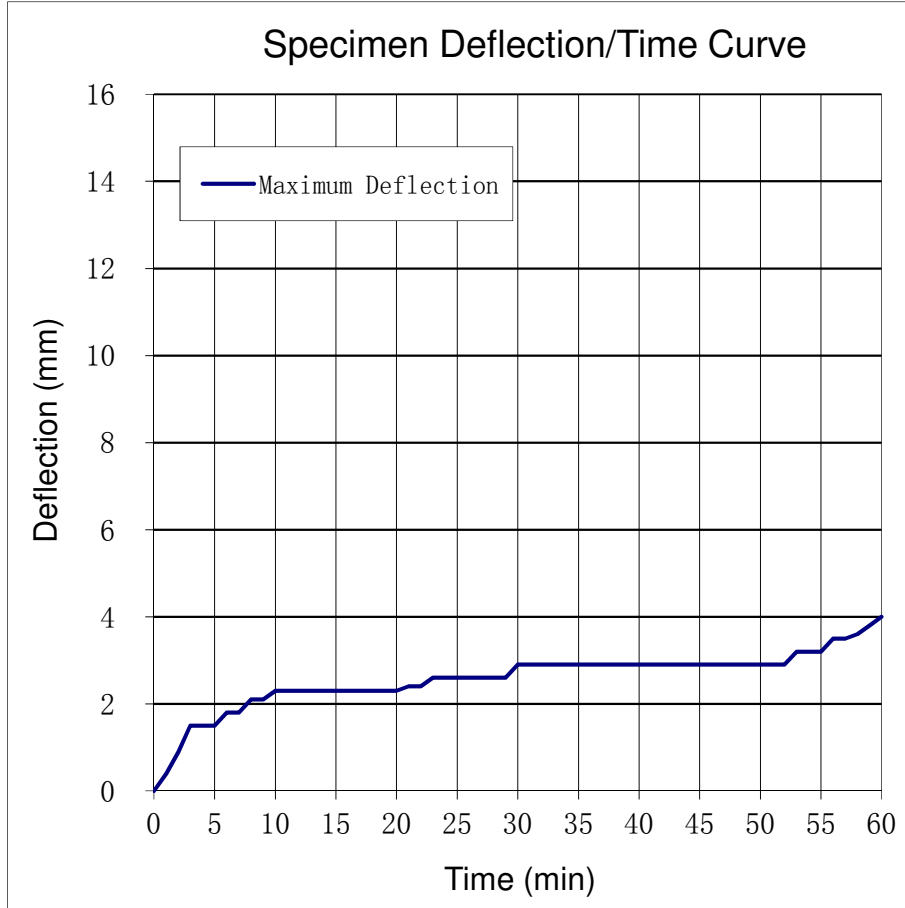


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Figure 10 - Sample Deflection (At the centre of the sample)



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Table 1 Average Temperatures Recorded within the Furnace

Time (mins)	BS 476-20 Std Average (°C)	Furnace Average (°C)	Error (%)
0	20.0	32.1	-
5	576.4	565.2	6.3%
10	678.4	670.1	2.4%
15	738.6	732.4	1.0%
20	781.4	778.1	0.4%
25	814.6	790.5	0.0%
30	841.8	837.7	-0.2%
35	864.8	862.5	-0.2%
40	884.7	882.0	-0.3%
45	902.3	901.9	-0.3%
50	918.1	907.6	-0.3%
55	932.3	927.9	-0.3%
60	945.3	940.2	-0.4%
65	957.3	948.6	-0.4%
70	968.4	957.3	-0.5%
75	978.7	968.9	-0.5%
80	988.4	975.3	-0.6%
85	997.4	984.9	-0.6%
90	1006.0	996.4	-0.7%

To be continued....



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Table 2 Individual Temperatures on the Unexposed Surface of the Sample

Time (mins)	Temperatures (°C)								
	1	2	3	4	5	6	7	8	9
0	19.4	18.6	18.2	18.9	19.9	19.8	19.4	19.2	19.0
5	19.5	18.9	18.6	19.2	20.1	20.1	19.7	19.7	19.1
10	19.8	20.5	19.3	20.7	20.6	22.1	20.4	20.7	19.3
15	21.7	22.9	20.2	26.4	21.5	26.5	21.3	21.1	19.5
20	27.1	27.1	23.8	32.0	29.1	30.1	22.0	21.6	19.6
25	32.1	31.5	29.0	36.4	36.3	32.6	22.5	24.0	20.0
30	35.9	35.8	34.6	39.8	41.7	35.3	24.4	30.1	21.5
35	41.0	39.2	41.2	43.2	45.2	37.7	33.0	38.5	25.3
40	45.3	42.6	47.5	46.7	48.0	39.7	44.3	46.6	29.3
45	50.3	45.1	50.8	50.1	51.4	42.9	56.2	51.2	33.7
50	53.7	47.5	53.2	52.5	53.4	46.1	64.5	54.1	38.2
55	55.6	49.7	56.0	55.0	61.3	48.3	67.5	56.2	43.1
60	58.4	52.7	58.7	58.3	71.6	51.4	69.7	60.0	48.7
65	60.3	59.7	61.1	60.6	76.0	62.9	72.8	66.2	52.2
70	63.6	76.6	64.8	62.9	78.7	70.3	77.5	69.1	66.2
75	69.8	80.9	69.5	65.1	85.7	72.7	82.3	72.1	76.9
80	78.3	85.5	74.7	68.6	89.7	79.5	91.0	80.4	80.4
85	83.1	91.1	82.0	75.7	93.5	83.8	94.5	84.9	85.4
90	87.8	98.2	86.6	84.2	98.1	87.2	99.5	93.6	87.9

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Table 3 Individual Temperatures Recorded Adjacent to
the Downlight Fittings at Mid-height of the Cavity and sponsor Additional

Time (min)	Mid-Cavity Thermocouples (°C)								Additional Thermocouples (°C)			
	A1	B1	C1	D1	E1	F1	G1	H1	A2	B2	C2	D2
0	26.3	28.2	31.9	27.4	28.6	28.7	29.3	30.2	21.3	20.5	19.7	20.7
5	45.3	101.8	73.6	60.6	60.1	62.0	73.9	71.9	21.6	20.8	20.0	21.5
10	94.7	161.6	89.0	145.3	89.8	106.5	116.5	107.7	23.2	21.5	20.3	28.4
15	115.6	174.8	114.8	250.0	118.1	131.0	161.4	125.0	33.2	27.3	20.7	31.4
20	126.9	182.5	143.0	270.6	139.8	213.8	182.4	132.5	43.7	35.1	26.1	34.6
25	138.4	229.5	173.3	309.5	200.2	355.8	239.4	145.7	50.1	41.3	38.3	39.0
30	149.3	253.7	218.3	351.2	300.8	454.0	312.1	202.7	52.6	45.9	50.2	43.6
35	154.1	262.9	356.9	408.8	467.0	494.5	359.7	283.1	55.8	50.2	60.2	48.2
40	240.5	271.2	508.5	524.3	582.6	549.1	407.2	427.6	59.5	55.4	64.0	52.7
45	630.2	509.9	567.5	543.2	642.6	613.1	454.1	569.6	64.1	56.1	65.9	54.8
50	749.9	802.2	692.0	659.0	694.1	660.9	518.1	633.2	67.7	57.5	67.0	55.8
55	757.9	810.4	700.7	740.8	738.0	713.2	578.0	672.5	71.7	59.0	68.3	56.5
60	770.2	823.4	706.7	789.9	748.5	720.3	648.1	715.7	74.4	59.9	68.9	57.5
65	800.9	835.0	710.4	803.0	753.8	730.5	659.2	721.7	77.0	66.3	69.4	60.9
70	837.8	856.9	722.8	808.5	757.6	738.7	672.8	725.4	79.0	70.9	70.5	65.6
75	854.3	863.2	758.7	810.1	783.0	751.7	708.7	737.8	81.5	75.6	72.2	70.4
80	867.3	877.6	763.2	836.2	796.6	763.3	725.7	773.7	85.7	80.6	81.5	79.1
85	871.3	897.1	772.6	849.7	820.9	785.2	744.1	778.2	93.2	87.3	87.2	82.6
90	923.8	931.1	780.9	866.7	828.9	791.5	764.8	787.6	101.3	92.8	90.0	86.5

To be continued....



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Table 4 Deflection Recorded on the Unexposed Surface of the Sample

Time (mins)	Deflection (mm)	Rate of Deflection (mm/min)
0	0.0	---
5	1.5	0.0
10	2.3	0.2
15	2.3	0.0
20	2.3	0.0
25	2.6	0.0
30	2.9	0.3
35	2.9	0.0
40	2.9	0.0
45	2.9	0.0
50	2.9	0.0
55	3.2	0.0
60	4.0	0.2
65	4.6	0.0
70	5.5	0.1
75	6.3	0.0
80	7.2	0.0
85	8.3	0.2
90	10.0	0.9

To be continued....



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Table 5 Observations Made during the Test

Time (min:sec)	Observations
00:00	Furnace Fired
03:20	Slight smoke released from the joints between the joists and flooring
11:00	The downlight surface is all carbonized and discolored.
22:00	The outer layer plasterboard of exposed face cracked.
35:00	The outer layer plasterboard the middle part starts to fall off.
42:30	The outer layer plasterboard the increased fall off.
65:00	The second layer plasterboard began to fall off.
76:00	The second layer plasterboard the increased fall off, the exposed surface produce big fire flame.
90:00	The sample maintained the loadbearing capacity and kept integrity and insulation.
91:00	Test was terminated as per sponsor requirement.

5. Performance Criteria (BS EN1363-1:2012, Clause 11)

The performance of the sample was assessed against the criteria for integrity and insulation in accordance with BS EN1363-1:2012, Clause 11.

Loadbearing Capability:

Failure to support the load is deemed to have occurred when both of the following criteria have been exceeded.

Limiting deflection, $=L^2/400d = 177.8 \text{ mm}$,

And,

Limiting rate of deflection, $=L^2/9000d = 7.9 \text{ mm/min}$,

Where,

L is the clear span of the test sample, in millimetres; $L=4200 \text{ mm}$

d is the distance from the extreme fibre of the design compression zone to the extreme fibre of the design tensile zone of the structural section, in millimetres. $d=248 \text{ mm}$

To be continued....



Integrity: Failure is deemed to occur:

- a) When collapse occurs; or
- b) When sustained flaming for not less than 10s on the unexposed surface occurs; or
- c) For situations where the cotton pad is suitable, when flames and/or hot gases cause flaming or glowing of the cotton fibre pad; or
- d) For situations where the cotton pad is not suitable, when either:
 - i) the 6 mm diameter gap gauge can penetrate a through gap such that the end of the gauge projects into the furnace and the gauge can be moved in the gap for a distance of at least 150 mm; or
 - ii) the 25 mm diameter gap gauge can penetrate a through gap such that the end of the gauge projects into the furnace.

Insulation: Failure is deemed to occur:

- a) When the mean unexposed surface temperature rise more than 140 K; or
- b) When the temperature rise recorded at any position on the unexposed surface, either by a fixed thermocouple or by the roving thermocouple is in excess of 180 K; or
- c) When integrity failure occurs.

6. Conclusion

The tested sample has been subjected to a fire resistance test in accordance with BS EN 1365-2:2014 Fire resistance tests for loadbearing elements Part 2: Floors and roofs.

During the heating period of 90 minutes, the maximum deflection was 10.0mm and the maximum rate of deflection was 1.3 mm/min. No collapse and sustained flaming were occurred. The mean temperature rise of unexposed surface was 72.0°C and the maximum temperature rise was 80.5°C.

The fire resistance performance of the sample was judged against the criteria for insulation and integrity as specified in BS EN 1363-1:2012 chapter 11 of this report, and the sample satisfied the performance requirements for the following period:

Loadbearing capacity	Integrity	Insulation
≥ 90 minutes	≥ 90 minutes	≥ 90 minutes

The test was terminated after a period of 91 minutes as requested by the test sponsor.

To be continued....



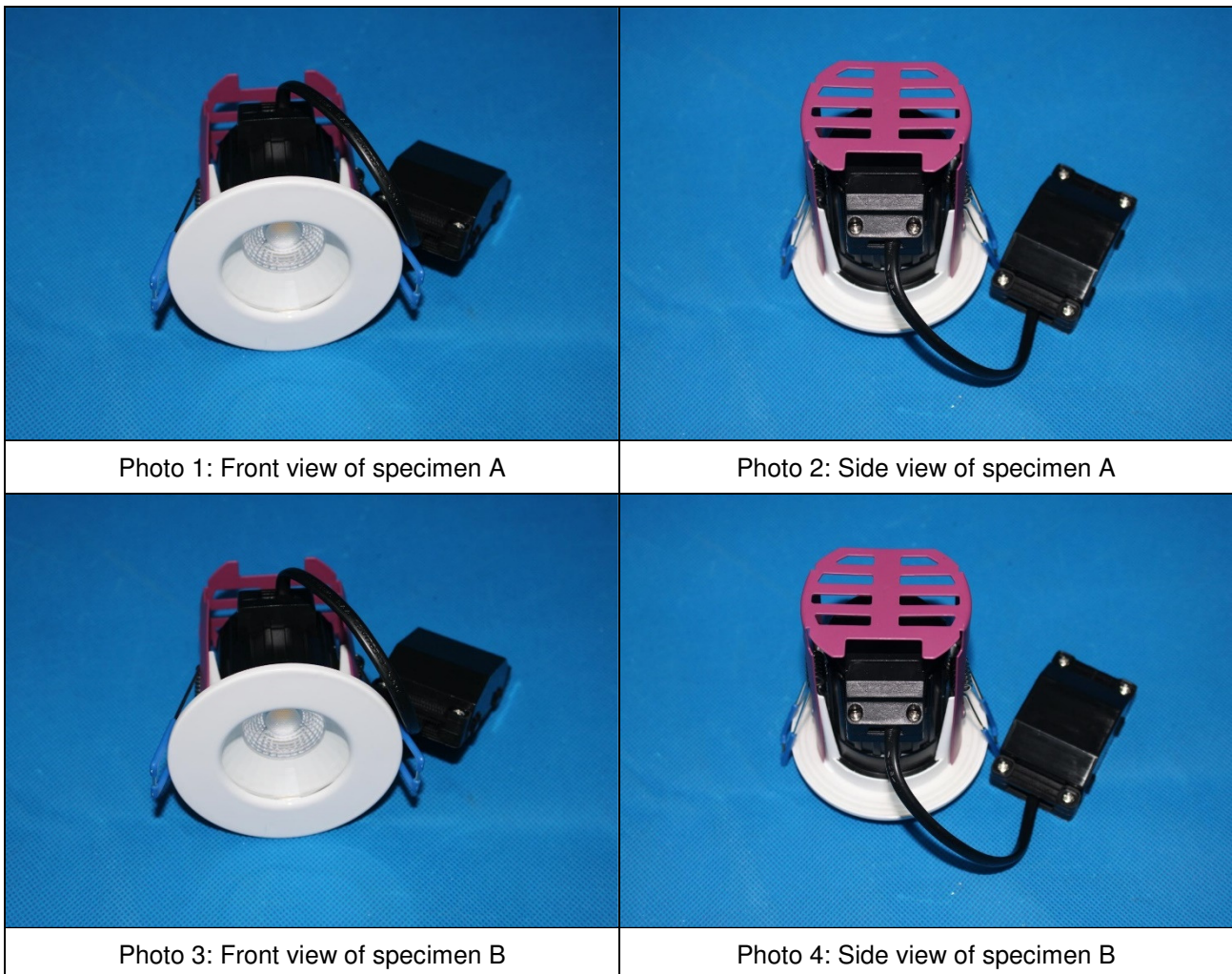
7. Limitation

The results only relate to the behaviour of the sample of the element of construction under the particular conditions of the test. They are not intended to be the sole criteria for assessing the potential fire performance of the element in use nor do they reflect the actual behaviour in fires.

The test results relate only to the sample tested. The fire resistance performance of sample of this design may change if different dimensions, different gaps, incorporating different components, or mounted within different wall construction.

The sample was asymmetrical and was tested such that the specified surface towards the heating conditions of the test. The test result may not be appropriate to situation other side towards the heating conditions.

Appendix - Photographs



To be continued....





Photo 5: Front view of specimen C



Photo 6: Side view of specimen C



Photo 7: Front view of specimen D



Photo 8: Side view of specimen D

To be continued....



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Photo 9: Front view of specimen E



Photo 10: Side view of specimen E



Photo 11: Front view of specimen F



Photo 12: Side view of specimen F

To be continued....



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Photo 13: The unexposed face before the test



Photo 14: The exposed face before the test



Photo 15: The unexposed face before the test
(Distribution of the weights)



Photo 16: The unexposed face of sample
(Test start)

To be continued....



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Photo 17: The exposed face of sample
(After test duration of 10 & 20 minutes)



Photo 18: The unexposed face of sample
(After test duration of 30 minutes)



Photo 19: The exposed face of sample
(After test duration of 30 & 40 minutes)



Photo 20: The unexposed face of sample
(After test duration of 60 minutes)

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Photo 21: The exposed face of sample
(After test duration of 50 & 60 minutes)



Photo 22: The unexposed face of sample
(After test duration of 70 minutes)



Photo 23: The exposed face of sample
(After test duration of 70 & 80 minutes)



Photo 24: The unexposed face of sample
(After test duration of 90 minutes)

SGS authenticate the photo on original report only

End of Report



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