bre

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

Prepared for:
Fire Proofing Services Ltd.,
Evolution House,
Aston Road,
Nuneaton.
CV11 5EL

17th January 2007

Test report number 231891

UKAS TESTING

0578

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

Prepared on behalf of BRE Testing by

Name K. D. Fardell

Position Consultant

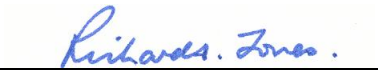
Signature 

Approved on behalf of BRE Testing by

Name Richard A Jones

Position Associate Director

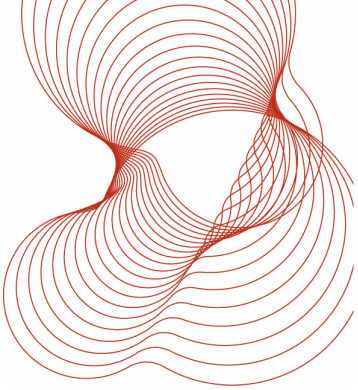
Date 17-Jan-2007

Signature 

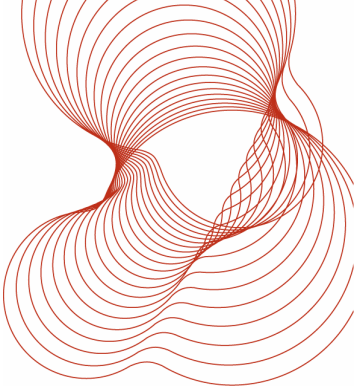
BRE Testing
Garston
WD25 9XX
T + 44 (0) 1923 664100
F + 44 (0) 1923 664994
E enquiries@brecertification.co.uk
www.bre.co.uk

BRE Testing is not UKAS accredited to make opinions and interpretation. Any opinions and interpretations included as part of this report are clearly marked as such.

UKAS TESTING
0578



Contents



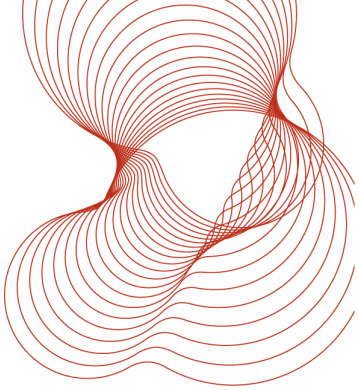
SUMMARY

A plasterboard ceiling membrane, constructed from a steel framework with two layers of Lafarge Firecheck plasterboard fixed on the underside, incorporating a Fire Proofing Services Ltd. access panel, was submitted to a fire resistance test in accordance with B.S. 476 : Part 22 : 1987[1] (Method 9 for ceiling membranes) on 30th August 2006. The ceiling membrane was of overall dimensions 3.5m x 4.15m with the access panel installed in a structural opening, nominally 1156mm x 1306mm near the centre of the ceiling.

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

Integrity: 68 minutes

The specimen was not evaluated for insulation, as agreed with the sponsor.



1 OBJECTIVE

To determine, at the request of Fire Proofing Services Ltd., the fire resistance of a plasterboard ceiling membrane incorporating a double-leaf Fire Proofing Services Ltd. access panel, when tested in accordance with B.S. 476 : Part 22 : 1987[1] (Method 9 for ceiling membranes).

2 TEST CONSTRUCTION

2.1 General

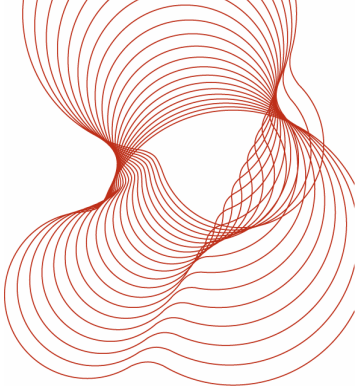
The ceiling membrane and access panel were installed within the 3.5m x 4.15m aperture of a heavily reinforced concrete test frame between 22nd and 25th August 2005, with the access panel located near the centre of the ceiling. The access panel opened towards the furnace.

The construction is shown in Figures 1 to 5, and before the test in Photos 1 to 3.

2.2 Ceiling Membrane

The ceiling membrane was constructed from a steel framework and two layers of 12.5mm-thick Lafarge Firecheck Plasterboard. A perimeter channel (19mm x 40mm x 32mm) was attached around the perimeter of the test frame. Four main runners (formed from T-sections, 38mm x 38mm) spanned the width of the test frame at 1200mm centres, being supported on the perimeter channels, and suspended from three I-section beams spanning the length of the test frame. Cross Tees were fitted between the main runners at 450mm centres, the resulting grid being clad with two layers of 12.5mm-thick Lafarge Firecheck plasterboard.

The first layer of plasterboard was attached to the ceiling using 25mm drywall screws, the second layer being attached using 38mm screws, all at nominally 150mm centres along board edges and 230mm in the fields of the boards. Joints between the two layers were staggered, with joints between boards on the exposed face being sealed with jointing compound and paper tape.



2.3 Access Panel

The access panel was delivered as a complete unit, and was fitted into the aperture in the ceiling. The following description was provided by the sponsor, and verified by BRE where possible.

The access panel consisted of a perimeter frame, providing a clear opening of 1246mm x 1076mm, which was closed via two door leaves, nominally 1300mm x 574mm. The perimeter frame was made from 1.2mm thick Zintec steel which had been polyester powder coated to RAL 9010, 20% gloss, and had a section as shown in Figure 2. The frame was fitted into the ceiling from below and had a 25mm wide beaded front flange which was mitred in each corner and overlapped the plasterboard ceiling membrane by approximately 20mm. The frame was fixed into position using sixteen special brackets (see Figure 4, item 14) which were secured into position over the ceiling tee section around the perimeter of the access panel frame. The gap between the access panel frame and the plasterboard ceiling was filled with Bailey's Sealocrete white fire resistant mastic.

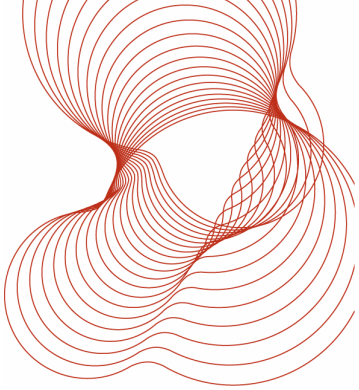
Each of the door leaves consisted of a 1.0mm thick folded Zintec steel tray which was polyester powder coated RAL 9010, 20% gloss. Each leaf was internally stiffened via two pre-formed top hat sections (shown in Figure 3) that were welded to the locking and hinge sides of the door tray. A 12.5mm thick sheet of Lafarge Megadecco plasterboard, treated with one coat of Lafarge Drywall sealer was fixed to the rear (unexposed face) of each of the door trays. The Megadecco plasterboard was fixed into position with 32mm long drywall screws screwed into the stiffeners and return ends of the door tray. Each of the door trays were hung via a continuous hinge that was welded to the door trays and bolted to the frame using five M6 bolts at 300mm centres. A rear cover plate was fixed to the passive door tray which overlapped the active door tray by approximately 25mm. The passive leaf was fitted with two budget locks that engaged approximately 14mm with steel locking angles (nominally 20mm x 15mm) attached to the panel frame. The two locks were operated from the rear face of the door leaf (unexposed face) via a standard budget key. The active door leaf was fitted with three budget locks, one lock at each end that engaged steel locking angles by approximately 14mm (nominally 20mm x 15mm) and one central budget lock locating into the slot in the passive door tray, all operated from the front of the active door tray via a budget lock key.

The access panel was fitted with three fire retardant smoke seals (see Figure 4), one continuous seal around the perimeter of the frame, and two seals incorporated in the meeting stile of the two leaves.

The three lock holes on the exposed face of the active door leaf were fitted with a plastic collar and dome plug.

3 CONDITIONING

At the time of construction a representative sample of Firecheck plasterboard was taken and on the day of the test was weighed and placed in a 50°C oven in order to determine its 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 30th August 2006 in accordance with B.S. 476 : Part 22 : 1987[1] (method 9 for ceiling membranes) and was witnessed by Mr T Beasley and P. Loffman representing the sponsor.

The ambient temperature at the start of the test was 18°C.

4.2 Furnace control

The furnace temperature was measured using ten bare-wire chromel/alumel thermocouples arranged in the furnace as shown in Photo 1, with their measuring junctions 100mm below the exposed face of the ceiling. The furnace was controlled so that the mean of these thermocouple readings followed the time/temperature relationship of B.S. 476 : Part 20 : 1987[2].

A pressure-sensing head was located in the furnace 100mm below the ceiling. The pressure conditions within the furnace were maintained in accordance with Section 3.2 of B.S. 476 : Part 20 : 1987[2].

4.3 Temperature measurements on specimen

Although no insulation rating was required by the sponsor, the temperatures of the unexposed face of the access panel were measured (for information) using six chromel / alumal thermocouples fixed to the surface and covered with an insulating pad. The location of the thermocouples is given in Table 1.

Table 1 Thermocouple locations

Thermocouple	Location
1	On the access panel frame (parallel with the ceiling) adjacent to the meeting point of the two leaves.
2	On the access panel frame (perpendicular to the ceiling) at mid length along the hinged edge of the active leaf.
3	On the steel adjacent to a budget lock on the leaves.
4	On the active leaf, adjacent to a screw, and near the hinge.
5	In the centre of the passive leaf.
6	On the steel of the meeting style in the centre of the specimen.

4.4 Deflection measurements

A linear deflection transducer was connected via a fine steel wire to the centre of the access panel to continuously measure vertical deflection throughout the test at that point.

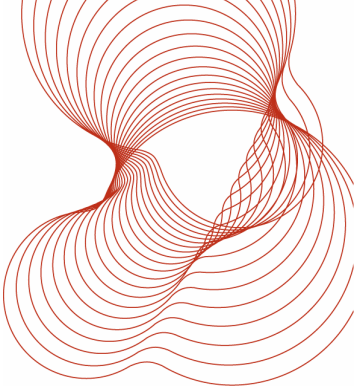
5 RESULTS

5.1 Observations

Observations made during the test are given in Table 2. Unless otherwise stated observations are from the unexposed face.

Table 2 Observations

Time Minutes	Observation
0	Start test.
3	Smoke is coming from between the two leaves, and from the perimeter of the leaves.
8	The access panel leaves are bowing towards the furnace. A yellow discolouration has formed near the centre of the passive leaf where it meets the active leaf, and at one end of the leaves.
15	Considerable smoke is coming out from the hinge side of the active leaf at approximately mid length. Some brown charring is occurring on the surface of the leaf at this location.
17	The jointing compound has fallen from between the plasterboard sheets on the exposed face, and is hanging down from the access panel perimeter (where it meets the ceiling).
18	Some further charring is occurring at the location described at 15 minutes.
22	An area near the hinge corner of the passive leaf is now charring and smoke is coming from this location.
30	A brown discolouration (scorching) has occurred along the centre of both leaves at the meeting style.
34	The surfaces of the leaves are turning a brown colour as they heat up.
37	Some of the paper coating of the Megadecco boards has turned to ash near the centre of the leaves.
41	Both leaves are now a dark brown colour as they continue to heat up.
46	A slight glow from the paper surface of the Megadecco boards was observed near one edge of the active leaf.
54	Smoke levels from the specimen have greatly reduced. The active leaf has sagged slightly, and a red glow can be seen between the leaves. The surface of the leaves is too hot to allow testing of integrity using the cotton pad.



Time Minutes	Observation
56	Some sagging of the plasterboard ceiling is occurring inside the furnace, but all plasterboard is intact. Several pieces of paper continue to glow and char on the unexposed face of the leaves.
62	The first (exposed) layer of plasterboard on the ceiling is starting to fall off.
68	Test stopped. No failure of integrity.

The test specimen is shown at termination and after test in Photo's 4 and 5.

5.2 Furnace temperature

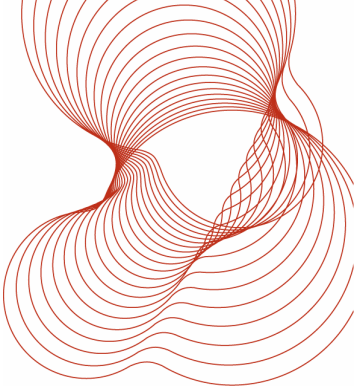
The mean furnace temperature, together with the specified curve for comparison is given in Graph 1.

5.3 Surface temperatures

Temperatures (recorded for information) on the unexposed face of the access panel are given in Graph 2.

5.4 Deflection measurements

The deflection recorded at the centre of the access panel is plotted against time in Graph 3. A maximum deflection (towards the furnace) of 47.4mm was recorded at the end of the test.



6 PERFORMANCE CRITERIA

The standards[1,2] 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.

Insulation: At the request of the sponsor, the access panel was not assessed for insulation.

7 CONCLUSION

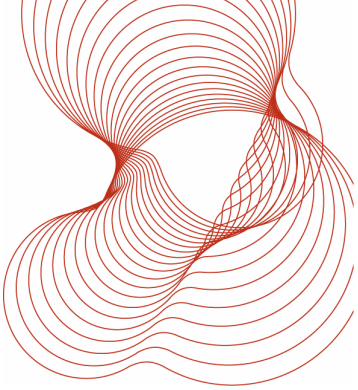
A plasterboard ceiling membrane incorporating a double-leaf Fire Proofing Services Ltd. access panel installed in the centre, as described in this report, when tested in accordance with British Standard 476 : Part 22 : 1987 (Method 9) achieved the following fire resistance:

Integrity: 68 minutes

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.

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.



8 REFERENCES

1. 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.

2. 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

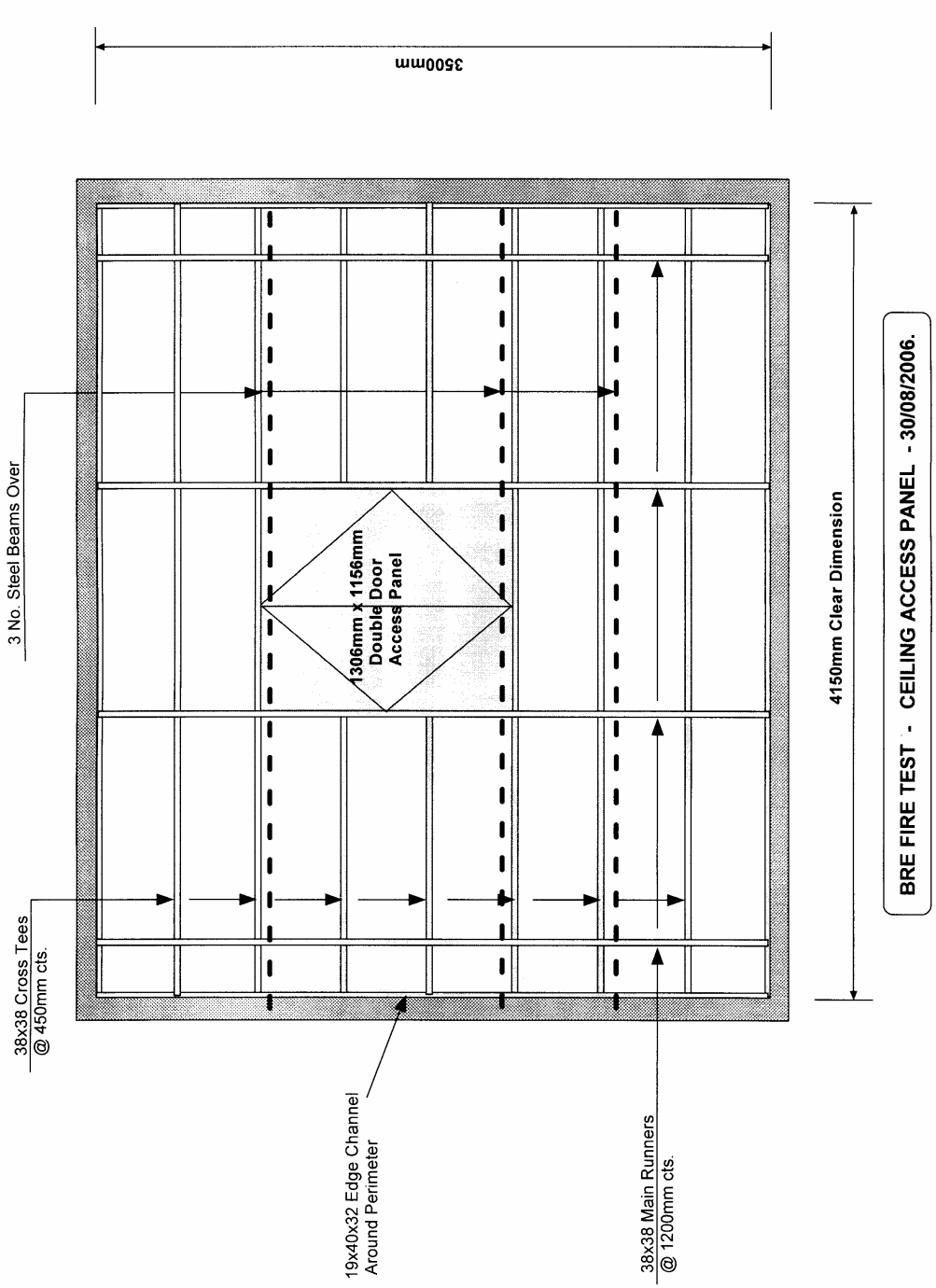


Figure 1 Plan view of specimen.

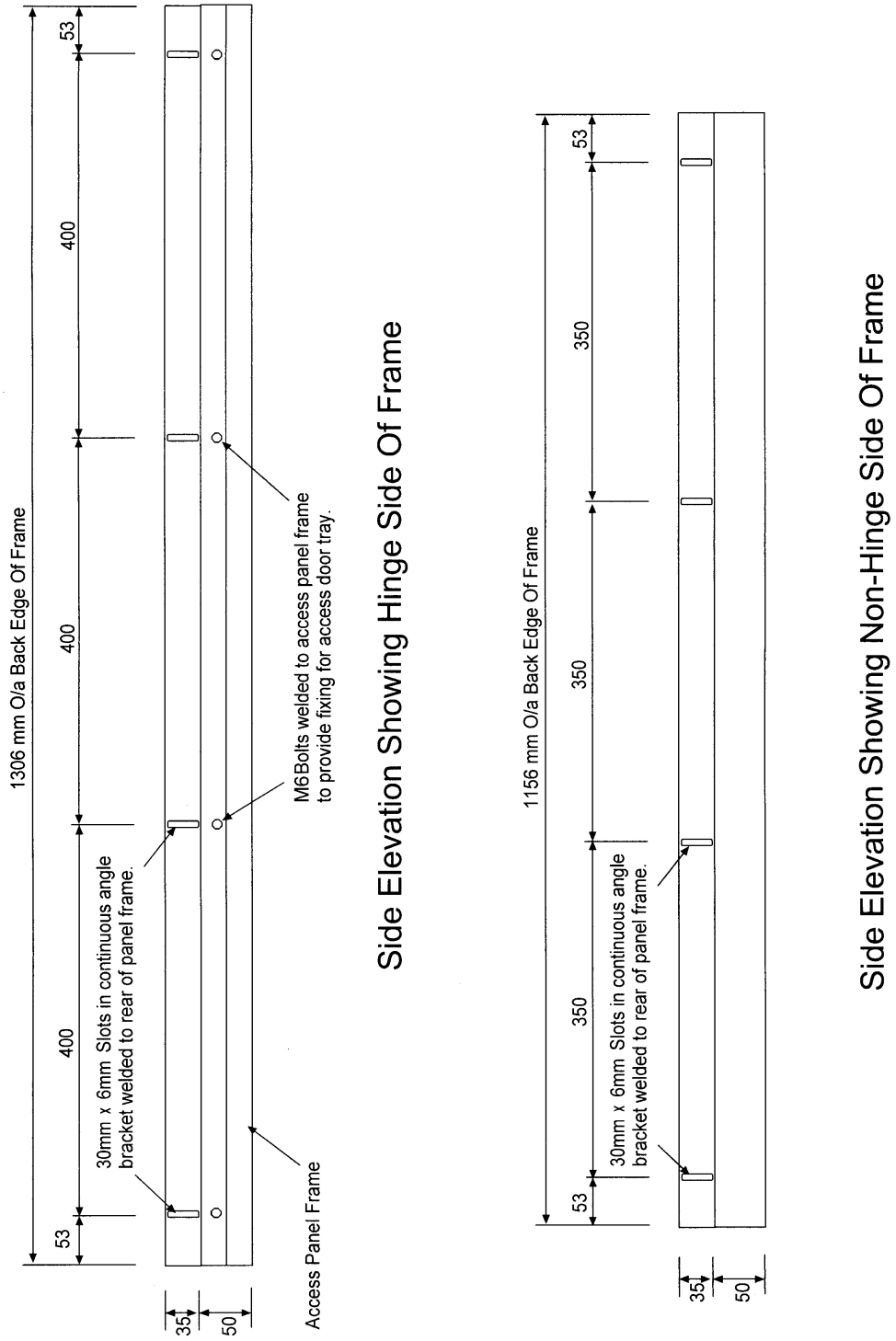


Figure 2 Side elevation showing frame detail.

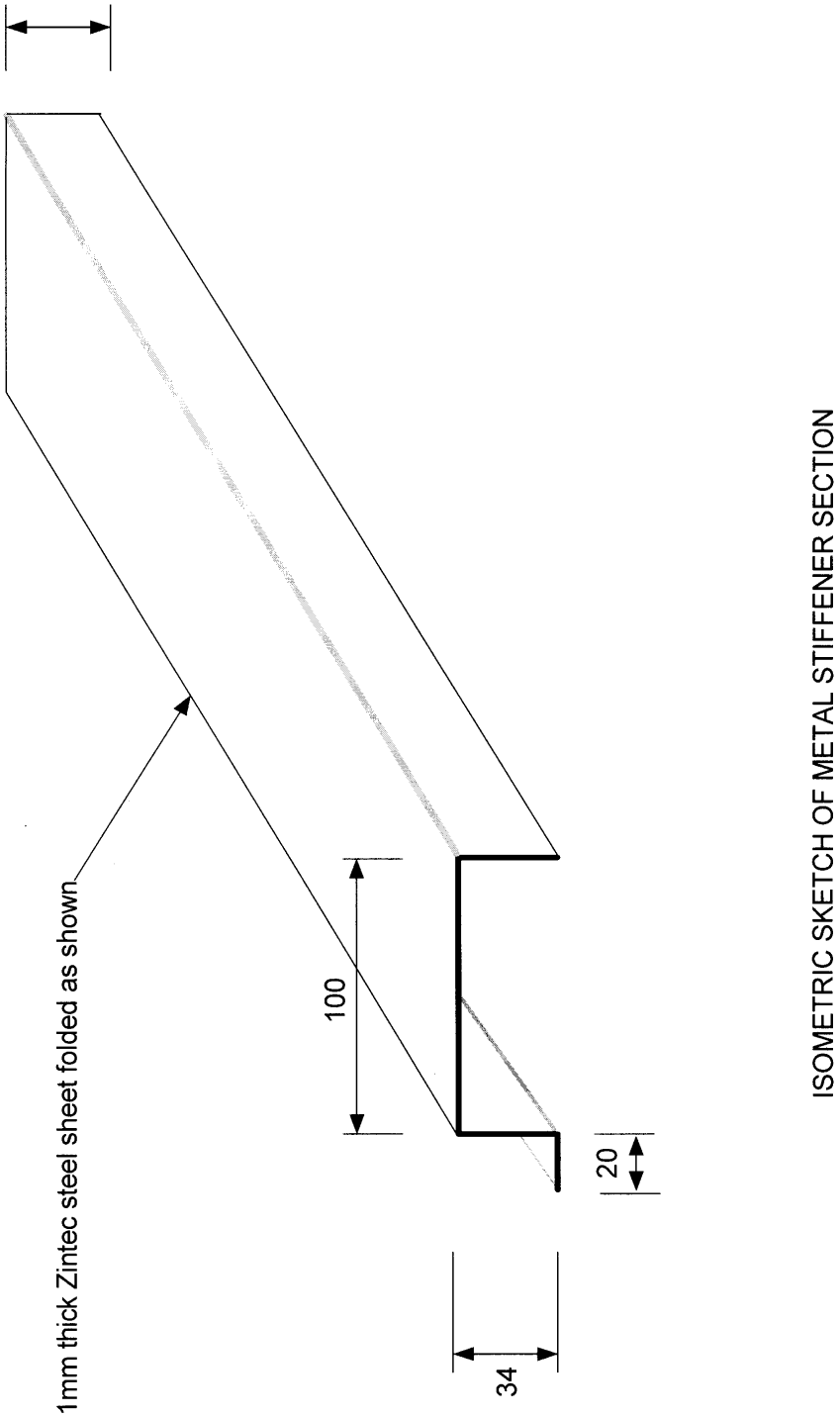


Figure 3 Metal stiffener section used in leaf construction.

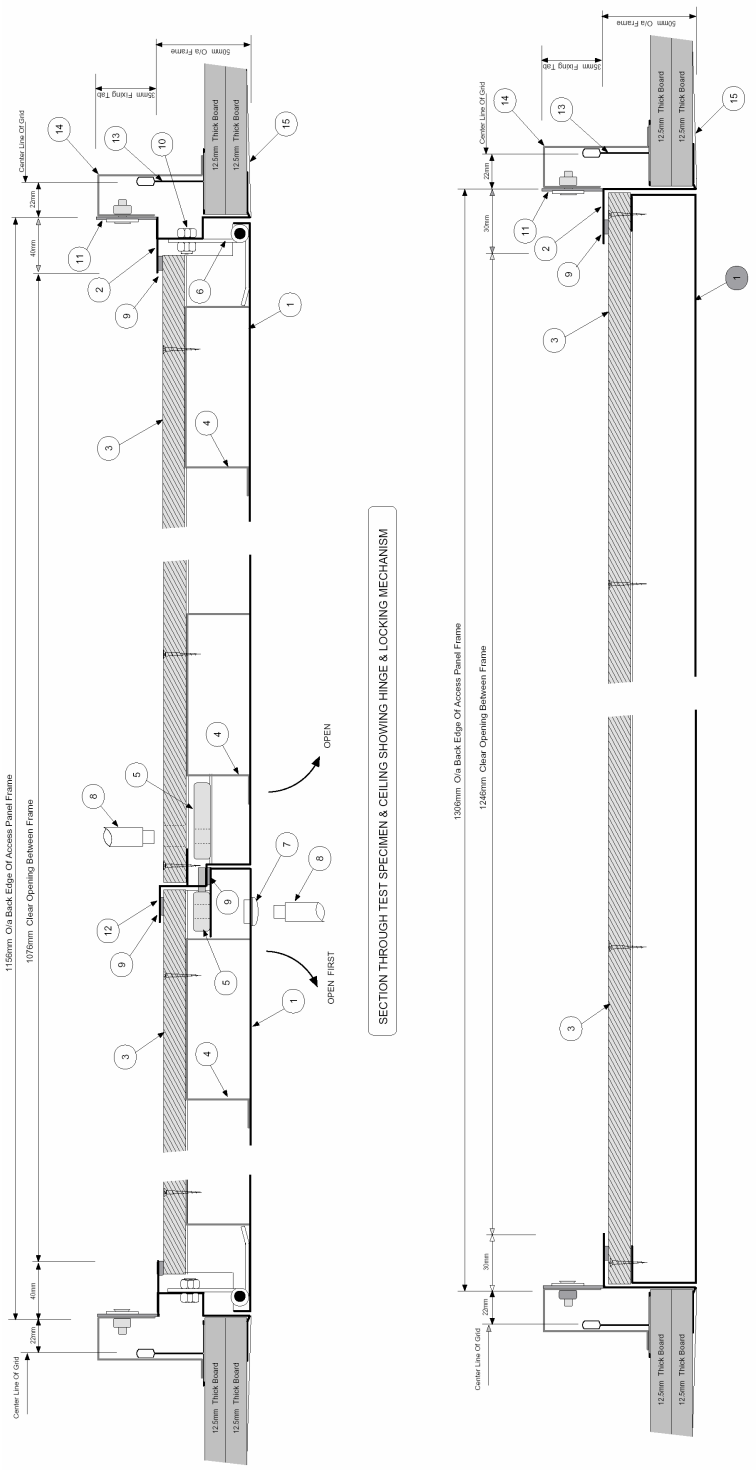
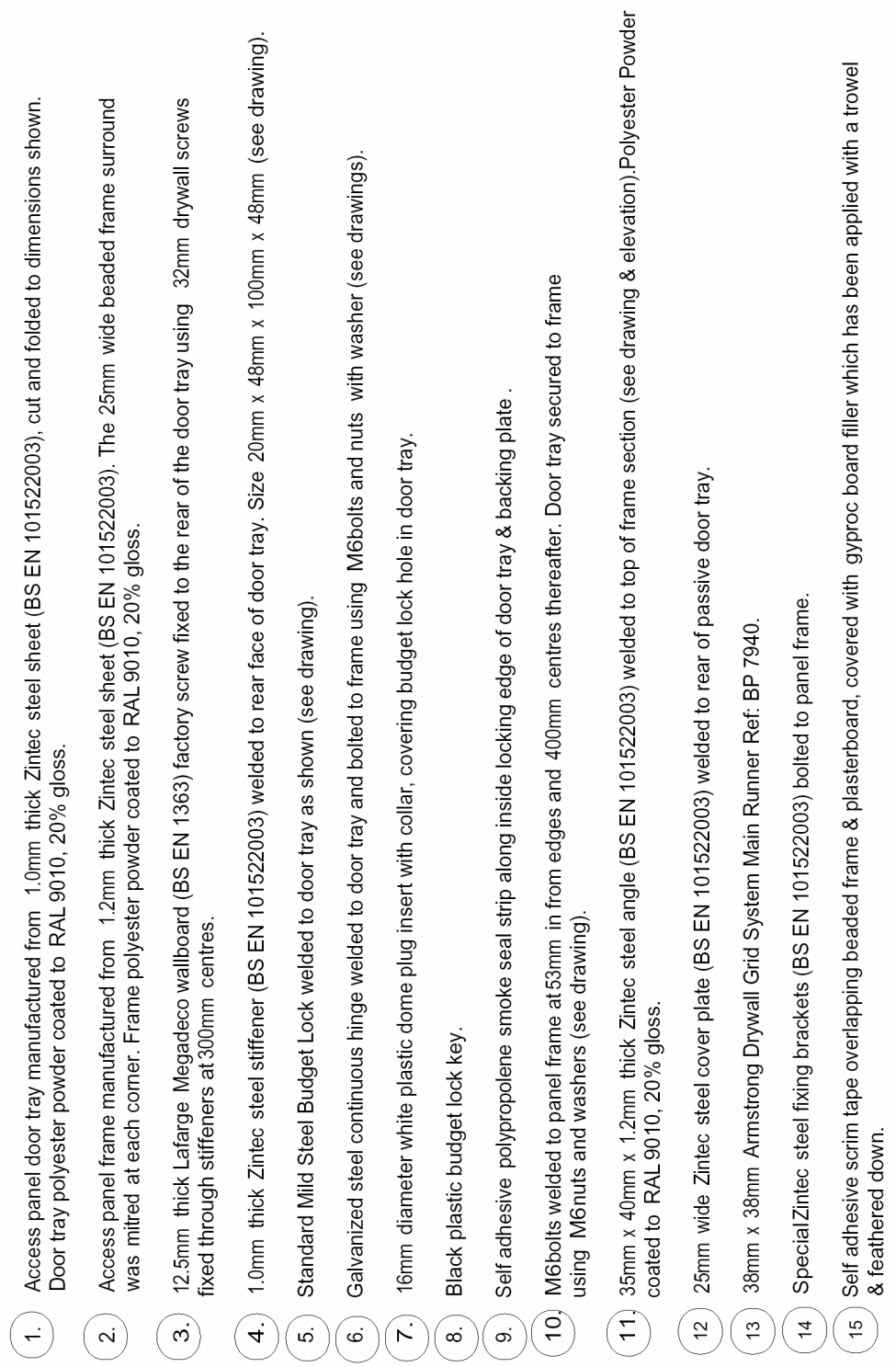


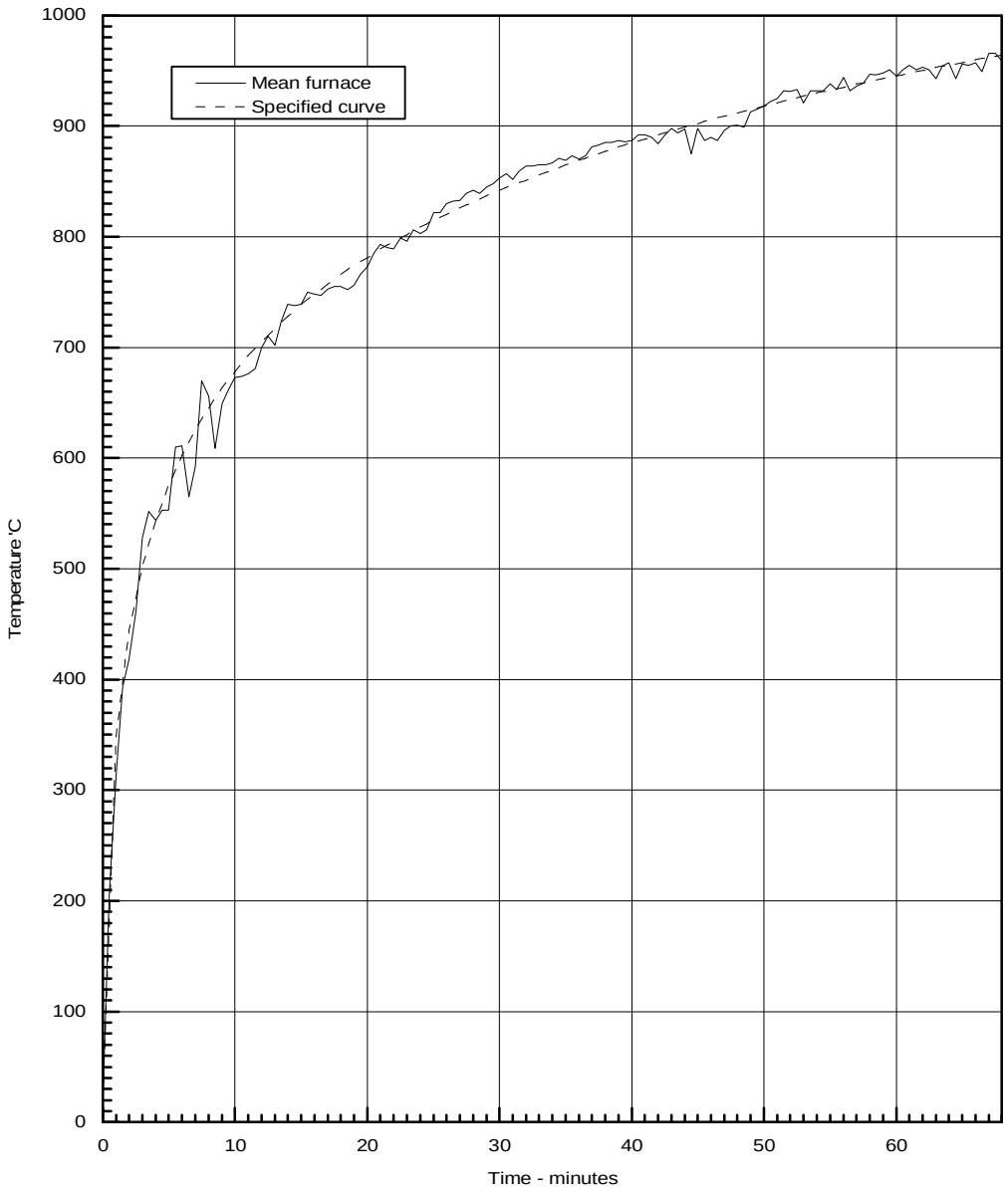
Figure 4 Detail of specimen construction (see page 16 for key to label numbers).



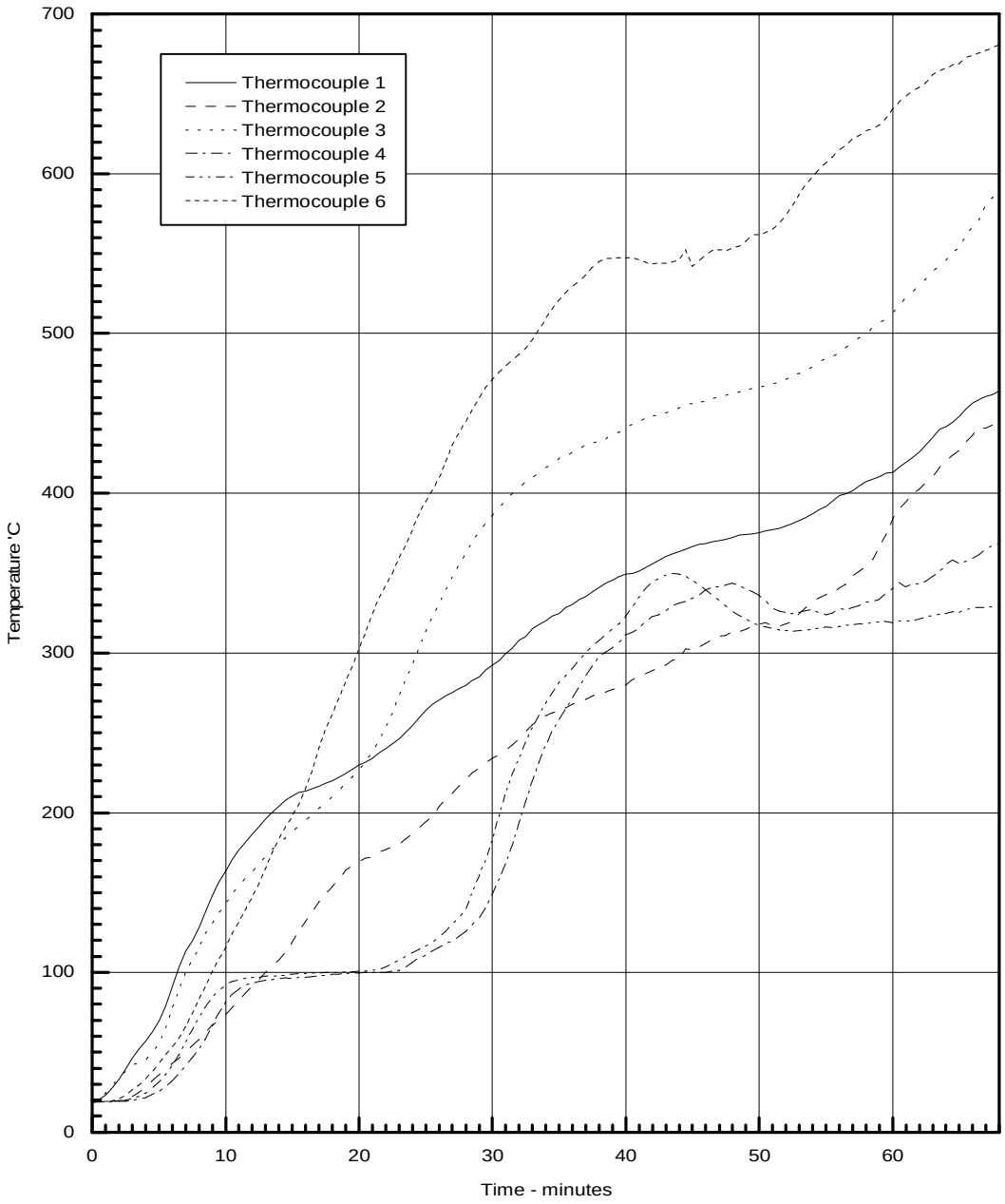
1. Access panel door tray manufactured from 1.0mm thick Zintec steel sheet (BS EN 101522003), cut and folded to dimensions shown. Door tray polyester powder coated to RAL 9010, 20% gloss.
2. Access panel frame manufactured from 1.2mm thick Zintec steel sheet (BS EN 101522003). The 25mm wide beaded frame surround was mitred at each corner. Frame polyester powder coated to RAL 9010, 20% gloss.
3. 12.5mm thick Lafarge Megadeco wallboard (BS EN 1363) factory screw fixed to the rear of the door tray using 32mm drywall screws fixed through stiffeners at 300mm centres.
4. 1.0mm thick Zintec steel stiffener (BS EN 101522003) welded to rear face of door tray. Size 20mm x 48mm x 100mm x 48mm (see drawing).
5. Standard Mild Steel Budget Lock welded to door tray as shown (see drawing).
6. Galvanized steel continuous hinge welded to door tray and bolted to frame using M6bolts and nuts with washer (see drawings).
7. 16mm diameter white plastic dome plug insert with collar, covering budget lock hole in door tray.
8. Black plastic budget lock key.
9. Self adhesive polypropolene smoke seal strip along inside locking edge of door tray & backing plate .
10. M6bolts welded to panel frame at 53mm in from edges and 400mm centres thereafter. Door tray secured to frame using M6nuts and washers (see drawing).
11. 35mm x 40mm x 1.2mm thick Zintec steel angle (BS EN 101522003) welded to top of frame section (see drawing & elevation).Polyester Powder coated to RAL 9010, 20% gloss.
12. 25mm wide Zintec steel cover plate (BS EN 101522003) welded to rear of passive door tray.
13. 38mm x 38mm Armstrong Drywall Grid System Main Runner Ref: BP 7940.
14. Special Zintec steel fixing brackets (BS EN 101522003) bolted to panel frame.
15. Self adhesive scrim tape overlapping beaded frame & plasterboard, covered with gyproc board filler which has been applied with a trowel & feathered down.

Figure 5 Key to label numbers from Figure 4 on page 15).

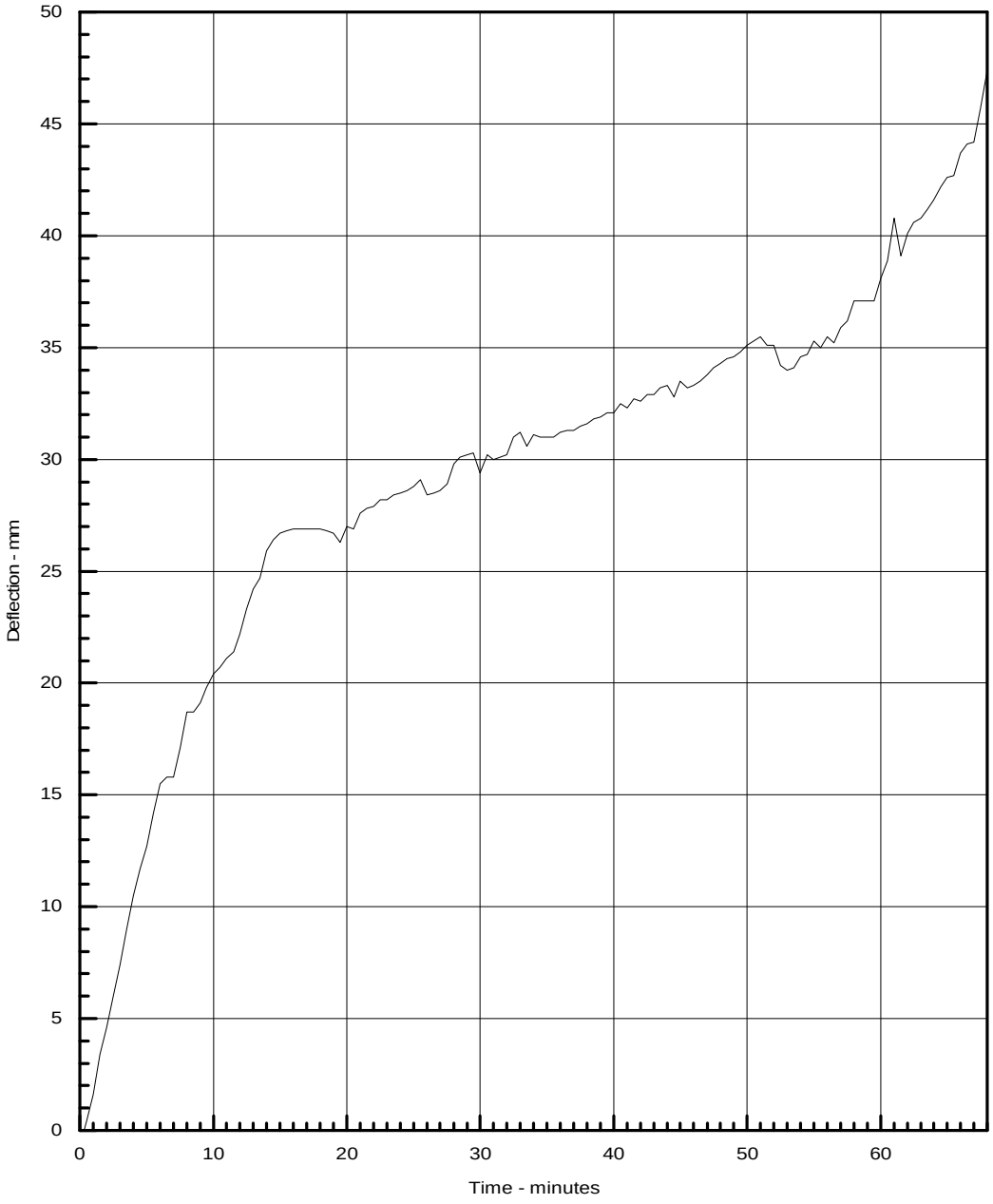
10 GRAPHS



Graph 1 Mean furnace temperature with specified curve for comparison.



Graph 2 Temperatures recorded on the unexposed face of the specimen.



Graph 3 Deflection recorded at centre of access panel.

11 PHOTOGRAPHS

Photo 1 Exposed face of specimen before test.

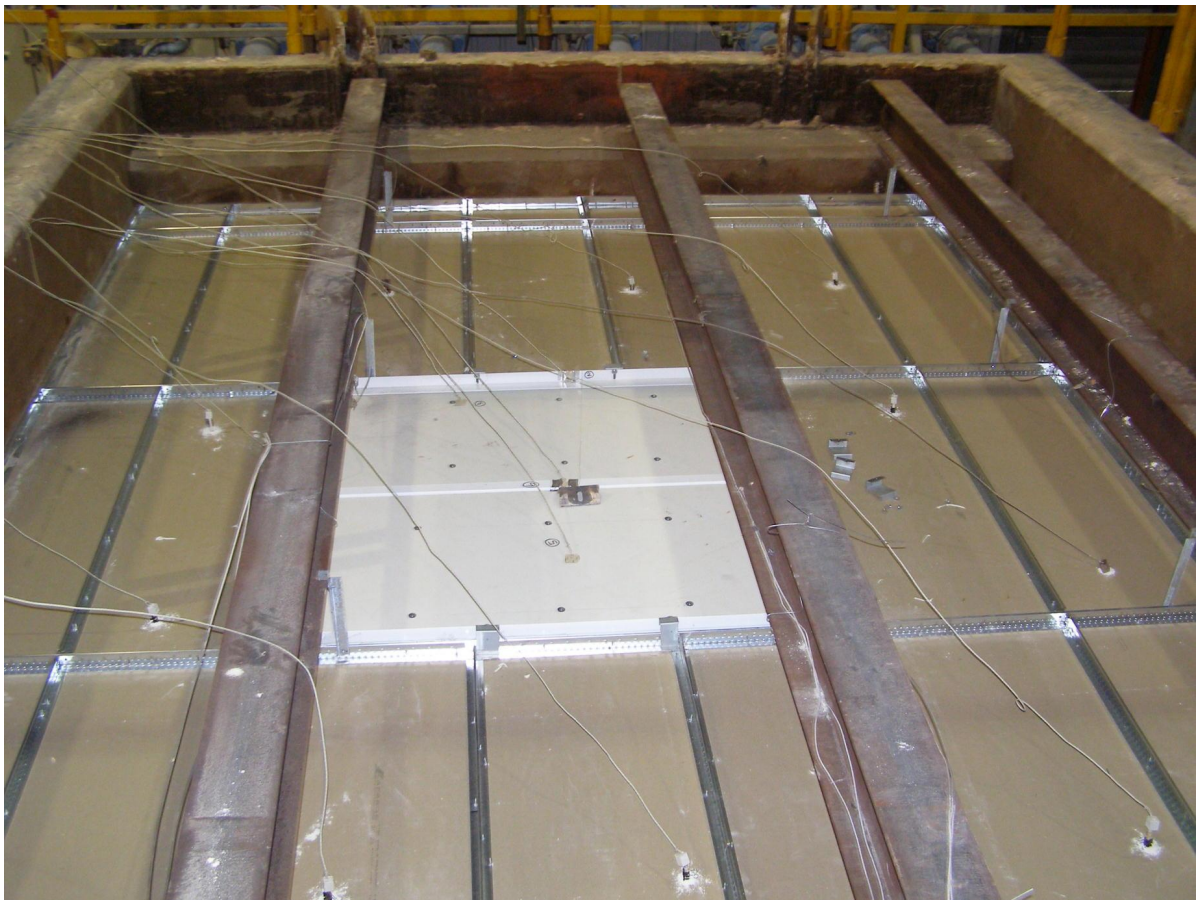


Photo 2 Unexposed face of specimen before test.

Photo 3 Unexposed face of access panel before test.

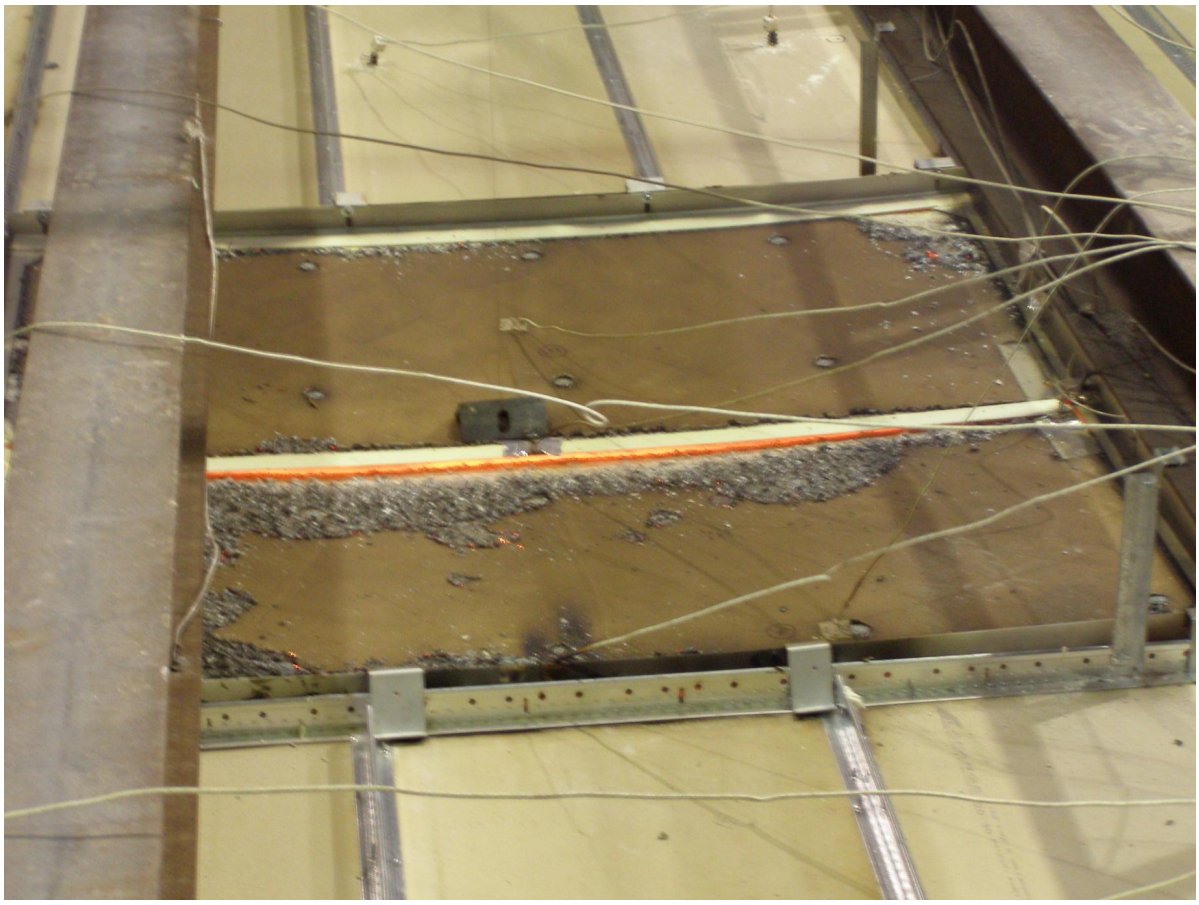


Photo 4 Unexposed face of access panel at termination of test.

Photo 5 Exposed face of access panel after test.

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