bre

Fire resistance test in accordance with BS 476 : Part 22 : 1987 on a single-leaf hinged access panel in a plasterboard partition

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

11 January 2007

Test report number 232236

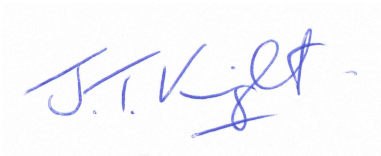
UKAS TESTING

0578

Prepared on behalf of BRE Testing by

Name J T Knight

Position Senior Consultant

Signature 

Approved on behalf of BRE Testing

Name R A Jones

Position Associate Director

Date 11 January 2007

Signature 

BRE Testing
BRE
Garston
WD25 9XX
T + 44 (0) 1923 664100
F + 44 (0) 1923 664910
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 single-leaf steel/plasterboard access panel incorporated in a steel-framed plasterboard partition, was submitted to a fire resistance test carried out in accordance with BS 476 : Part 22 : 1987 (Method 6) on 20 September 2006 for a duration of 69min.

The access panel comprised a preformed steel door leaf, nominally 1993mm high x 892mm wide x 63mm thick, manufactured from a polyester powder coated 1mm-thick steel sheet incorporating a sheet of 12.5mm-thick Megadeco plasterboard on the unexposed face The panel leaf was hung in a steel frame incorporating seals.

The access panel was incorporated in a steel-frame partition comprising two layers of 15mm-thick Lafarge Firecheck plasterboard on each face of the partition. The access panel opened towards the furnace and in this orientation achieved the following fire resistance:

Insulation: 13min

Integrity: 38min

1 Objective

A test was carried out in accordance with BS 476 : Part 22 : 1987[1], at the request of Fire Proofing Services Ltd., to determine the fire resistance of a single-leaf hinged access panel in a plasterboard partition.

2 Test construction

2.1 Supporting construction

A Lafarge drywall partition, 130mm thick, was constructed within the opening (nominally 3m x 3m) of a steel reinforced concrete test frame as follows:

Galvanised steel channel was secured to the test frame along the base and soffit using drywall screws and plugs at nominally 600mm centres. Lafarge galvanised steel studs, ref. CS70/R were friction-fit located vertically between the channels at nominally 600mm centres.

Each side of the partition was clad with two layers of Lafarge 15mm-thick Firecheck plasterboard. All boards were screwed to the studs at nominally 300mm centres using drywall screws. The boards were arranged so that the vertical joints coincided with studs and were staggered in adjacent layers

Lafarge Plasterboard FineForm Ready-mixed Joint Compound and tape finished the joints in the outer layer of plasterboard.

An aperture, 2m tall x 910mm wide, was located in the partition centred on the mid-height of a central stud.

Two additional studs bounded the sides of the aperture. Additional steel channel horizontal members bounded the aperture at the top and bottom fixed to these studs. The inside face of the aperture was lined with 15mm-thick Firecheck.

2.2 Specimen construction

The following descriptions of the specimen are an amplification of those supplied by the sponsor. Surface detail and dimensions were verified by the BRE before the test.

2.2.1 Panel door leaf

The door leaf measured 1993mm high and 850mm wide x 40mm thick on the unexposed face and 892mm wide x 23mm thick on the exposed face, it consisted of a 1.0mm-thick Zintec steel skin strengthened with three pre-formed 1.0mm-thick vertical stiffeners welded to the sides and middle section of the door leaf.

The voids between the stiffeners were filled with an acoustic quilt (50mm-thick E-Coustiquilt membrane). Lafarge Megadeco wallboard, 12.5mm thick, was fitted to the rear of the door leaf with 32mm-long drywall screws. A Zintec folded steel rear protection plate, 1.0mm thick was fitted to the perimeter of the rear face of the door covering the edges of the Megadeco board and the face over a width of 100mm.

The door hinge consisted of a 1.5mm-thick mild-steel continuous hinge welded to the inside face of the door tray and to the panel frame using M6 bolts and nuts with washers.

The locking device was a 3-point locking system using 8mm-diameter rods locking into the frame top and bottom, with a central lock on the locking side having a latch of 5mm-thick steel, 35mm wide which protruded by 15mm.

All door seams and edges were fully sealed and welded.

2.2.2 Panel frame

The frame provided an aperture 1996mm x 882mm into which the door leaf closed. The frame consisted of a 1.2mm-thick Zintec steel section with M6 bolts welded to the hinge side 150mm in from each edge and then at 300mm centres. The 25mm-wide front flange was mitred at each corner. The frame was fixed into the aperture in the partition with screws at typically 450mm centres being 50mm-long x 5mm-diameter self-drill/tap countersunk-head Phillips bright-steel.

A grey intumescent seal, 10mm wide x 2mm thick, was fitted to the frame stop adjacent to the aperture. A double Lorient white-coloured flexible seal, 18mm wide x 4mm thick was fitted to the frame stop parallel to the intumescent seal. A grey-coloured flexible-foam fire-retardant smoke seal, 8mm x 4mm, was fitted on the locking vertical frame member.

All frame edges were welded and fully sealed with Bailey's Sealocrete white mastic. Each locking hole position in the frame was capped and sealed. The reveal of the aperture in the partition on the unexposed side of the access panel was lined with Hepworth Terracotta Flue Liner Jointing Compound Product code Y108 041906.

2.2.3 Miscellaneous

The door opened towards the furnace.

The partition was constructed on 11 and 12 September 2006, the access panel was installed into the partition on 19 September 2006.

The gap between the access panel door leaf and the frame was measured to range between 1.5mm and 3.5mm along the top edge, 1mm and 2mm along the bottom edge, 0.5mm and 1.5mm along the hinge side, and 0mm and 1.5mm along the latch side.

The test construction is shown in Figures 1 and 2, and also before test in Photos 1-8. Figure 2 shows one rib on the panel frame behind which the door latch acted, however there were actually two ribs 8mm apart of 1.5mm-thick steel which protruded by 14mm.

3 Test procedure

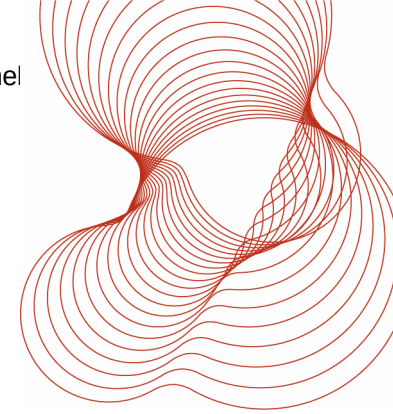
3.1 General

The test was carried out on 20 September 2006 and was witnessed by Messrs T Beasley, P Loffman and D Williams representing the sponsor. The ambient temperature at the start of the test was 19ºC.

3.2 Furnace control

The furnace temperature was measured by means of sixteen bare-wire chromel/alumel thermocouples arranged symmetrically in the furnace in four rows of four with their measuring junctions 100mm away from the exposed face of the specimen. The furnace was controlled so that the average temperature followed the time temperature relationship specified in BS 476 : Part 20 : 1987[2]. The mean furnace temperature recorded is plotted against time in Graph 1.

After the first 5min of the test the pressure in the furnace was maintained in accordance with the standard[2] so that a pressure of 18Pa ±2Pa existed at the level of the top of the access panel to represent the access panel located at the top of a wall.



3.3 Temperature measurements on unexposed face

Twelve K-type thermocouples were fitted, in accordance with the standard[2], to the unexposed face of the access panel to monitor the temperature of the unexposed face at locations given in Table 1.

Thermocouple	Location
1	At centre of top frame member
2	Near top non-hinge side corner of leaf
3	At top of leaf centrally
4	At centre of upper left-hand quarter section of leaf
5	At centre of upper right-hand quarter section of leaf
6	At mid-height of left-hand frame member
7	Near left-hand edge of leaf at mid-height
8	At centre of leaf
9	At mid-height of leaf to right of centre over an internal stiffener
10	At mid-height of right-hand frame member
11	At centre of lower left-hand quarter section of leaf
12	At centre of lower right-hand quarter section of leaf

The mean unexposed face temperature was calculated from the average of thermocouples 4, 5, 8, 11 and 12.

3.4 Deflection measurements

A displacement transducer was connected to the centre of the access panel leaf by a fine steel wire in order to continuously measure horizontal deflection at that point during the test.

4 Results

4.1 Observations

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

Table 2 Observations

Time mins	Observation
0	Test started
3	Smoke/water vapour issuing from frame/partition and leaf/frame interfaces at 700mm below top of left-hand side
15	Top half of leaf bowed towards furnace on non-hinge side creating gap, up to approx. 20mm wide between leaf face and frame stop. Smoke issuing from gap causing discolouration of leaf face.
33	Similar gap between leaf face and frame stop developed in lower half of non-hinge side and also at hinge side
38	Sustained flaming occurred on unexposed face from leaf/frame interface at 800mm below top of hinge side from a gap, 10mm wide, between the intumesced seal and the frame stop (integrity failure)
49	Sustained flaming occurred on unexposed face from leaf/frame stop interface at top of non-hinge side (integrity failure)
48	Flaming from hinge side ceased
55	Gap between leaf face and frame stop increased up to approx. 40mm at level of thermocouple 4 with approx. 20mm of the gap sealed with intumesced material
57	Paper face of plasterboard on rear of leaf charred especially over upper half of leaf
69	Test stopped.

Failure of integrity first occurred after 38min from the start of the test.

The construction after test is shown is Photos 9 and 10.

4.2 Temperatures recorded on unexposed face

The unexposed-face temperature limit was first exceeded (180ºC maximum rise) by thermocouple 10 after 13min. The mean and individual temperatures recorded are plotted against time in Graphs 2 – 4.

4.3 Deflection recorded

The horizontal deflection recorded at the centre of the leaf is plotted against time in Graph 5. The maximum deflection measured was 55.3mm recorded at the end of the test.

5 Performance criteria

The standards[1,2] state that a partition is regarded as having a fire resistance (expressed in minutes under integrity and insulation) that is equal to the elapsed time (in completed minutes) between the commencement of heating and either the termination of heating, or failure to meet the integrity or insulation criteria, 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, before the unexposed face in the vicinity indicates a temperature of 300°C, cracks, gaps or fissures allow flames or hot gases to cause flaming or glowing of a cotton fibre pad;

c) when (after the cotton pad test is unsuitable) a 6mm-diameter gap gauge can penetrate through a gap into the furnace and be moved in the gap for a distance of at least 150mm;

d) when (after the cotton pad test is unsuitable) a 25mm gap gauge can penetrate through a gap into the furnace.

Insulation : Failure is deemed to occur:

a) when the mean unexposed face temperature increases by more than 140°C above its initial value;

b) when the temperature recorded at any position on the unexposed face is in excess of 180°C above the initial mean unexposed face temperature;

c) when integrity failure occurs.

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.

6 Conclusion

A single-leaf access panel in a plasterboard partition, as described in this report, was tested in accordance with BS 476 : Part 22 : 1987. In the orientation tested, opening towards the furnace, the access panel was found to achieve the following fire resistance:

Insulation: 13min

Integrity: 38min

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.

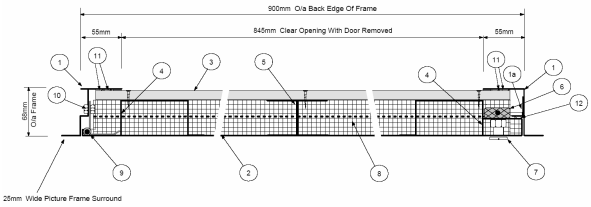
7 References

1 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.

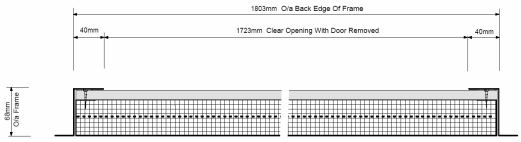
2 Fire tests on building materials and structures. Part 22. Method for determination of the fire resistance of non-loadbearing elements of construction. British Standard 476 : Part 22 : 1987. British Standards Institution, London, 1987.

8 Figures

Horizontal Section Showing Hinge & Locking Systems



Longitudinal Section Through Access Panel



exitile | ACOUSTIC ACCESS PANEL FIRE TEST -BRE 20/09/2006 | Date: 12/09/2006 | Drawn By:Tom Beasley | Drawing No. 120906/TB/12 | Sheet 1 of 1 | DO NOT SCALE | Revision

Exitile Ltd., William House, Jodrell Street, Nuneaton, Warwickshire. CV11 5EG
Tel: + 44 (0)24 76352771. Fax: +44 (0)24 76352761. e-mail: tom@ exitile.com Website: www.exitile.com

exitile | ACOUSTIC ACCESS PANEL FIRE TEST -BRE 20/09/2006 | Date: 12/09/2006 | Drawn By:Tom Beasley | Drawing No. 120906/TB/13 | Sheet 1 of 1 | DO NOT SCALE | Revision

Exitile Ltd., William House, Jodrell Street, Nuneaton, Warwickshire. CV11 5EG
Tel: + 44 (0)24 76352771. Fax: +44 (0)24 76352761. e-mail: tom@ exitile.com Website: www.exitile.com

Key To Drawings :

1. Access panel frame manufactured from 1.2mm thick Zintec steel sheet. The 25mm wide picture frame surround was mitred at each corner. All seams were fully welded and sealed.
1a. 30mm x 15mm x 1.2mm thick Zintec steel locking angle welded to inside of frame.
2. Access panel door tray manufactured from 1.0mm thick Zintec steel sheet, cut and folded to dimensions shown.
3. 12.5mm thick Lafarge Megadeco wallboard factory screw fixed to the rear of the door tray using 32mm drywall screws.
4. 1.0mm thick Zintec steel stiffener welded to rear face of door tray. Size 20mm x 48mm x 90mm x 48mm .
5. 2No. 1.0mm thick Zintec steel stiffeners welded back to back at the centre of door tray. Size 40mm x 48mm x 40mm .
6. 3-point locking system (see enclosed detail) with central lock operating 8mm diameter rods which lock into frame top and bottom. The rods are secured to the door tray with 4No. lock guides.
7. 12mm diameter metal screw bung with neoprene washer, covering budget lock hole in door tray.
8. 50mm thick E-Coustiquiltmatting inserted into cavities between door tray and Megadeco wall board.
9. Galvanized steel continuous hinge welded to door tray and bolted to frame using M6bolts and nuts with washer.
10. M6bolts welded to panel frame at150mm in from edges and 300mm centres thereafter. Door tray secured to frame using M6nuts and washers.
11. 2 No. strips of self-adhesive LorientNeoprene Seal around inside edge of frame.
12. 1 No. polypropolene smoke seal strip along inside locking edge of frame.

ACOUSTIC PANEL DESCRIPTION

Access Panel Door Tray

The door tray consisted of a 1.0mm thick Zintec Steel skin, strengthened with 3No. pre-formed 1.0mm thick vertical stiffeners welded to the sides and middle section of the door tray (see drawings).
The voids between the stiffeners were filled with an acoustic quilt (50mm thick E-Coustiquiltmembrane) and sealed using a 12.5mm thick Lafarge Megadeco wallboard screw-fixed to the rear of the door tray using 32mm drywall screws.
The door hinge consisted of a 1.5mm thick mild steel continuous hinge welded to the inside face of the door tray, which was fitted to the panel frame using M6bolts and nuts with washers.
The locking device was a 3-point locking system using 8mm diameter rods locking into the frame top and bottom, with a central lock on the locking side.
All door seams and edges were fully sealed and welded.

Access Panel Frame.

This consisted of a 1.2mm thick Zintec Steel section with M6bolts welded to the hinge side 150mm in from each edge and then at 300mm centres. The 25mm wide front flange was mitred in each corner.
The panel frame had a double Lorientneoprene seal around the inside rear flange, and also an intumescentself adhesive strip along the outer edge adjacent to the lorientseal. A fire retardentsmoke seal was provided on the inside locking edge of the frame (see drawings).
All frame edges were fully sealed and welded. Each locking hole position in the frame was capped and sealed.

exitile | Key To Drawing No. 120906/TB/12 - BRE FIRE TEST 20/09/2006 | Date: 12/09/2006 | Drawn By:Tom Beasley | Drawing No. 120906/TB/14 | Sheet 1 of 1 | DO NOT SCALE | Revision

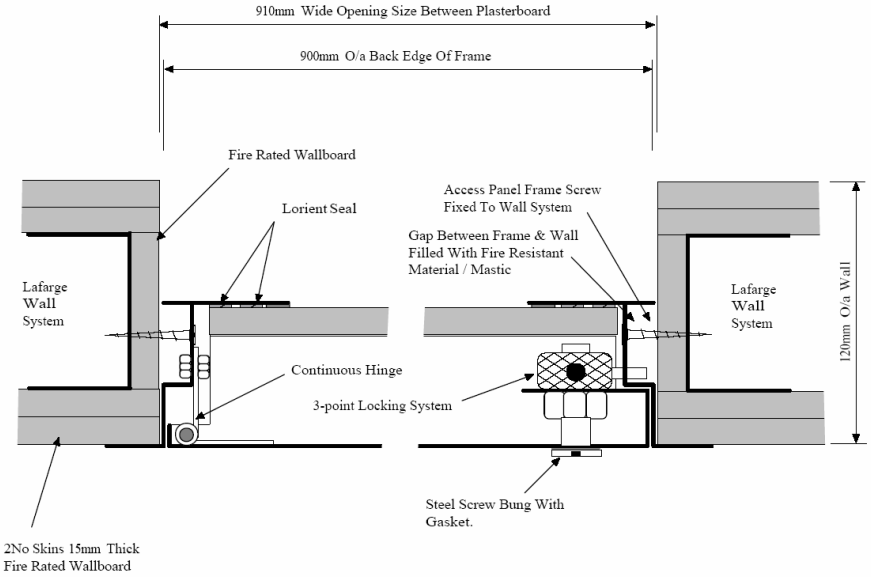
Exitile Ltd., William House, Jodrell Street, Nuneaton, Warwickshire. CV11 5EG
Tel: + 44 (0)24 76352771. Fax: +44 (0)24 76352761. e-mail: tom@ exitile.com Website: www.exitile.com

exitile | ACOUSTIC ACCESS PANEL FIRE TEST -BRE 20/09/2006 | Date: 12/09/2006 | Drawn By:Tom Beasley | Drawing No. 120906/TB/15 | Sheet 1 of 1 | DO NOT SCALE | Revision

Exitile Ltd., William House, Jodrell Street, Nuneaton, Warwickshire. CV11 5EG
Tel: + 44 (0)24 76352771. Fax: +44 (0)24 76352761. e-mail: tom@ exitile.com Website: www.exitile.com

Figure 1 Details of door leaf

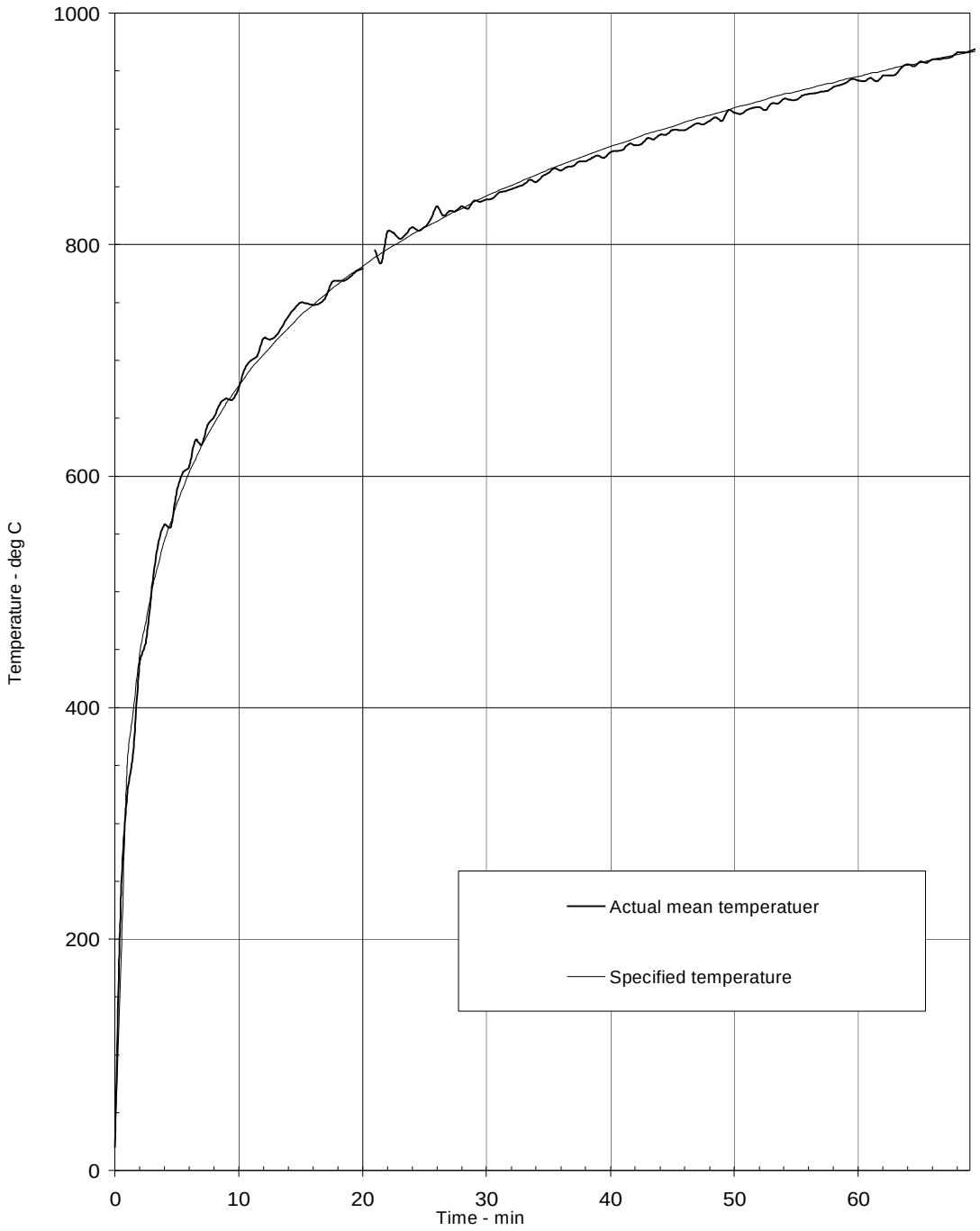
BRE FIRE TEST - 20/09/2006.



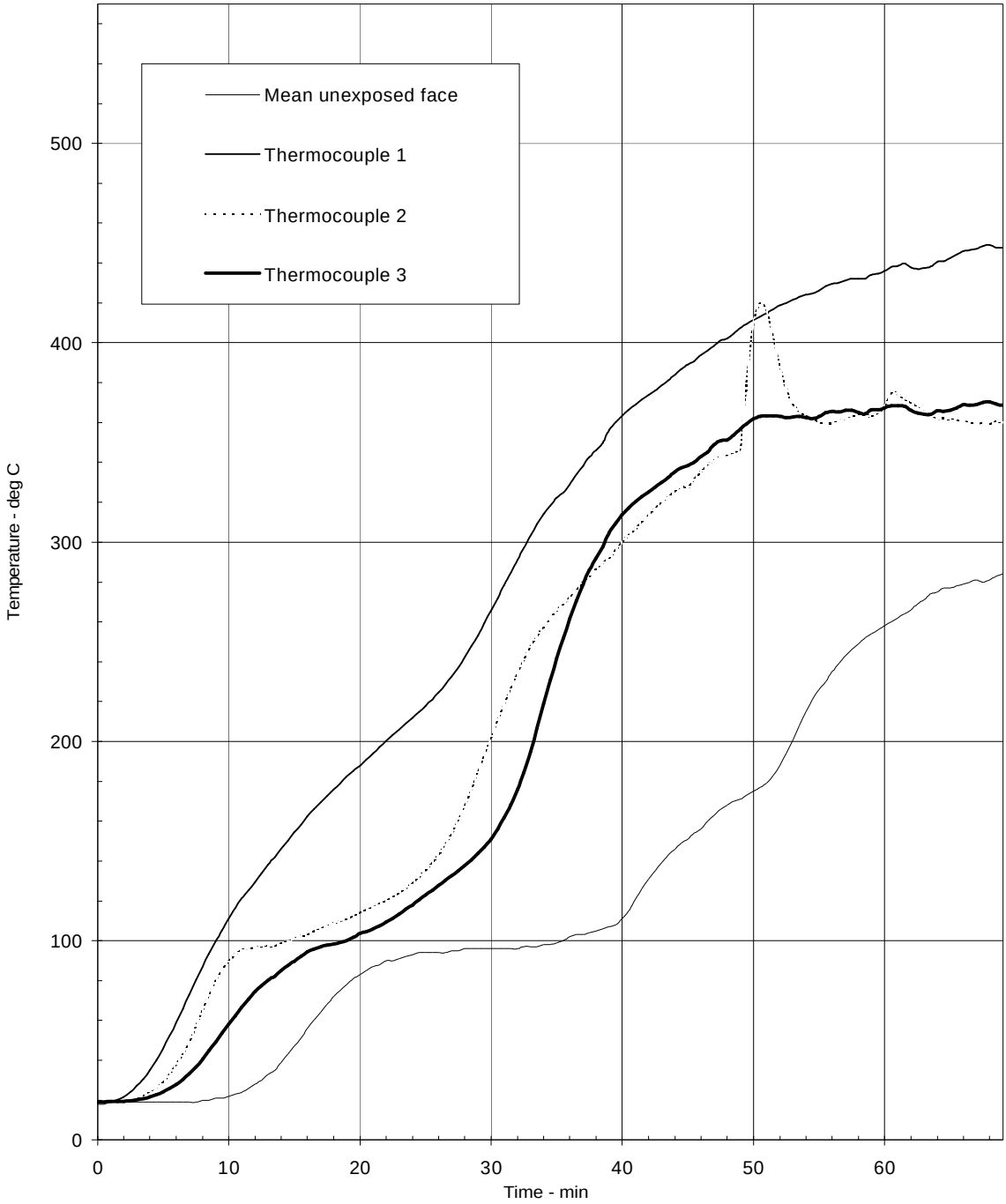
exitile	Typical Horizontal Section Through Access Panel & Partition	Date: 12/09/2006	DO NOT SCALE
		Drawn By: T. Beasley	Revision
		Drawing No. 120906/TB/10	
	Exitile Ltd., William House, Jodrell Street, Nuneaton, Warwickshire. CV11 5EG Tel: + 44 (0)24 76352771. Fax: +44 (0)24 76352761. e-mail: tom@ exitile.com Website: www.exitile.com	Sheet 1 of 1	

Figure 2 Horizontal section through door in wall

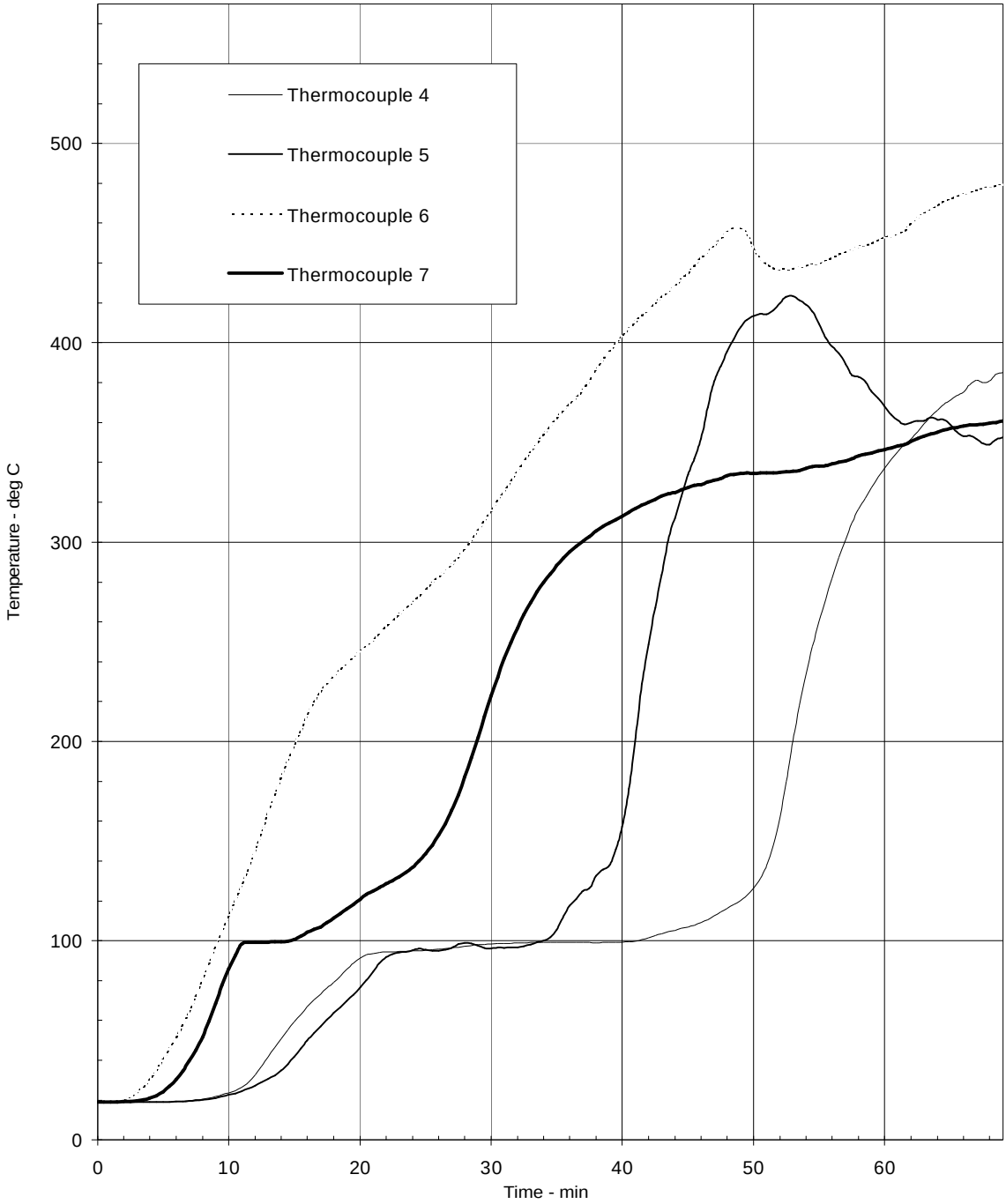
9 Graphs



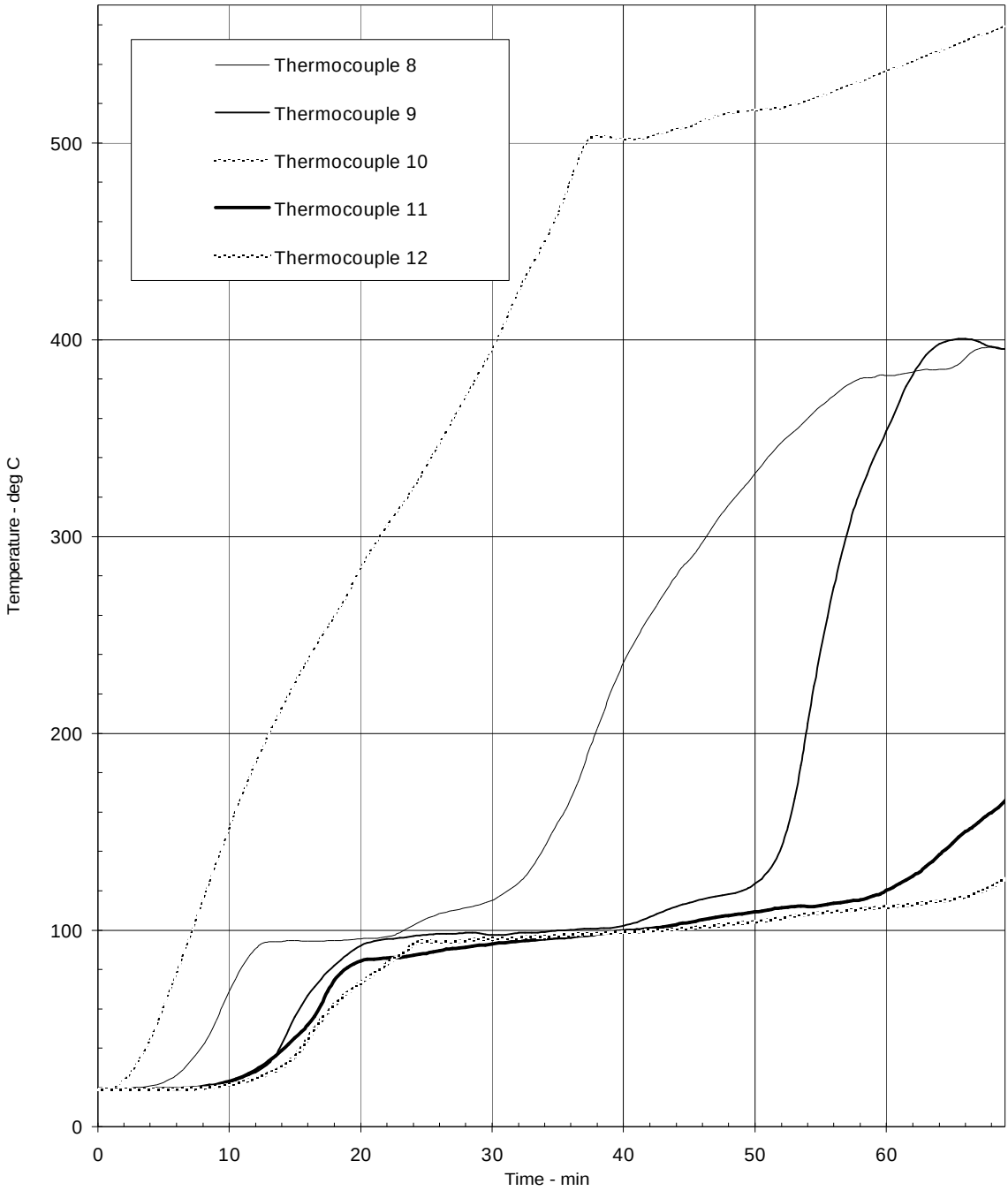
Graph 1 Furnace temperature



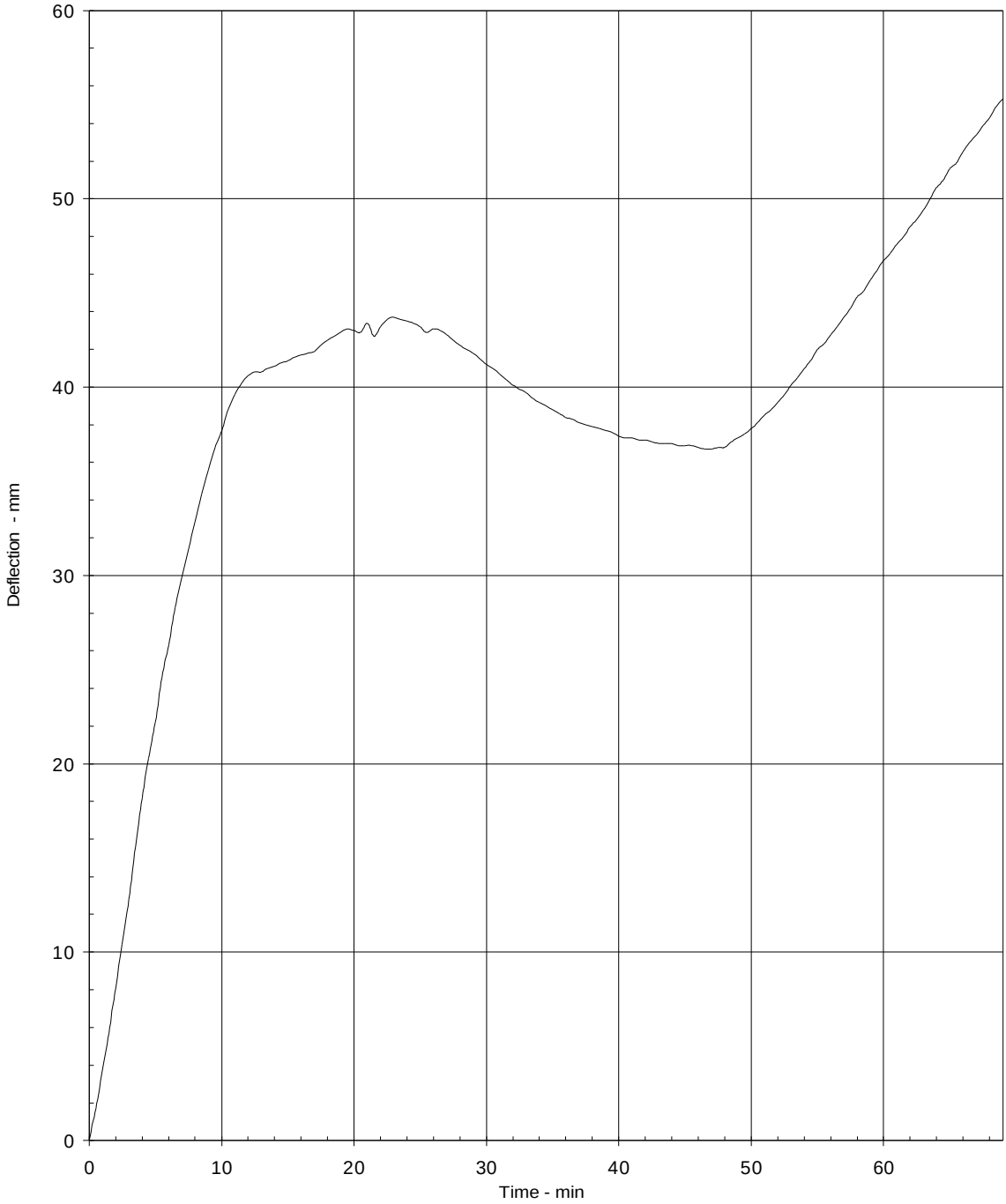
Graph 2 Temperatures recorded on unexposed face



Graph 3 Temperatures recorded on unexposed face



Graph 4 Temperatures recorded on unexposed face



Graph 5 Deflection recorded

10 Photographs

Photo 1 Open access panel before test

Photo 2 Access panel frame before test

Photo 3 Access panel frame before test

Photo 4 Open access panel leaf before test

Photo 5 Open access panel leaf before test

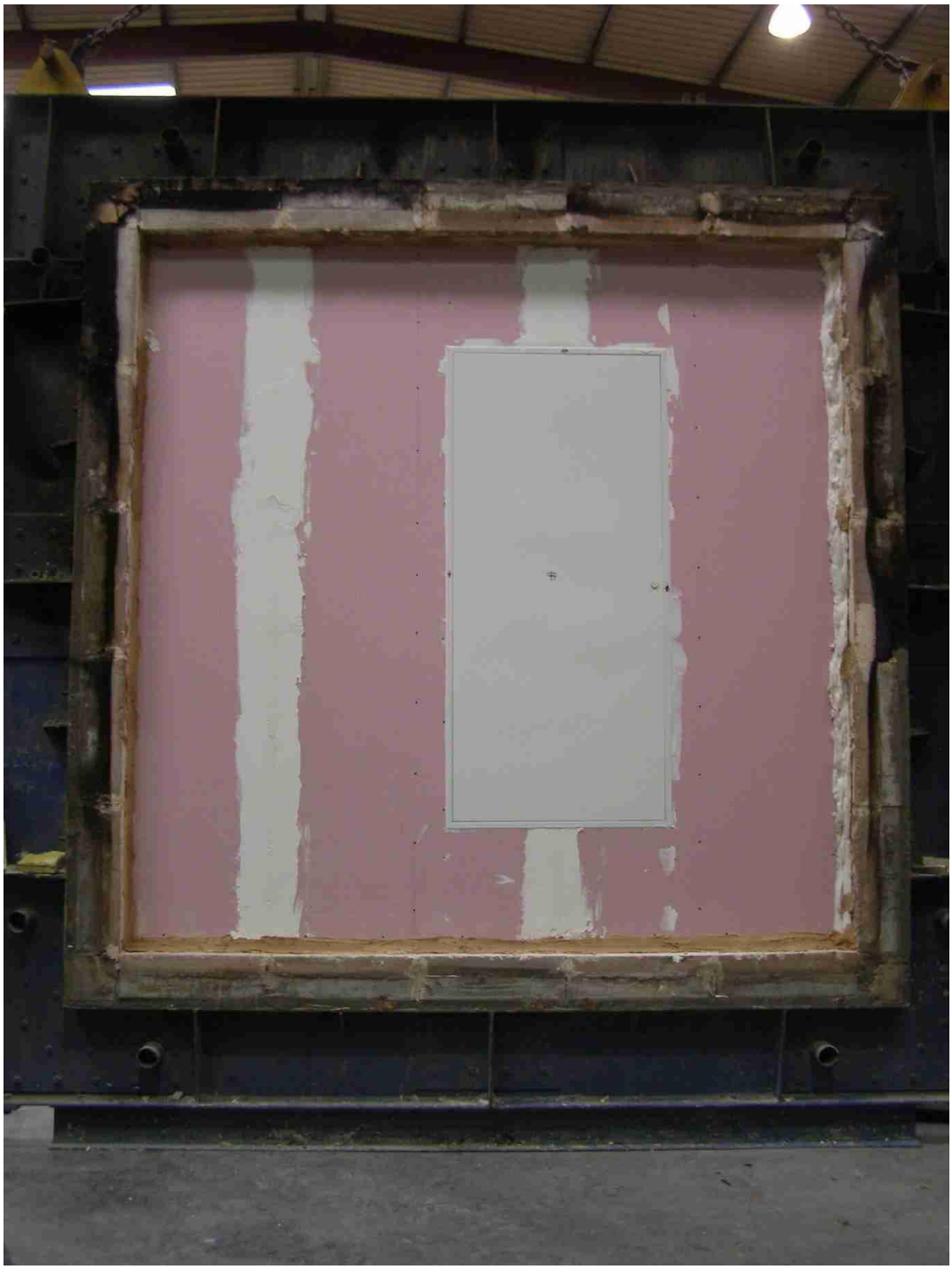


Photo 6 Exposed face of test construction before test

Photo 7 Unexposed face of test construction before test

Photo 8 Unexposed face of access panel before test

Photo 9 Unexposed face of access panel after test

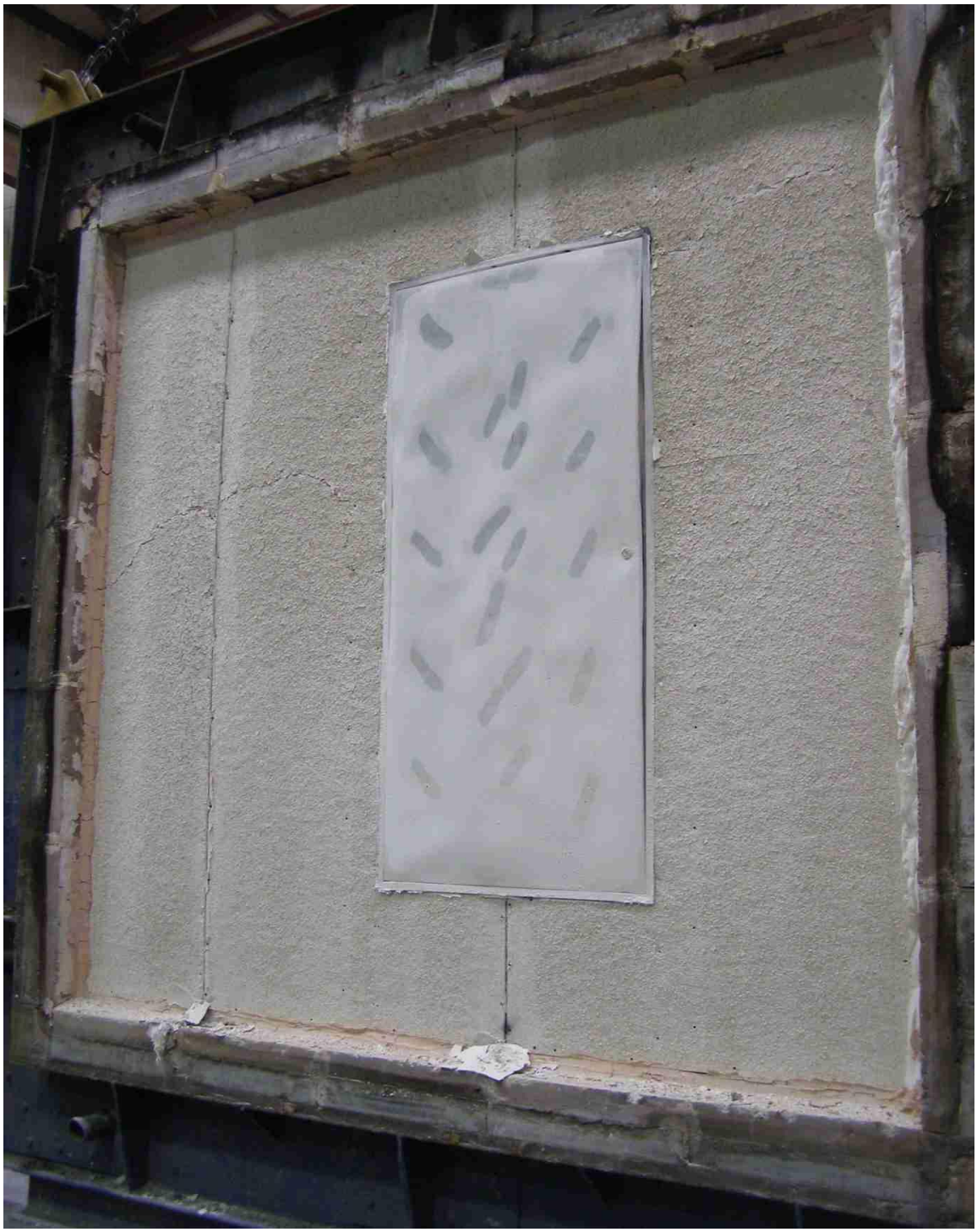


Photo 10 Exposed face of access panel after test