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GML-V023

FLOOR ASSEMBLY FIRE TEST REPORT

Sponsor: JCC LIGHTING PRODUCTS

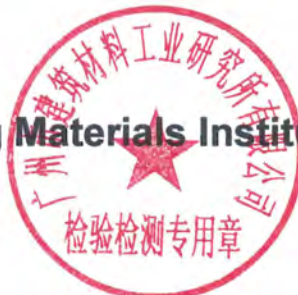
Address of Sponsor: INNOVATION CENTRE SOUTHERN
CROSS TRADING ESTATE BEEDING
CLOSE BOGNOR REGIS PO22 9TS

Test Method: BS 476-21:1987, BS 476-20:1987

Date of issues: August 11, 2020

Test Report No. V03-20000297(E)

Guangzhou Building Materials Institute Limited Company



FLOOR ASSEMBLY FIRE TEST REPORT

Tested by: Wu Xin

Sign:



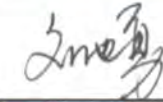
Checked by: Wu Yulong

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Certified by: Liu Jianyong

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3FW1

SUMMARY

Objective

To determine the fire resistance of a timber floor assembly protected by a plasterboard ceiling designed to provide 31 minutes fire resistance, incorporating eight 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".

Summary of Tested Assembly

The timber floor assembly had overall nominal dimensions of 4800 mm long by 3230 mm wide and comprised joists at 600mm centres. The depth of the solid timber joist was 195mm. The upper surface of the floor comprised nominally 18mm thick OSB board, and screwed fixed to the upside of the floor joists. The floor assembly was protected on its underside by a direct fixed ceiling, formed from a single layer of 15mm thick fire shield plaster board, the ceiling was screw fixed to the underside of the floor joists.

The floor supported a uniformly distributed load of 1.08kN/m². This load was specified by the sponsor of the test.

The ceiling incorporated eight downlight fittings referenced as follows.



Test Ref.	Product Name	Type No.
A	Fire Guard	JC010010 WH / CH / BN / BLK
B	Fire Guard	JC010010 WH / CH / BN / BLK
C	Fire Guard	JC010016 WH / CH / BN / BLK
D	Fire Guard	JC010023 WH / CH / BN / BLK
E	Fire Guard	JC010023/NB
F	Fire Guard	JC010016 WH / CH / BN / BLK
G	Fire Guard	JC010010/NB
H	Fire Guard	JC010023 WH / CH / BN / BLK

Test Results:

Loadbearing Capacity: 31min (No failure)

Integrity: 31min (No failure)

Insulation: 31min (No failure)

Date of Test July 24, 2020

Note: According to sponsor requirements, the test was discontinued after a period of 31 minutes.



CONTENTS	PAGE No.
SUMMARY	3
SCHEDULE OF COMPONENTS.....	6
TEST PROCEDURE	12
TEST DATA AND INFORMATION.....	13
PERFORMANCE CRITERIA	14
CONCLUSIONS	16
TEST PHOTOGRAPHS	17
DETAILS OF TEST SPECIMEN	28
TEMPERATURE CURVES	34
DEFLECTION CURVES	36
TEST OBSERVATIONS.....	37
TEMPERATURE RECORDS.....	38
DEFORMATION RECORDS.....	41



SCHEDULE OF COMPONENTS

(Refer to Figures 1 to 10)

(All values are nominal unless stated otherwise)

(All other details are as stated by the sponsor)

<u>Item</u>	<u>Description</u>
1. Floor Joists	
Material	: Solid Timber Joist, softwood
Size	: 195mm deep, 45mm thick
Centres:	: 600 mm
2. Floorboards	
Material	: OSB board
Thickness	: 18mm
Fixing method	: All board joints staggered with respect to adjacent layer and screw fixed to all joists
3. Ceiling boards	
Material	: Fire shield Gypsum plasterboard
Thickness	: 1 layer, 15mm thick
Fixing method	: All board fixed to joists with Drywall screws at max.230mm c/c. The joints between the boards were filled with joint filler with was also used to cover the heads of the screws.

4.End Joists

Material	: Softwood
Size	: 195mm high x 45mm thick
Fixing method	: Fitted across the ends of the joists and through screwed to each joist.

5.Specimen 'A'

Product Name	: Fire Guard
Type No.	: JC010010 WH / CH / BN / BLK
Manufacturer	: JCC Lighting
Reference	: JC010010 Fireguard Fixed Downlight
Type	: Recessed Downlight
Overall dimensions and construction	: 94mm (H) x 87mm (∅) , See figure 3
Hole size in ceiling boards	: 72mm ∅
Materials	i: Casing: Mild Steel ii: Cover: White/Chrome/Brushed Nickel iii: Spring clip: Steel iv: Connection block: Polycarbonate Housing Approx. weight: 0.202 Kg
Details of fireproof material	i: Manufacturer: JCC lighting Products ii: Type: Mild Steel 'Can' iii: Thickness: 0.8mm

6.Specimen 'B'

Product Name	: Fire Guard
Type No.	: JC010010 WH / CH / BN / BLK
Manufacturer	: JCC Lighting
Reference	: JC010010 Fireguard Fixed Downlight
Type	: Recessed Downlight
Overall dimensions and construction	: 94mm (H) x 87mm (∅) , See figure 4
Hole size in ceiling boards	: 72mm ∅

Materials	i: Casing: Mild Steel ii: Cover: White/Chrome/Brushed Nickel iii: Spring clip: Steel iv: Connection block: Polycarbonate Housing Approx. weight: 0.202 Kg
Details of fireproof material	i: Manufacturer: JCC lighting Products ii: Type: Mild Steel 'Can' iii: Thickness: 0.8mm

7.Specimen 'C'

Product Name	: Fire Guard
Type No.	: JC010016 WH / CH / BN / BLK
Manufacturer	: JCC Lighting
Reference	: JC010016 Fireguard IP65 Downlight
Type	: Recessed Downlight
Overall dimensions and construction	: 94mm (H) x 87mm (⌀) , See figure 5
Hole size in ceiling boards	: 72mm ⌀
Materials	i: Casing: Mild Steel ii: Cover: White/Chrome/Brushed Nickel iii: Spring clip: Steel iv: Connection block: Polycarbonate Housing Approx. weight: 0.217 Kg
Details of fireproof material	i: Manufacturer: JCC lighting Products ii: Type: Mild Steel 'Can' iii: Thickness: 0.8mm

8.Specimen 'D'

Product Name	: Fire Guard
Type No.	: JC010023 WH / CH / BN / BLK
Manufacturer	: JCC Lighting
Reference	: JC010023 Fireguard Tilt Downlight
Type	: Recessed Downlight



Overall dimensions and construction	: 101mm (H) x 100mm (∅) , See figure 6
Hole size in ceiling boards	: 84mm ∅
Materials	i: Casing: Mild Steel ii: Cover: White/Chrome/Brushed Nickel iii: Spring clip: Steel iv: Connection block: Polycarbonate Housing Approx. weight: 0.261 Kg
Details of fireproof material	i: Manufacturer: JCC lighting Products ii: Type: Mild Steel 'Can' iii: Thickness: 0.8mm

9.Specimen 'E'

Product Name	: Fire Guard
Type No.	: JC010023/NB
Manufacturer	: JCC Lighting
Reference	: JC010023NB Fireguard Tilt Downlight without bezel
Type	: Recessed Downlight
Overall dimensions and construction	: 98mm (H) x 94mm (∅) , See figure 7
Hole size in ceiling boards	: 84mm ∅
Materials	i: Casing: Mild Steel ii: Spring clip: Steel iii: Connection block: Polycarbonate Housing Approx. weight: 0.194 Kg
Details of fireproof material	i: Manufacturer: JCC lighting Products ii: Type: Mild Steel 'Can' iii: Thickness: 0.8mm

10.Specimen 'F'

Product Name	: Fire Guard
Type No.	: JC010016 WH / CH / BN / BLK
Manufacturer	: JCC Lighting
Reference	: JC010016 Fireguard IP65 Downlight



Type	: Recessed Downlight
Overall dimensions and construction	: 94mm (H) x 87mm (∅) , See figure 8
Hole size in ceiling boards	: 72mm ∅
Materials	i: Casing: Mild Steel ii: Cover: White/Chrome/Brushed Nickel iii: Spring clip: Steel iv: Connection block: Polycarbonate Housing Approx. weight: 0.217 Kg
Details of fireproof material	i: Manufacturer: JCC lighting Products ii: Type: Mild Steel 'Can' iii: Thickness: 0.8mm

11.Specimen 'G'

Product Name	: Fire Guard
Type No.	: JC010010/NB
Manufacturer	: JCC Lighting
Reference	: JC010010NB Fireguard Fixed Downlight without bezel
Type	: Recessed Downlight
Overall dimensions and construction	: 92mm (H) x 81mm (∅) , See figure 9
Hole size in ceiling boards	: 72mm ∅
Materials	i: Casing: Mild Steel ii: Cover: White/Chrome/Brushed Nickel iii: Spring clip: Steel iv: Connection block: Polycarbonate Housing Approx. weight: 0.171Kg
Details of fireproof material	i: Manufacturer: JCC lighting Products ii: Type: Mild Steel 'Can' iii: Thickness: 0.8mm

12.Specimen 'H'

Product Name	: Fire Guard
Type No.	: JC010023 WH / CH / BN / BLK



Manufacturer	: JCC Lighting
Reference	: JC010023 Fireguard Tilt Downlight
Type	: Recessed Downlight
Overall dimensions and construction	: 101mm (H) x 100mm (s) , See figure 10
Hole size in ceiling boards	: 84mm s
Materials	<ul style="list-style-type: none"> i: Casing: Mild Steel ii: Cover: White/Chrome/Brushed Nickel iii: Spring clip: Steel iv: Connection block: Polycarbonate Housing
	Approx. weight: 0.261 Kg
Details of fireproof material	<ul style="list-style-type: none"> i: Manufacturer: JCC lighting Products ii: Type: Mild Steel 'Can' iii: Thickness: 0.8mm



TEST PROCEDURE

General

The test was carried out on July 24, 2020 at the request of JCC LIGHTING PRODUCTS, the test sponsor. The ambient temperature at the beginning of the test was 22 °C.

Furnace Temperature

The furnace temperature was measured by means of nine thermocouples distributed evenly in the furnace, with their measuring junctions 100 mm \pm 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.

Furnace Pressure

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

Thermocouple Allocation

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 Photo 18.

TEST DATA AND INFORMATION

Test Specimen Information

Details of the specimen structure are shown in Figure 1 to 10. The photographs of the Downlights are shown in Photo 1 to 16.

Observations

Photographs of the test are shown in Photos 17 to 22. A summary of the observations made on the general behavior of the specimen is given in Appendix 1.

Furnace Temperature Measurements

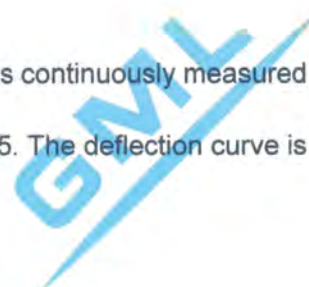
The mean furnace temperature records are shown in Appendix 2, and the actual time-temperature curve of furnace in relation to the specified time-temperature curve is shown in Figure 11.

Unexposed Surface Temperature Measurements

The unexposed surface temperature records are shown in Appendix 3, and the individual temperatures recorded adjacent to the spotlight fittings at mid-height of the cavity are shown in Appendix 4. The unexposed surface maximum and mean temperature curve are shown in Figure 12.

Deflection

The vertical deflection at the centre of the floor assembly was continuously measured during the test, and the data records are given in Appendix 5. The deflection curve is shown in Figure 13.



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:

$$\text{Limiting rate of deflection} = \frac{4500^2}{9000 \times 228} = 9.9 \text{ (mm/min);}$$

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.

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 eight downlight fittings has been subjected to a fire resistance test in accordance with BS 476-21:1987, Clause 7.

At the heating period of 31 minutes, the maximum deflection was 7.2 mm; the rate of deflection was 0.4 mm/min. The loadbearing capacity was satisfied.

At the heating period of 31 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 31 minutes, the mean temperature rise of the unexposed face was 31.0°C, the maximum temperature rise of the unexposed face was 38.2°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:

Loadbearing Capacity: 31min (No failure)

Integrity: 31min (No failure)

Insulation: 31min (No failure)

Date of Test July 24, 2020

Note: According to sponsor requirements, the test was discontinued after a period of 31 minutes.



TEST PHOTOGRAPHS



Photo 1



Photo 2

Photo 1: Front view of specimen 'A'

Photo 2: Side view of specimen 'A'

GML

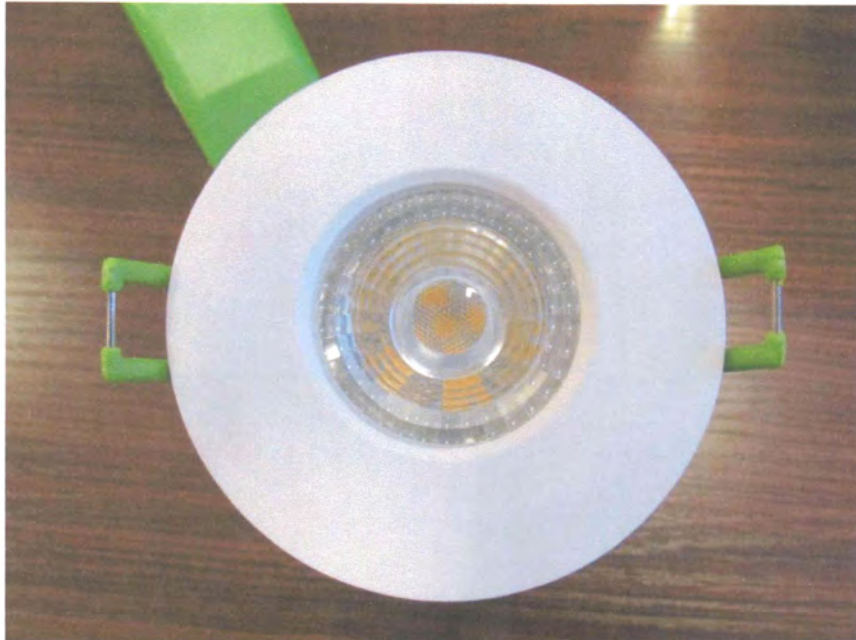


Photo 3



Photo 4

Photo 3: Front view of specimen 'B'

Photo 4: Side view of specimen 'B'

GML



Photo 5



Photo 6

Photo 5: Front view of specimen 'C'

Photo 6: Side view of specimen 'C'

GML



Photo 7



Photo 8

Photo 7: Front view of specimen 'D'

Photo 8: Side view of specimen 'D'

GML



Photo 9



Photo 10

Photo 9: Front view of specimen 'E'

Photo 10: Side view of specimen 'E'

GML



Photo 11



Photo 12

Photo 11: Front view of specimen 'F'

Photo 12: Side view of specimen 'F'

GML



Photo 13



Photo 14

Photo 13: Front view of specimen 'G'

Photo 14: Side view of specimen 'G'

GML



Photo 15



Photo 16

Photo 15: Front view of specimen 'H'

Photo 16: Side view of specimen 'H'

GML



Photo 17

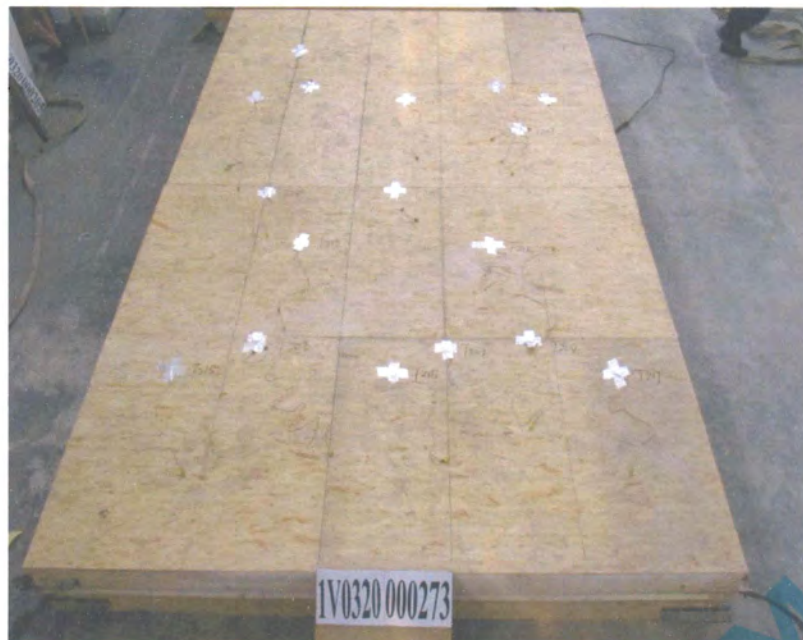


Photo 18

Photo 17: The exposed surface of the specimen before the test

Photo 18: The unexposed surface of the specimen before the test.



Photo 19



Photo 20

Photo 19: The exposed surface of the specimen after test duration of 3 minutes, showing the lens of specimen was fusing.

Photo 20: The unexposed surface of the specimen after test duration of 15 minutes.



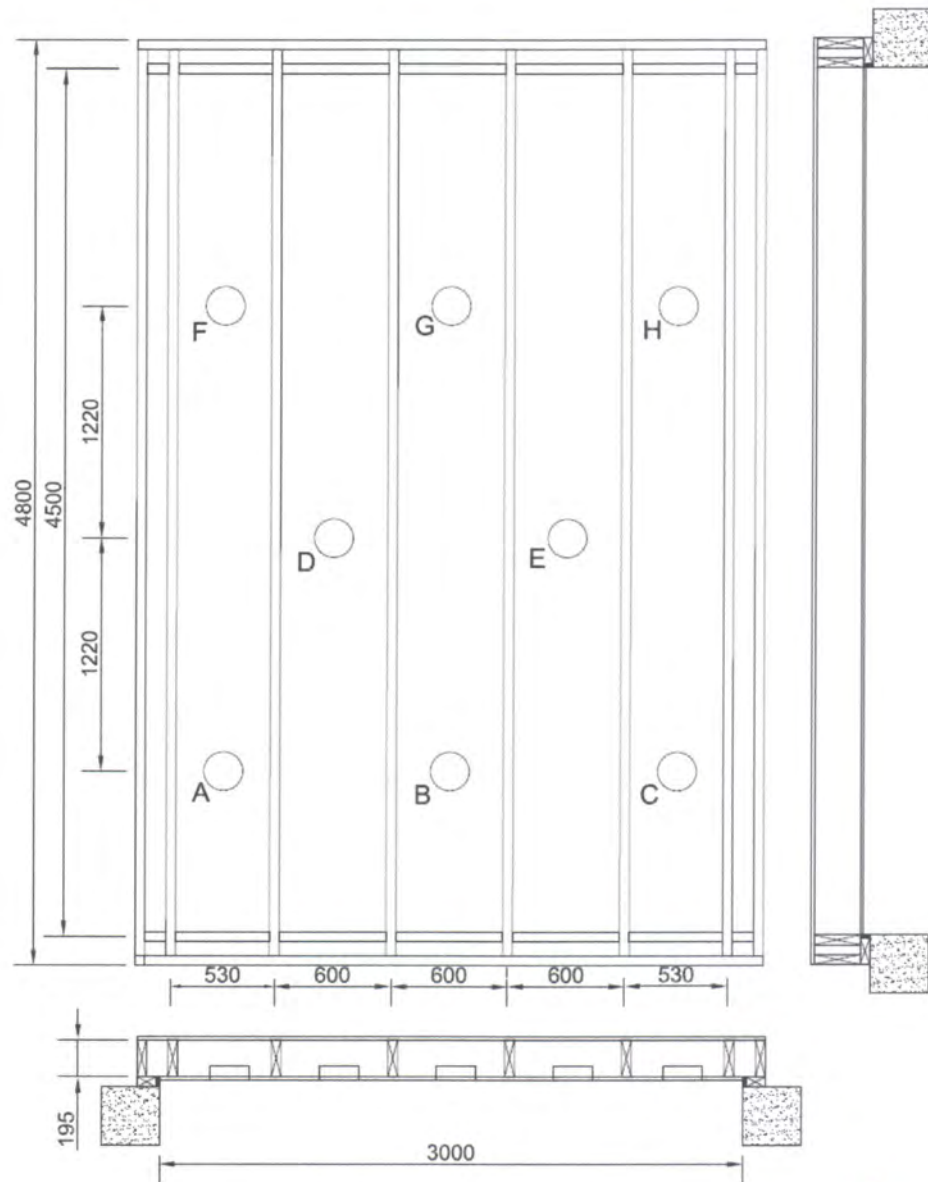
Photo 21



Photo 22

Photo 21: The unexposed surface of the specimen after test duration of 30 minutes.
Photo 22: The unexposed surface of the specimen after the test.

DETAILS OF TEST SPECIMEN

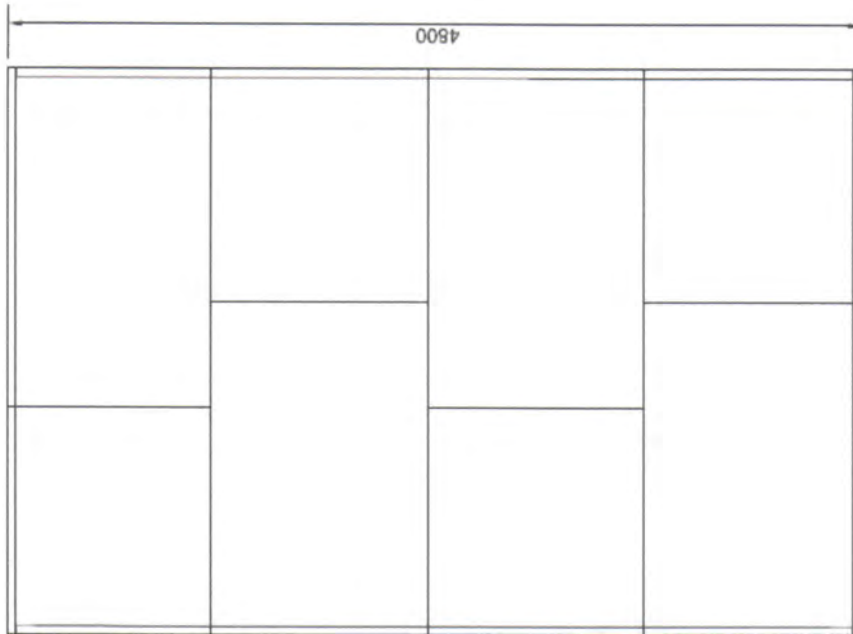


Timber Joist Layout

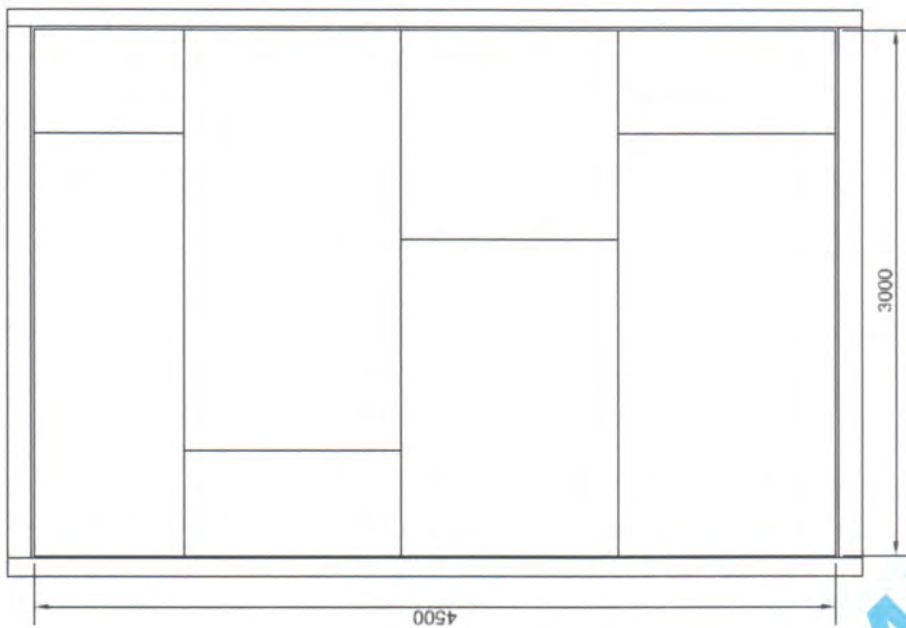
Figure 1 - Specimen Structural Drawing

Note: the specimen details provided by the sponsor





Chipboard Layout



Plasterboard Layout

Figure 2 - Specimen Structural Drawing

Note: the specimen details provided by the sponsor



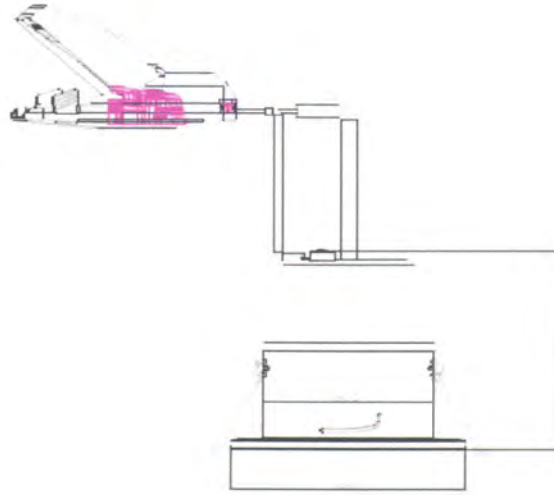


Figure 3 – Details of specimen 'A'

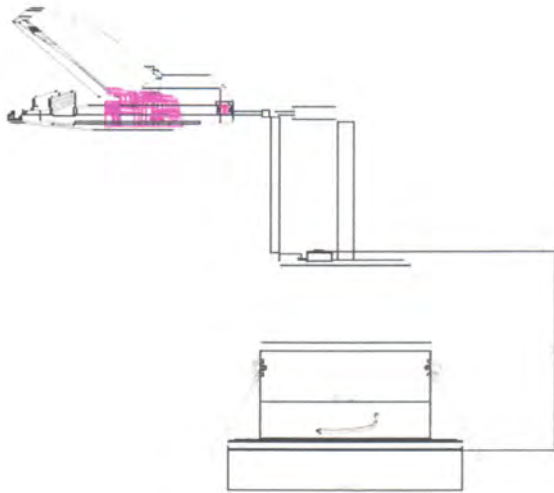


Figure 4 –Details of specimen 'B'

Note: the specimen details provided by the sponsor



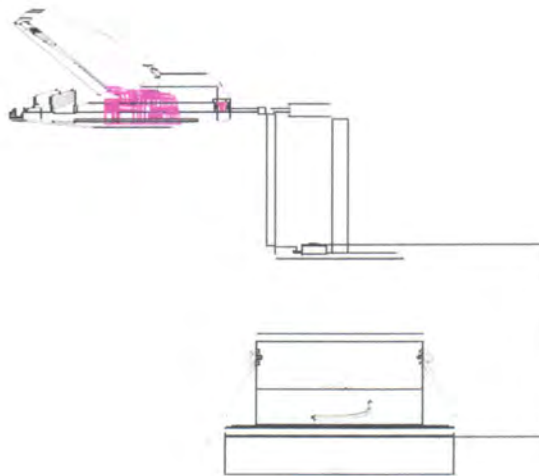


Figure 5 –Details of specimen 'C'

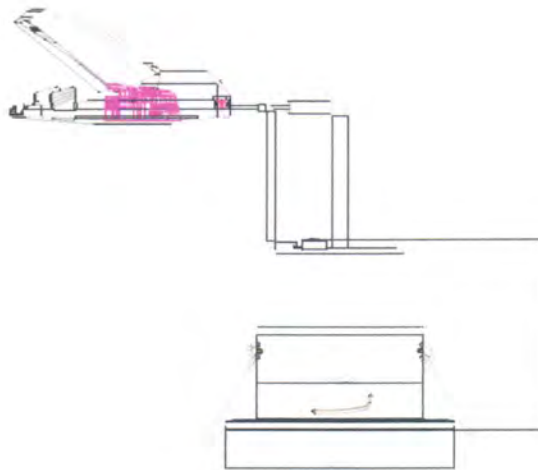


Figure 6 –Details of specimen 'D'

Note: the specimen details provided by the sponsor



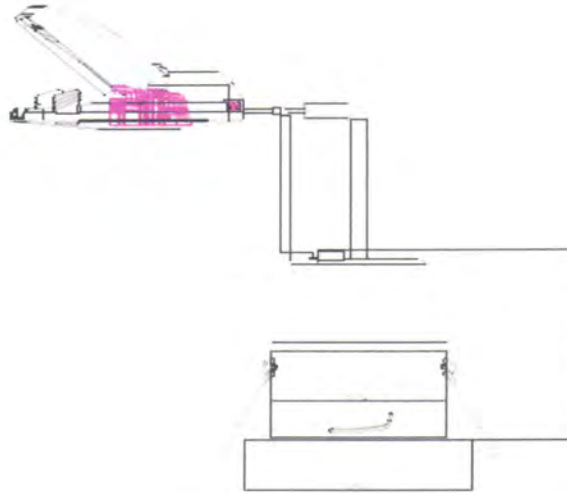


Figure 7 –Details of specimen 'E'

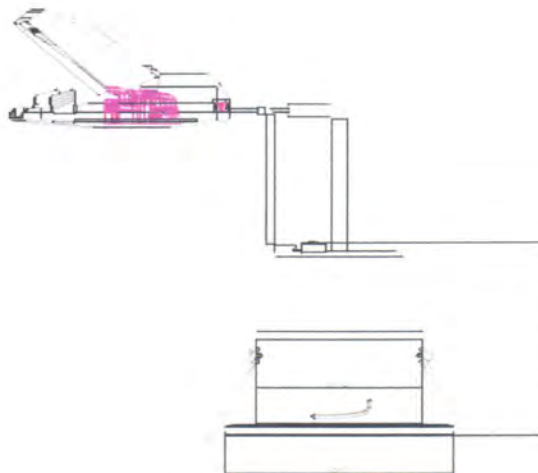


Figure 8 –Details of specimen 'F'

Note: the specimen details provided by the sponsor



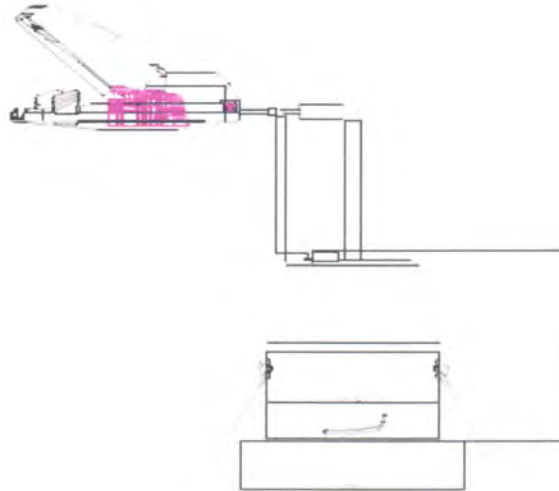


Figure 9 –Details of specimen 'G'

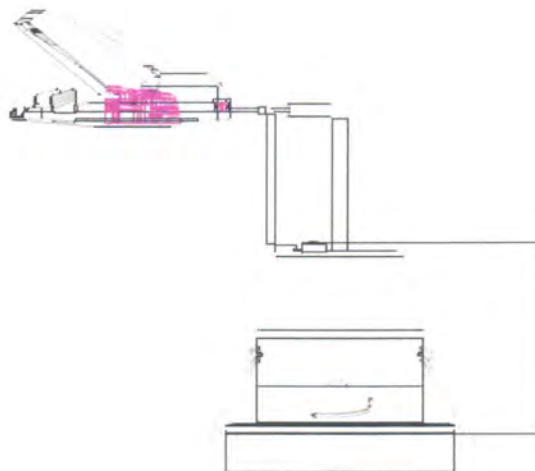


Figure 10 –Details of specimen 'H'

Note: the specimen details provided by the sponsor



TEMPERATURE CURVES

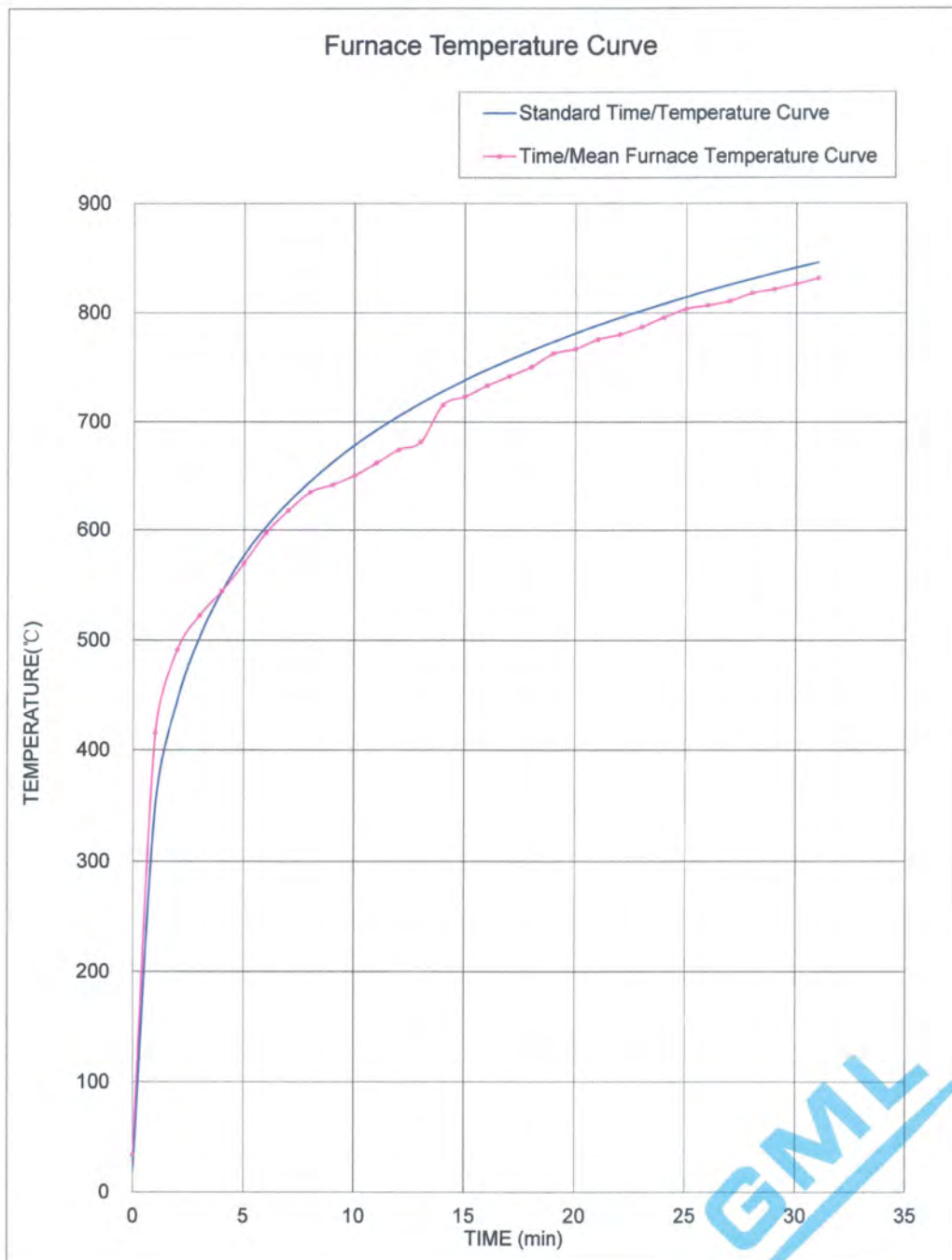


Figure 11 - Furnace Temperature Curve

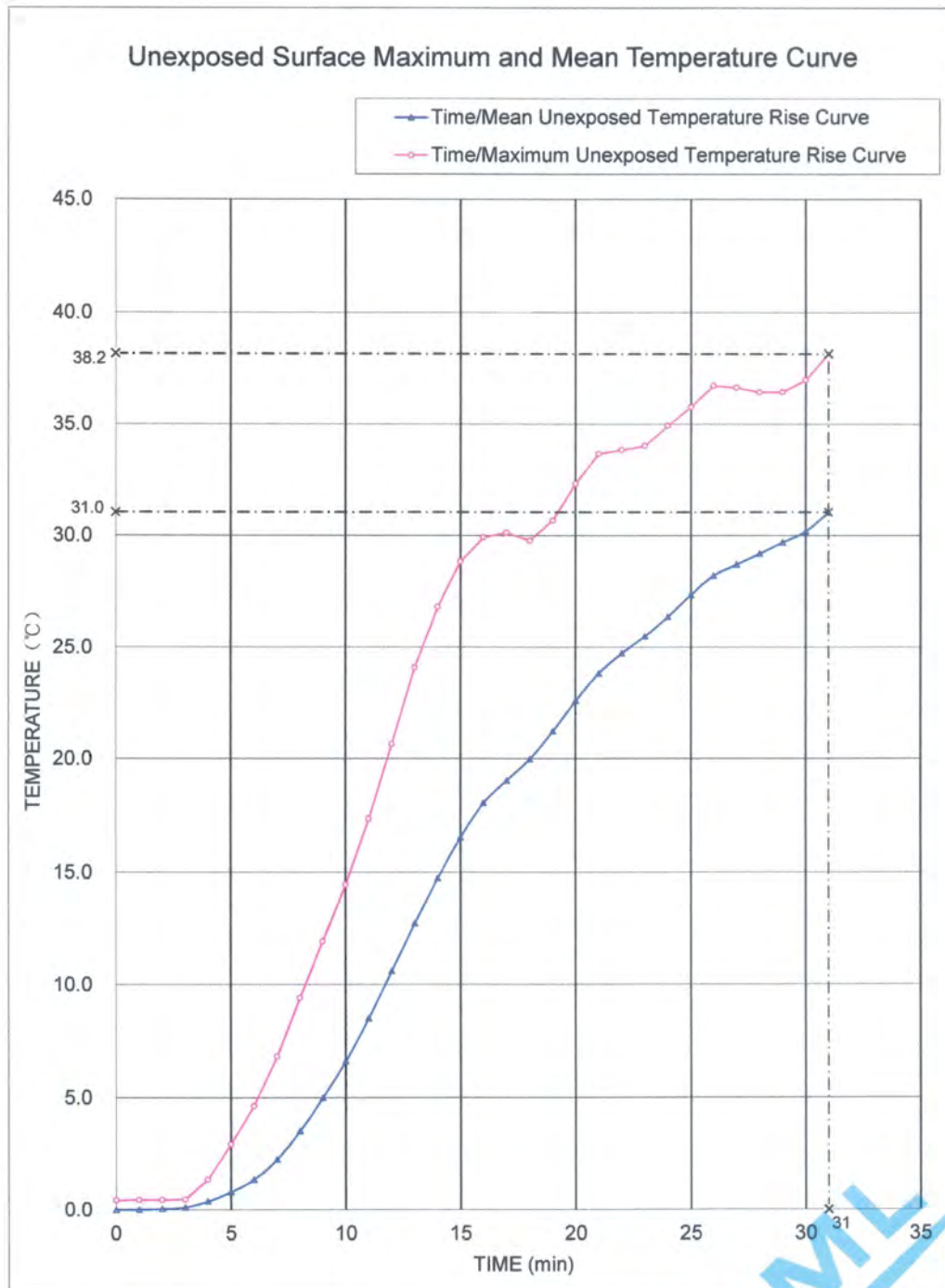


Figure 12 - Unexposed Face Mean and Maximum Temperature Curve

DEFLECTION CURVES

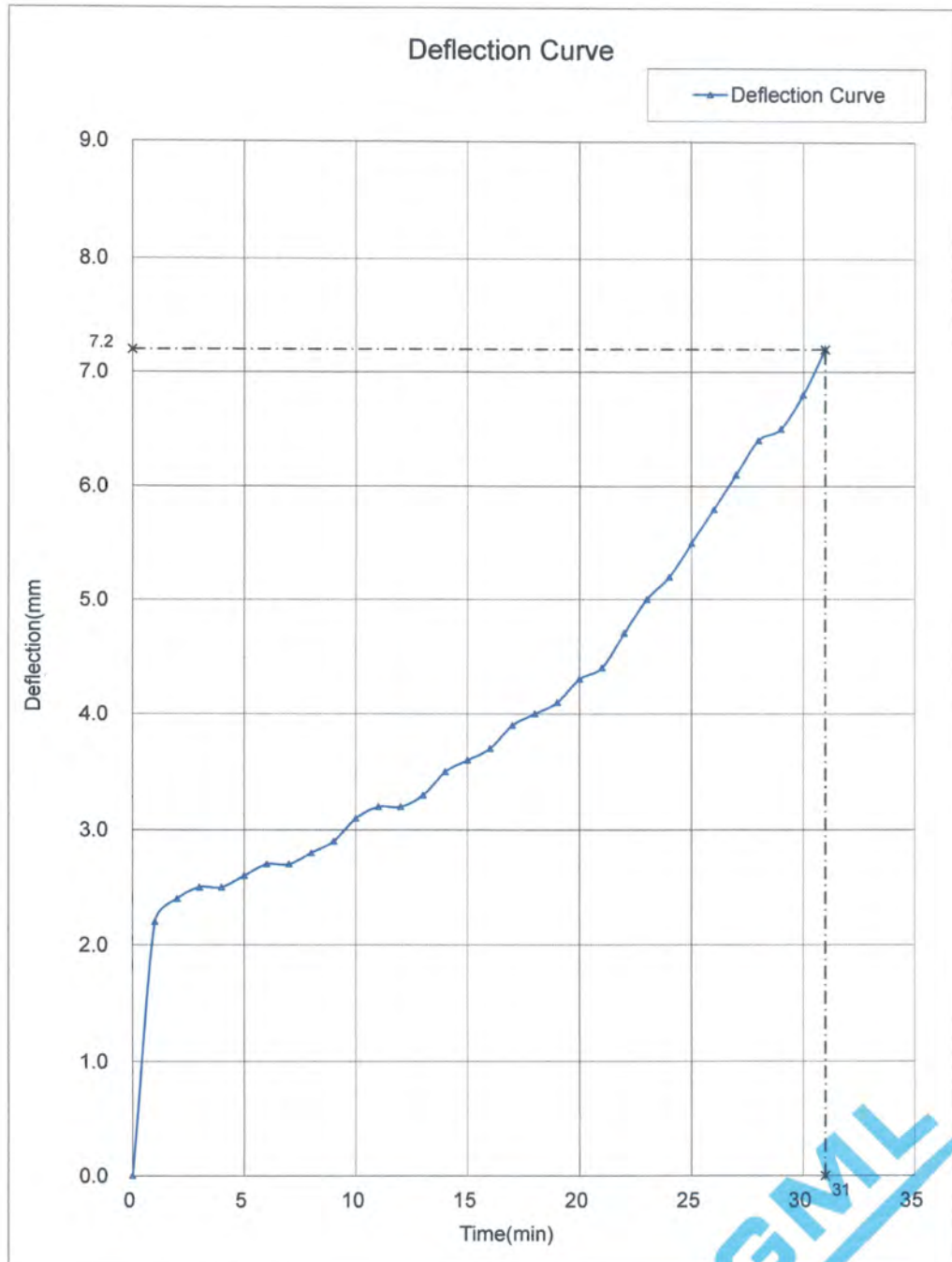


Figure 13 - Deflection Curve

TEST OBSERVATIONS

Time min	Observation (All observations are from the exposed face unless noted otherwise)
0	Test started.
3	The lens of specimen 'B' fused.
4	The lens of specimen 'A' and 'C' fused.
8	The lens of specimen 'D' fused.
12	The bezels of specimen 'B' fell away.
14	Coating of the plasterboard ceiling fell away.
27	The first layer plasterboard ceiling started to sag slightly and joints began to open.
31	Test terminated at sponsor's request.

Appendix 1 –Test Observations



TEMPERATURE RECORDS

Time min	Specified Furnace Temperature °C	Actual Furnace Mean Temperature °C
0	20	34
5	576	569
10	678	651
15	739	723
20	781	767
25	815	803
30	842	827
31	847	832

Appendix 2 – Furnace 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	32.5	32.8	32.4	32.8	32.8	32.8	32.9	32.3	33.1	32.7	0.0	0.4
5	32.6	35.6	32.7	33.4	33.0	32.9	33.0	32.3	33.2	33.5	0.8	2.9
10	35.9	47.1	36.6	40.1	36.7	34.2	34.5	33.5	34.7	39.3	6.6	14.4
15	43.9	61.5	44.0	52.2	44.4	38.2	38.7	38.6	39.3	49.2	16.5	28.8
20	51.7	65.0	49.9	58.1	51.6	43.1	43.5	43.5	44.7	55.2	22.6	32.3
25	57.9	68.4	54.7	61.6	57.4	47.6	48.2	47.5	50.1	60.0	27.4	35.8
30	62.6	69.7	56.3	61.7	64.0	51.8	52.5	51.2	54.4	62.8	30.2	37.0
31	63.7	70.8	56.7	61.8	65.4	52.3	53.5	51.3	55.3	63.7	31.0	38.2

Appendix 3 – Unexposed Surface Temperature Records



Time min	TC No.210 °C	TC No.211 °C	TC No.212 °C	TC No.213 °C	TC No.214 °C	TC No.215 °C	TC No.216 °C	TC No.217 °C
0	32.8	33.3	32.8	33.0	33.0	33.0	32.7	33.0
5	75.3	70.9	85.2	82.0	103.1	79.6	81.7	76.1
10	89.5	87.2	95.2	99.8	127.8	94.6	109.1	94.3
15	101.8	100.5	112.5	116.9	126.9	104.5	119.2	105.7
20	111.4	115.4	119.2	130.3	140.7	114.8	130.9	112.4
25	164.4	152.4	219.5	226.2	192.4	186.5	201.0	153.3
30	213.5	213.5	246.3	238.5	217.0	220.9	225.6	197.5
31	216.6	222.5	242.6	213.8	215.9	217.8	219.4	197.1

Appendix 4 – Individual Temperatures Recorded Adjacent to the Spotlight
Fittings at Mid-height of the Cavity



DEFORMATION RECORDS

Time min	Central Vertical Deflection mm	Rate of Deflection mm/min
0	0.0	0.0
5	2.6	0.1
10	3.1	0.2
15	3.6	0.1
20	4.3	0.2
25	5.5	0.3
30	6.8	0.3
31	7.2	0.4

Note:

1. A positive value indicates deflection towards to the furnace

Appendix 5 – Deflection of the floor assembly during the test

End



注 意 事 项

Notice

1. 检验检测报告未加盖本机构“检验检测专用章”无效；
Inspection Test Report is Invalid without the Seal of "Special Stamp of Inspection Test Report" of the Institution.
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4. 未经本机构书面批准，不得部分复制检验检测报告（完整复制除外），复印检验检测报告未重新加盖“检验检测专用章”无效；
Inspection Test Report shall not be Reproduced except in Full, without the Written Approval of Our Institution. Reproduced Report is Invalid without the Seal of "Special Stamp of Inspection Test Report" of the Institution.
5. 对检验检测报告若有异议应于收到检验检测报告之日起十五日内向本机构提出；
Any Objection against to the Inspection Test Report Should be Put forward to the Institution Within 15 days from the Day Receiving the Inspection Test Report.
6. 除见证检验外，委托检验仅对来样负责。
Except Sampling by Witness, the Inspection Test Report for the Samples Delivered by Client is Valid only for the Samples Tested.

The logo for GML (Guangdong Metrology) is located in the bottom right corner. It consists of the letters "GML" in a bold, blue, sans-serif font, slanted upwards to the right. A blue diagonal line passes through the bottom of the letters.