BRE

Centre for Fire Resistance
BRE, Bucknalls Lane, Garston, Walford, Hertfordshire, WD25 9XX
Telephone: 01923 664000 Facsimile: 01923 664010

TE 201768

TEST REPORT

Title: Fire resistance test in accordance with B.S. 476 : Part 22 : 1987 on a single-leaf access panel incorporated in a steel stud plasterboard partition.

Client: Fire Proofing Services Ltd.,
13 Shilton Road,
Barwell,
Leicestershire,
LE9 8NB.

Date: 12 March 2001

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract.
Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

BRE

Centre for Fire Resistance

BRE, Bucknalls Lane, Garston, Watford, Hertfordshire, WD25 9XX
Telephone: 01923 664000 Facsimile: 01923 664010

CONTENTS

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

BRE, Bucknalls Lane, Garston, Watford. Hertfordshire, WD25 9XX
Telephone: 01923 664000 Facsimile: 01923 664010

SUMMARY

A single-leaf steel/plasterboard access panel incorporated in a steel-framed plasterboard partition, was subjected to a fire resistance test, in accordance with B.S. 476 : Part 22 : 1987 (Method 6) on 2 November 2000.

The access panel comprised a preformed steel uninsulated door leaf, nominally 2m high x 900mm wide x 34mm thick, manufactured from a polyester powder coated 1mm-thick steel sheet clad on one side (unexposed face) with 12.5mm-thick Megadeco plasterboard painted on the exposed face with Lafarge drywall sealer, a fire retardant formulation. The panel leaf was hung in a steel frame incorporating a smoke seal, the leaf opening towards the furnace.

The access panel was incorporated in a steel-frame partition comprising two layers of 12.5mm-thick Lafarge Firecheck plasterboard on each face of the partition. The specimen when tested in the orientation described was found to have the following fire resistance:

Insulation:	7min
Integrity:	70min

The limit for the rise in mean temperature was exceeded after 30min and the maximum temperature limit was exceeded on the leaf after 27min.

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

BRE, Bucknalls Lane, Garston, Watford, Hertfordshire, WD25 9XX
Telephone: 01923 664000 Facsimile: 01923 664010

1 OBJECTIVE

To determine, at the request of Fire Proofing Services Ltd., the fire resistance of a single-leaf access panel when installed in a plasterboard partition and tested in accordance with Method 6 of B.S. 476 : Part 22 : 1987[1].

2 CONSTRUCTION

2.1 Supporting construction

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

Galvanised steel track, 50mm wide x 30mm deep, was secured to the test frame on three edges using 38mm Drywall screws and plugs at nominally 600mm centres. Vertical galvanised steel studs, 50mm wide x 33mm deep, were located at nominally 600mm centres across the partition. The vertical studs fitted tightly into the perimeter channel, with no other fixing being used.

Each side of the partition was clad with two layers of Lafarge 12.5mm Firecheck plasterboard. All boards were screwed to the studs at nominally 300mm centres using 32mm-long Drywall screws on the inside layer of boards, and 45mm-long Drywall screws on the outer layer. The boards were arranged so that the vertical joints in each layer of board on each face were staggered by a minimum of 600mm, relative to vertical joints in the immediately adjacent plasterboard layer.

One vertical edge of the partition was unrestrained (i.e. not attached to the test frame).

2.2 Specimen construction

The sponsor provided the following descriptions of the specimen. Surface detail and dimensions were verified by the LPC before the test.

2.2.1 Panel door tray

This was a 1.0mm-thick Zintec steel skin, which was polyester powder-coated in Ral9010 20% gloss with pre-formed 1.2mm-thick top-hat section vertical stiffeners welded to the sides and middle section of the door tray. The stiffeners welded to each vertical side were 18mm x 30mm x 105mm x 30mm x 18mm and the central stiffener 18mm x 30mm x 87mm x 30mm x 18mm. The voids within the door tray were unfilled. A 12.5mm-thick sheet of Lafarge Megadeco wallboard, treated with one coat of Lafarge Drywall Sealer, was fixed to the rear face of the door tray using 32mm drywall screws. The panel had a fire retardant smoke seal attached to the frame perimeter and was fitted to M6 bolts welded to the door tray and fixed to the frame using nuts and washers to M6 bolts welded to the frame at 150mm in from the edges and 300mm centres thereafter. The panel was locked by three budget locks, one lock positioned approximately 200mm in from each end, top and bottom, with one lock central.

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

2.2.2 Panel frame

This consisted of a 1.2mm-thick Zintec steel section with M6 bolts welded to the hinge side. The 25mm-wide front picture frame flange was mitred at each corner. The frame was polyester powder coated to Ral9010 20% gloss.

2.2.3 General

The actual overall panel dimensions, not including the picture frame surround were 2000mm high x 900mm wide, with a 25mm-wide picture frame surround mitred at each corner. The three budget lock holes on the front face of the panel door were each fitted with a plastic collar and a removable dome plug. Plastic spacer plugs were also fitted in the edge of the door tray, two top and bottom with two on the opening side.

Full details of the specimen construction are shown in Figures 1 to 4 and the completed construction is shown before the test in Plates 1 and 2.

3 TEST PROCEDURE

3.1 General

The test was carried out on 2 November 2000 and was witnessed by Messrs T Beasley and R Douglas representing the sponsor and Mr. J Kitchener, consultant. The ambient temperature at the start of the test was 14°C.

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 B.S. 476 : Part 20 : 1987[1]. After the first 5min of the test the pressure in the furnace was maintained in accordance with B.S. 476 : Part 22 : 1987, so that a neutral pressure plane existed 1m above the bottom of the partition.

3.3 Specimen temperature

The temperature on the unexposed face of the specimen was measured using fifteen copper constantan (T type) thermocouples each soldered to a copper disc and covered with an insulating pad, 30mm x 30mm x 2mm thick, as described in B.S. 476 : Part 20 : 1987[1].

The location of the thermocouples is shown in Figure 5. Thermocouples attached to the supporting partition construction were for information only.

3.4 Deflection

A transducer activated by a fine taut wire was attached to the centre of the access panel leaf to continuously monitor deflection at this point throughout the test. The deflection at this height was also recorded using a steel rule at seven other locations (given in Figure 5) across the specimen and supporting construction, by reference to a taut fixed wire.

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

3.5 Irradiance

A radiometer was located horizontally 3m from the centre of the access panel to record irradiance during the test.

4 RESULTS

4.1 Observations

The observations made during the test are given in Table 2. All observations are of the unexposed face.

Table 2 Observations

Time min : s	Observation
0 : 00	Test started.
5 : 00	Slight smoke emissions.
8 : 48	Brown scorch mark on the right-hand side vertical edge of the panel adjacent to the frame.
10 : 50	Large bubble formed on the paper cladding of the plasterboard core beneath thermocouple 12.
10 : 57	Scorch marks present on both the right- and left-hand vertical edges of the access panels from ¼ height to full height.
14 : 48	Considerable steam emissions at the periphery of the plasterboard on the access panel.
17 : 56	Bubble noted at 10min 50s decreasing in size. Horizontal tear in paper full width of plasterboard on the access panel at approximately ½ height. Paper very damp.
20 : 00	Plasterboard cracked on access panel extending down to steel across full width of panel at approximately ½ height.
28 : 00	Crack in plasterboard on the access panel now up to 10mm wide maximum. Steel glowing red visible through crack.
30 : 00	General photograph taken (Plate 3).
37 : 00	All plasterboard in place on the exposed face of the specimen.
39 : 00	Crack in plasterboard on the unexposed face of the access panel now opened up to 15mm wide.
46 : 31	All plasterboard still in place on the exposed face of the specimen.
57 : 00	All plasterboard in place on both exposed and unexposed faces of the specimen.
60 : 00	General photograph taken (Plate 4). No integrity failure.
70 : 00	General photograph taken of specimen (Plate 5) and close-up photograph taken of access panel (Plate 6). Test stopped at the request of the sponsor. There was no integrity failure during the test. Integrity rating 70min.

The specimen is shown after the test in Plates 7 and 8.

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

4.2 Temperature measurements

4.2.1 Furnace temperature

The mean furnace temperature is plotted against time in Figure 6 with the specified curve for comparison.

4.2.2 Temperature measurements on the unexposed face

The mean (recorded by thermocouples 6, 7, 10, 12 and 13 and maximum temperatures recorded on the access panel leaf are plotted against time in Figure 7. Individual temperatures recorded on the access panel frame and leaf are shown in Figures 8 and 9 respectively. Individual surface temperatures recorded on the supporting partition are given in Figure 10.

The limit for maximum temperature rise (180°C) was first exceeded on the access panel frame after 7min by thermocouple number 2. The limit for the rise in mean temperature on the access panel door leaf (140°C) was exceeded after 30min. The limit for maximum temperature rise (180°C) was first exceeded on the access panel door leaf after 27min.

4.3 Deflection measurements

The deflection recorded at the centre of the access panel is shown plotted against time in Figure 11. Manual deflection measurements made across the construction are given in Table 2. The positions of the manual deflection measurement locations A to G are shown in Figure 5.

Table 2 Manual deflection measurements (mm)

All deflection was towards the furnace.

Time min	Deflection point A	Deflection point B	Deflection point C	Deflection point D	Deflection point E	Deflection point F	Deflection point G
0	0	0	0	0	0	0	0
7	-1	11	15	39	26	8	0
13	-	-	22	44	21	-	-
28	0	20	24	49	30	11	1
42	0	18	22	54	35	12	3
54	9	32	42	59	56	23	1
65	12	48	62	61	70	52	2

4.4 Irradiance measurements

The radiometer located 3m from the centre of the access panel malfunctioned and no reliable irradiance measurements were obtained.

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

5 PERFORMANCE CRITERIA

The standards[1,3] state that a door / shutter assembly is regarded as having a fire resistance (expressed in minutes) that is equal to the elapsed time (to the nearest completed minute) 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) a 6mm-diameter gap gauge can penetrate through a gap into the furnace except at sill level, 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 : 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 positions 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 incorporated in a plasterboard partition, as described in this report, when tested in accordance with B.S. 476 : Part 22 : 1987 was found to have the following fire resistance:

Insulation:	7min
Integrity:	70min

The limit for the rise in mean temperature was exceeded after 30min and the maximum temperature limit was exceeded on the leaf after 27min.

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.

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

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.

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

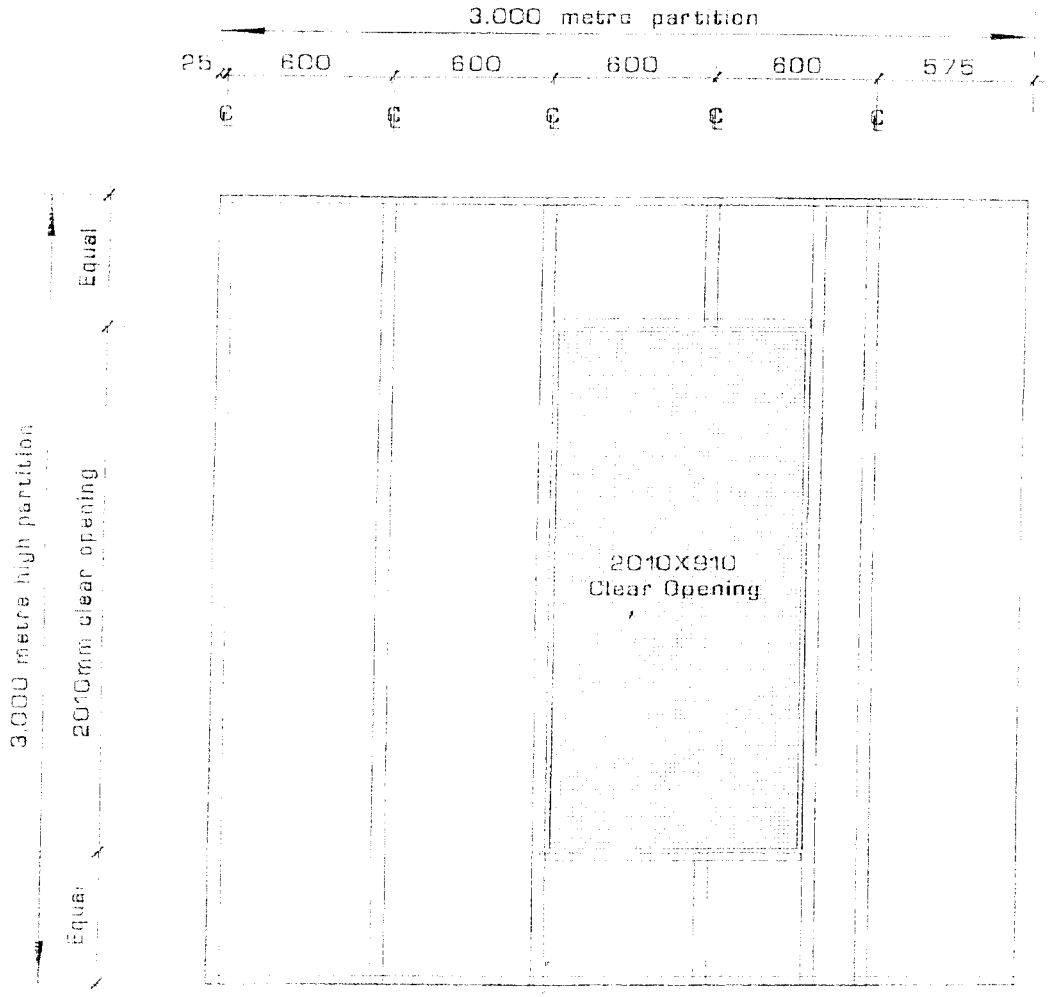


Figure 1 Supporting construction showing location of access panel opening viewed from the exposed side

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

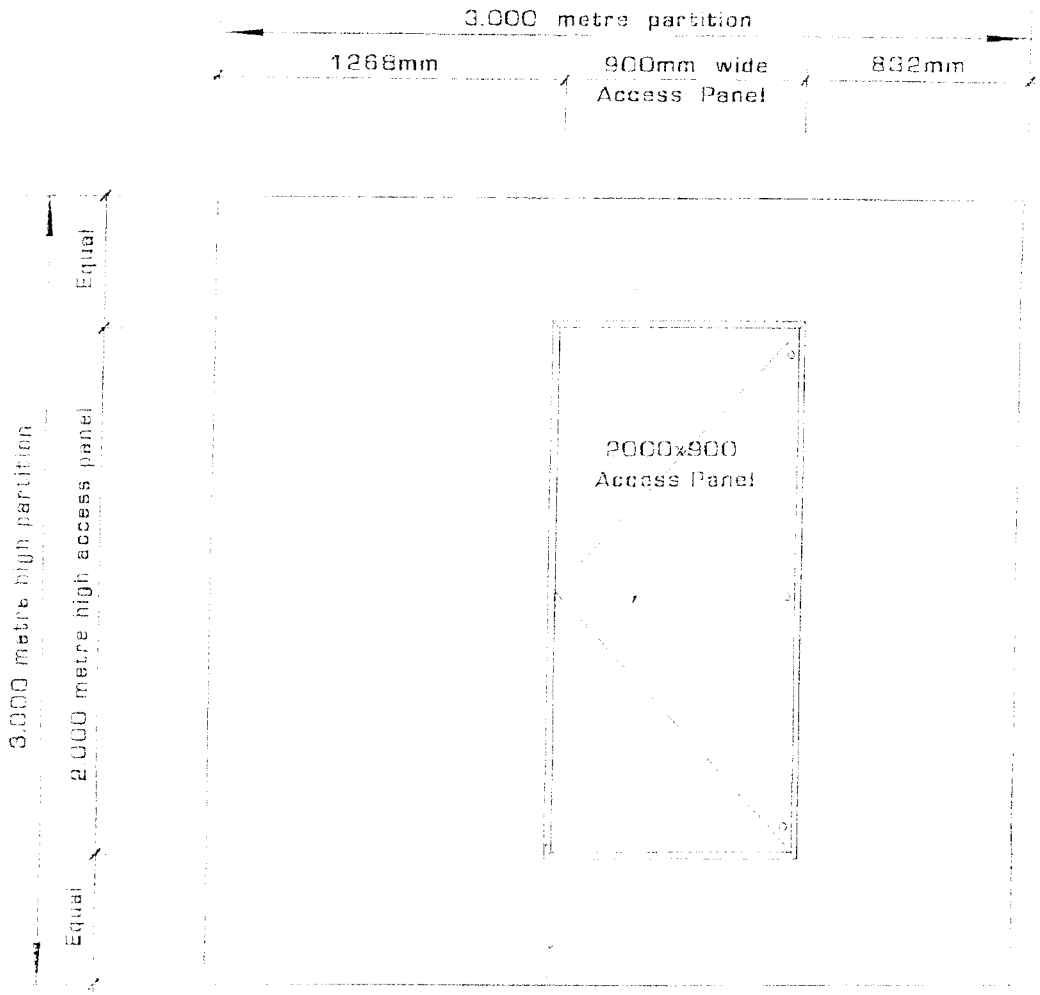


Figure 2 Front elevation showing access panel position

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

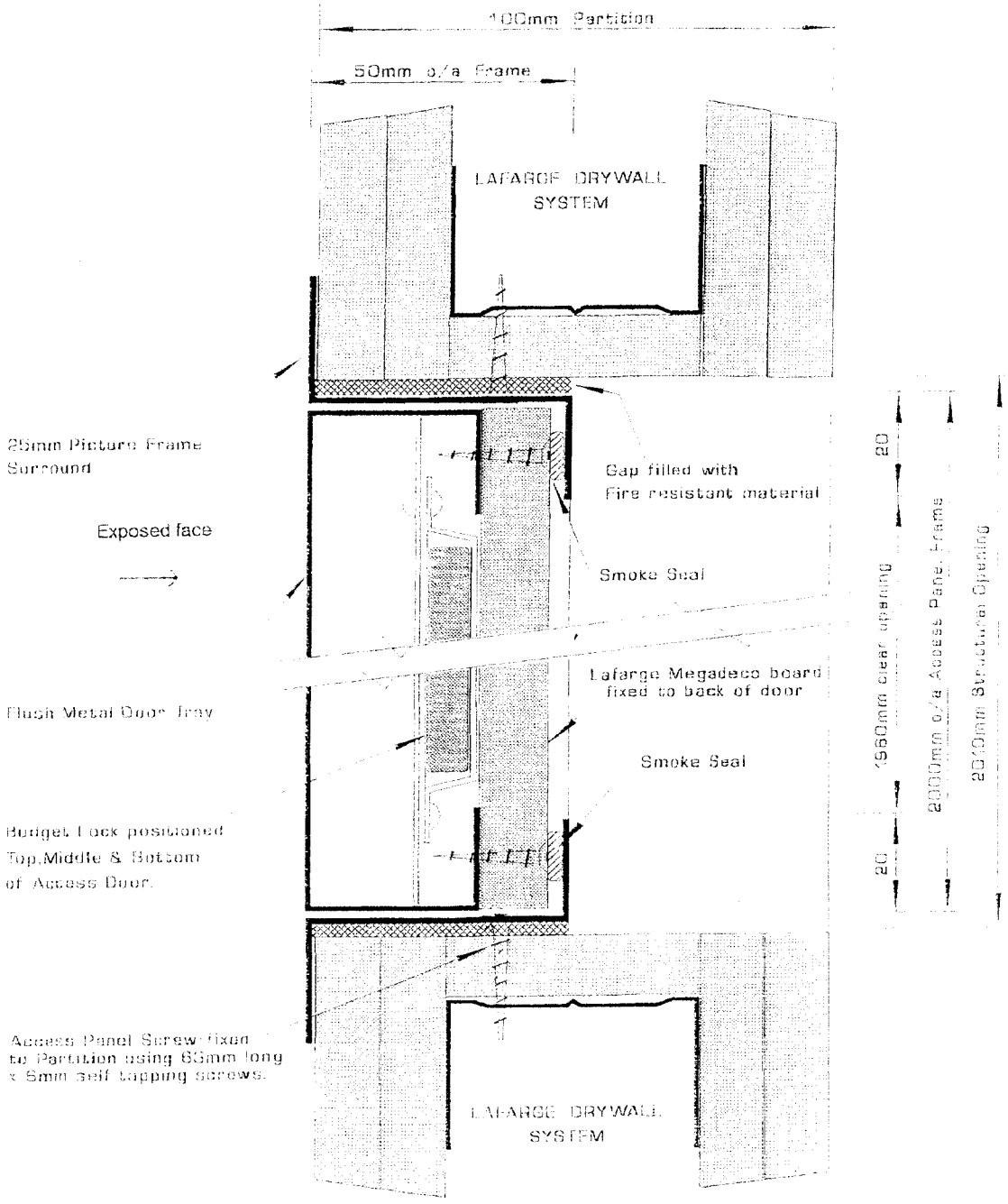


Figure 3 Vertical section through partition and access panel

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

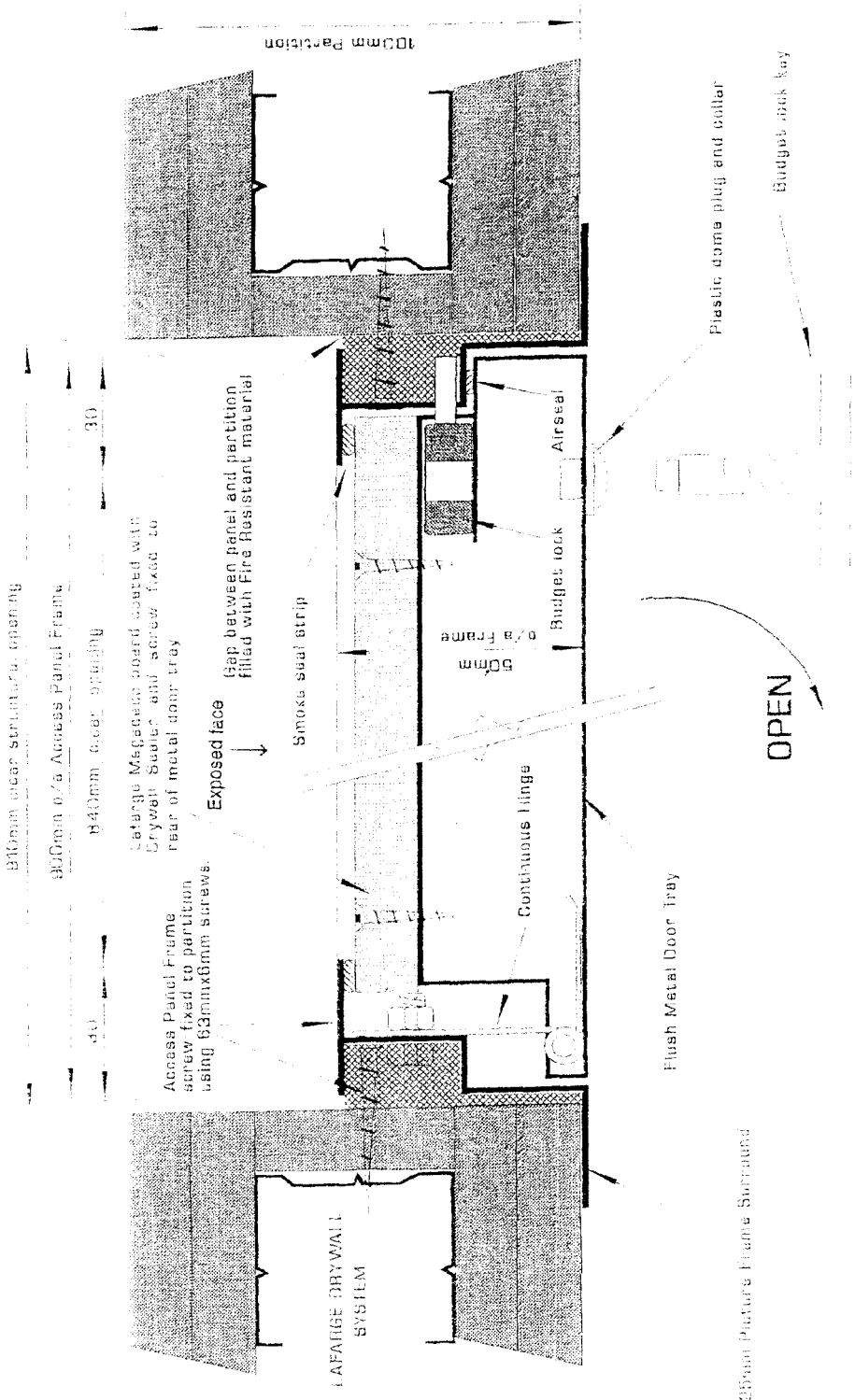
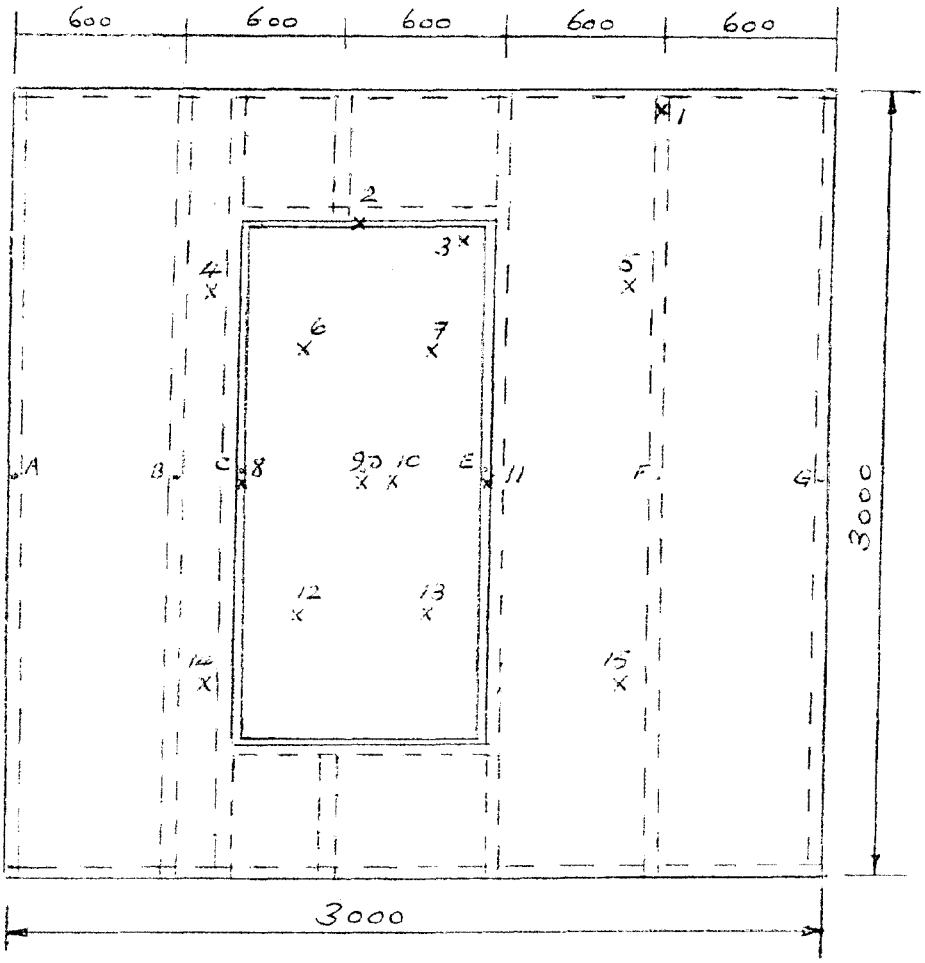


Figure 4 Horizontal section through partition and access panel

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.



T type thermocouples X1-15

• A-G manual deflection measurement positions

Dimensions in mm Not to scale

Figure 5 Location of thermocouples and manual deflection measurement positions

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

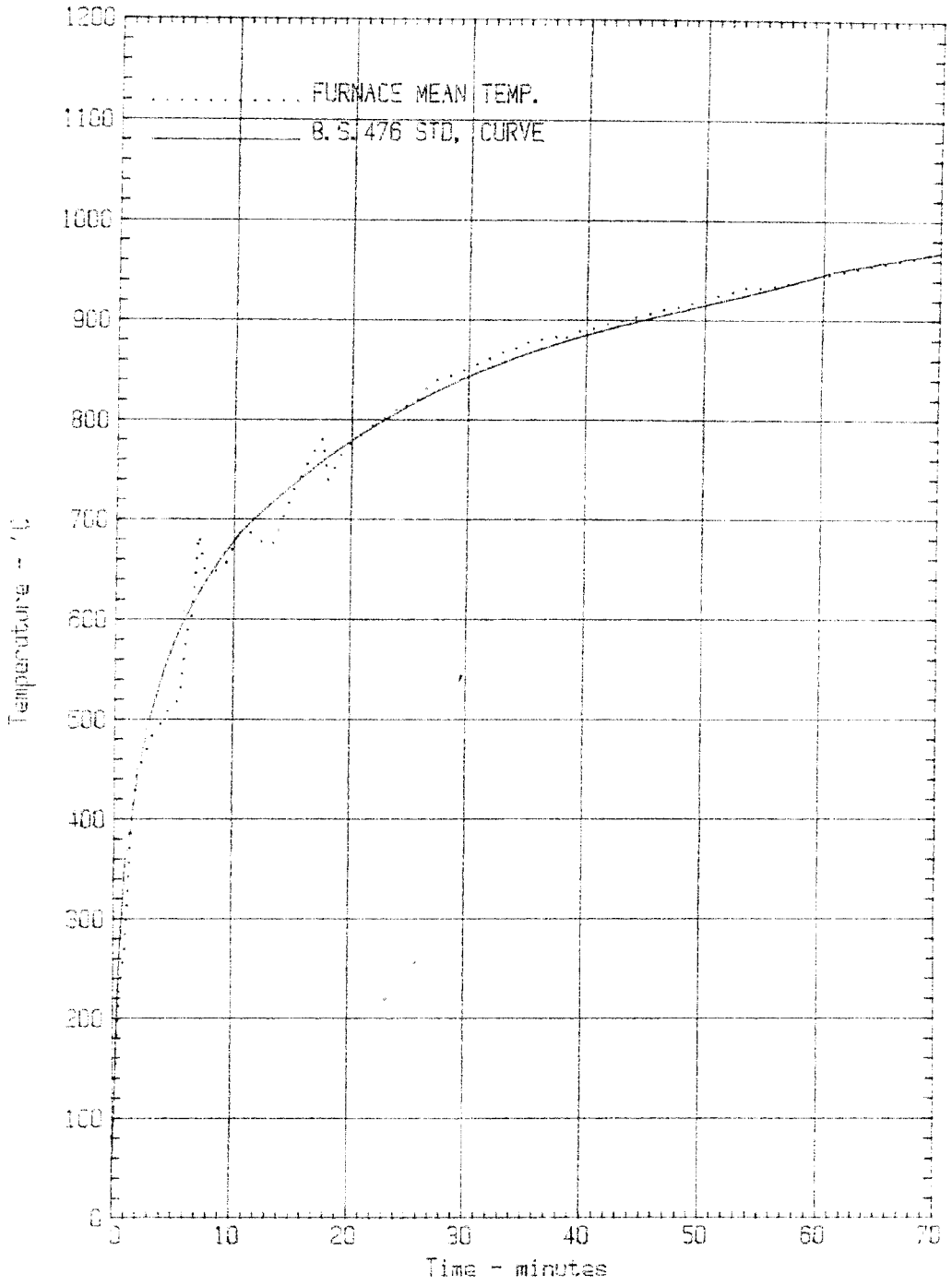


Figure 6 Furnace temperature data

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

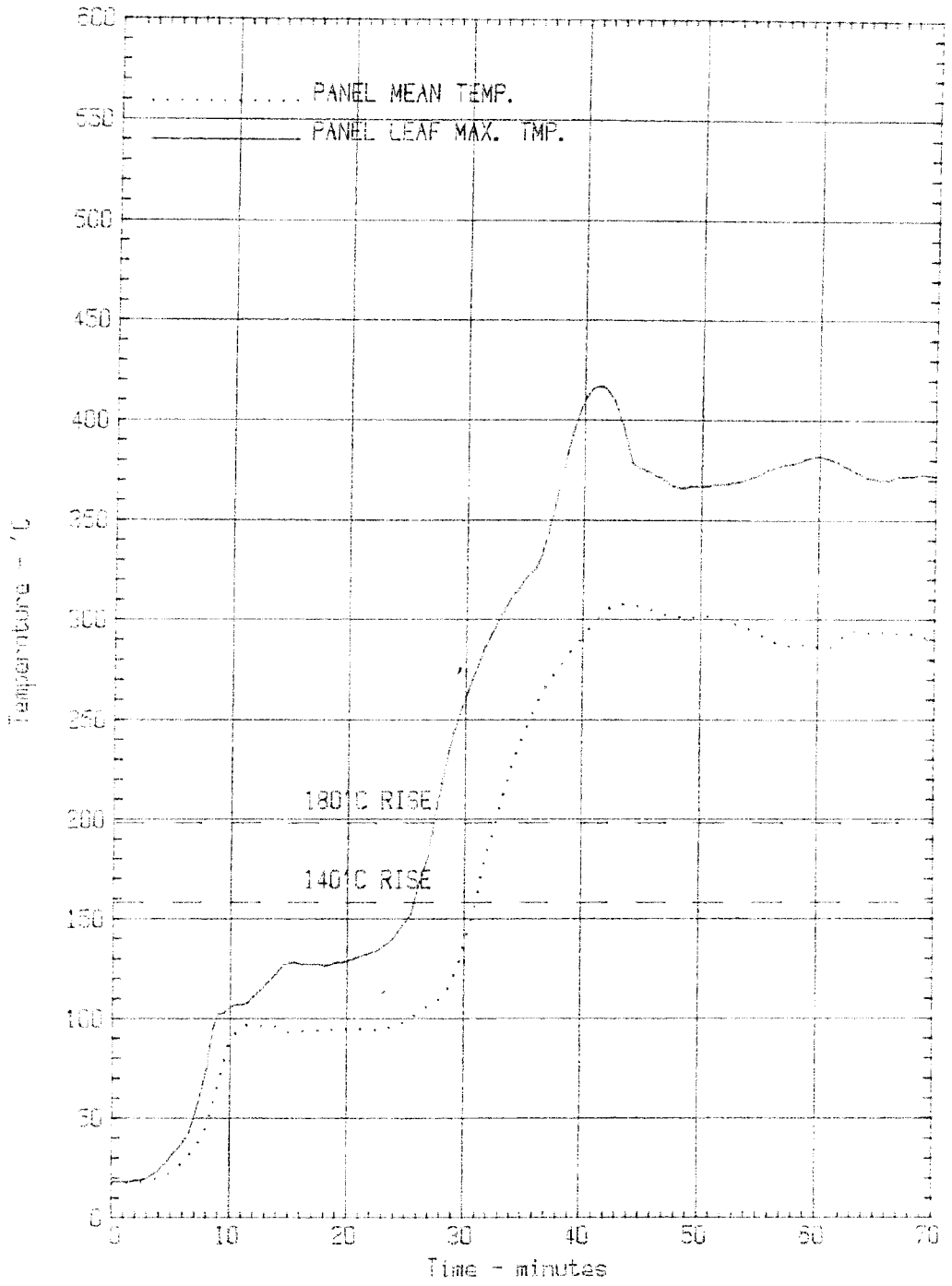


Figure 7 Access panel – mean and maximum temperatures

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

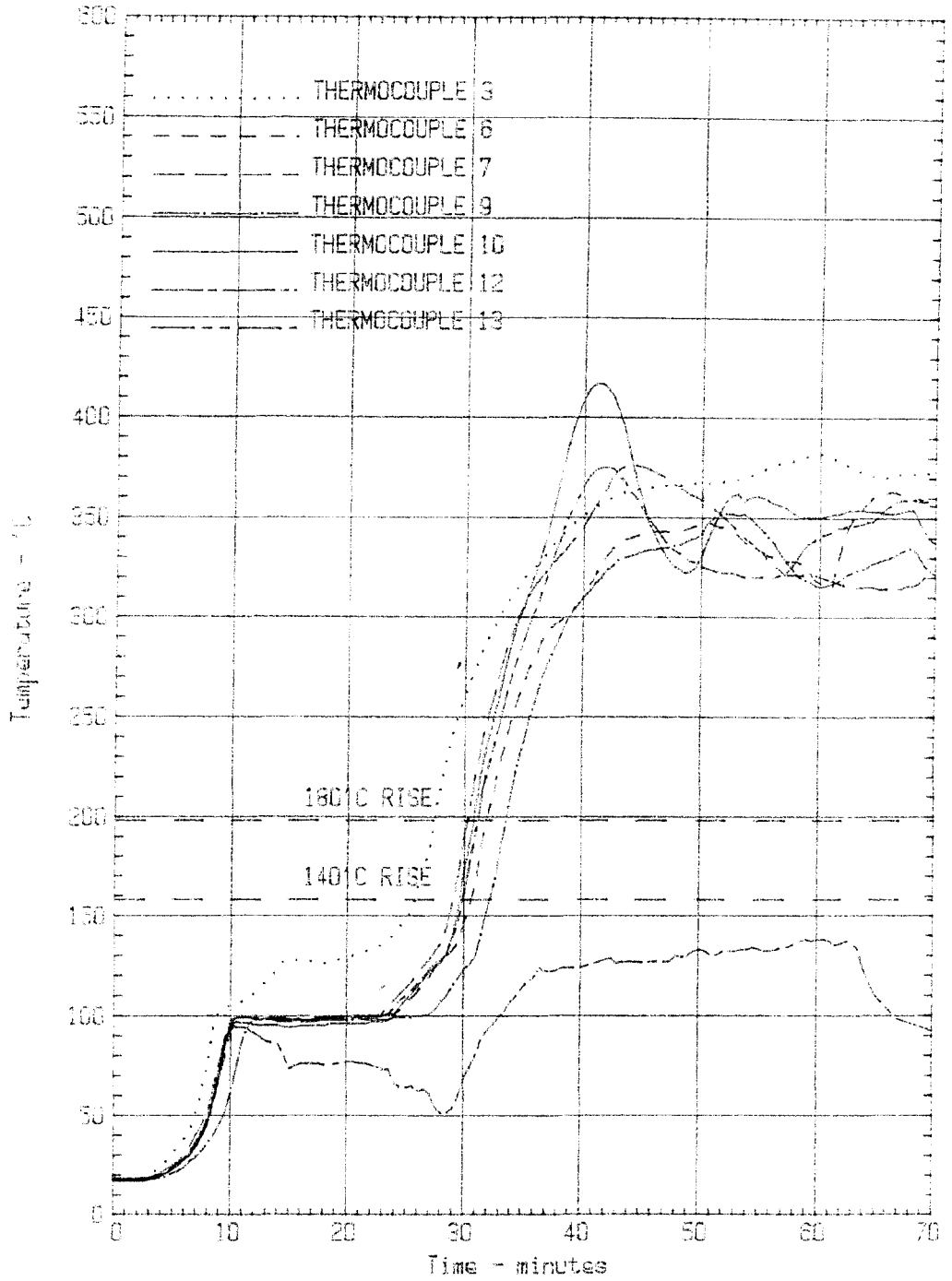


Figure 8 Access panel – recorded temperatures

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

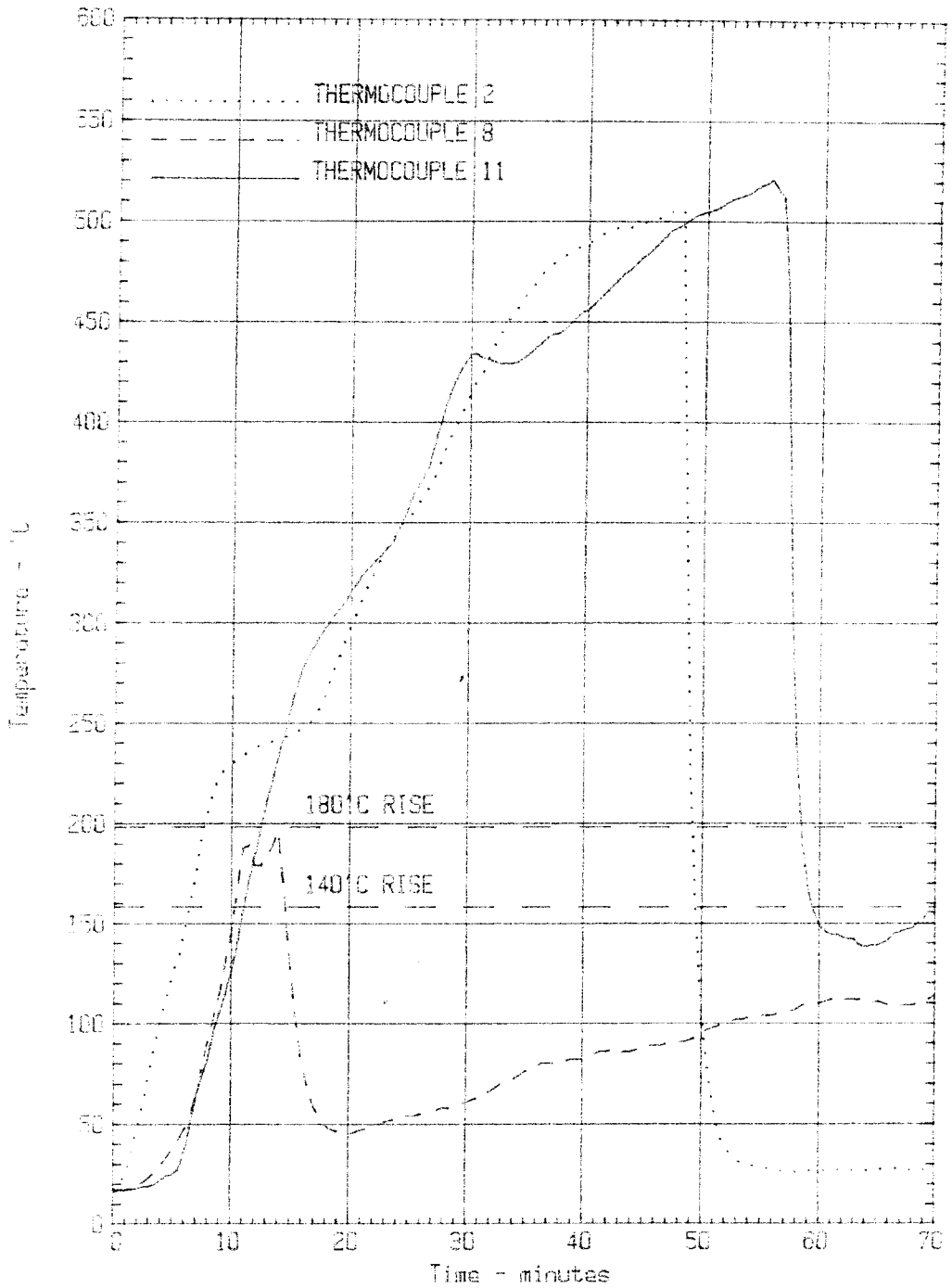


Figure 9 Access panel frame – recorded temperatures

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

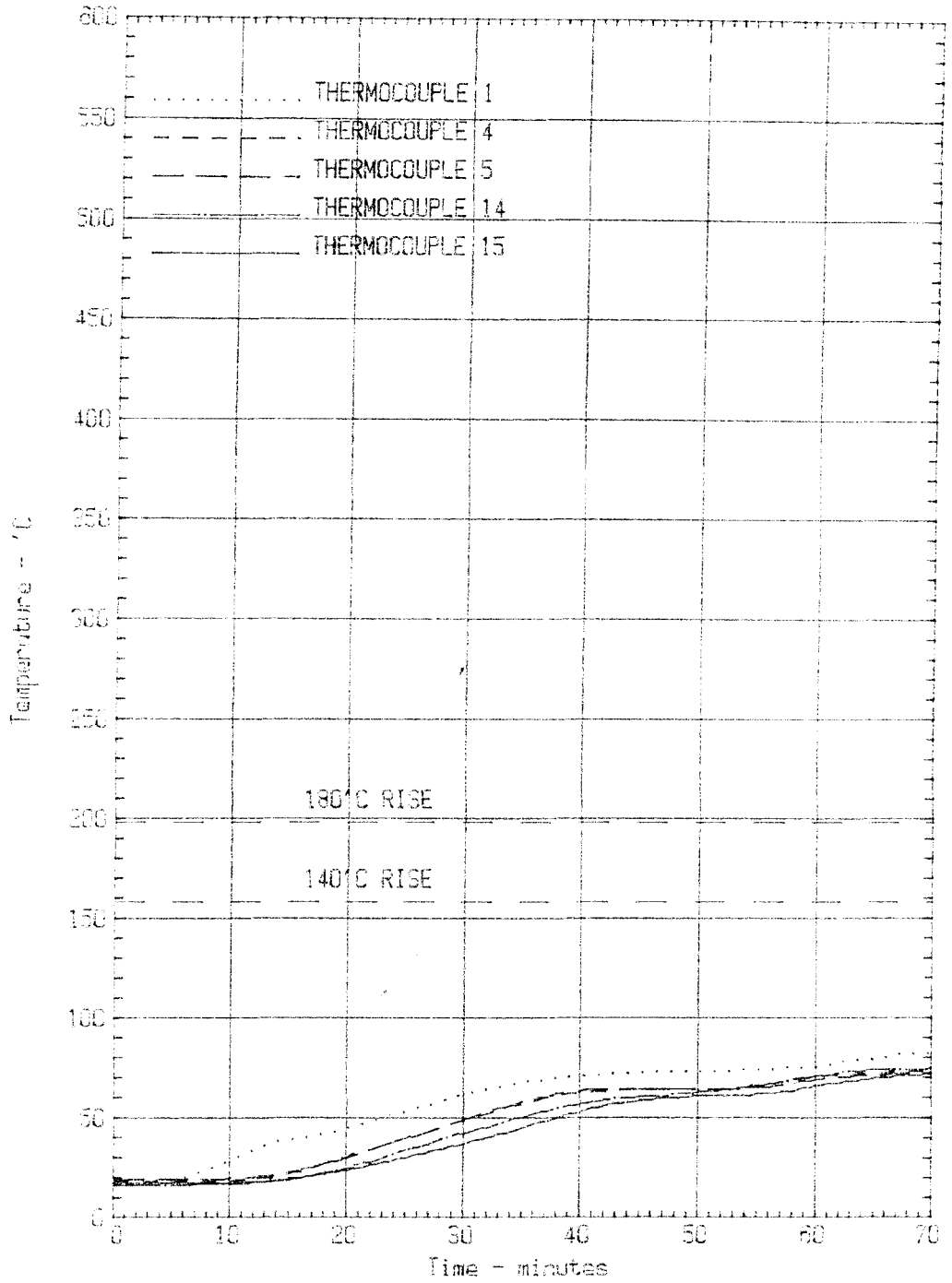


Figure 10 Supporting partition – recorded temperatures

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

BRE, Bucknalls Lane, Garston, Watford, Hertfordshire, WD25 9XX
Telephone: 01923 664000 Facsimile: 01923 664010

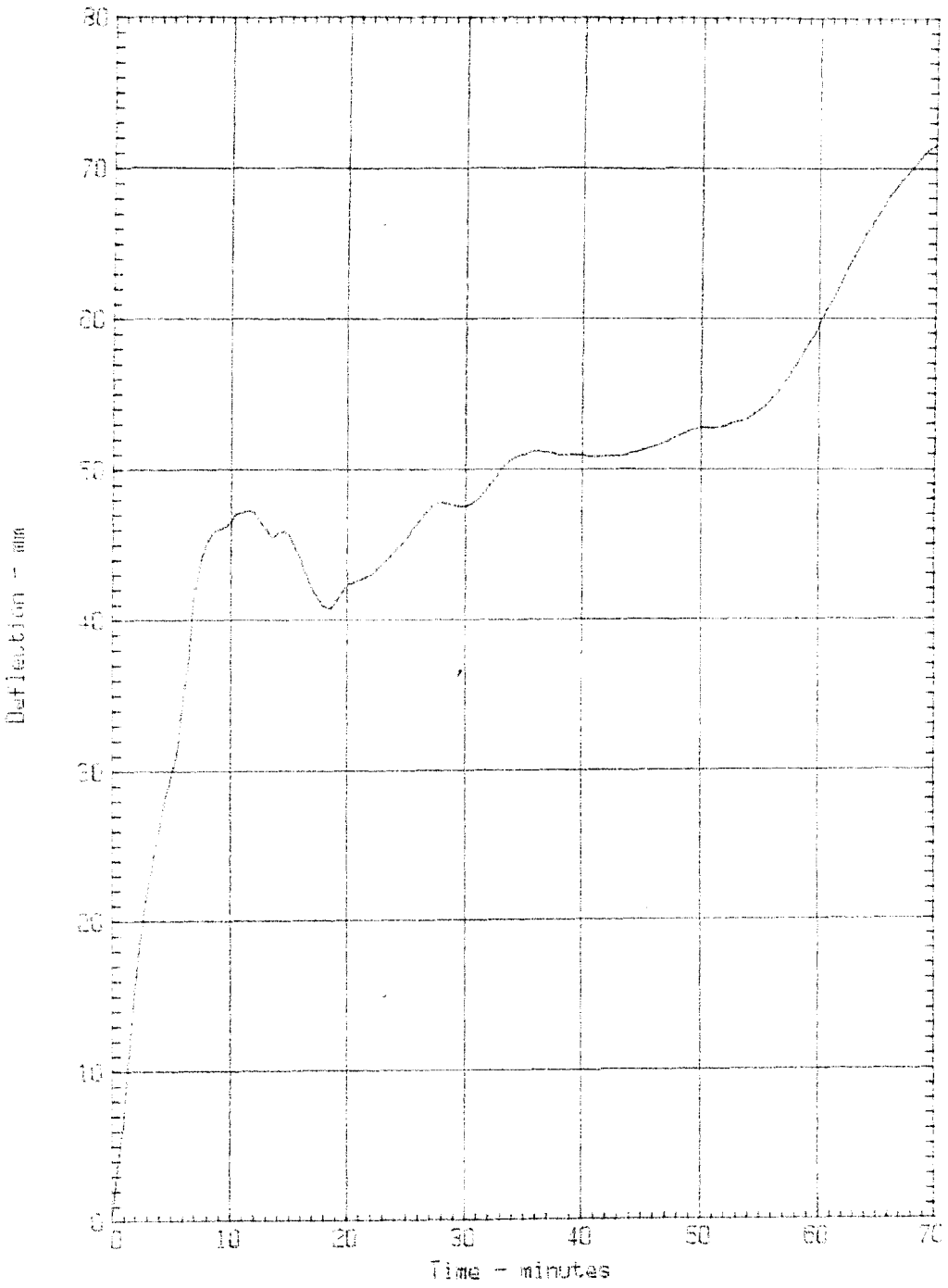


Figure 11 Horizontal deflection at centre of access panel

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

BRE, Bucknalls Lane, Garston, Watford, Hertfordshire, WD25 9XX
Telephone: 01923 664000 Facsimile: 01923 664010

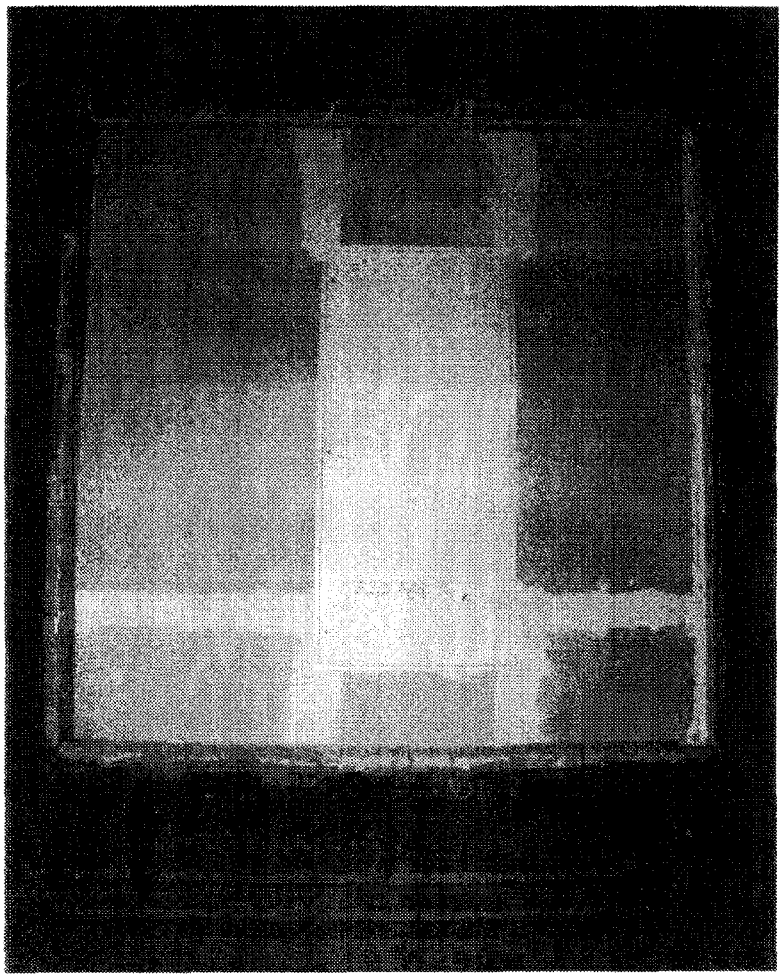


Plate 1 **Exposed face of specimen before test**

(Neg.No. 001)

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Fire resistance relates only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

BRE, Bucknalls Lane, Garston, Watford, Hertfordshire, WD25 9XX
Telephone: 01923 664000 Facsimile: 01923 664010

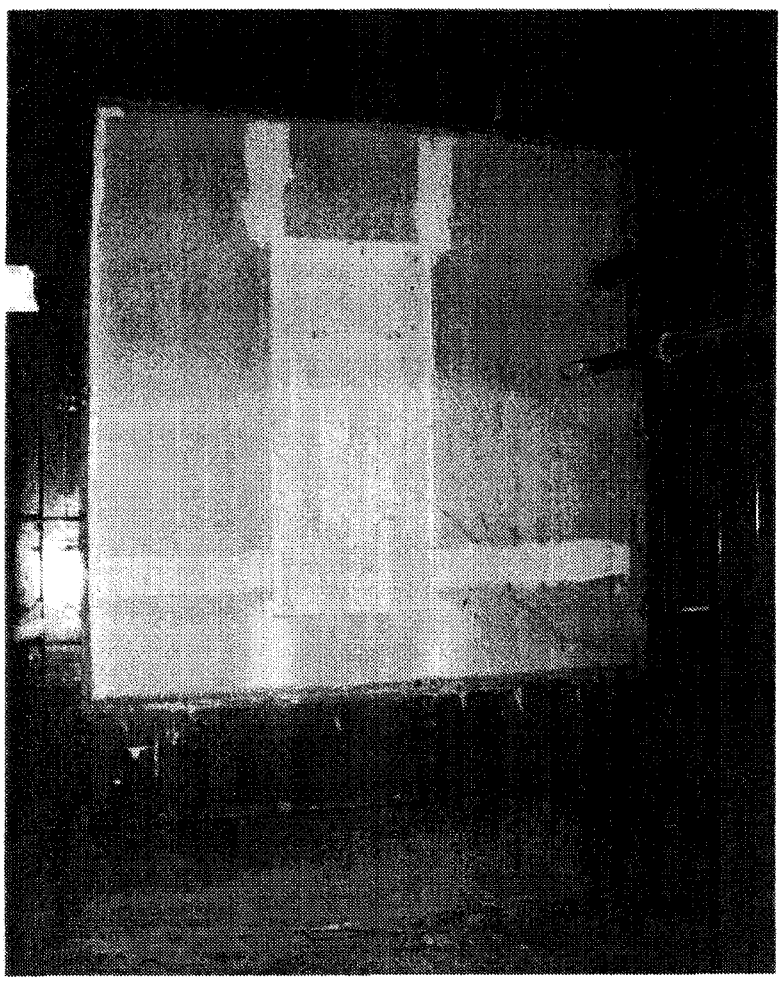


Plate 2 Unexposed face of specimen before test

(Neg.No. 003)

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or any part thereof. This report does not constitute an approval, certification or endorsement of the product tested.

BRE, Bucknalls Lane, Garston, Watford, Hertfordshire, WD25 9XX
Telephone: 01923 664000 Facsimile: 01923 664010

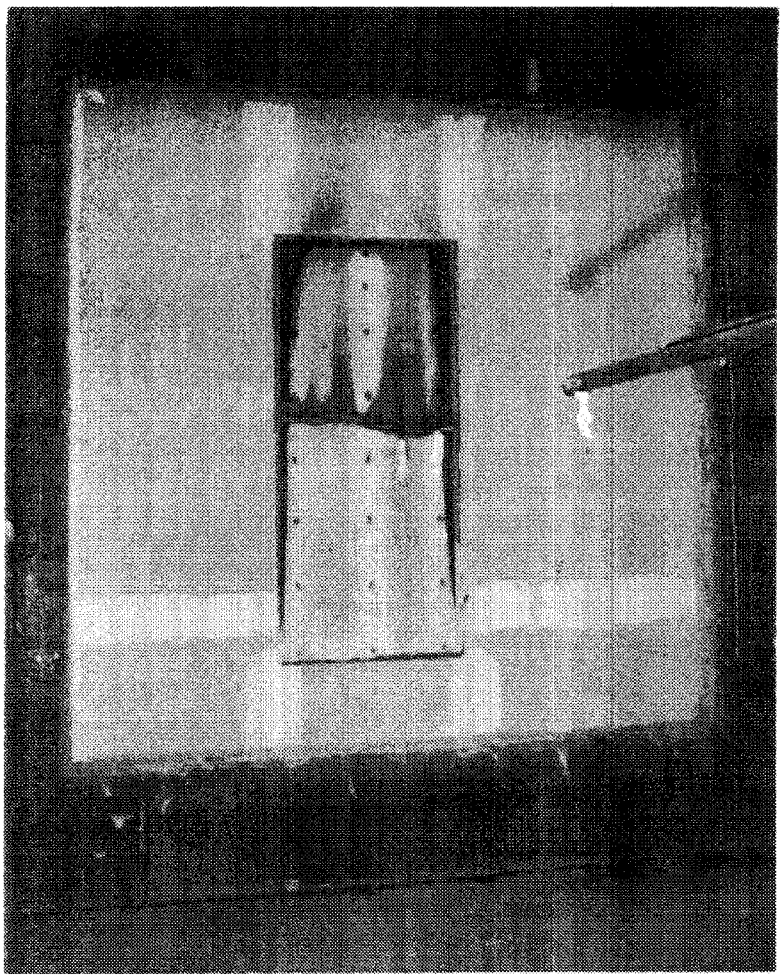


Plate 3 Unexposed face of specimen at 30min

(Neg.No. 006)

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

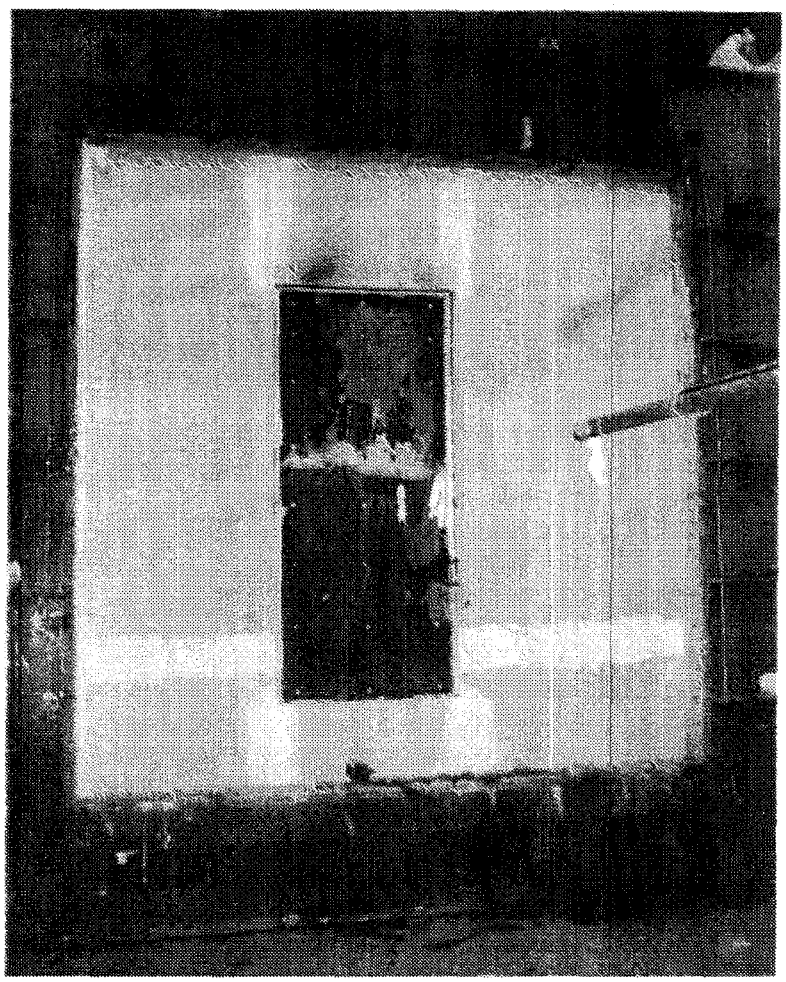


Plate 4 Unexposed face of specimen at 60min

(Neg.No. 007)

This report may be distributed in its entirety and in accordance with the terms and conditions of the contract. Extracts may apply only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

BRE, Bucknalls Lane, Garston, Watford, Hertfordshire, WD25 9XX
Telephone: 01923 664000 Facsimile: 01923 664010

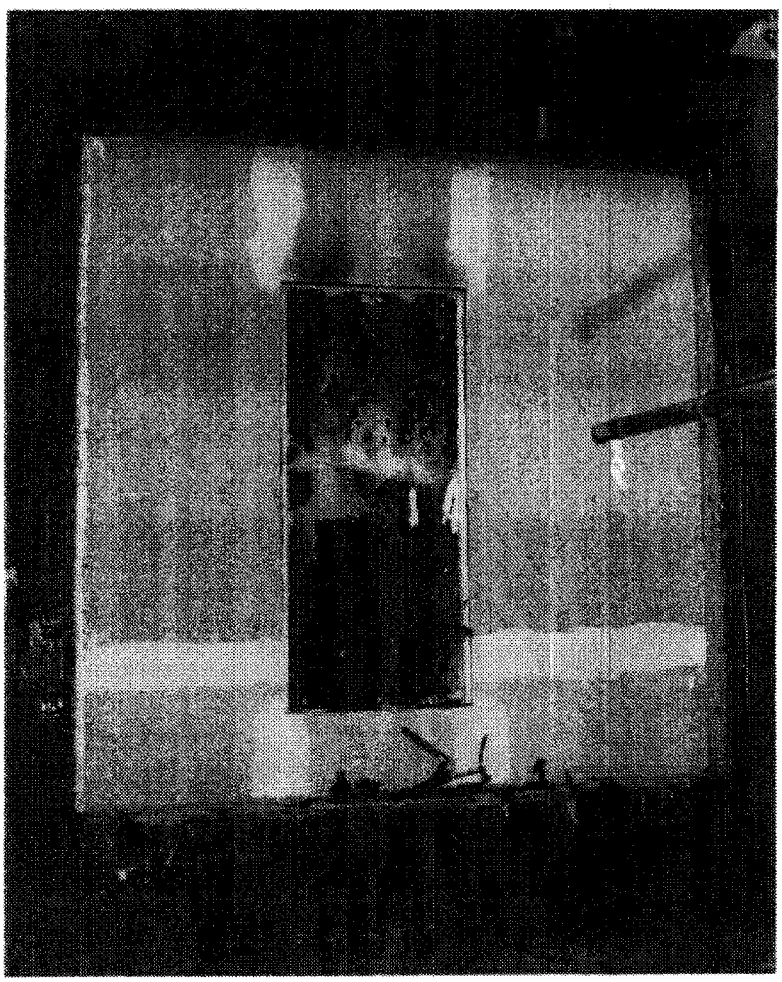


Plate 5 Unexposed face of specimen at 70min

(Neg.No. 008)

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of any product or item tested. This report does not constitute an approval, certification or endorsement of the product tested.

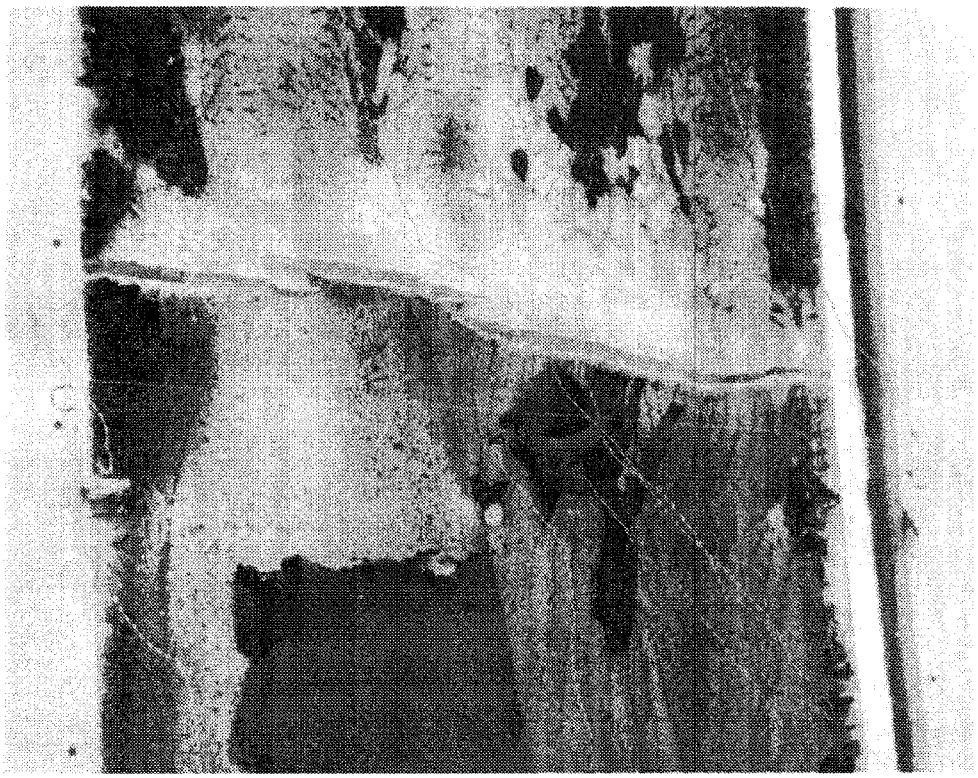


Plate 6 Close-up of crack in plasterboard on the access panel at 70min approximately

(Neg.No. 009)

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or item tested. This report does not constitute an approval, certification or endorsement of the product tested.

BRE, Bucknalls Lane, Garston, Watford, Hertfordshire, WD25 9XX
Telephone: 01923 664000 Facsimile: 01923 664010

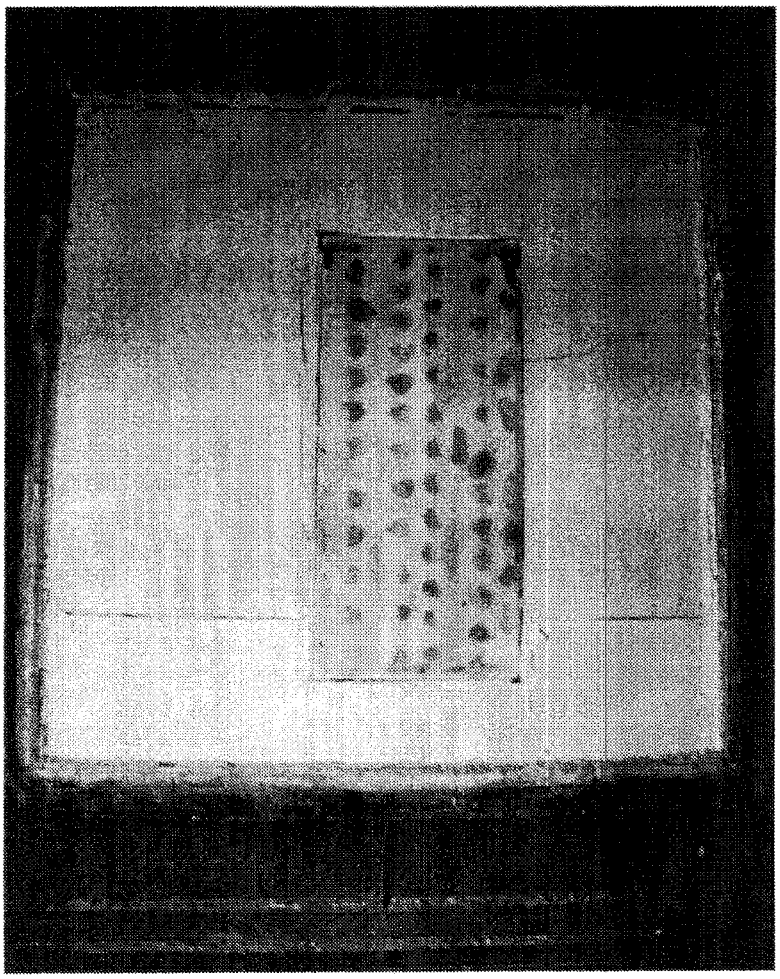


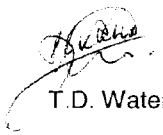
Plate 7 **Exposed face of access panel after cooling to ambient temperature**

(Neg.No. 0010)

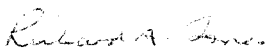
This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

Centre for Fire Resistance
BRE, Bucknalls Lane, Garston, Watford, Hertfordshire, WD25 9XX
Telephone: 01923 664000 Facsimile: 01923 664010

Test and report by:

Signature	
Name	T.D. Waters
Position	Technical Officer

Approved by:

Signature	
Name	R.A. Jones
Position	Centre Head

Reference	TDW/MB
Date	12 March 2001

This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. BRE has no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.