

TEST REPORT

No. : XMIN191002620CCM

Date : Dec.02, 2019

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CUSTOMER NAME: JCC LIGHTING PRODUCTS
ADDRESS: INNOVATION CENTRE SOUTHERN CROSS TRADING ESTATE BEEDING
CLOSE BOGNOR REGIS PO22 9TS

Sample Name : DOWNLIGHT
Client Ref. Info. : Sample A: V50 Fixed Downlight, Type No.: JC1001
Sample B: V50 Tilt Downlight, Type No.: JC1002
Sample C: FG2 IP65 Downlight, Type No.: JC94110
Sample D: FG2 Fixed Downlight, Type No.: JC94113
Sample E: FG2 Tilt Downlight, Type No.: JC94114

Above information and sample(s) was/were submitted and confirmed by the client. SGS, however, assumes no responsibility to verify the accuracy, adequacy and completeness of the sample information provided by client.

Test Required : Selected test(s) as requested by applicant
Date of Receipt : Oct. 29, 2019
Testing Start Date : Oct. 29, 2019
Testing End Date : Nov. 20, 2019
Test result(s) : For further details, please refer to the following page(s)
(Unless otherwise stated the results shown in this test report refer only to the sample(s) tested)

***** To be continued*****

Signed for
SGS-CSTC Standards Technical
Services Co., Ltd. Xiamen Branch
Testing Center


Civi Huang Authorized Signatory



SGS-CSTC Standards Technical Services Co., Ltd.
Xiamen Branch Testing Center Construction Material Laboratory

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Test Summary

To determine the fire resistance of a timber floor assembly protected by a plasterboard ceiling designed to provide 61 minutes fire resistance, incorporating five DOWNLIGHT fittings, when tested in accordance with Clause 7 of BS 476-21:1987 "Fire tests on building materials and structures – Part 21: Methods for determination of the fire resistance of loadbearing elements of construction".

Performance Criteria	Test Results
Loadbearing Capacity	61min (No failure)
Integrity	61min (No failure)
Insulation	61min (No failure)

Note: According to sponsor requirements, the test was discontinued after a period of 61 minutes.

Sample details and conditioning

The ceiling incorporated five DOWNLIGHT fittings referenced as follows:

Test Ref.	Product Name	Reference	Detail
A	V50 Fixed Downlight	JC1001	See Figure 2
B	V50 Tilt Downlight	JC1002	See Figure 3
C	FG2 IP65 Downlight	JC94110	See Figure 4
D	FG2 Fixed Downlight	JC94113	See Figure 5
E	FG2 Tilt Downlight	JC94114	See Figure 6

The floor assembly had overall nominal dimensions of 4696 mm long by 3200 mm wide. The unexposed surface of the floor comprised 1 layer of 18mm thick Egger Chipboard, the layers was screw fixed to the upside of the floor joists.

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

The floor supported an evenly distributed load of 1107.1 N/m².

***** To be continued*****



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Test procedure

The ambient temperature at the beginning of the test was 25 °C.

The furnace temperature was measured by means of nine thermocouples distributed evenly in the furnace, with their measuring junctions 100 mm ± 10 mm from the exposed surface of the specimen. The furnace was controlled so that the mean of the nine thermocouple readings followed as closely as possible the time/temperature relationship specified in Clause 3.1 of BS 476-20:1987.

After the first five minutes of the test, the furnace pressure was maintained at 0±2 Pa at 1,000 mm from the notional floor level.

Thermocouples were provided to monitor the unexposed surface of the floor assembly and 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.

Test data and information

Details of the specimen structure are shown in Figure 1 to 6. The photographs of the DOWNLIGHTs are shown in Photo 1 to 10.

Photographs of the test are shown in Photos 11 to 22. A summary of the observations made on the general behavior of the specimen is given in Appendix 3.

The mean furnace temperature records are shown in Appendix 4, and the actual time-temperature curve of furnace in relation to the specified time-temperature curve is shown in Figure 7.

The unexposed surface temperature records are shown in Appendix 5, and the individual temperatures recorded adjacent to the spotlight fittings at mid-height of the cavity are shown in Appendix 6. The unexposed surface maximum and mean temperature curve are shown in Figure 8.

The vertical deflection at the centre of the floor assembly was continuously measured during the test, and the data records are given in Appendix 7. The deflection curve is shown in Figure 9.

The Load Calculations is given in Appendix 1.

***** To be continued*****



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Performance criteria

This test was according to performance criteria which specified in BS 476-21:1987, section 7.6 to determine the loadbearing capacity, integrity and insulation of the specimen:

Loadbearing capacity: A failure of the test construction to maintain its loadbearing capacity shall be deemed to have occurred when any of the requirements specified in given as follow are exceeded.

a) a deflection of $L/20$, in this test:

$$\text{Limiting deflection} = 4500 / 20 = 225 \text{ (mm); or}$$

b) where the rate of deflection (in mm/min), calculated over 1 min intervals, starting at 1 min from the commencement of the heating period, exceeds the limit set by the following equation:

$$\text{rate of deflection} = \frac{L^2}{9000d}$$

in this test:

$$\text{Limiting rate of deflection} = \frac{(4500)^2}{9000 \times 238} = 9.5 \text{ (mm/min);}$$

Where

L is the clear span of specimen (in mm);

d is the distance from the top of the structural section to the bottom of the design tension zone (in mm).

Integrity: A failure of the test construction to maintain integrity shall be deemed to have occurred when collapse or sustained flaming on the unexposed face occurs or the criteria given as follow for impermeability are exceeded.

a) For situations where the cotton pad is suitable, failure shall be deemed to have occurred when flames and/or hot gases cause flaming or glowing of the cotton fiber pad.

b) For situations where the use of the cotton pad is not suitable, failure shall be deemed to have occurred when either:

1) 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

2) the 25 mm diameter gap gauge can penetrate a through gap such that the end of the gauge projects into the furnace.

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Insulation: Failure shall be deemed to have occurred when one of the following occurs:

- a) When the mean unexposed face temperature increases by more than 140°C above its initial value;
- b) When the temperature recorded at any positions on the unexposed face is in excess of 180°C above the initial mean unexposed face temperature;
- c) When integrity failure occurs.

Conclusions

A specimen of a timber floor assembly protected by a plasterboard ceiling incorporating five DOWNLIGHT fittings has been subjected to a fire resistance test in accordance with BS 476-21:1987, Clause 7.

At the heating period of 61 minutes, the maximum deflection was 19.9 mm; the rate of deflection was 0.4 mm/min. The loadbearing capacity was satisfied.

At the heating period of 61 minutes, there was no collapse of the specimen, no sustained flaming on the unexposed surface and no loss of impermeability. The integrity requirement was satisfied.

At the heating period of 61 minutes, the mean temperature rise of the unexposed face was 37.3°C, the maximum temperature rise of the unexposed face was 40.4°C. The insulation requirement was satisfied.

The floor assemblies satisfied the performance requirements specified in Clause 7 of BS 476-21:1987, for the following periods:

Performance Criteria	Test Results
Loadbearing Capacity	61min (No failure)
Integrity	61min (No failure)
Insulation	61min (No failure)

Note: According to sponsor requirements, the test was discontinued after a period of 61 minutes.

Remark:

The test results relate only to the specimen tested. Appendix A of BS 476-20 provides guidance information on the application of fire resistance tests and the interpretation of test data. Application of the result to assemblies of different dimensions or supported in other manners or incorporating different components should be the subject of a design appraisal.

***** To be continued*****



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Appendix 1: Schedule of components

1. Floor Joists

Material : Softwood timber joists
 Overall section size : 45 mm thick×190 mm deep
 Density of Joist: : 600 kg/m³

2.Floorboards

Manufacturer : Egger
 Material : Egger Chipboard, E1
 Thickness : 1 no. layer, 18mm thick
 Density : 700 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 x 3.9 mm diameter screws for the layer, at 200 mm centers along joists and 150 mm centers along perimeter of floor.

3.Ceiling boards

Manufacturer : Knauf
 Material : Gypsum plasterboard
 Thickness : 2 no. layers, each 15mm thick
 Density : 727 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 x 3.9 mm diameter screws for first layer and 55 mm long x 3.9 mm diameter screws for second layer, at 200 mm centers along joists and 150 mm centers along perimeter of ceiling.

***** To be continued*****



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4. Specimen A

Product Name : V50 Fixed Downlight
 Reference : JC1001 V50 Fixed Downlight
 Manufacturer : JCC LIGHTING PRODUCTS
 Type : Recessed Downlight
 Overall dimensions and construction : See figure 2
 Hole size in ceiling boards : 70 mm diameter
 Materials : i. Casing: Mild Steel
 ii. Cover: Polycarbonate
 iii. Spring clip: Steel
 iv. Connection block: Polycarbonate Housing
 Approx. weight: 0.29 Kg
 Details of fireproof material : i. Manufacturer: JCC Lighting Products
 ii. Type: Mild Steel 'can'
 iii. Thickness: 0.8mm
 Details of expanding material : i. Manufacturer: Tai-G
 ii. Type: SM43.5-1.0mm
 iii. Material: Fire Reactive Expandable Graphite
 iv. Thickness: 1.0mm
 v. Location: Top of 'Can'

5. Specimen B

Product Name : V50 Tilt Downlight
 Reference : JC1002 V50 Tilt Downlight
 Manufacturer : JCC LIGHTING PRODUCTS
 Type : Recessed Downlight
 Overall dimensions and construction : See figure 3
 Hole size in ceiling boards : 85 mm diameter
 Materials : i. Casing: Mild Steel
 ii. Cover: Polycarbonate
 iii. Spring clip: Steel
 iv. Connection block: Polycarbonate Housing
 Approx. weight: 0.46 Kg
 Details of fireproof material : i. Manufacturer: JCC Lighting Products
 ii. Type: Mild Steel 'can'
 iii. Thickness: 0.8mm
 Details of expanding material : i. Manufacturer: Tai-G
 ii. Type: SM43.5-1.0mm
 iii. Material: Fire Reactive Expandable Graphite
 iv. Thickness: 1.0mm
 v. Location: Top of 'Can'

***** To be continued*****



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6. Specimen C

Product Name : FG2 IP65 Downlight
 Reference : JC94110 FG2 IP65 Downlight
 Manufacturer : JCC LIGHTING PRODUCTS
 Type : Recessed Downlight
 Overall dimensions and construction : See figure 4
 Hole size in ceiling boards : 74 mm diameter
 Materials : i. Casing: Mild Steel
 ii. Cover: Mild Steel
 iii. Spring clip: Steel
 iv. Connection block: Polycarbonate Housing
 Approx. weight: 0.27 Kg
 Details of fireproof material : i. Manufacturer: JCC Lighting Products
 ii. Type: Mild Steel 'can'
 iii. Thickness: 0.8mm
 Details of expanding material : i. Manufacturer: Tai-G
 ii. Type: SM43.5-1.0mm
 iii. Material: Fire Reactive Expandable Graphite
 iv. Thickness: 1.0mm
 v. Location: Top of 'Can'

7. Specimen D

Product Name : FG2 Fixed Downlight
 Reference : JC94113 FG2 Fixed Downlight
 Manufacturer : JCC LIGHTING PRODUCTS
 Type : Recessed Downlight
 Overall dimensions and construction : See figure 5
 Hole size in ceiling boards : 74 mm diameter
 Materials : i. Casing: Mild Steel
 ii. Cover: Mild Steel
 iii. Spring clip: Steel
 iv. Connection block: Polycarbonate Housing
 Approx. weight: 0.25 Kg
 Details of fireproof material : i. Manufacturer: JCC Lighting Products
 ii. Type: Mild Steel 'can'
 iii. Thickness: 0.8mm
 Details of expanding material : i. Manufacturer: Tai-G
 ii. Type: SM43.5-1.0mm
 iii. Material: Fire Reactive Expandable Graphite
 iv. Thickness: 1.0mm
 v. Location: Top of 'Can'

***** To be continued*****



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8. Specimen E

Product Name : FG2 Tilt Downlight
 Reference : JC94114 FG2 Tilt Downlight
 Manufacturer : JCC LIGHTING PRODUCTS
 Type : Recessed Downlight
 Overall dimensions and construction : See figure 6
 Hole size in ceiling boards : 85 mm diameter
 Materials :
 i. Casing: Mild Steel
 ii. Cover: Mild Steel
 iii. Spring clip: Steel
 iv. Connection block: Polycarbonate Housing
 Approx. weight: 0.32 Kg
 Details of fireproof material :
 i. Manufacturer: JCC Lighting Products
 ii. Type: Mild Steel 'can'
 iii. Thickness: 0.8mm
 Details of expanding material :
 i. Manufacturer: Tai-G
 ii. Type: SM43.5-1.0mm
 iii. Material: Fire Reactive Expandable Graphite
 iv. Thickness: 1.0mm
 v. Location: Top of 'Can'
 ***** To be continued*****



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Load Calculations

1. Physical Parameters of Timber Joists

Measured Joist dimensions	: 190 mm deep by 45 mm thick
Mean spacing	: 640 mm
Effective span	: 4500 mm
Density of Joist	: 600 kg/m ³

2. Physical Parameters of Floorboards

Thickness	: 1 layers, 18 mm thick
Density	: 700 kg/m ³

3. Physical Parameters of Ceiling boards

Thickness	: 2 layers, each 15 mm thick
Density	: 727 kg/m ³

4. Weight of Actual Timber Joists

Actual volume of Joist	: 0.286 m ³
Actual weight of Joist	: 171.6 kg

5. Weight of Actual Floorboards

Actual volume of Floorboards	: 0.243 m ³
Actual weight of Floorboards	: 170.1 kg

6. Weight of Actual Ceiling boards

Actual volume of Floorboards	: 0.405 m ³
Actual weight of Floorboards	: 294.4 kg

7. Actual Dead Weight

Actual Dead Weight of overall specimen	: 636.1 kg
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8. Actual Dead Load

Actual Dead Load per meter square	: $(636.1 \times 9.81) / (4.5 \times 3.0)$ 462.2 N/m ² , 47.1 kg/m ²
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9. Imposed Load

Imposed Load per meter square	: $(1523.5 \times 9.81) / (4.5 \times 3.0)$ 1107.1 N/m ² , 112.9 kg/m ²
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Remark:

1. All values are nominal unless stated otherwise.
2. All other details are as stated by the sponsor.

***** To be continued*****



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Appendix 2: Details of test specimen

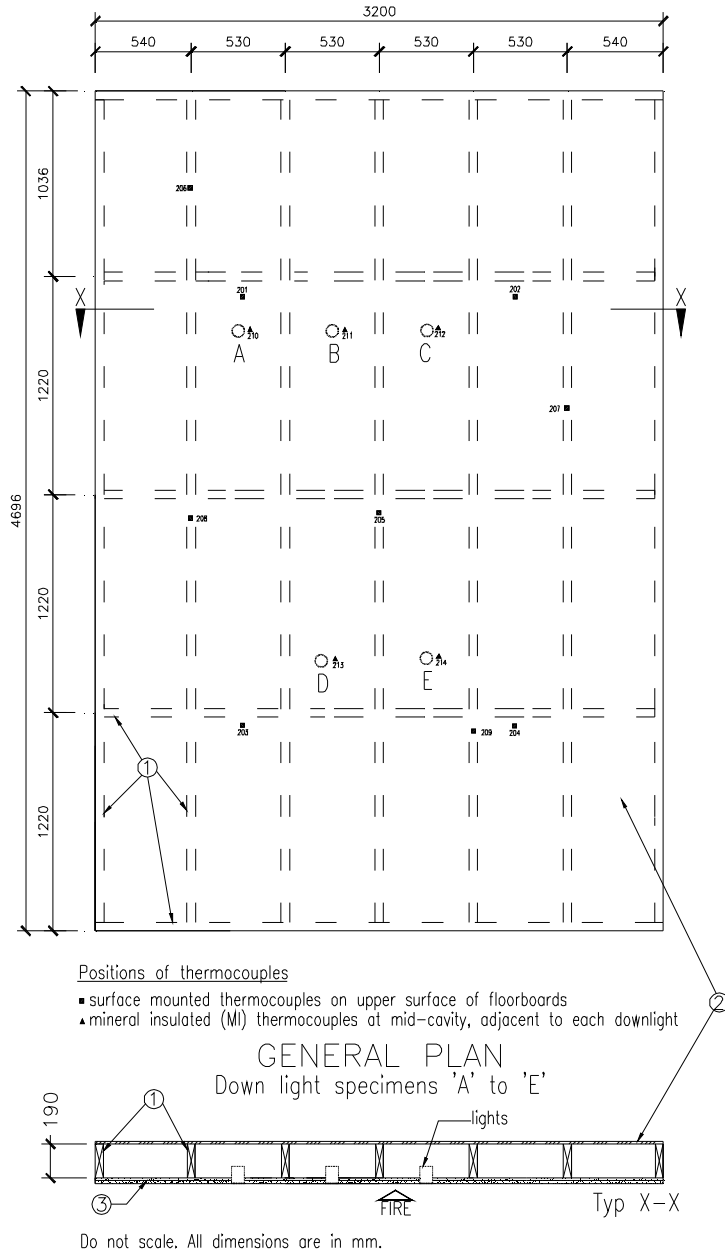


Figure 1 - Specimen General Plan

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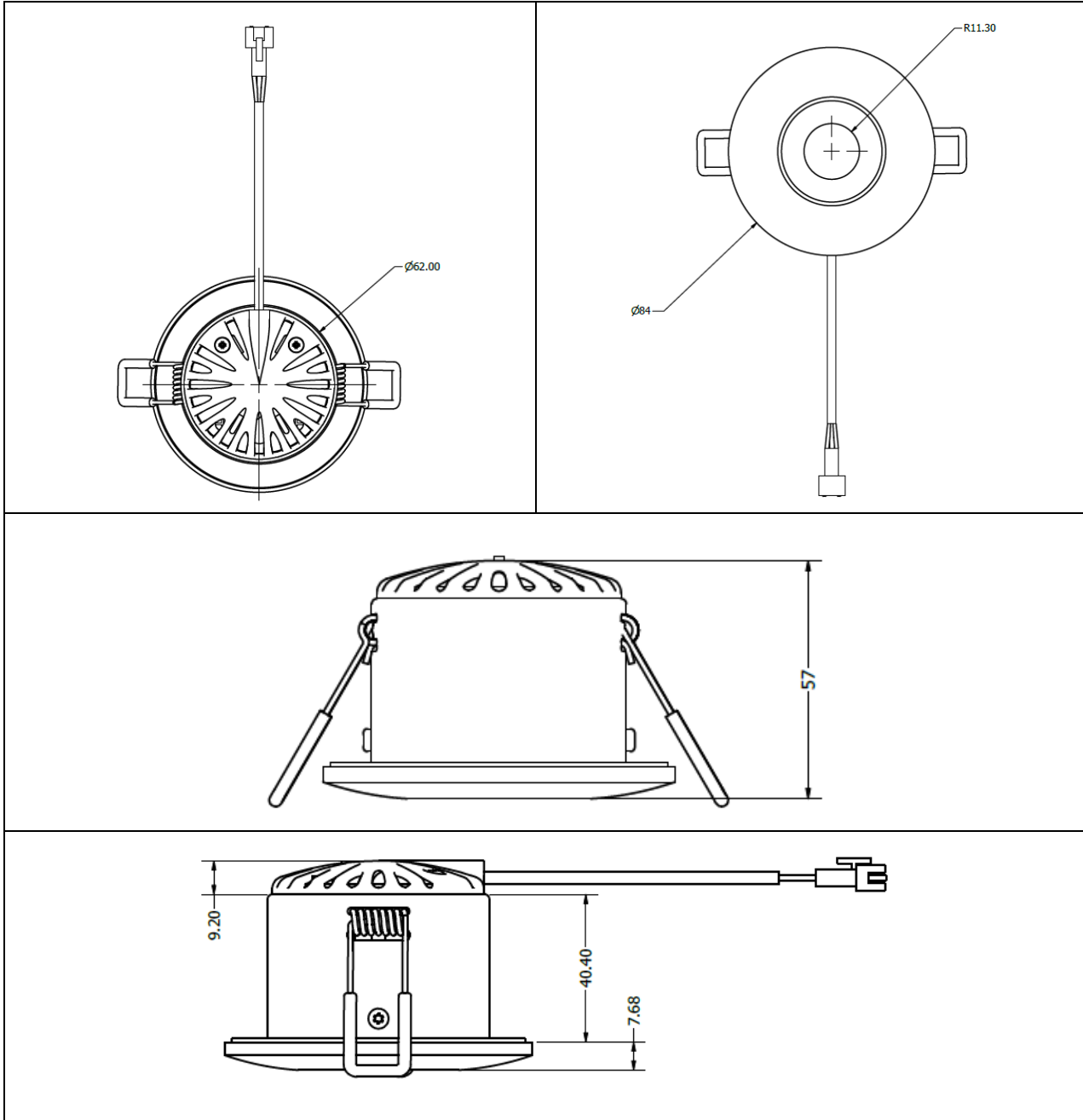


Figure 2 – Details of specimen 'A'

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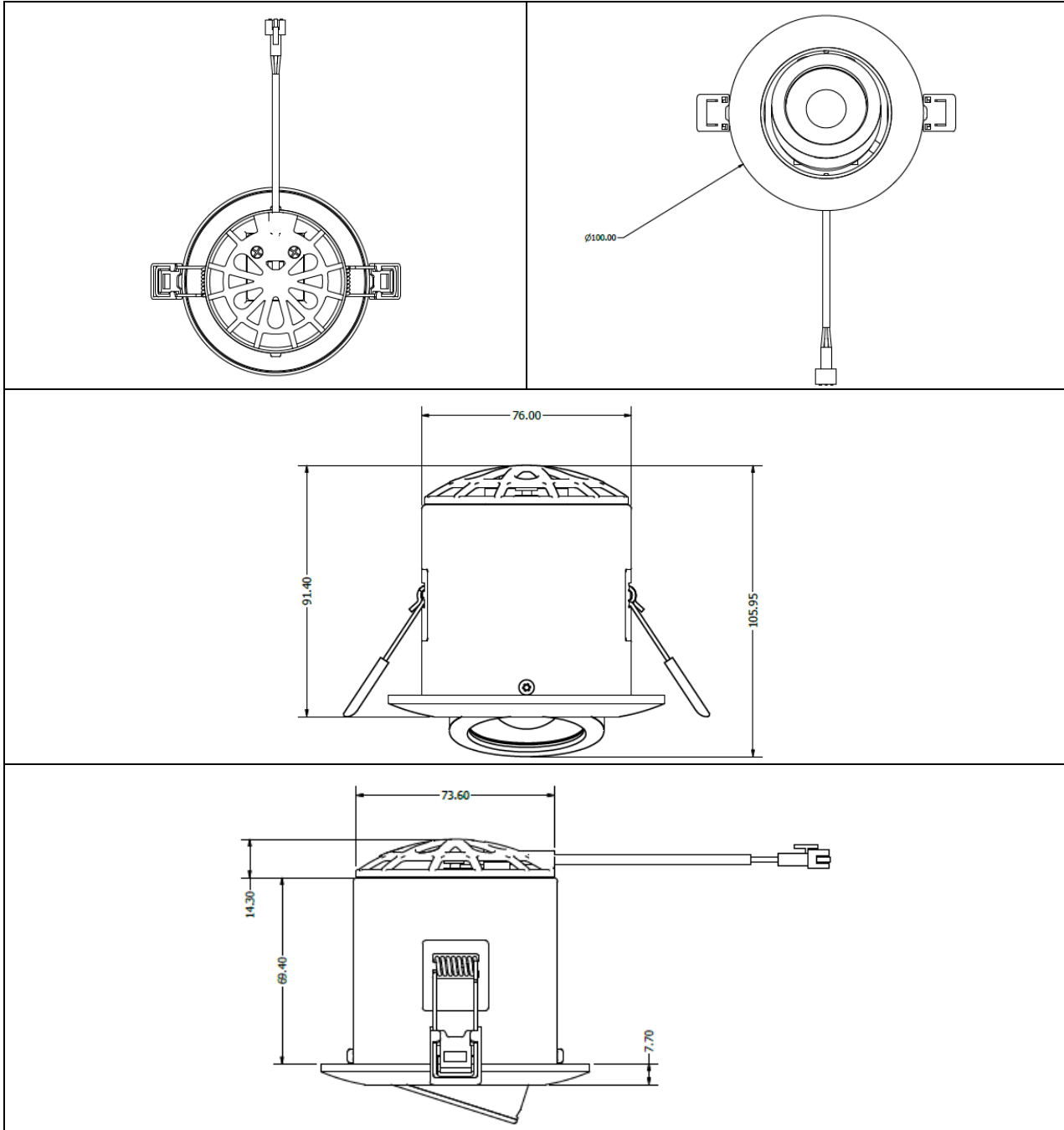


Figure 3 –Details of specimen 'B'
***** To be continued*****



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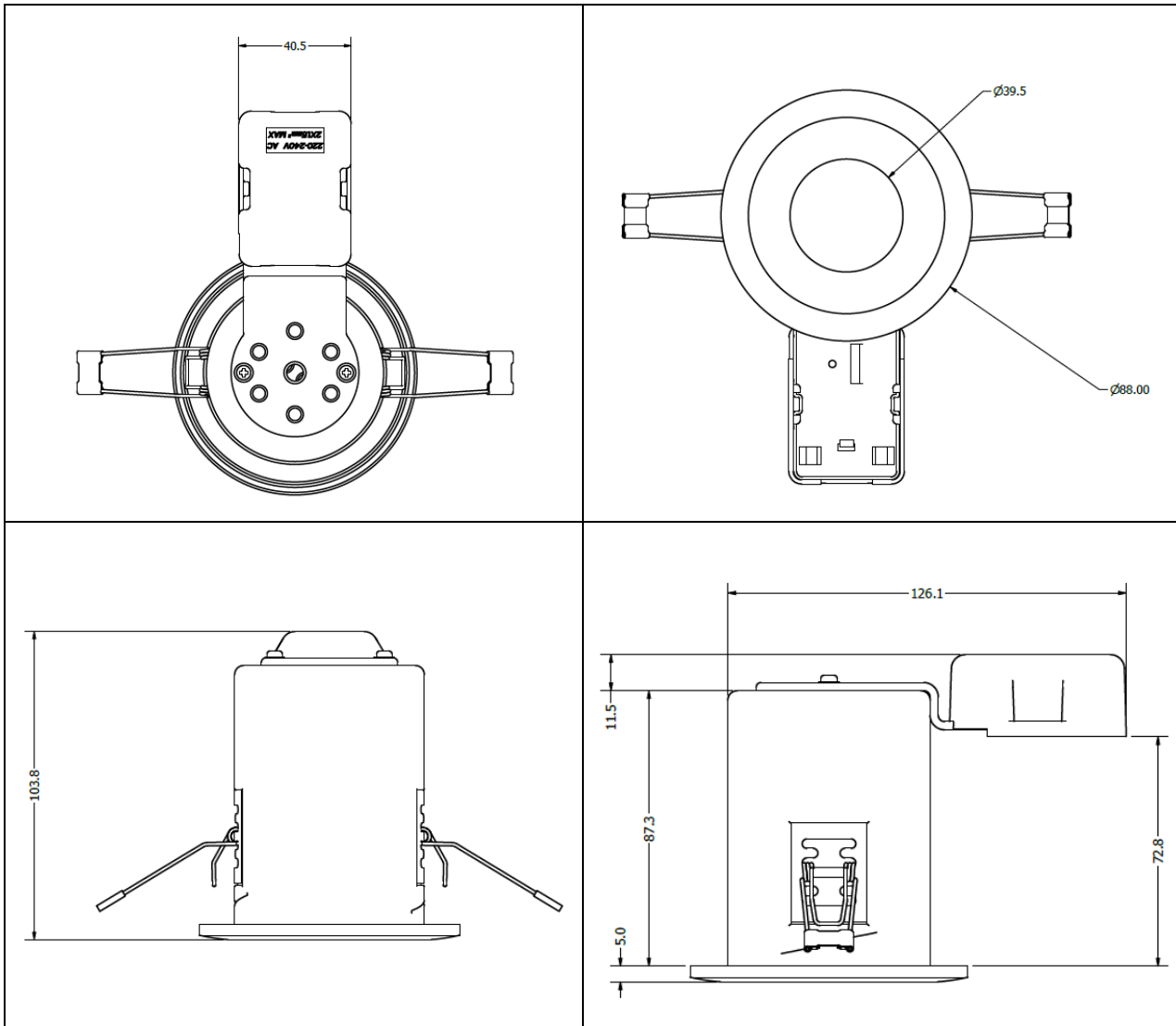


Figure 4 -Details of specimen 'C'

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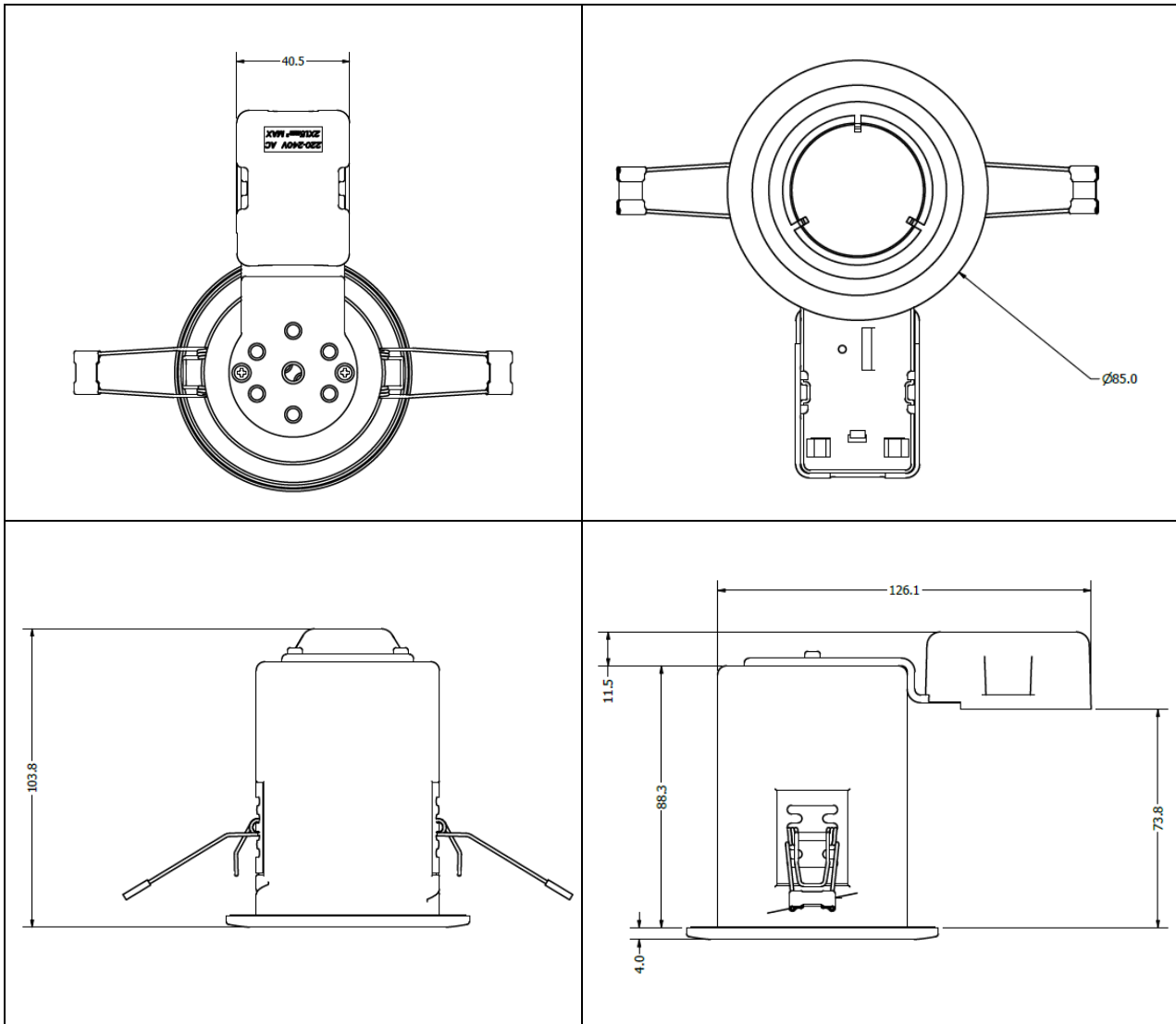


Figure 5 –Details of specimen 'D'

***** To be continued*****



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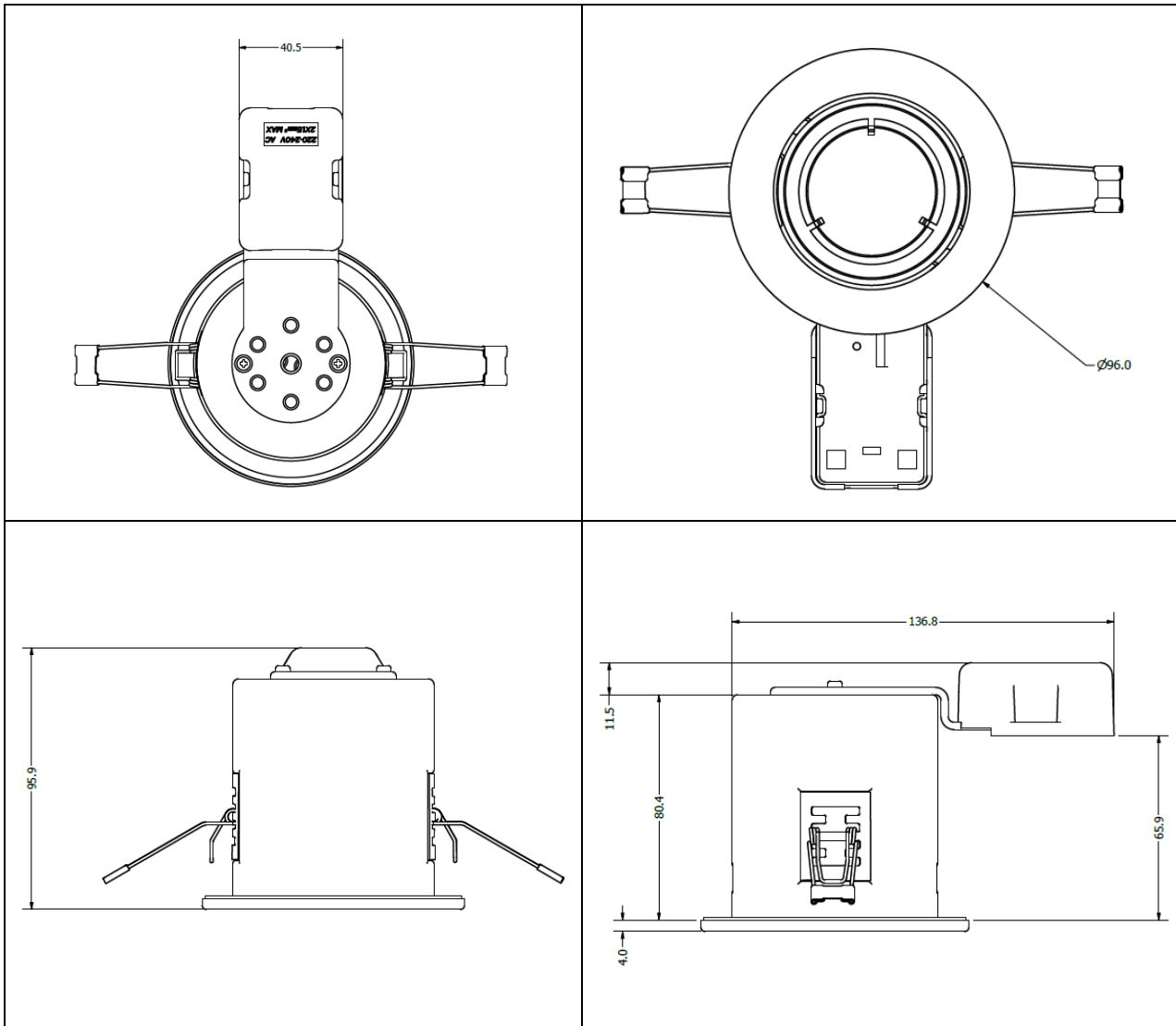


Figure 6 -Details of specimen 'E'

Note: the specimen details provided by the sponsor

***** To be continued*****



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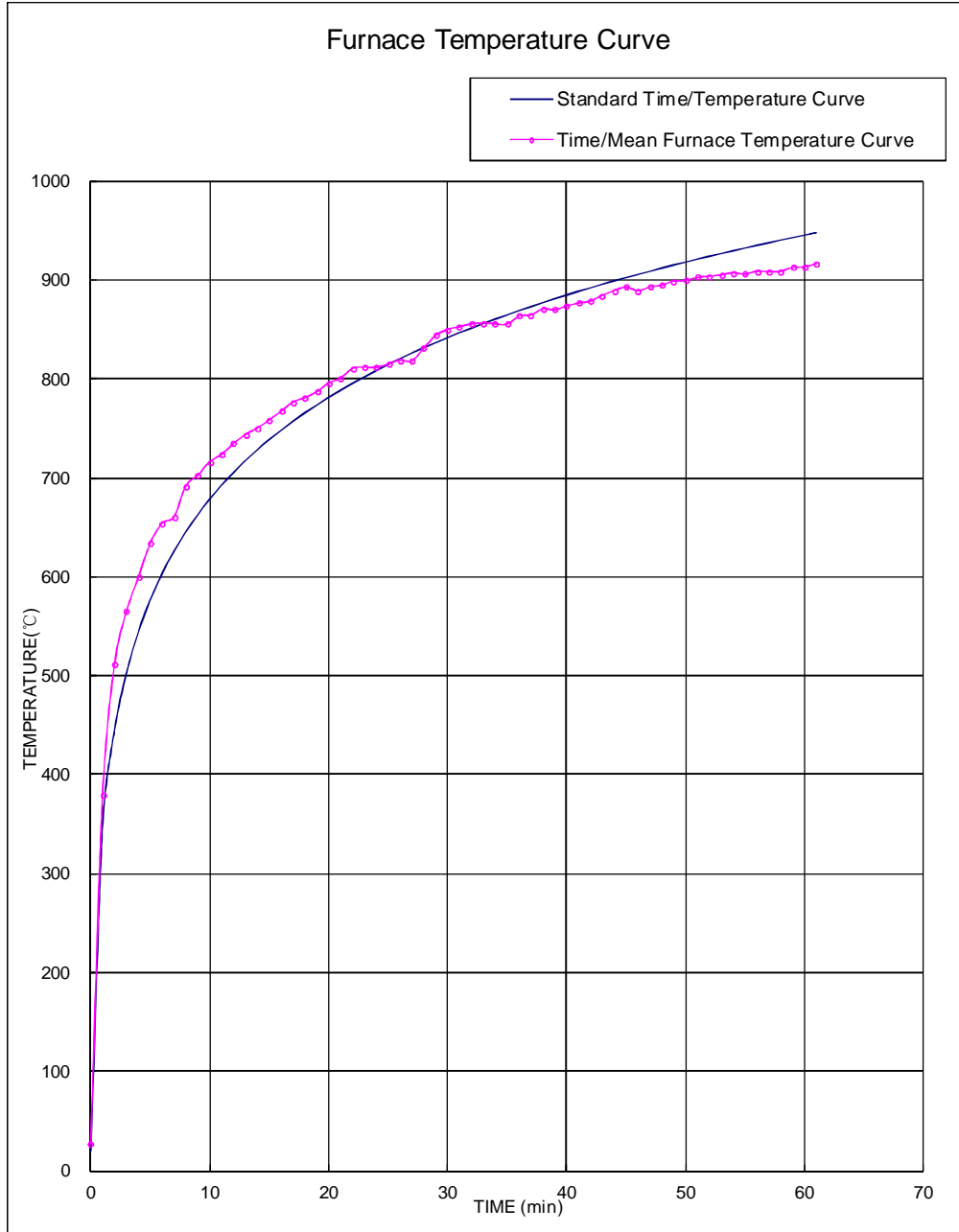
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Figure 7 - Furnace Temperature Curve



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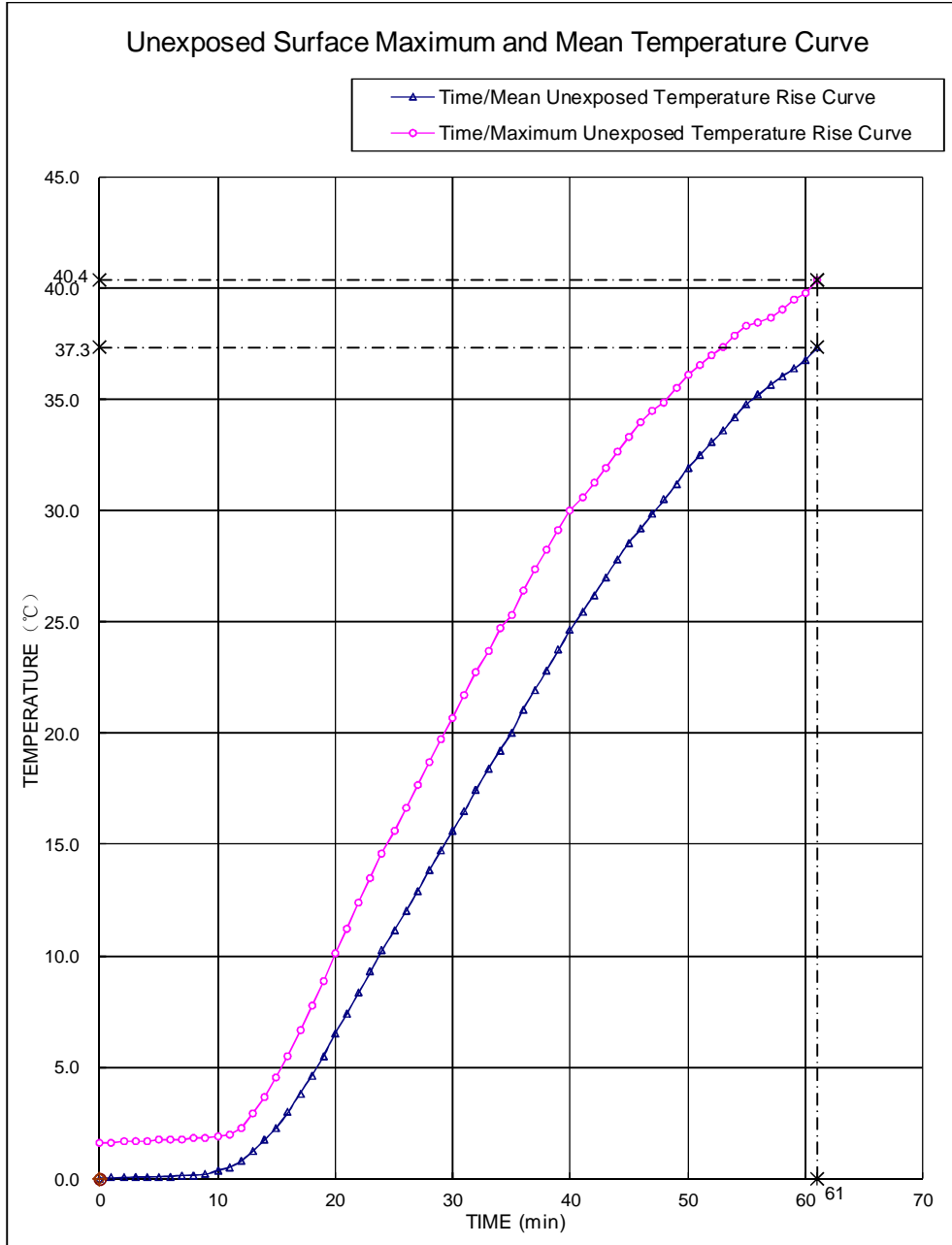
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Figure 8- Unexposed Face Mean and Maximum Temperature Curve



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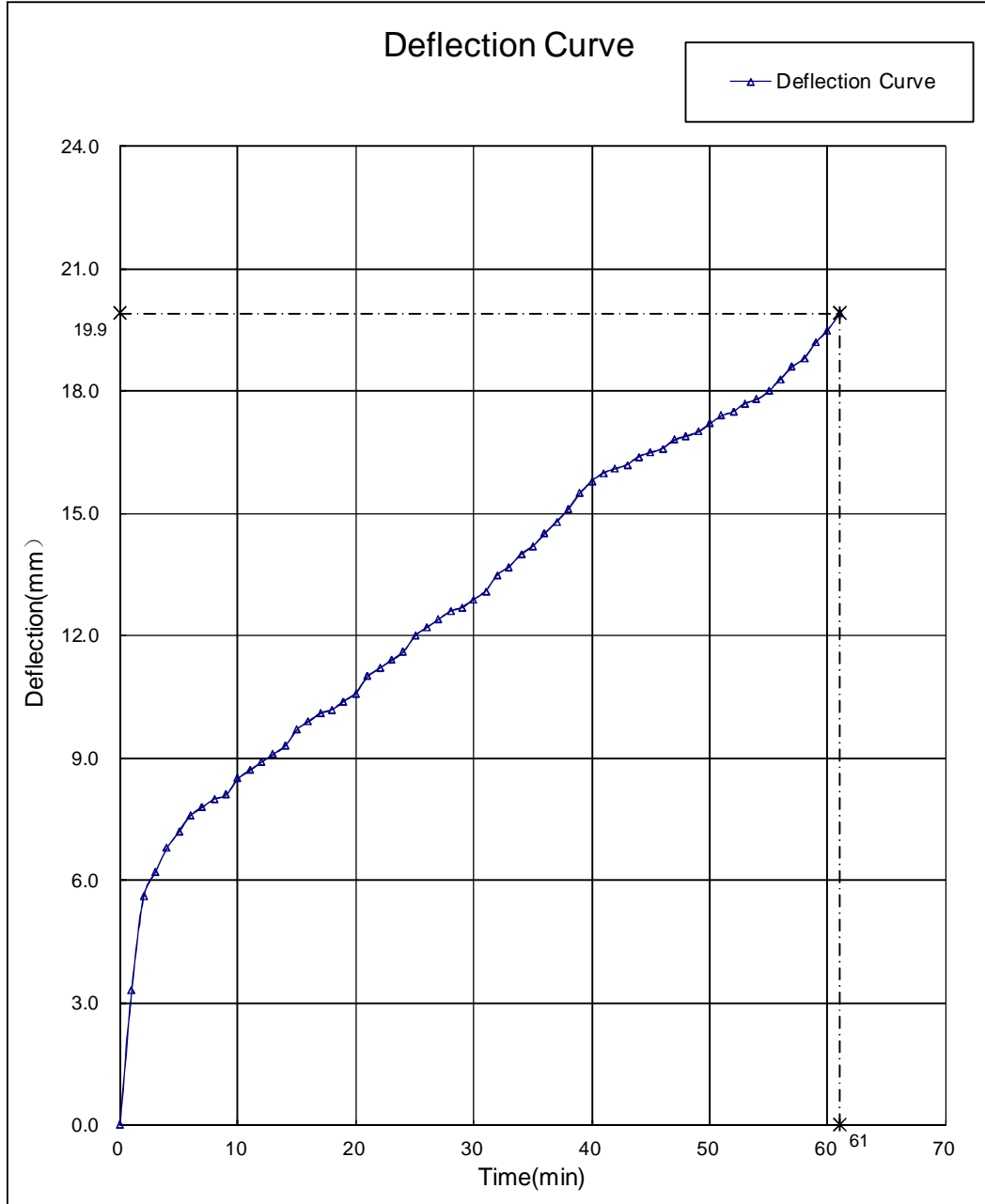
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Figure 9- Deflection Curve



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Appendix 3 –Test Observations

Time (min)	Observation (All observations are from the exposed face unless noted otherwise)
0	Test started.
2	The lens of specimens 'B' fused.
4	The lens of specimens 'C' fused.
13	Smoke released from the perimeter of the specimen.
16	Coating of the plasterboard ceiling already fell away.
21	The faceplates of the specimens 'A' and 'C' fell away.
24	The lamp cup of specimen 'B' fell out from the light can.
27	The lamp cup of specimen 'C' fell out from the light can.
28	Some cracks appeared on the first layer plasterboard ceiling.
40	The first layer plasterboard ceiling started to sag slightly and joints began to open.
57	Part of first layer plasterboard ceiling fell into the furnace.
61	Test terminated at sponsor's request.

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Appendix 4 – Furnace Temperature Records

Time min	Specified Furnace Temperature °C	Actual Furnace Mean Temperature °C
0	20	26
5	576	634
10	678	716
15	739	759
20	781	796
25	815	815
30	842	850
35	865	855
40	885	874
45	902	893
50	918	899
55	932	906
60	945	913
61	948	916

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Appendix 5 –Unexposed Surface Temperature Records

Time min	TC No.201 °C	TC No.202 °C	TC No.203 °C	TC No.204 °C	TC No.205 °C	TC No.206 °C	TC No.207 °C	TC No.208 °C	TC No.209 °C	Mean Temp °C	Mean Temp Rise °C	Max Temp Rise °C
0	28.2	27.7	25.7	25.7	25.8	27.1	26.8	26.1	25.6	26.6	0.0	1.6
5	28.3	27.8	25.8	25.7	25.8	27.2	26.9	26.1	25.6	26.7	0.1	1.7
10	28.5	28.1	26.1	26.1	26.1	27.3	27.0	26.3	25.7	27.0	0.4	1.9
15	30.4	31.1	27.7	27.8	27.5	27.7	28.1	28.0	26.4	28.9	2.3	4.5
20	34.6	36.7	31.8	31.6	31.0	29.6	30.9	31.8	28.6	33.1	6.5	10.1
25	39.1	42.2	35.9	35.8	35.6	32.3	34.6	36.4	32.3	37.7	11.1	15.6
30	43.5	47.3	40.0	39.9	40.5	35.2	38.5	41.1	36.4	42.2	15.6	20.7
35	47.8	51.9	44.3	44.1	45.1	38.2	43.1	46.0	40.9	46.6	20.0	25.3
40	52.3	56.6	49.1	48.6	49.6	41.5	47.4	51.4	45.6	51.2	24.6	30.0
45	56.3	59.9	53.4	52.8	53.5	45.0	51.1	55.8	50.0	55.2	28.6	33.3
50	59.6	62.7	57.2	56.6	56.5	47.9	54.3	58.9	53.5	58.5	31.9	36.1
55	62.3	64.9	60.6	60.0	59.1	50.9	57.1	61.6	56.8	61.4	34.8	38.3
60	64.1	66.4	63.4	62.3	60.8	53.4	59.7	63.5	59.3	63.4	36.8	39.8
61	64.6	67.0	64.0	62.9	61.3	53.9	60.2	63.8	59.7	63.9	37.3	40.4

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Appendix 6 – Individual Temperatures Recorded Adjacent to the Spotlight Fittings at Mid-height of the Cavity

Time min	TC No.210 °C	TC No.211 °C	TC No.212 °C	TC No.213 °C	TC No.214 °C
0	29.4	29.2	29.1	28.4	28.7
5	36.9	41.5	40.5	43.1	45.6
10	60.4	69.9	66.0	72.1	81.6
15	69.8	79.6	78.9	82.4	95.4
20	74.8	84.9	87.0	88.0	99.4
25	79.9	90.8	93.1	94.2	102.5
30	87.6	97.9	107.1	101.8	104.3
35	95.9	105.6	112.4	110.0	106.7
40	100.9	107.7	110.7	112.2	108.2
45	102.5	109.5	112.1	114.1	109.9
50	104.9	113.6	114.9	118.5	114.5
55	106.5	127.5	124.0	133.2	125.3
60	122.7	158.4	163.5	166.0	153.2
61	131.1	162.3	168.5	168.6	161.2

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Appendix 7 - Deflection of the floor assembly during the test

Time min	Central Vertical Deflection mm	Rate of Deflection mm/min
0	0.0	0.0
5	7.2	0.4
10	8.5	0.4
15	9.7	0.4
20	10.6	0.2
25	12.0	0.4
30	12.9	0.2
35	14.2	0.2
40	15.8	0.3
45	16.5	0.1
50	17.2	0.2
55	18.0	0.2
60	19.5	0.3
61	19.9	0.4

Note:

1. A positive value indicates deflection towards to the furnace
2. The above test was carried out by Guangzhou Building Materials Institute Limited Company.

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Photo Appendix:



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Photo 5: Front view of specimen 'C'

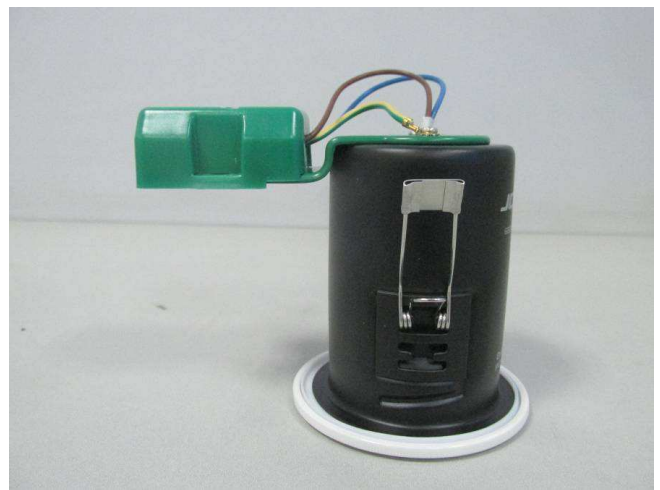


Photo 6: Side view of specimen 'C'



Photo 7: Front view of specimen 'D'



Photo 8: Side view of specimen 'D'

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Photo 9 : Front view of specimen 'E'



Photo 10: Side view of specimen 'E'



Photo 11: The exposed surface of the specimen before the test



Photo 12: The unexposed surface of the specimen before the test

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Photo 13: The exposed surface of the specimen after test duration of 2 minutes, showing the lens of specimen was fusing



Photo 14: The unexposed surface of the specimen after test duration of 15 minutes



Photo 15: The exposed surface of the specimen after test duration of 22 minutes, showing the lamp cup of specimen fell out from the light can



Photo 16: The exposed surface of the specimen after test duration of 28 minutes, showing some cracks appeared on the first layer plasterboard ceiling

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Photo 17: The unexposed surface of the specimen after test duration of 30 minutes



Photo 18: The unexposed surface of the specimen after test duration of 45 minutes



Photo 19: The exposed surface of the specimen after test duration of 57 minutes, showing part of first layer plasterboard ceiling was falling into the furnace.



Photo 20: The unexposed surface of the specimen after test duration of 60 minutes.

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Photo 21: The exposed surface of the specimen after the test



Photo 22: The unexposed surface of the specimen after the test

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