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Fire resistance test in accordance with B.S. 476 : Part 22 : 1987 on a plasterboard ceiling membrane incorporating two Fire Proofing Services Ltd. single-leaf access panels.

Prepared for:
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30th October 2009

Test report number 254906

UKAS TESTING

0578

Protecting People, Property and the Planet

Fire resistance test on two Fire Proofing Services Ltd. access panels in a plasterboard ceiling membrane.

Prepared on behalf of BRE Global by

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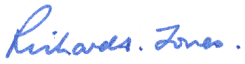
Date 30th October 2009

Signature 

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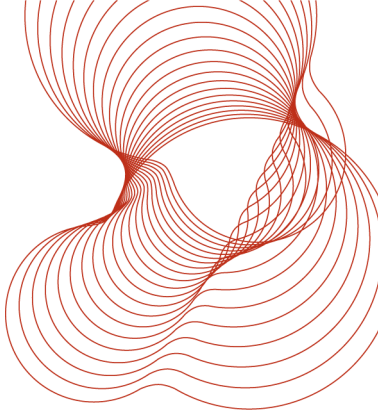


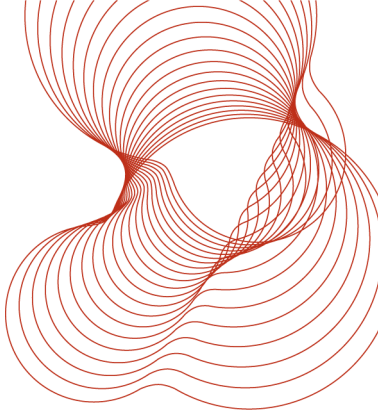
SUMMARY

A ceiling membrane constructed from a steel framework, with two layers of 12.5mm thick Lafarge Firecheck plasterboard fixed on the underside, incorporating two Fire Proofing Services Ltd. single-leaf access panels, was submitted to a fire resistance test in accordance with B.S. 476 : Part 22 : 1987 (Method 9 for ceiling membranes) on 27th July 2009. The ceiling membrane was of overall dimensions 3.5m x 4.15m with the access panels installed in structural openings, nominally 1205mm x 605mm.

The ceiling, incorporating the access panels (opening towards the furnace) achieved the following fire resistance:

Integrity: 13 minutes

The ceiling was not assessed for insulation (at the request of the sponsor).



1 OBJECTIVE

To determine, at the request of Fire Proofing Services Ltd., the fire resistance of a plasterboard ceiling membrane incorporating two single-leaf access panels, when tested in accordance with B.S. 476 : Part 22 : 1987 (Method 9 for ceiling membranes).

2 TEST CONSTRUCTION

2.1 General

The ceiling membrane and access panel were installed within the 3.5m x 4.15m aperture of a heavily reinforced concrete test frame during the week commencing 20th July 2009. The access panels opened towards the furnace.

The construction is shown in attached Figures and Photographs.

2.2 Ceiling Components

2.2.1 Perimeter channel

Perimeter channel was a 19.5mm x 26mm x 28mm C-section channel, formed from approximately 0.46mm-thick steel.

2.2.2 Primary channel

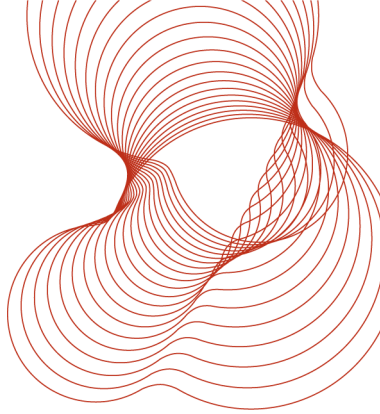
Primary channel was a 14mm x 45mm x 14mm C-section channel, formed from approximately 1.2mm-thick steel.

2.2.3 Furring channel

Furring channel was a splayed top-hat section, nominally 25mm deep. The narrow (top) part of the top hat section was 54mm wide, the sides extending outwards to a width of 60mm. The base of each side comprised a nominally 10mm flange, with a 3mm upturned lip.

2.2.4 Lafarge Gtec plasterboard

Lafarge 12.5mm-thick Gtec plasterboard was a nominally 12.5mm-thick Type 5 wall board, supplied to the laboratory as taper-edged sheets, 1200mm wide x 3000mm long. The boards, pink on the visible faces, were stated to consist of a gypsum plaster core with glass fibres and fillers with a nominal board weight between 10.0 kg/m^2 and 10.4 kg/m^2.



2.3 Ceiling construction

Perimeter channel was fixed around all four edges of the test frame as follows: Tabs, nominally 50mm-wide were cut in the 19.5mm side of the perimeter channel at 600mm centres and bent upwards to provide a means of fixing the channel to the test frame using 6mm x 40mm steel Rawl fixings.

Primary channels spanned the width of the test frame at 600mm centres, being supported on the perimeter channels, with some of the channels being additionally suspended at the nominal locations of the structural openings, from three I-section beams spanning the length of the test frame. Furring channels spanning the length of the ceiling were then located at 600mm centres, being attached to the primary channels and perimeter channel.

Two structural openings, 1025mm x 605mm, for the access panels were provided in the ceiling, the openings being formed form a length of primary channel joined to the top of a length of perimeter channel. The opening was lined with one layer of 12.5mm-thick Gtec plasterboard.

The first layer of plasterboard was attached to the ceiling using 32mm drywall screws, the second layer being attached using 50mm screws, all at nominally 250mm centres. Joints between the two layers were staggered, with joints between boards on the exposed face being sealed with British Gypsum Gyproc ready-Mix Joint Cement and 50mm mesh scrim tape.

2.4 Access Panels

Two different designs of access panel were fitted into the ceiling, one into each of the structural openings.

One panel was described as a PBFD panel, and incorporated a 0.9mm-thick door tray, faced with a 12.5mm -thick layer of plasterboard on the exposed face. A skim coat of ordinary plaster was also applied over the plasterboard after the access panel had been installed.

The other access panel was described as a MTFD panel, and comprised a 0.9mm thick door tray, with no additional insulation.

The access panels are shown in the figures.

No further information was provided.

3 CONDITIONING

At the time of construction a representative sample of plasterboard was taken and placed in an oven at 50°C to determine it's free moisture content by weight loss technique. The plasterboard was found to have a free moisture content of 0.5% by oven dry weight.

4 TEST PROCEDURE

4.1 General

The test was carried out on the 27th July 2009 in accordance with B.S. 476 : Part 22 : 1987 (method 9 for ceiling membranes) and was witnessed by Mr. R. Stokes representing the sponsor.

The ambient temperature at the start of the test was 17°C.

4.2 Furnace control

The furnace temperature was measured using ten bare-wire chromel/alumel thermocouples arranged symmetrically in the furnace, with their measuring junctions 100mm below the exposed face of the ceiling and access panel. The furnace was controlled so that the mean of these thermocouple readings followed the time/temperature relationship of B.S. 476 : Part 20 : 1987.

A pressure-sensing head was located in the furnace 100mm below the ceiling. The pressure conditions within the furnace were maintained at 18Pa, in accordance with Section 3.2 of B.S. 476 : Part 20 : 1987.

4.3 Temperature measurements on specimen

Although the specimen was not being evaluated for insulation, the temperatures of the unexposed face of the ceiling and access panels were measured using eleven chromel / alumal thermocouples fixed to the surface and covered with an insulating pad. The location of the thermocouples is given in the following table.

Thermocouple number	Location
*1	At the centre of the top left quarter of the ceiling.
*2	At the centre of the top right quarter of the ceiling.
*3	Near the centre of the ceiling.
*4	At the centre of the bottom left quarter of the ceiling.
*5	At the centre of the bottom right quarter of the ceiling (on the insulation surface).
6	On the frame of access panel MTFD.
7	On the access panel leaf of panel MTFD, adjacent to the frame.
8	In the centre of the leaf of access panel MTFD.
9	On the frame of access panel PBFD.
10	On the access panel leaf of panel PBFD, adjacent to the frame.

Thermocouple number	Location
11	In the centre of the leaf of access panel PBFD.

* These thermocouples were used to determine the mean surface temperature of the ceiling, for information.

5 RESULTS

5.1 Observations

Observations made during the test are given in the following table and unless stated refer to the unexposed face.

Time minutes	Observation
0	Start test.
4 ½	Some smoke is coming from access panel MTFD. No smoke from panel PBFD
6	Considerable smoke from access panel MTFD. Most of the smoke is coming from the access panel leaf / frame interface on the latch side.
10	The surface of access panel leaf MTFD is darkening to a black colour and some blistering of the surface is occurring.
11	Slight smoke form the latch areas of access panel PBFD
13	**Failure of integrity** of access panel PBFD using the 6mm gap gauge. The leaf has sagged, resulting in a gap between the leaf and frame at the top of the leaf.
15	The gap referred to at 13 minutes is now in excess of 25mm.
19	The surface of access panel leaf MTFD is now turning yellow in colour.
30	There are no gaps forming in any location on access panel MTFD.
35	On the exposed face, gaps at the joints between sheets of plasterboard on the exposed face layer have formed and are up to approximately 10mm. All boards are still in position.
38	Access panel MTFD is starting to glow red hot at the latch locations.
51	All plasterboard on the exposed face of the ceiling is intact.

Time minutes	Observation
54	**Failure of integrity** of the ceiling membrane using the cotton pad at a joint between plasterboard sheets. This failure is remote from the access panels, and the performance of the ceiling at this location is unlikely to have been affected by the access panels.
56	The whole joint between plasterboard sheets (referred to at 54 minutes) is now sufficiently wide to cause cotton pad failure.
58	No boards have fallen from the exposed face.
66	Test stopped.

The specimen is shown during and after the test in the attached Photos.

5.2 Furnace temperature

The mean furnace temperature, together with the specified curve for comparison is given in the attached graphs.

5.3 Surface temperatures

The temperatures recorded on the unexposed face of the specimen (for information only) are given in the attached graphs.

For information, the maximum temperature rise limit for insulation (180^{O}C rise) was first exceeded by thermocouple number 8 (located on the centre of the leaf of access panel MTFD) after 3 minutes.

Also for information, the mean temperature rise limit for insulation (140^{O}C rise) was first exceeded on the ceiling membrane after 52 minutes.

6 PERFORMANCE CRITERIA

The standards state that a ceiling membrane is regarded as having a fire resistance (expressed in minutes) that is equal to the elapsed time (in completed minutes) between the commencement of heating and the termination of heating, or until failure to meet the integrity or insulation criteria occurs, whichever is the sooner.

Integrity : Failure is deemed to occur:

a) when collapse or sustained flaming for not less than 10s on the unexposed face occurs;

b) when cracks, gaps or fissures allow flames or hot gases to cause flaming or glowing of a cotton fibre pad;

c) when a 6mm-diameter gap gauge can penetrate through a gap into the furnace, other than at sill level in doorsets, and be moved in the gap for a distance of at least 150mm;

d) a 25mm-diameter gap gauge can penetrate through a gap into the furnace.

7 CONCLUSION

A plasterboard ceiling membrane, incorporating two singe-leaf Fire Proofing Services Ltd. access panels, as described in this report, when tested in accordance with British Standard 476 : Part 22 : 1987 (Method 9) achieved the following fire resistance:

Integrity: 13 minutes

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty on measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

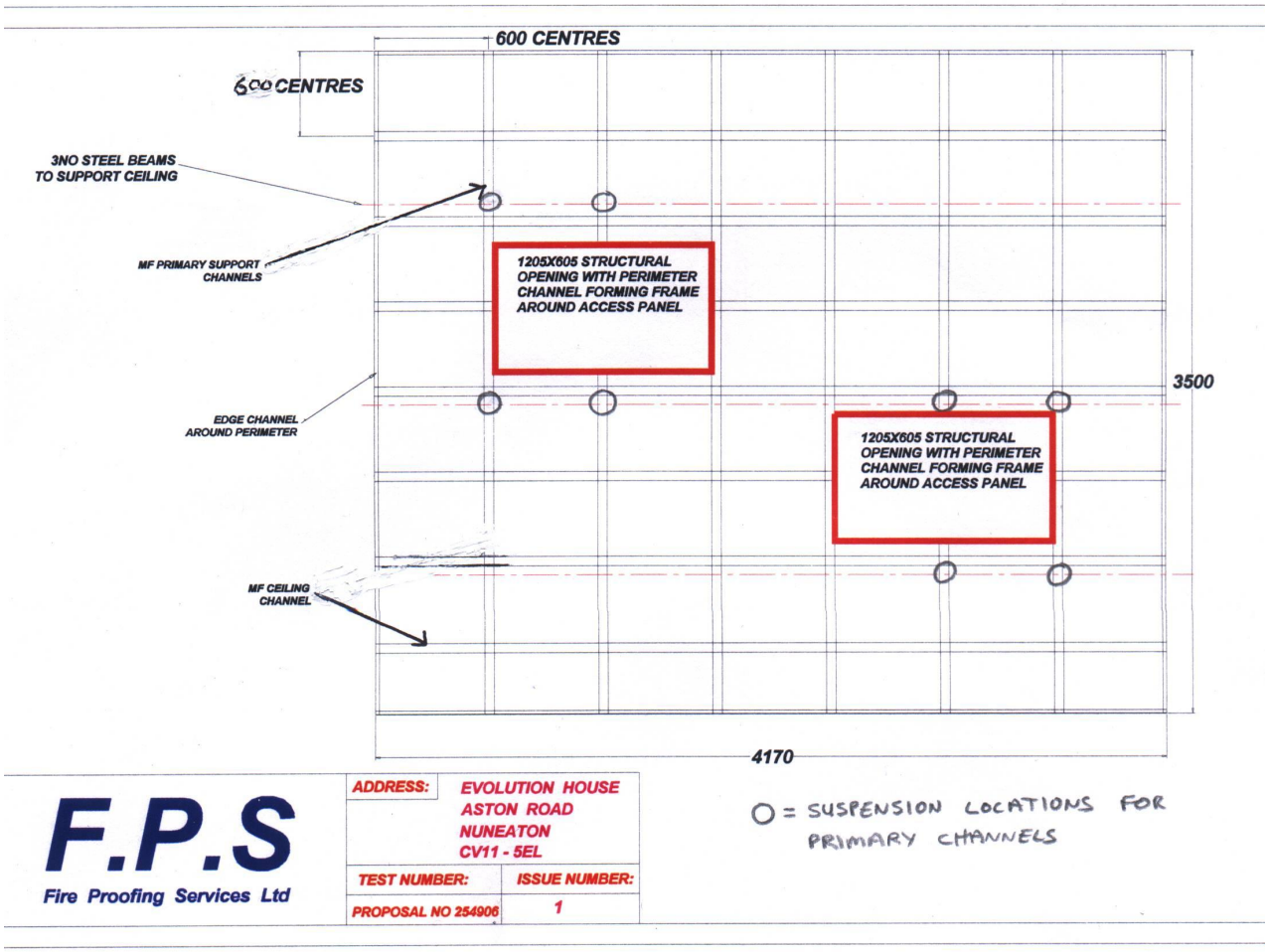
The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over 5 years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.

The results only relate to the behaviour of the specimen of the element of construction under the particular conditions of 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.

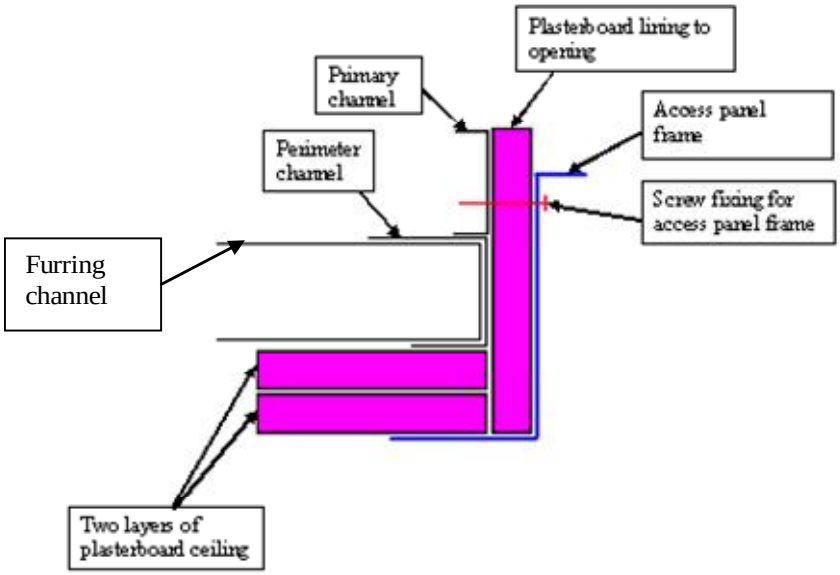
8 REFERENCES

- Fire tests on building materials and structures. Part 22. Methods for determination of the fire resistance of non-loadbearing elements of construction. British Standard 476 : Part 22 : 1987. British Standards Institution, London, 1987.
- Fire tests on building materials and structures. Part 20. Method for determination of the fire resistance of elements of construction (general principles). British Standard 476 : Part 20 : 1987. British Standards Institution, London, 1987.

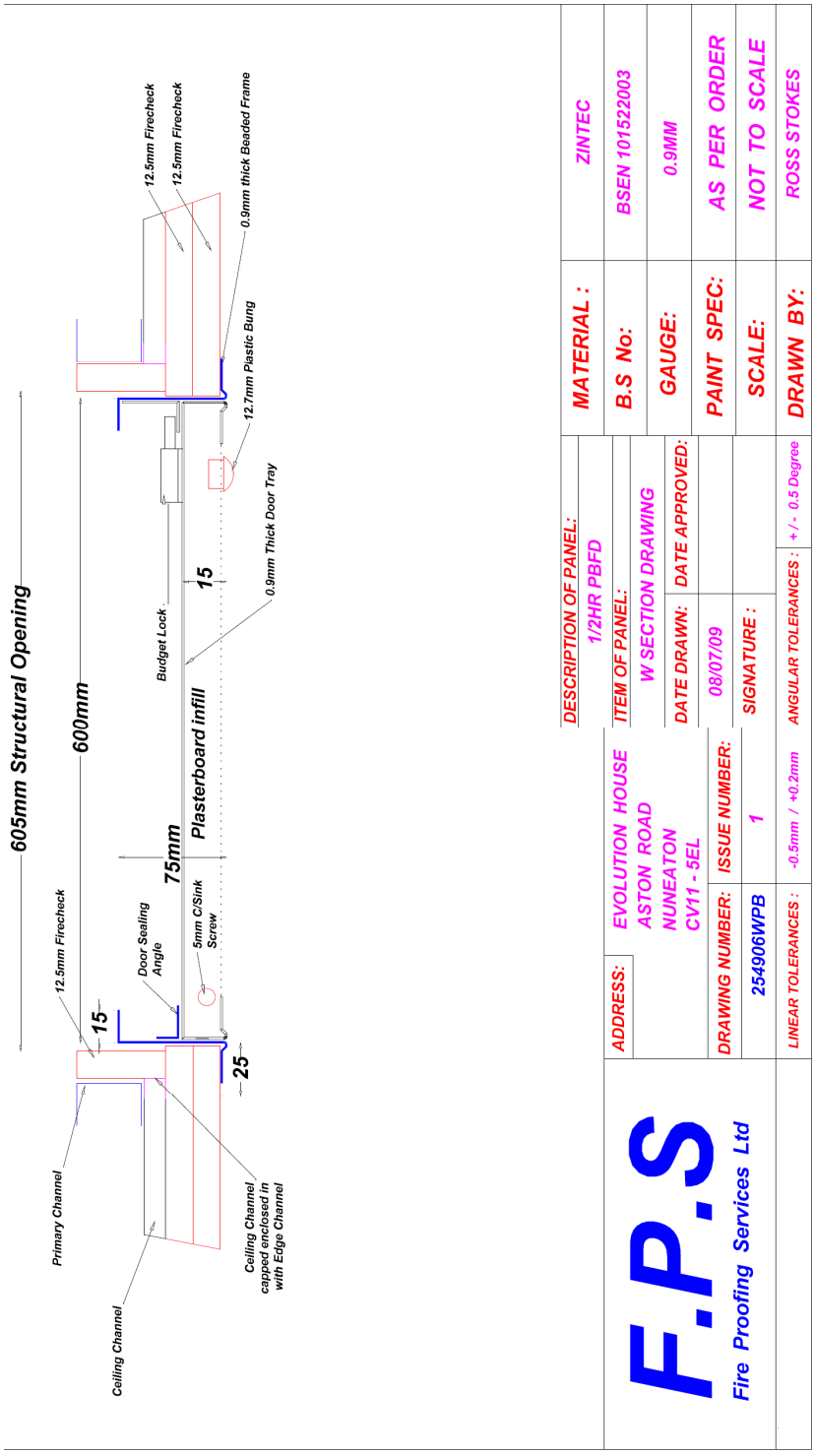
9 FIGURES



General arrangement of specimen.

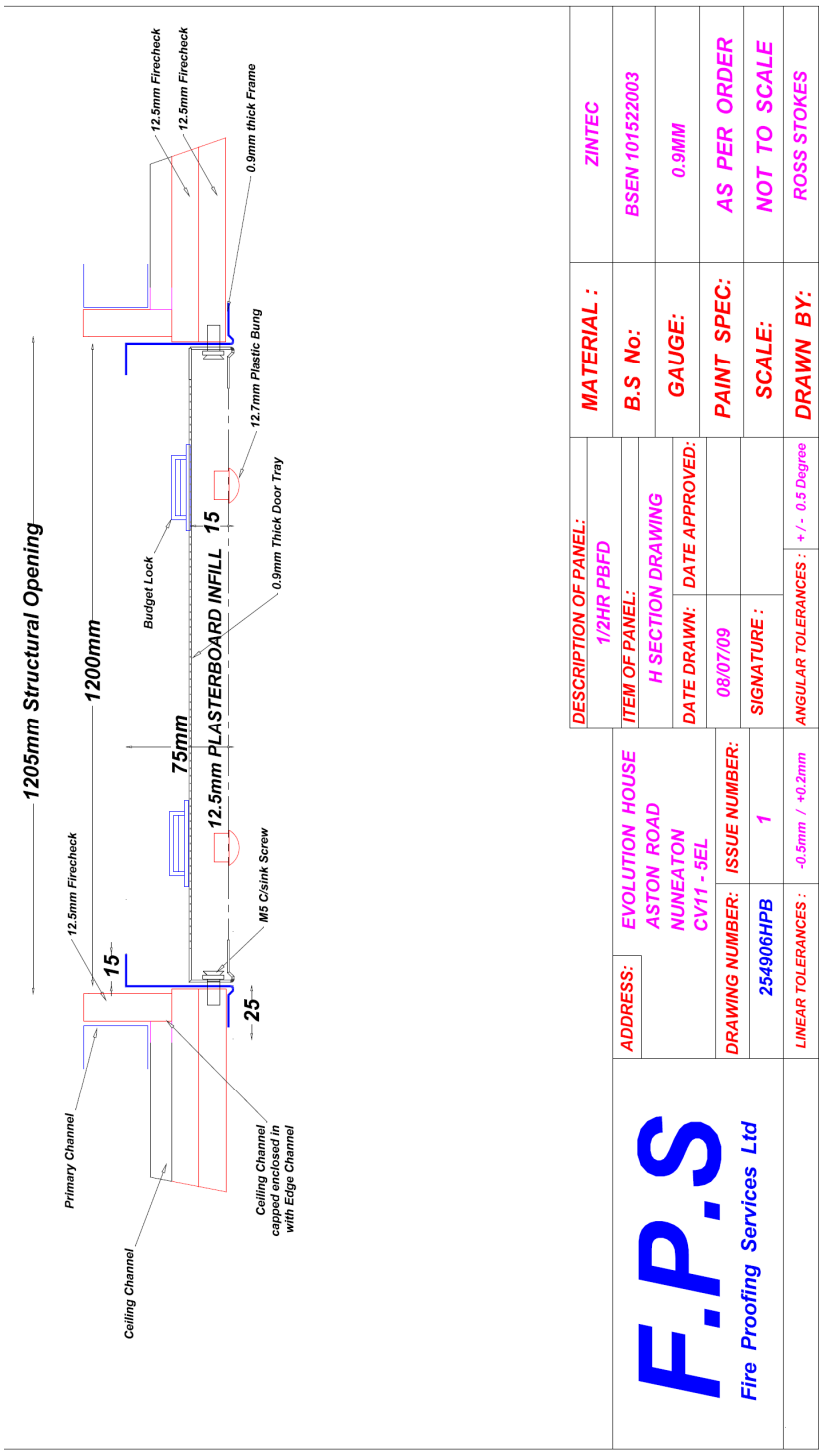


Sketch showing arrangement of structural openings in ceiling for mounting access panels.



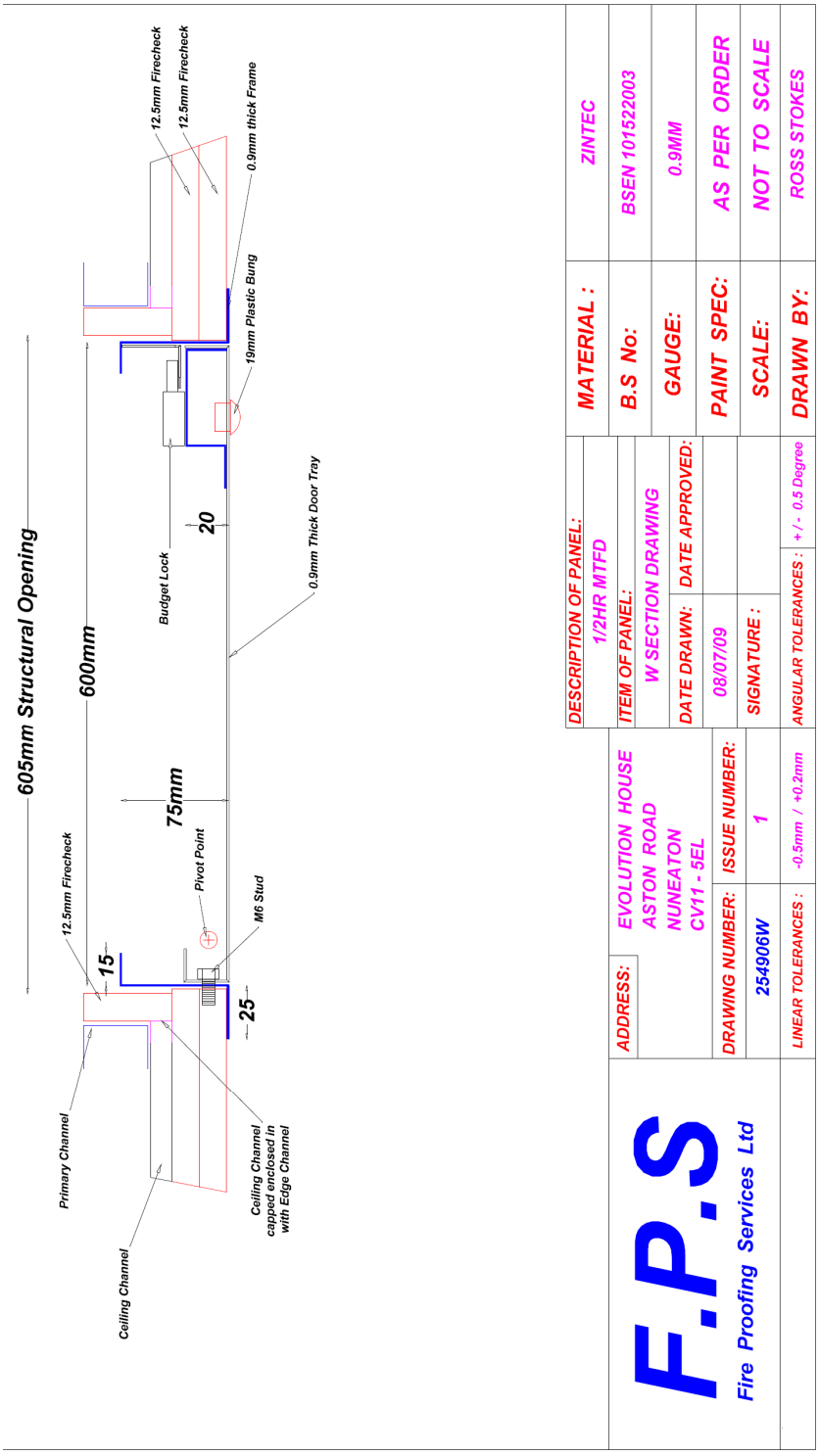
Section view through width of PBFD access panel.

Note: The detail of the structural opening in the ceiling is incorrect. The actual method of construction is shown in the sketch on the page 12.



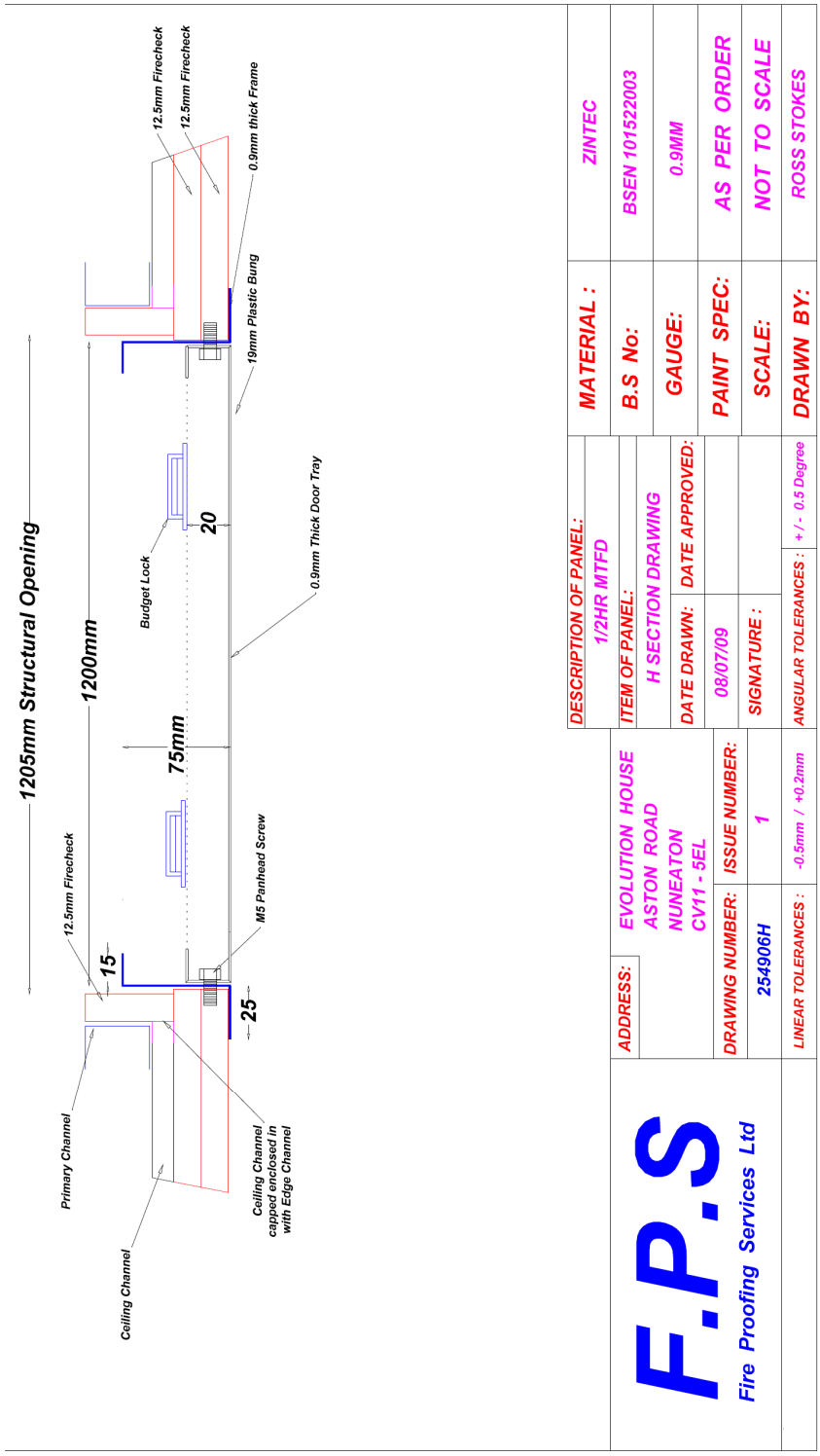
Section view through length of PBFD access panel.

Note: The detail of the structural opening in the ceiling is incorrect. The actual method of construction is shown in the sketch on the page 12.



Section view through width of MTFD access panel.

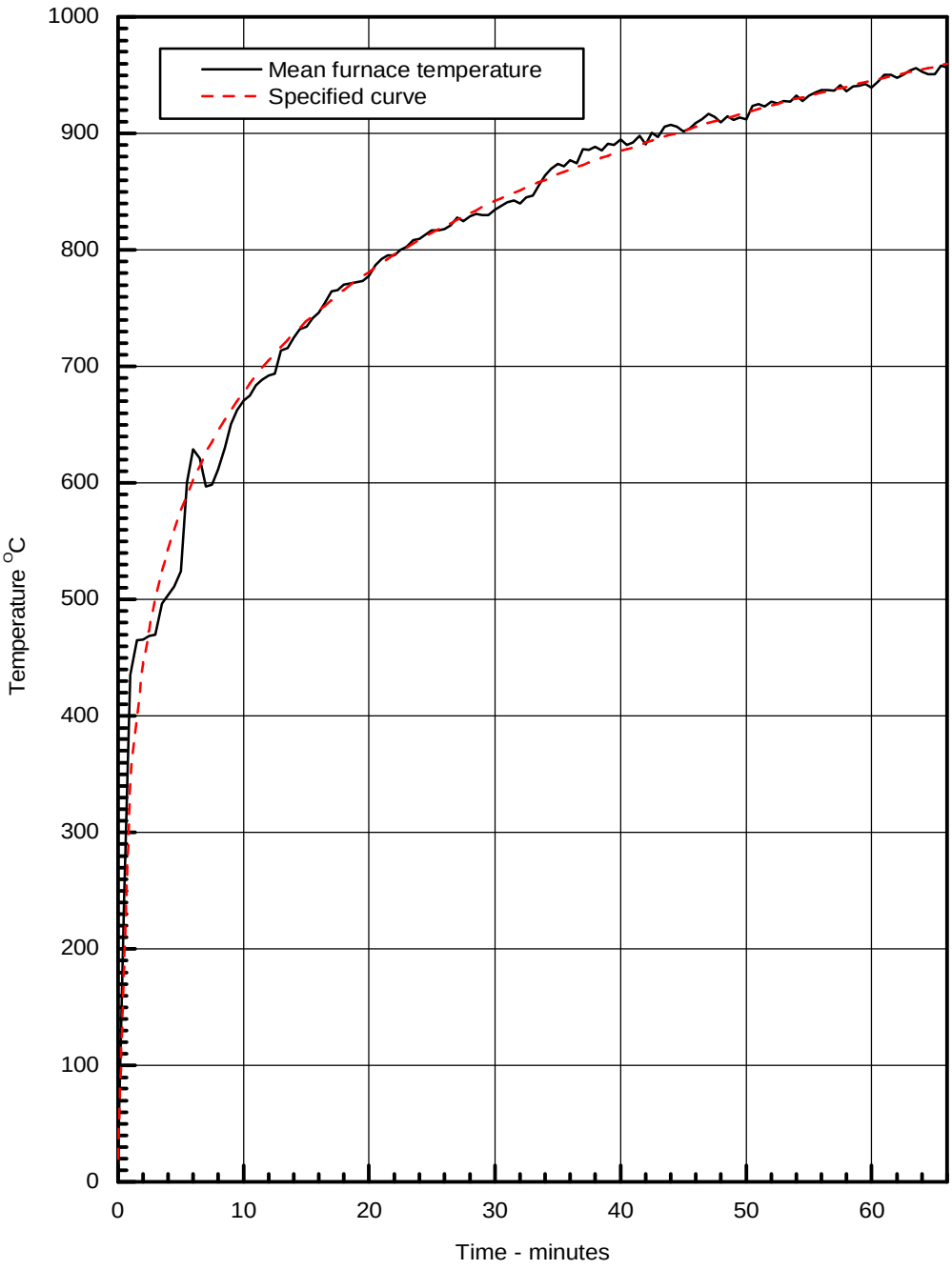
Note: The detail of the structural opening in the ceiling is incorrect. The actual method of construction is shown in the sketch on the page 12.



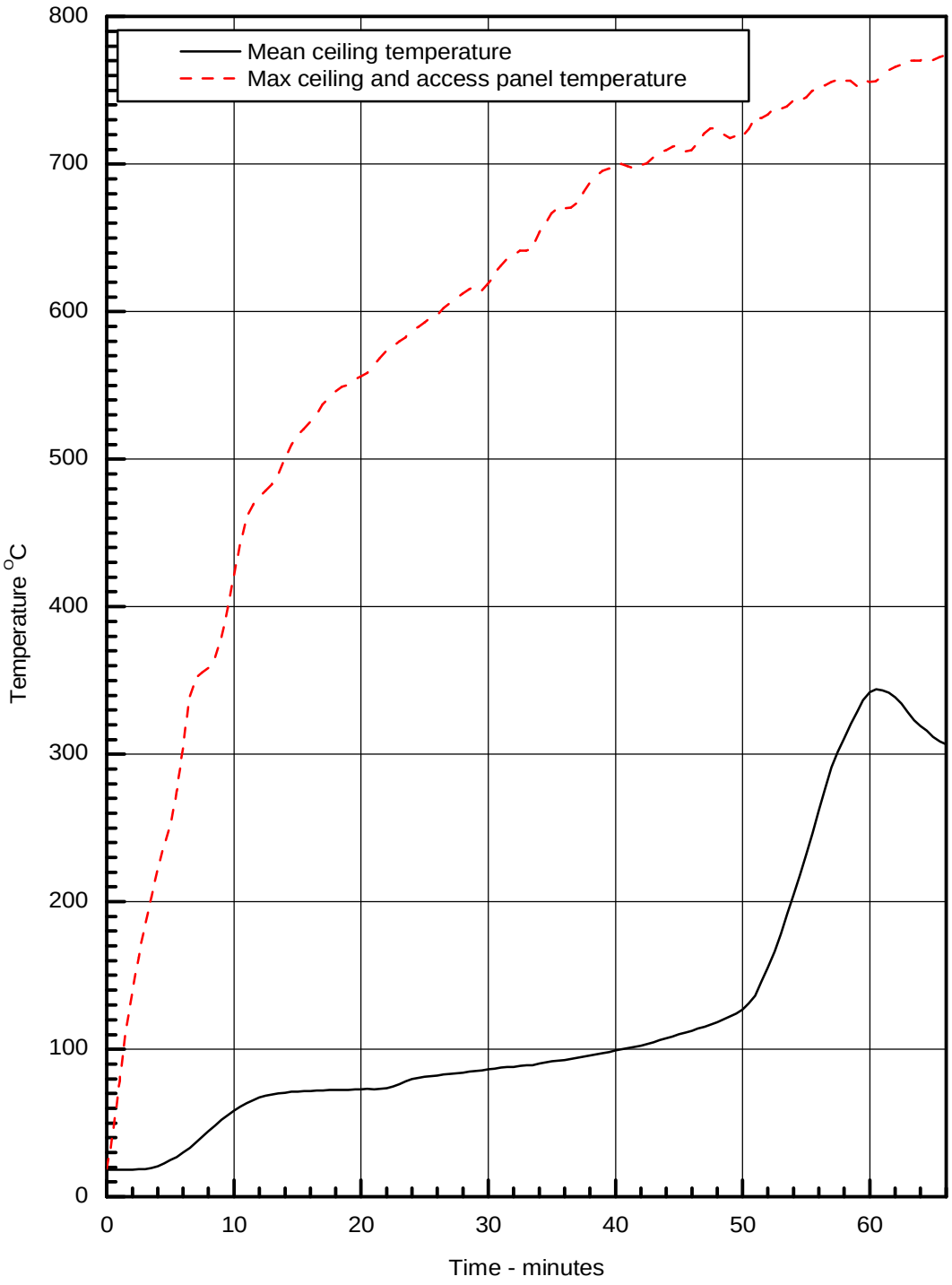
Section view through length of MTFD access panel.

Note: The detail of the structural opening in the ceiling is incorrect. The actual method of construction is shown in the sketch on the page 12.

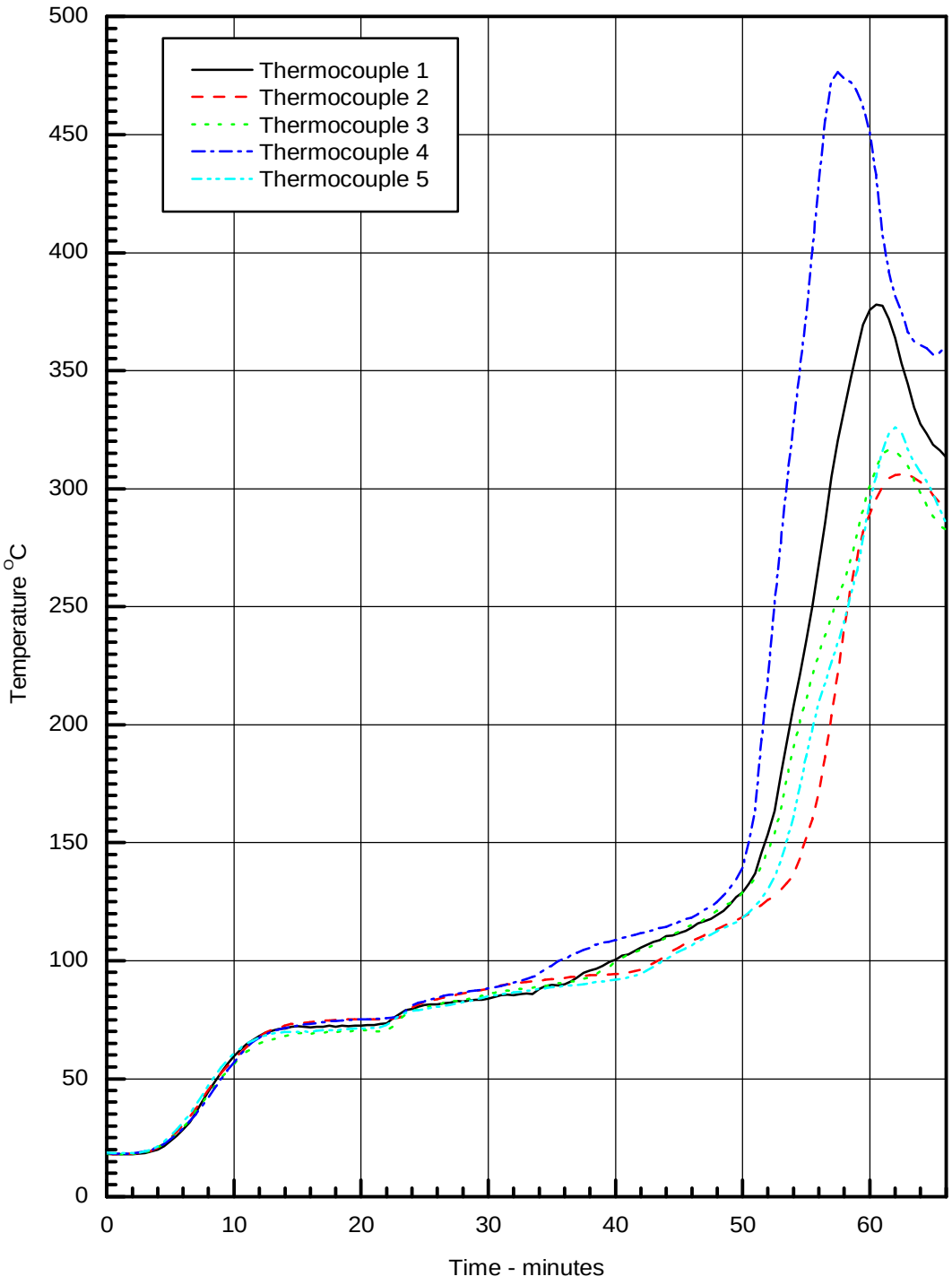
10 GRAPHS



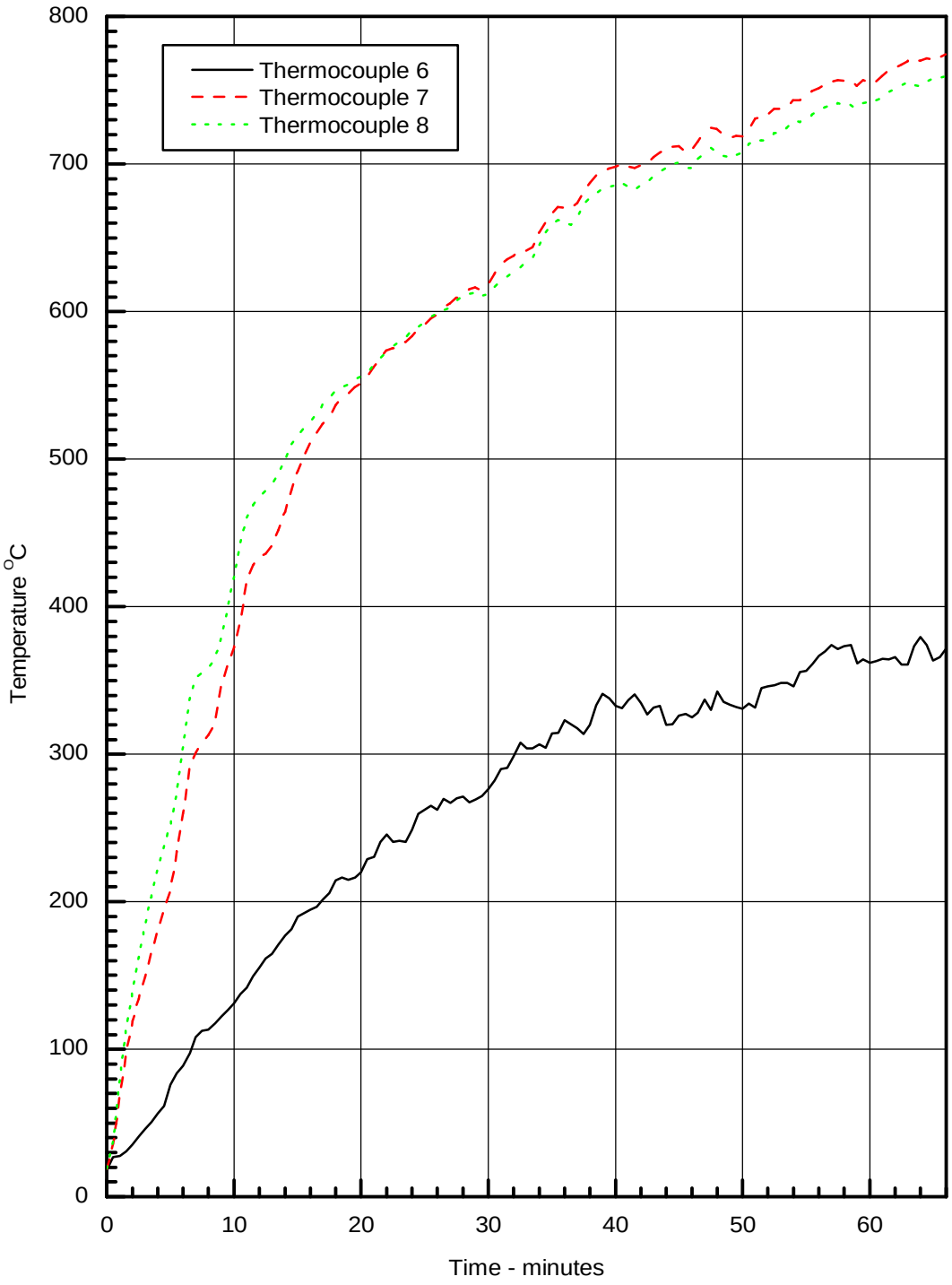
Mean furnace temperature with specified curve for comparison.



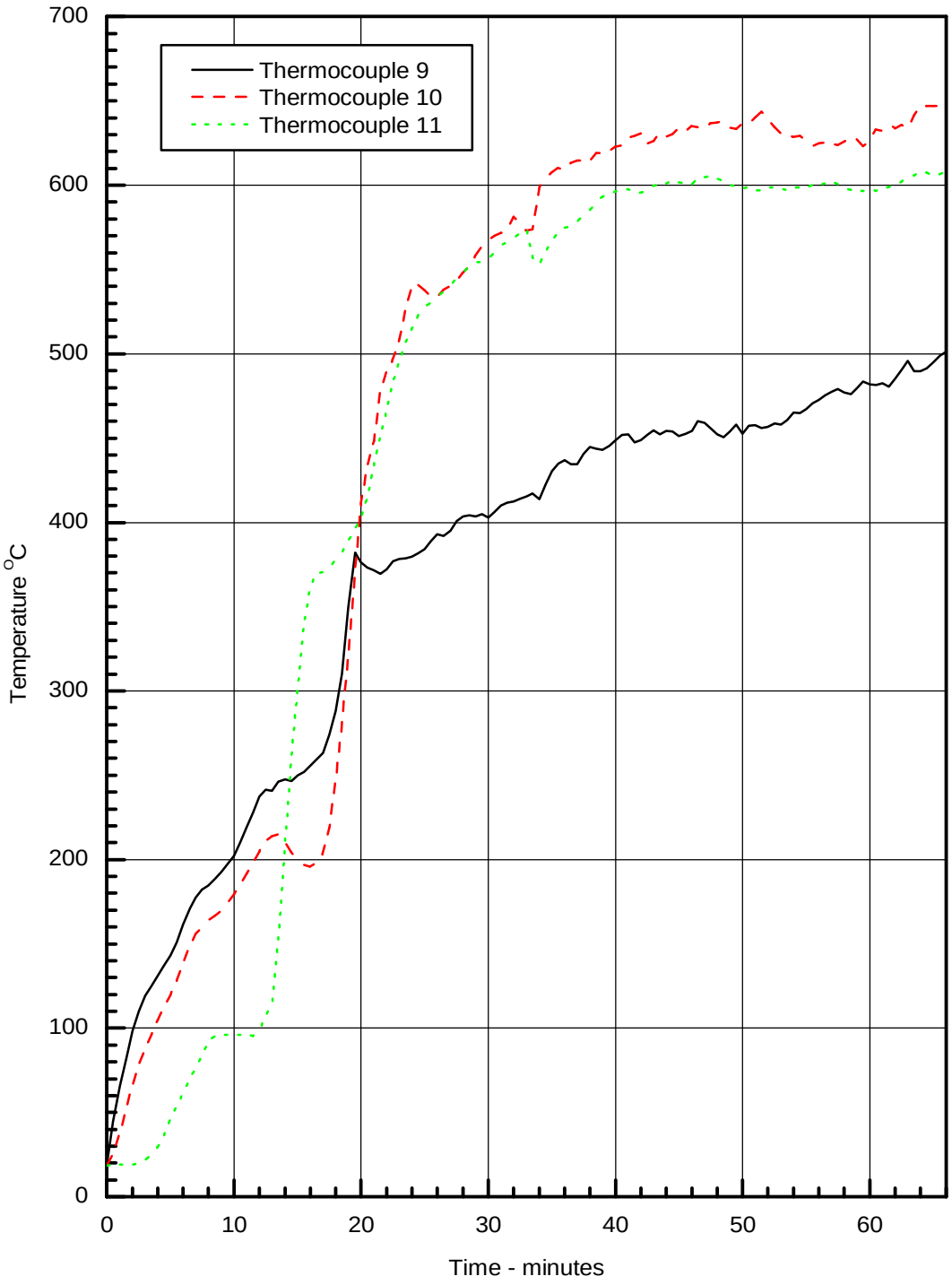
Mean and maximum temperatures recorded on the ceiling and access panels.



Individual temperatures recorded on the ceiling membrane surface.



Individual temperatures recorded on the MTFD access panel.

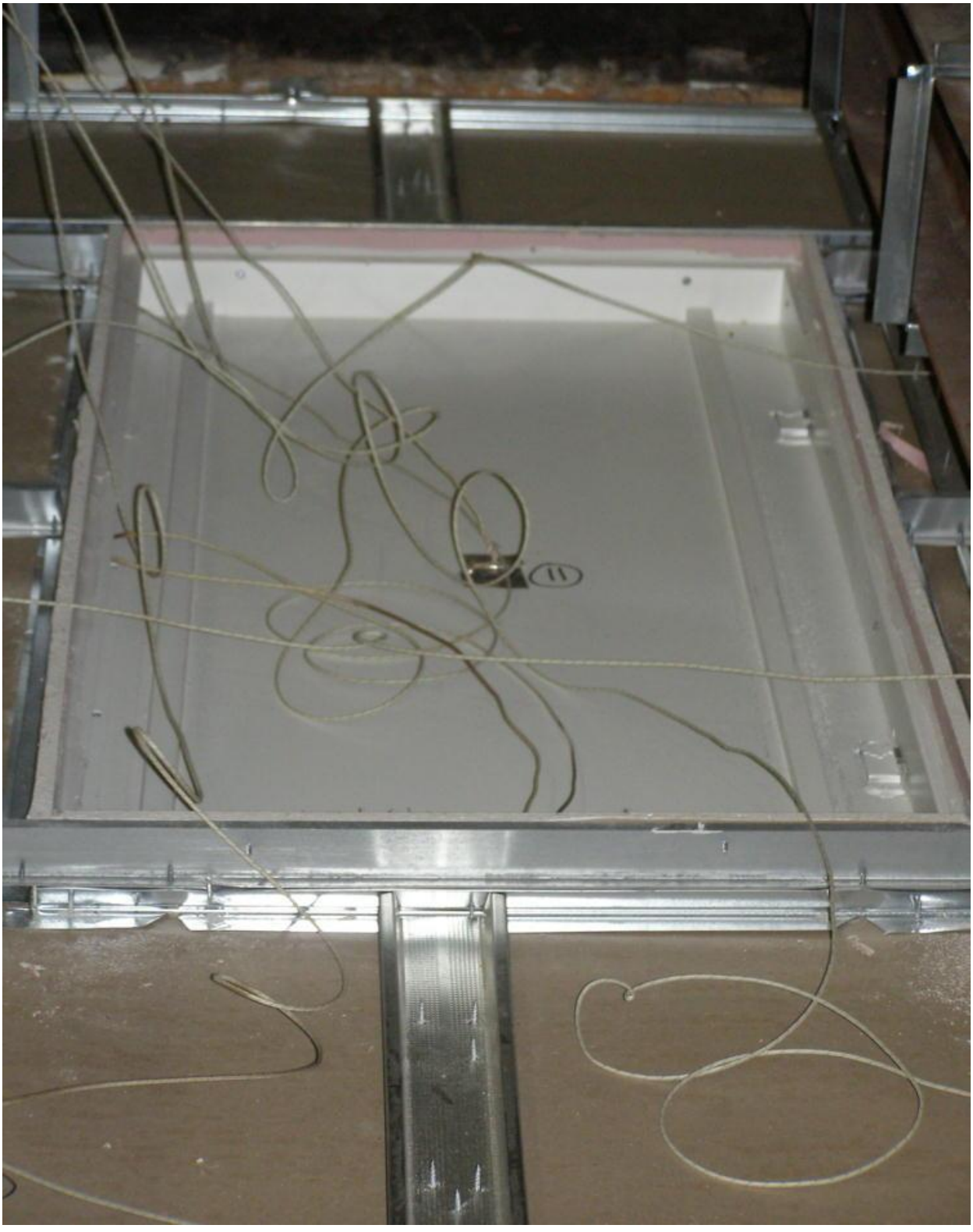


Individual temperatures recorded on the PBFD access panel.

11 PHOTOGRAPHS

Exposed face of ceiling before test.

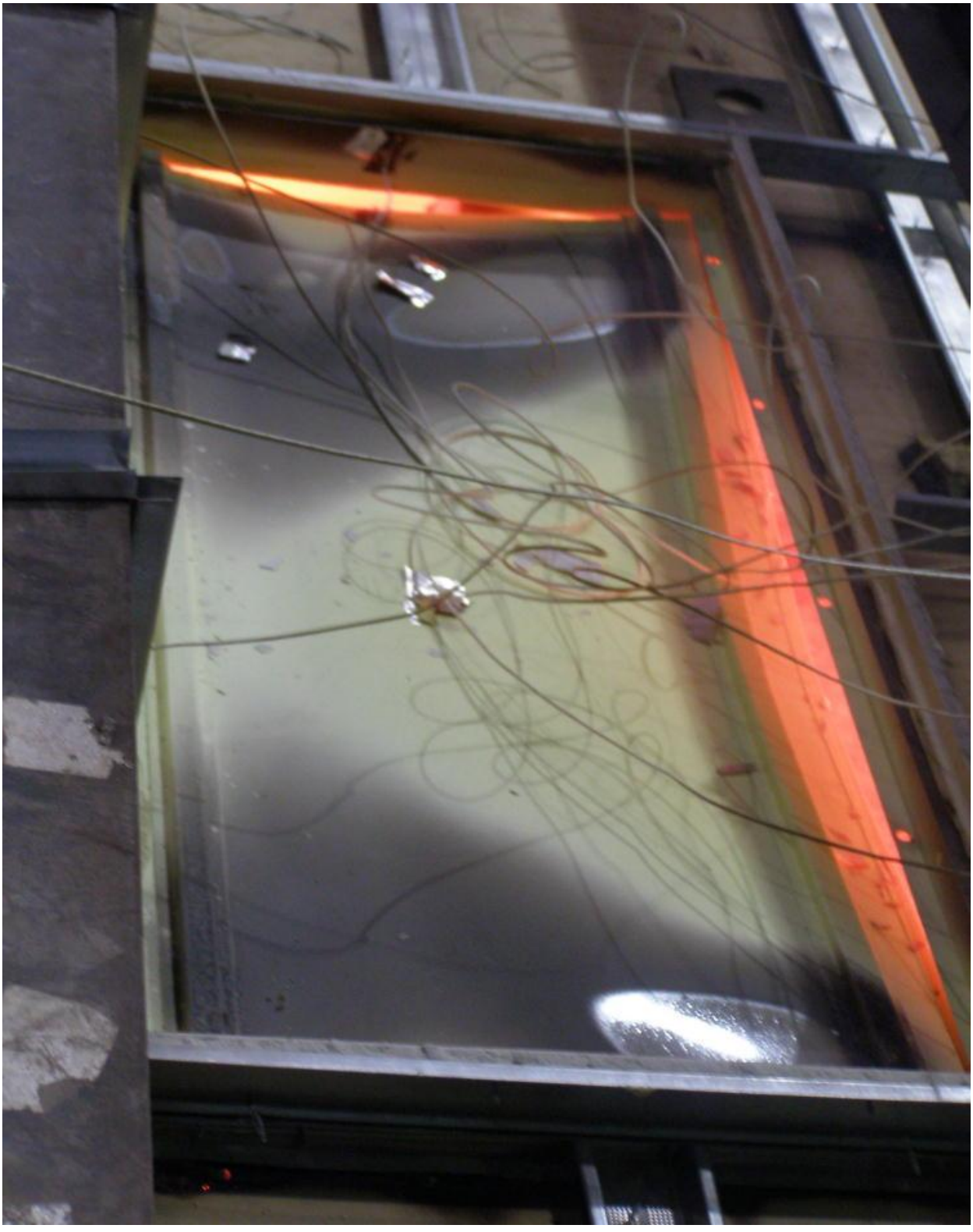
Unexposed face of ceiling showing MTFB access panel before test.



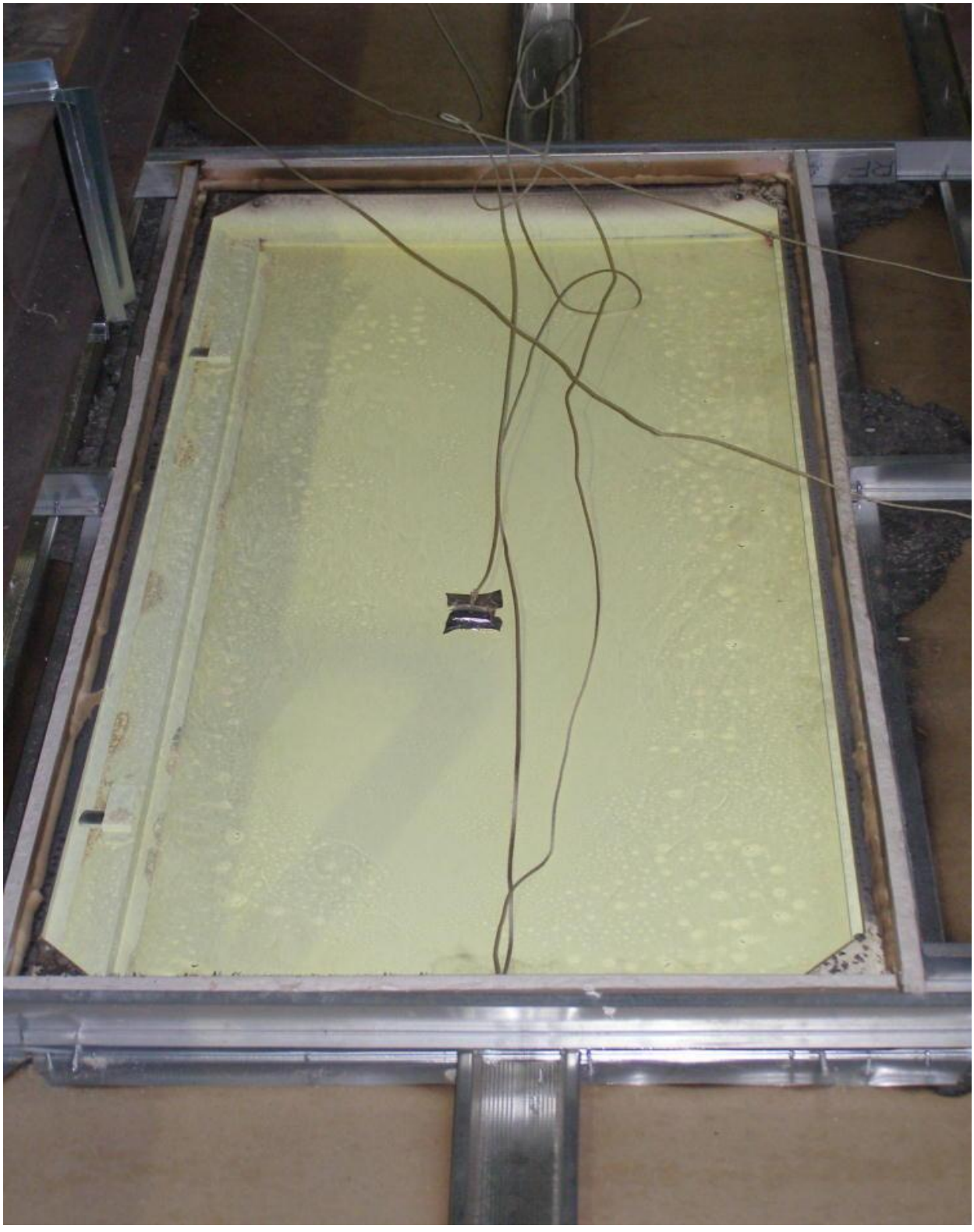
Unexposed face of PBFD access panel before test.

Unexposed face of ceiling showing PBFB access panel after 30 minutes.

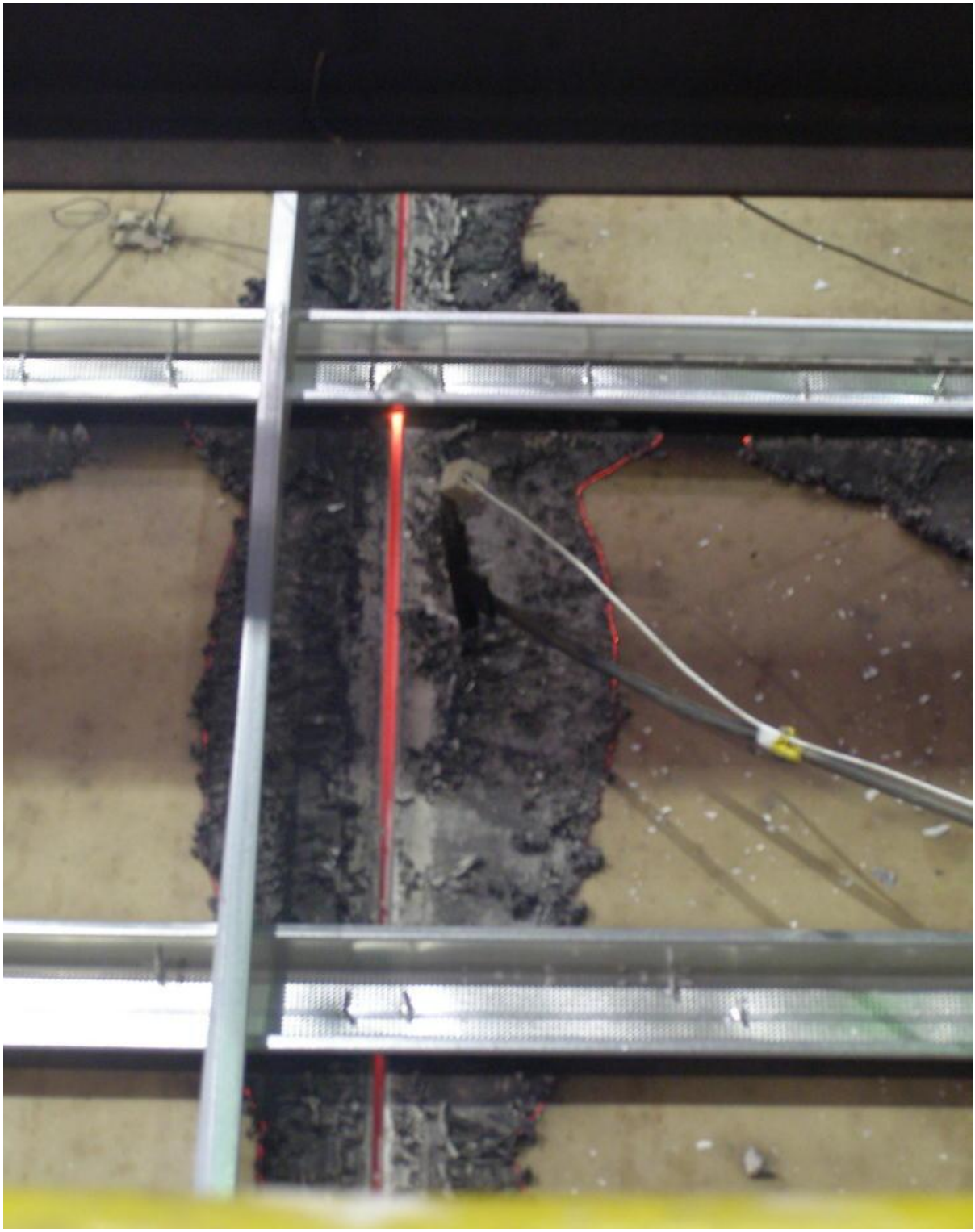
Unexposed face of ceiling showing MTFD access panel after 30 minutes.



Unexposed face of ceiling showing PBFB access panel after 60 minutes.



Unexposed face of ceiling showing MTFB access panel after 60 minutes.



Unexposed face of ceiling after 60 minutes, showing location of integrity failure of ceiling membrane.

Exposed face of specimen after test.

==========REPORT ENDS==========