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**Fire resistance test in
accordance with B.S.
476 : Part 22 : 1987 on
an access panel door
installed in a block wall.**

Prepared for:

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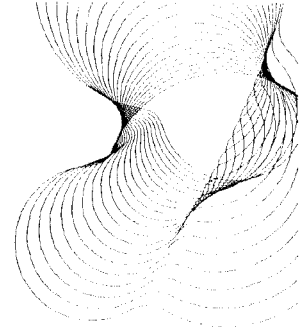
31st January 2006

Test report number 226657



0578

Fire resistance test on an access panel door installed in a block wall.



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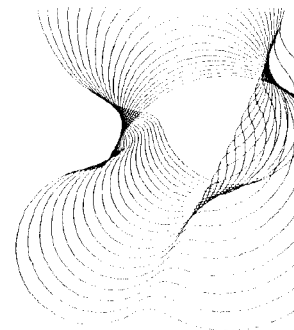
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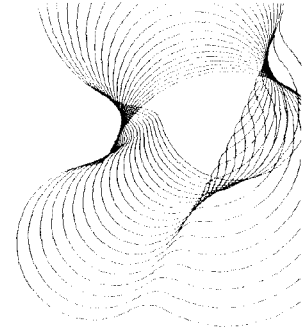
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Fire resistance test on an access panel door installed in a block wall.



SUMMARY

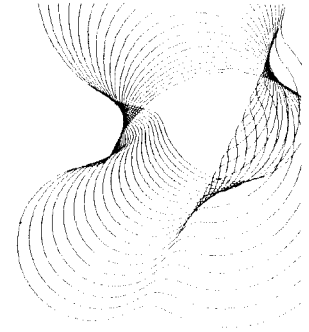
A single-leaf steel / plasterboard access panel installed in a 150mm-thick block wall, was subjected to a fire resistance test in accordance with B.S. 476 : Part 22 : 1987 on 14th December 2005.

The access panel comprised a single door leaf consisting of a polyester powder coated 1.5mm-thick steel skin on one side and 12.5mm-thick Gyproc moisture board with ceramic tiles attached, on the other. The panel leaf was hung in a steel frame bolted directly to the block wall. The leaf opened towards the furnace, the tiled plasterboard being exposed to the furnace.

The access panel was installed into a nominally 610mm wide x 910mm high opening in the block wall and when tested in the orientation described, was found to have the following fire resistance:

Insulation:	8 minutes
Integrity:	132 minutes.

Fire resistance test on an access panel door installed in a block wall.



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 block wall, and tested in accordance with B.S. 476 : Part 22 : 1987¹.

2 SPECIMEN DETAILS

The sponsor provided the description of the specimen. As the door leaf was supplied complete (including tiles) only surface details and dimensions were verified by BRE before the test.

A 150mm-thick aerated concrete block wall was constructed within the aperture (nominally 1.5m x 1.5m) of a steel test frame, leaving an opening, 610mm wide by 910mm high.

The door tray consisted of a 1.5mm thick Zintec steel skin, strengthened with three pre-formed 1.2mm thick vertical stiffeners welded to the sides and centre of the door tray. Horizontal stiffeners (40mm x 58mm x 20mm) were also welded to the top and bottom of the door tray.

The door hinge consisted of an 8mm diameter hinge pin and block fitted top and bottom into a 1.0mm thick top hat steel section welded to the rear of the door tray.

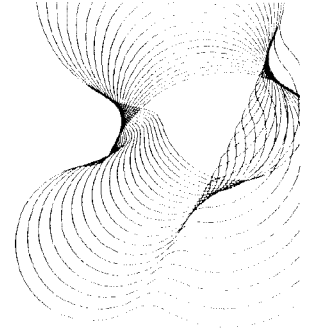
A 12.5mm thick Lafarge Moistureboard was inserted into the recessed door and screw fixed through to the door tray using 25mm Tek screws. The screws were observed to be located at nominally 150mm centres at the sides of the leaf, 200mm centres across the top and bottom of the leaf, with three screws located centrally down the centre of the leaf. One layer of white glazed ceramic tiles (147mm x 147mm x 6.5mm) were then attached to the door leaf, and the wall surrounding the specimen, using Sealocrete wet grip tile adhesive. The gaps between the tiles (nominally 2mm) was filled with Sealocrete powder grout. The tiles were observed to be supplied by H & R Johnson Tiles Ltd, and were type PRG1.

The locking device was a 3-point locking system welded to the rear of the door tray (near the leaf edge opposite the hinged edge), and comprised 8mm diameter steel rods locating into the frame top and bottom and a central cam locking onto a 1.2mm thick x 19mm x 19mm angle welded to the inside of the frame. The locking rods engaged approximately 15mm into the frame at the top and bottom of the door leaf, and the central cam overlapped the angle welded to the frame by approximately 5mm when the door was closed.

A 16mm diameter Stainless steel collar was inserted into the front locking hole after the wall and access panel were fully tiled prior to the test.

The frame consisted of a pre-formed 1.5mm-thick Zintec steel section with a 25mm wide front flange. The frame was tightly fitted into the structural opening in the block wall, and screwed in position using two screws (with plastic rawl plugs) on each side (one near the top and one near the bottom of the frame) and two on the top and bottom frame members (one near each side of the frame members). A bead of Sealocrete Fireseal 4129 flexible mastic sealant was applied on the unexposed face between the frame and block wall.

Fire resistance test on an access panel door installed in a block wall.



A steel roller ball castor was fitted to the top and bottom of the door, close to the hinge pin to facilitate smooth operation of the door.

The metal door and frame were polyester powder coated RAL 9010, 20% Gloss.

The gaps between the leaf and frame were observed to be nominally between 2mm and 3mm.

Further details of the specimen construction are shown in Figures 1 and 2, and the specimen is shown before the test in Photo's 1 and 2.

3 TEST PROCEDURE

3.1 General

The test was carried out on 14th December 2005 and was witnessed by Mr. D. Blenkinsopp, and Mr. T Baker representing the sponsor. The ambient temperature at the start of the test was 10°C.

3.2 Furnace control

The furnace temperature was measured by means of four bare-wire chromel/alumel thermocouples arranged symmetrically in the furnace 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 : 1987¹. After the first 5 minutes of the test, the pressure in the furnace was maintained so that a pressure of 18Pa existed at the top of the access panel.

3.3 Specimen temperature

The temperature on the unexposed face of the specimen was measured using eleven chromel / alumel (K-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 : 1987¹. The location of the thermocouples is given in Table 1 and is shown in Photo 2.

Fire resistance test on an access panel door installed in a block wall.

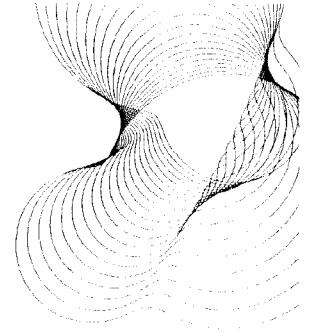


Table 1. Locations of surface thermocouples.

Thermocouple	Location
1	On the access panel frame, centrally above the leaf.
2	On the top left-hand corner of the access panel leaf, on a stiffener.
3	At the top of the access panel leaf, at mid width, on a stiffener.
4	At the top right corner of the access panel leaf, adjacent to stiffeners.
5*	In the centre of the top left quarter of the access panel leaf.
6*	In the centre of the top right quarter of the access panel leaf.
7	On the frame at the left-hand side of the access panel, at mid height.
8*	As near as possible to the centre of the access panel (50mm to the right hand side of the central stiffener).
9	On the frame at the right hand side, and mid height.
10*	In the centre of the bottom left quarter of the access panel leaf.
11*	In the centre of the bottom right quarter of the access panel leaf.

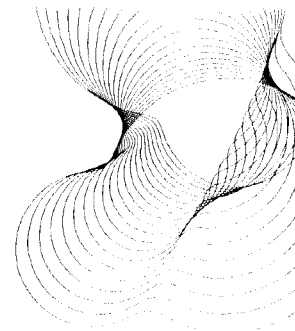
Thermocouples marked with a * were used to determine the mean surface temperature of the access panel.

3.4 Deflection.

A transducer activated by a fine taut wire attached at the centre of the access panel leaf was used to continuously monitor deflection of the leaf throughout the test.

3.5 Irradiance.

The irradiance from the access panel leaf was recorded via a radiometer located 1m from the centre of the specimen.



4 RESULTS

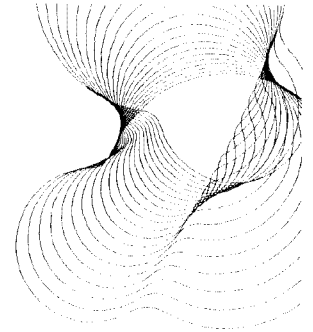
4.1 Observations

The observations made during the test are given in Table 2. Unless stated, all observations are of the unexposed face.

Table 2 Observations.

Time min	Observation.
0.00	Test started.
4	Some smoke is coming from the bottom of the access panel leaf / frame interface.
9	Blue smoke is coming from the surface of the access panel leaf.
11	White smoke is coming from the hinge side of the access panel leaf / frame interface. The side of the frame is turning brown in colour at this location. All the tiles on the exposed face are still in position.
17	The smoke observed at 11 minutes has greatly reduced, but considerable smoke is now coming from the top of the access panel leaf / frame interface. With the exception of one tile in the top (hinge) corner of the access panel leaf, all other tiles on the leaf have fallen from the exposed face.
21	The top right hand edge of the leaf is turning a brown colour.
24	Tiles are falling from the block wall on the exposed face.
30	A red glow is visible at the access panel leaf / frame interface on the hinged side of the leaf. All tiles have now fallen from the leaf on the exposed face.
36	A red glow is visible at the access panel leaf / frame interface at the top of the leaf, near the latched edge.
38	The vertical stiffener on the hinged side of the leaf, and the horizontal stiffener at the top of the leaf are turning brown in colour.
46	The vertical stiffener on the latching side of the leaf is now turning brown in colour.
58	With the exception of the central vertical stiffener, and the right hand side frame member, all other unexposed face surfaces are either a brown or grey colour.
62	The board on the exposed face of the leaf is cracking, but is all intact.

Fire resistance test on an access panel door installed in a block wall.



Time min	Observation.
66	A red glow is now visible across the top of the panel leaf / frame interface. Some areas on the top horizontal stiffener and the leaf areas around the stiffeners are turning black in colour.
83	The coating on the surface of the top half of the vertical stiffener on the hinge side is charring and forming a white ash.
110	The areas of white ash on the unexposed face are extending. All the board on the exposed face of the leaf is still intact.
116	A small piece of board (approximately 50mm x 50mm) at the top hinge corner of the leaf on the exposed face is starting to move away from the leaf. No significant changes to the unexposed face.
120	No significant changes.
123	The small piece of board observed at 116 minutes at the top hinge corner of the leaf on the exposed face has fallen off.
132	No failure of integrity. Test stopped.

The specimen is shown after 1 hour, at termination and after the test in Photo's 3 to 5.

4.2 Temperature measurements

4.2.1 Furnace temperature

The mean furnace temperature is plotted against time in Graph 1 with the specified curve for comparison.

4.2.2 Temperature measurements on the unexposed face

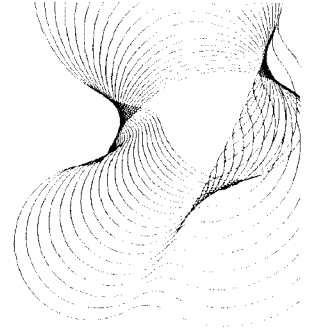
The mean, maximum and individual temperatures recorded on the access panel leaf and frame are plotted against time in Graphs 2 to 4. Due to a technical problem, the data between 28 and 87 minutes became unstable, and is not shown.

The limit for maximum temperature rise (180°C) was first exceeded on the specimen after 8 minutes and the limit for the rise in mean temperature on the access panel leaf was exceeded sometime after 28 minutes, although it is not possible to determine the exact time due to instability of the data.

4.2.3 Deflection measurements

The deflection recorded near the centre of the access panel leaf is shown plotted against time in Graph 5.

Fire resistance test on an access panel door installed in a block wall.



4.2.4 Radiation measurements

The irradiance recorded 1m from the access panel is given in Graph 6.

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:

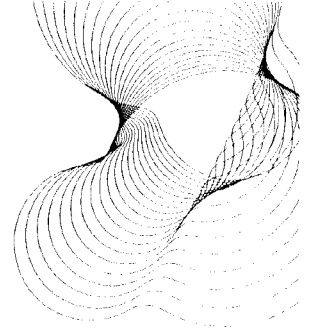
- a) when collapse or sustained flaming for not less than 10s on the unexposed face occurs;
- b) when cracks, gaps or fissures allow flames or hot gases to cause flaming or glowing of a cotton fibre pad;
- c) a 6mm-diameter gap gauge can penetrate through a gap into the furnace other than at sill level, 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.

Fire resistance test on an access panel door installed in a block wall.



6 CONCLUSION

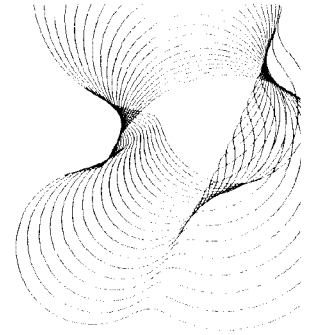
A single leaf access panel incorporated in a 150mm thick block wall, as described in this report, when tested in accordance with B.S. 476 : Part 22 : 1987 was found to have the following fire resistance:

Insulation:	8 minutes
Integrity:	132 minutes

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.

Fire resistance test on an access panel door installed in a block wall.



8 FIGURES

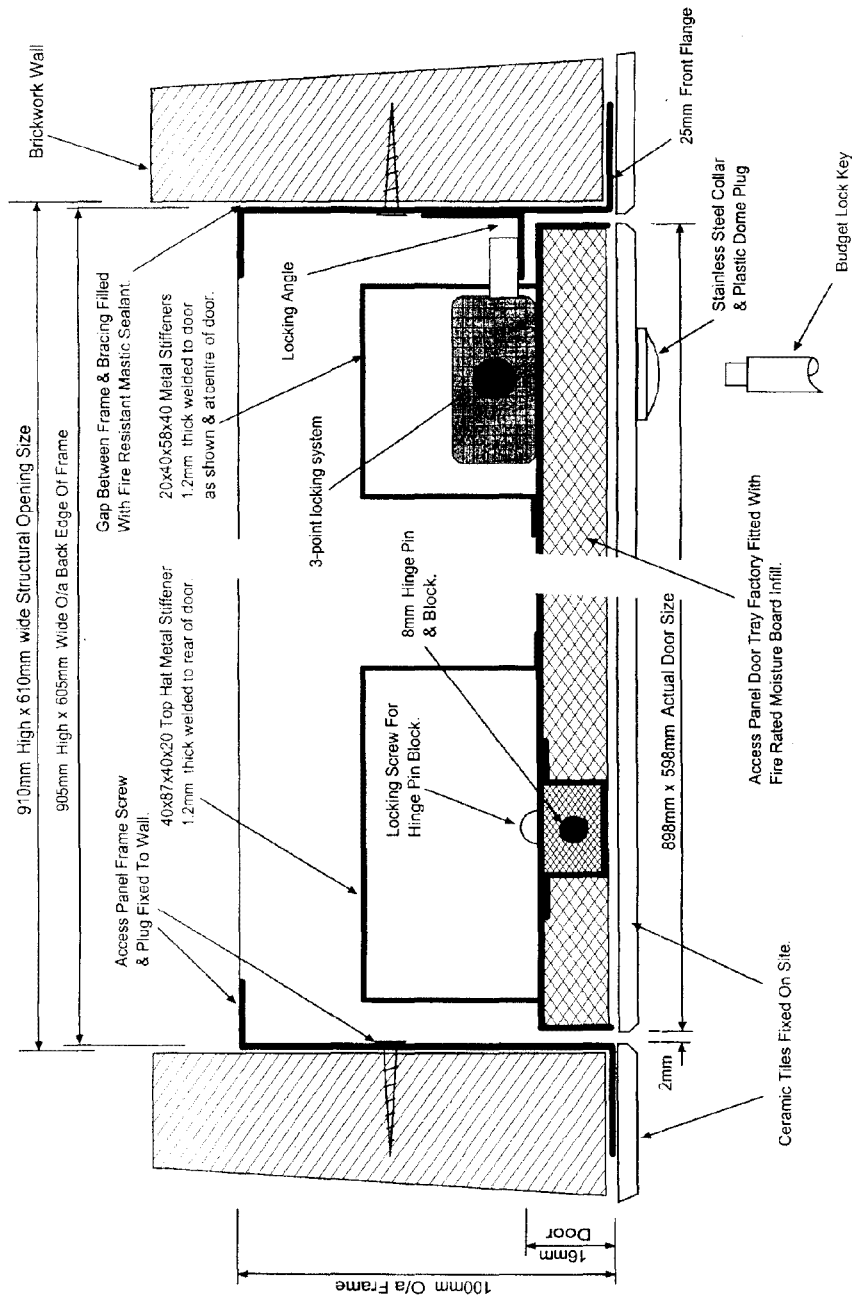


Figure 1 Details of access panel leaf and frame.

Fire resistance test on an access panel door installed in a block wall.

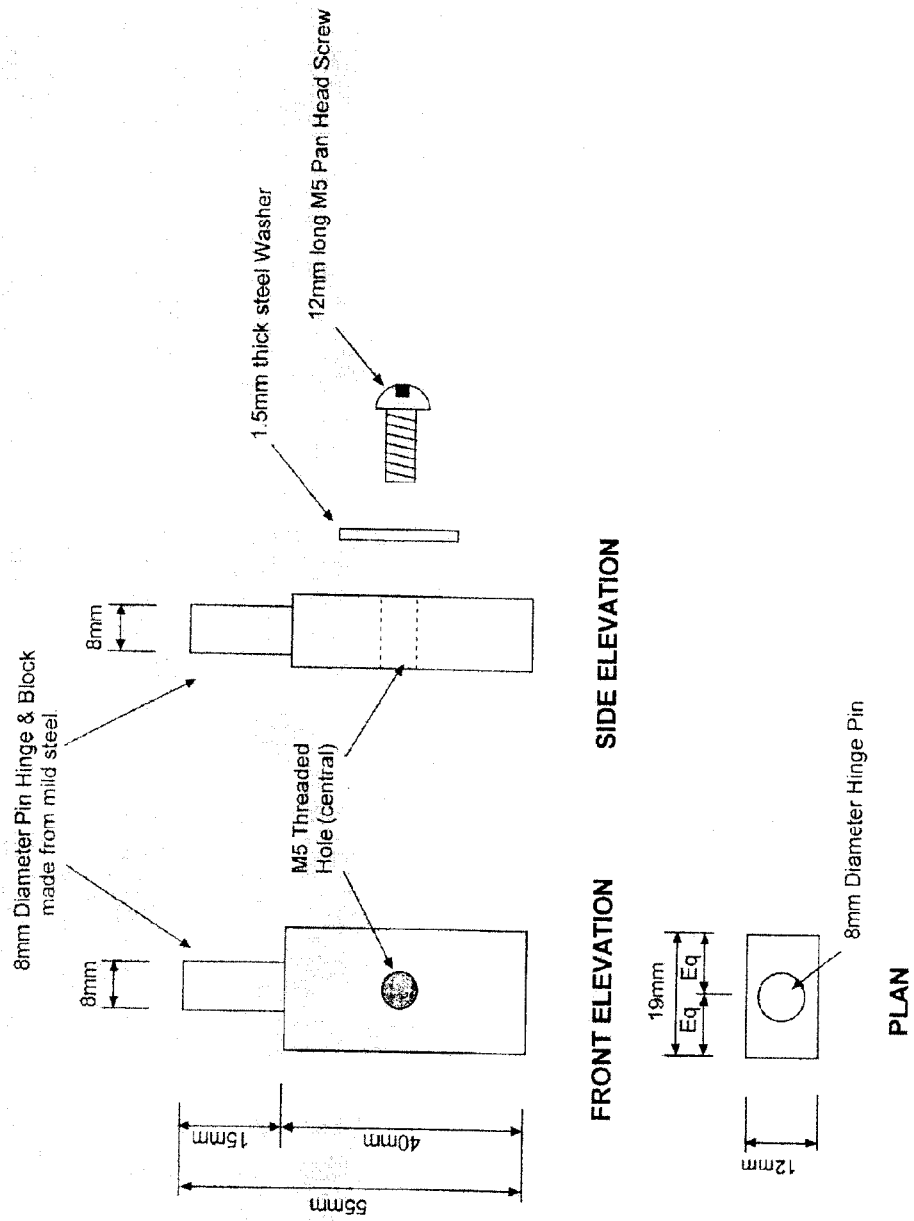
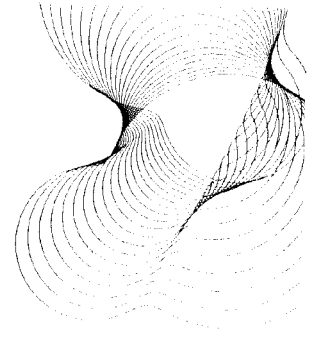
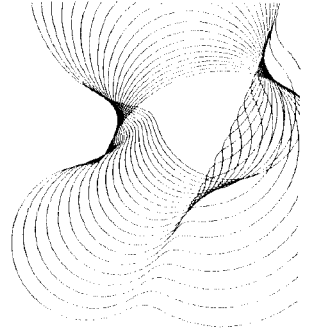
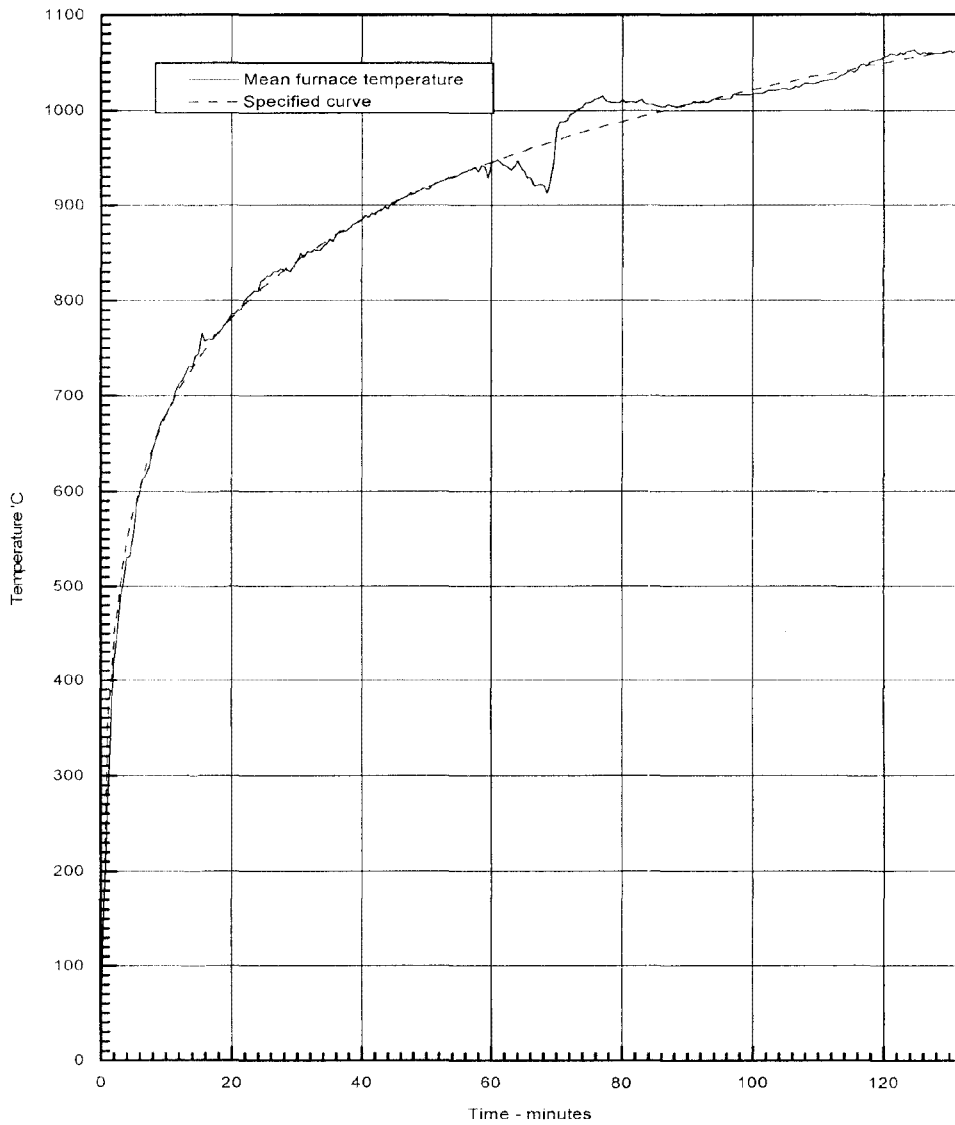


Figure 2 Details of hinge pin arrangement.

Fire resistance test on an access panel door installed in a block wall.

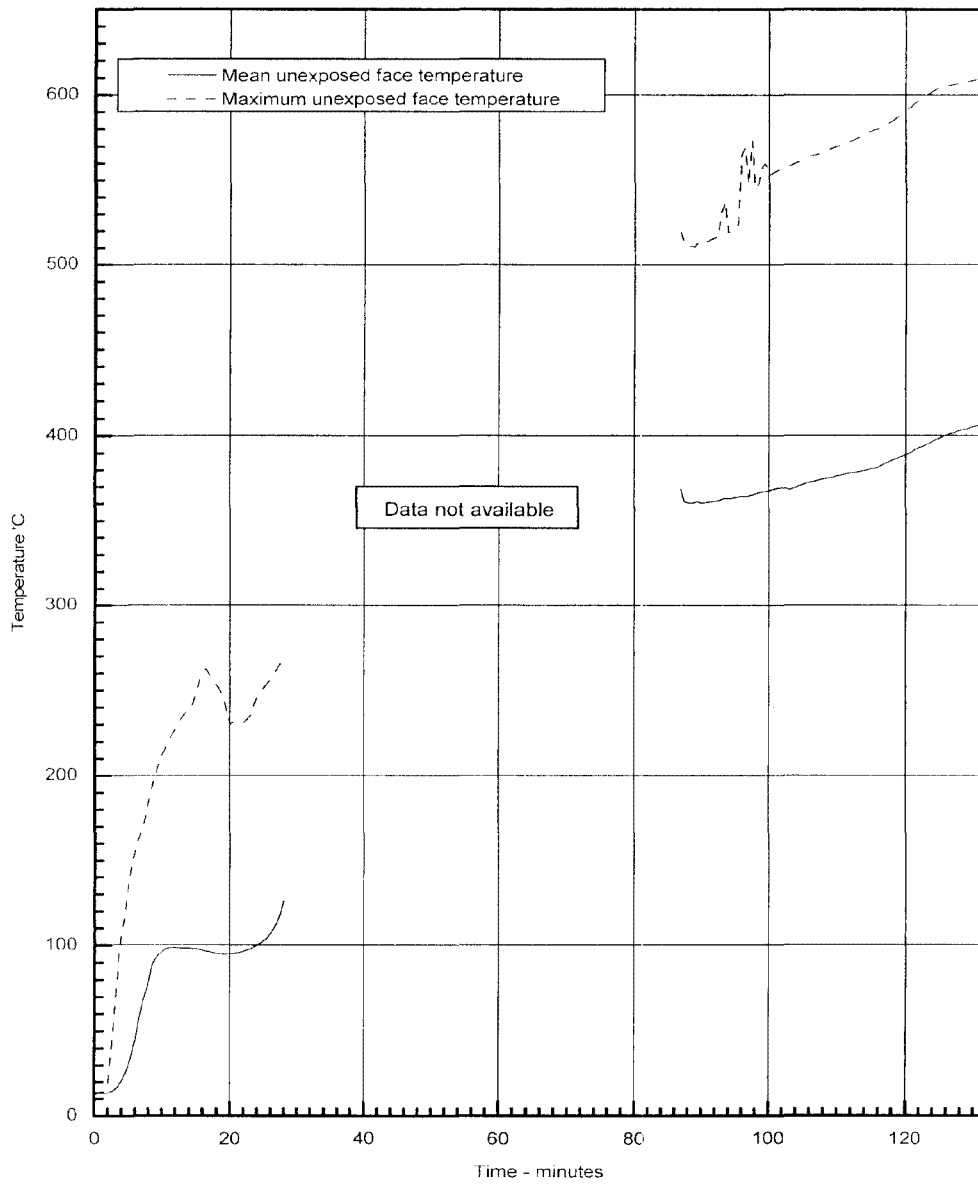
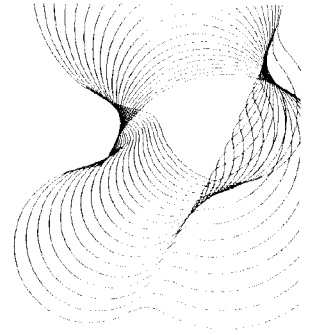


9 GRAPHS



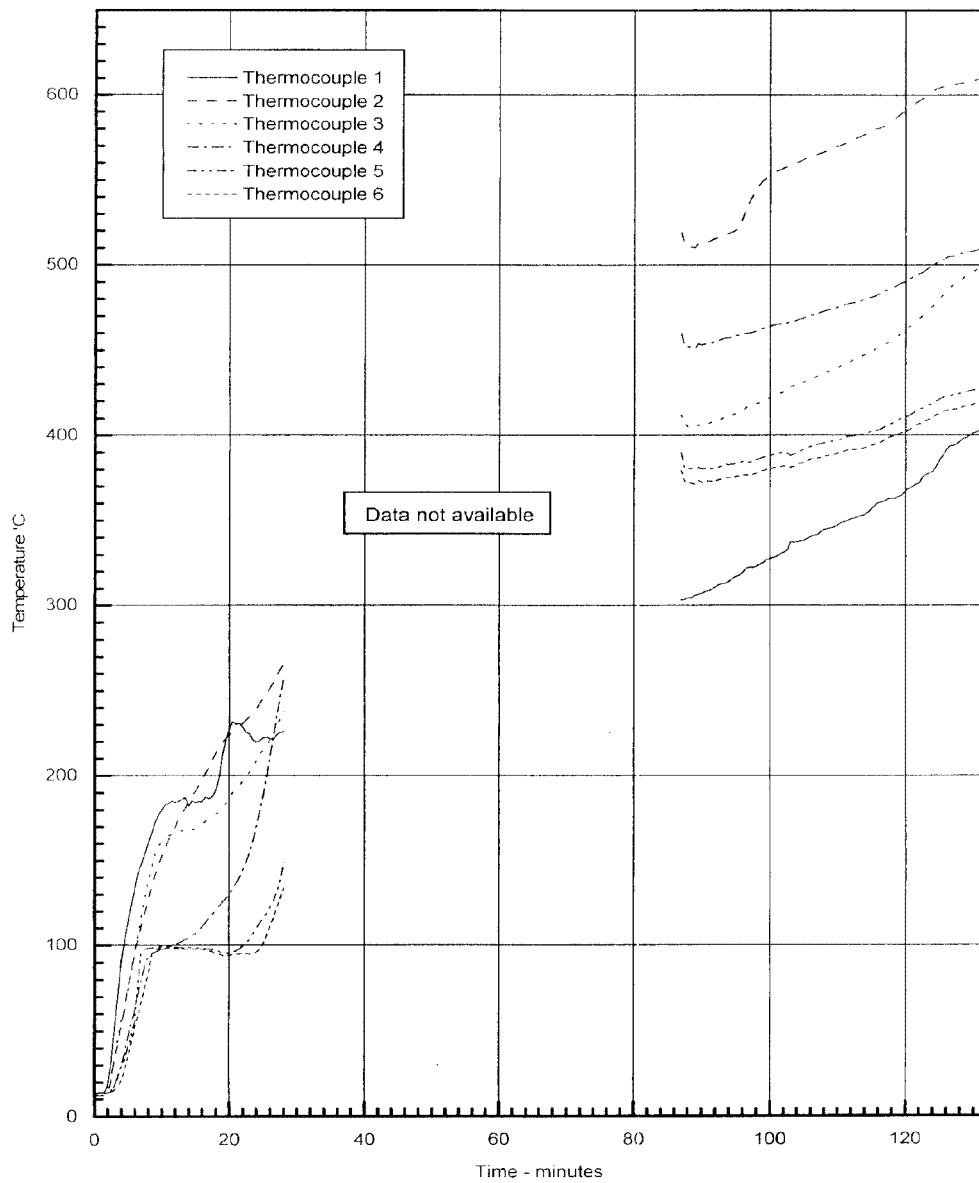
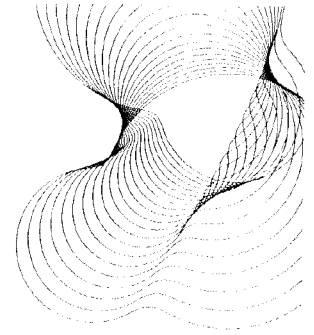
Graph 1 Mean furnace temperature with specified curve for comparison.

Fire resistance test on an access panel door installed in a block wall.



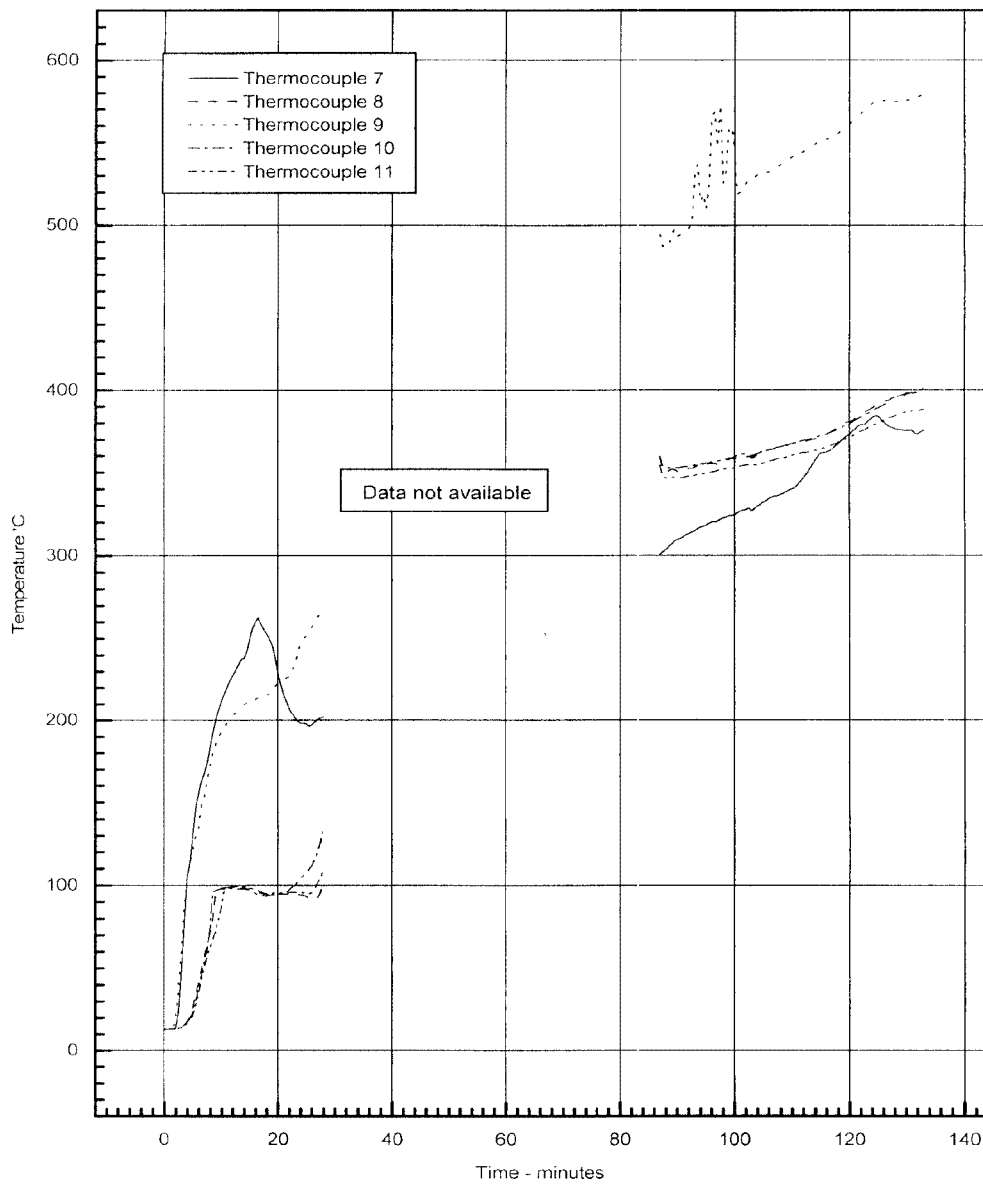
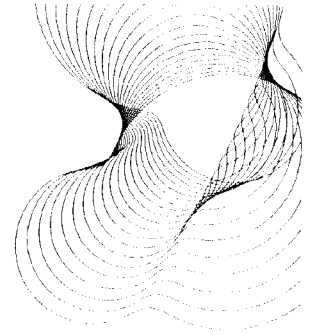
Graph 2 Mean and maximum unexposed face temperatures.

Fire resistance test on an access panel door installed in a block wall.



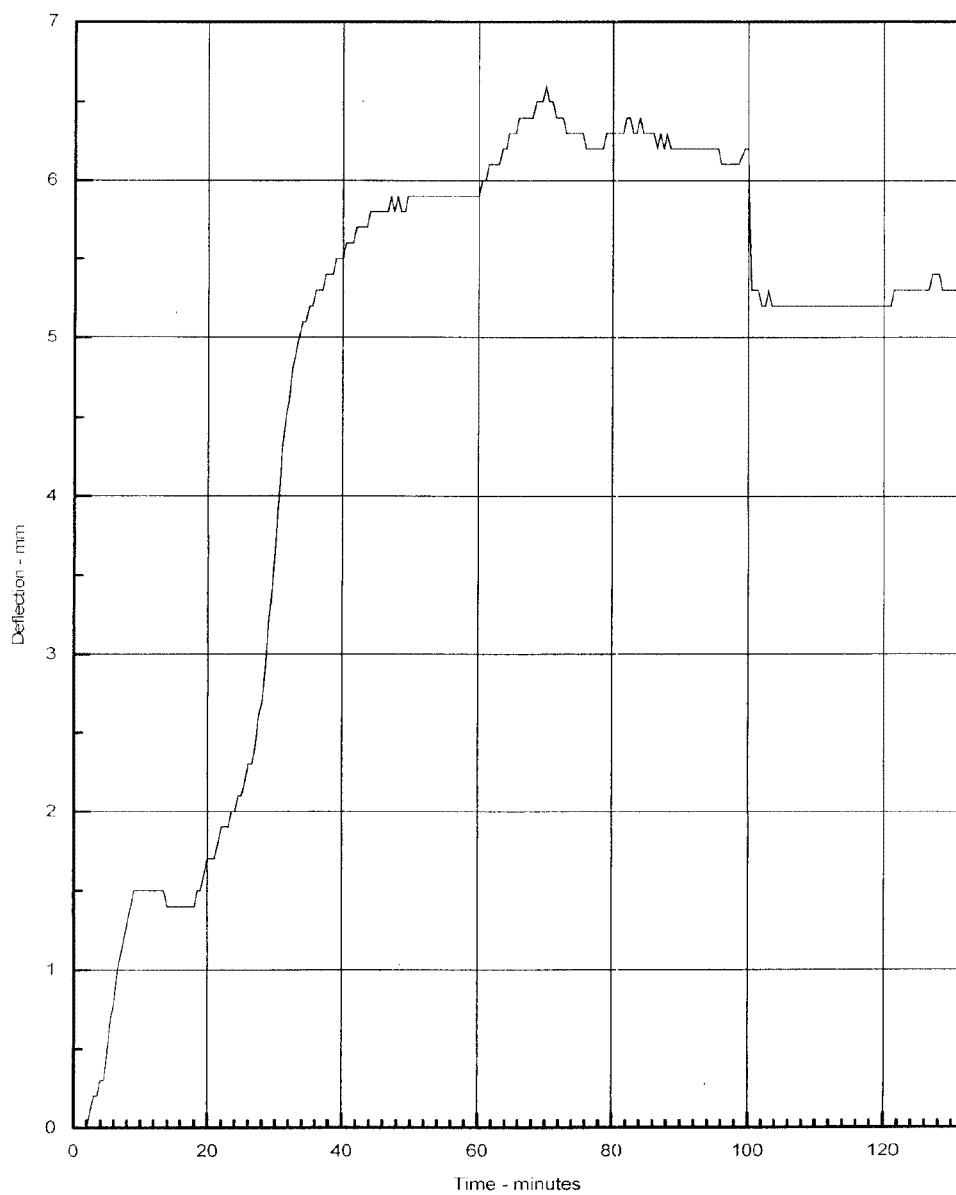
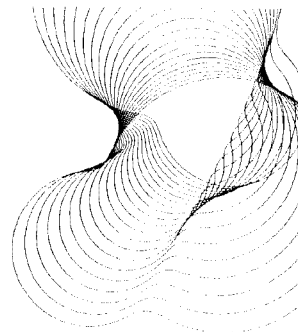
Graph 3 Temperatures recorded on the unexposed face by thermocouples 1 to 6.

Fire resistance test on an access panel door installed in a block wall.



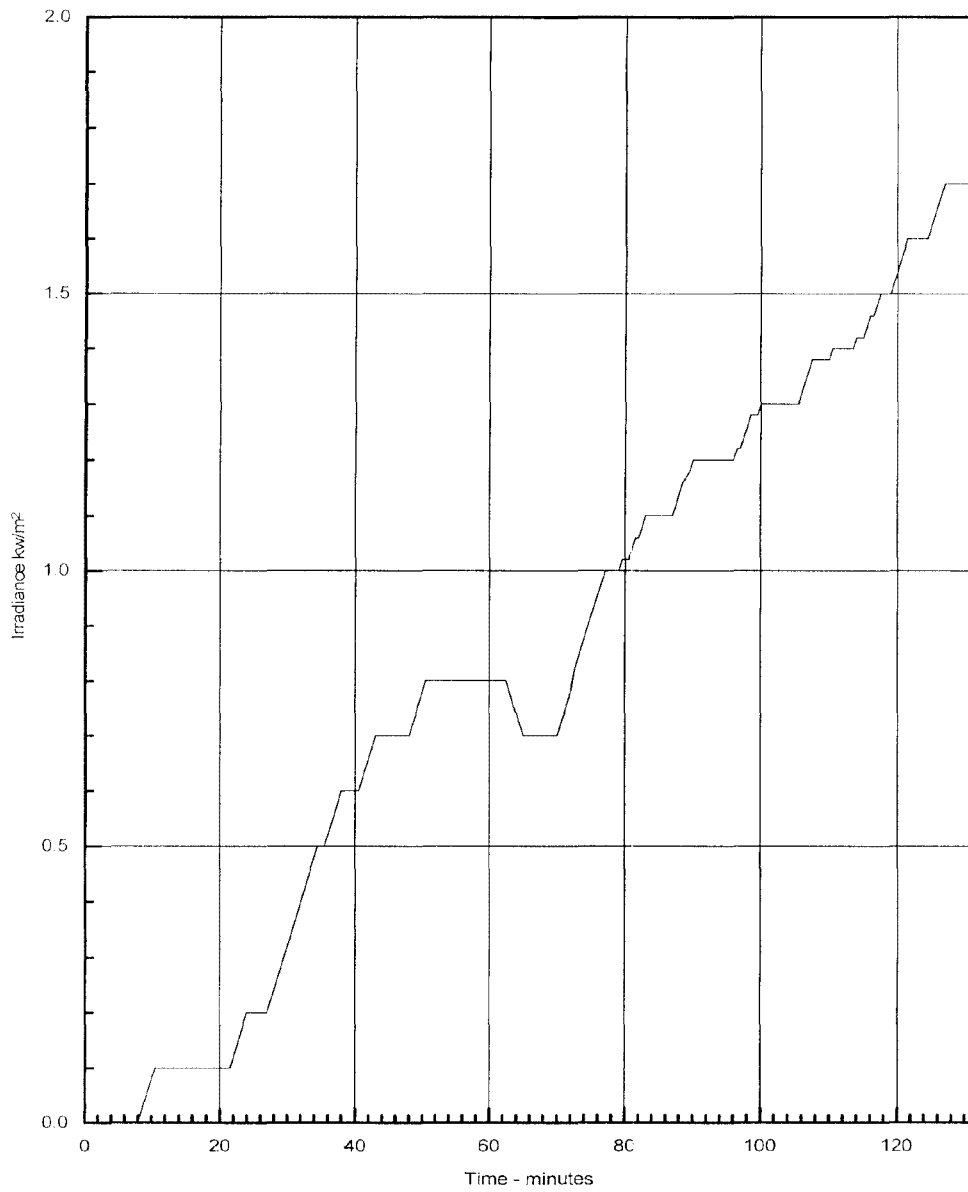
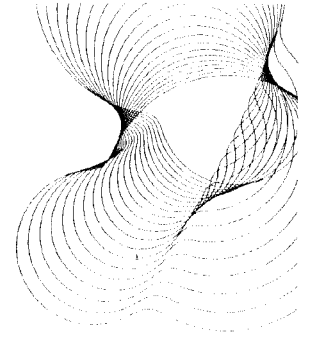
Graph 4 Temperatures recorded on the unexposed face by thermocouples 7 to 11.

Fire resistance test on an access panel door installed in a block wall.



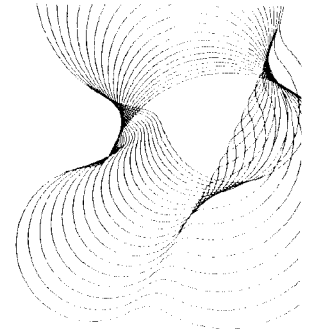
Graph 5 Deflection (towards furnace) recorded at the centre of the access panel leaf.

Fire resistance test on an access panel door installed in a block wall.



Graph 6 Irradiance recorded 1m from the unexposed face of the specimen.

Fire resistance test on an access panel door installed in a block wall.



10 PHOTOGRAPHS

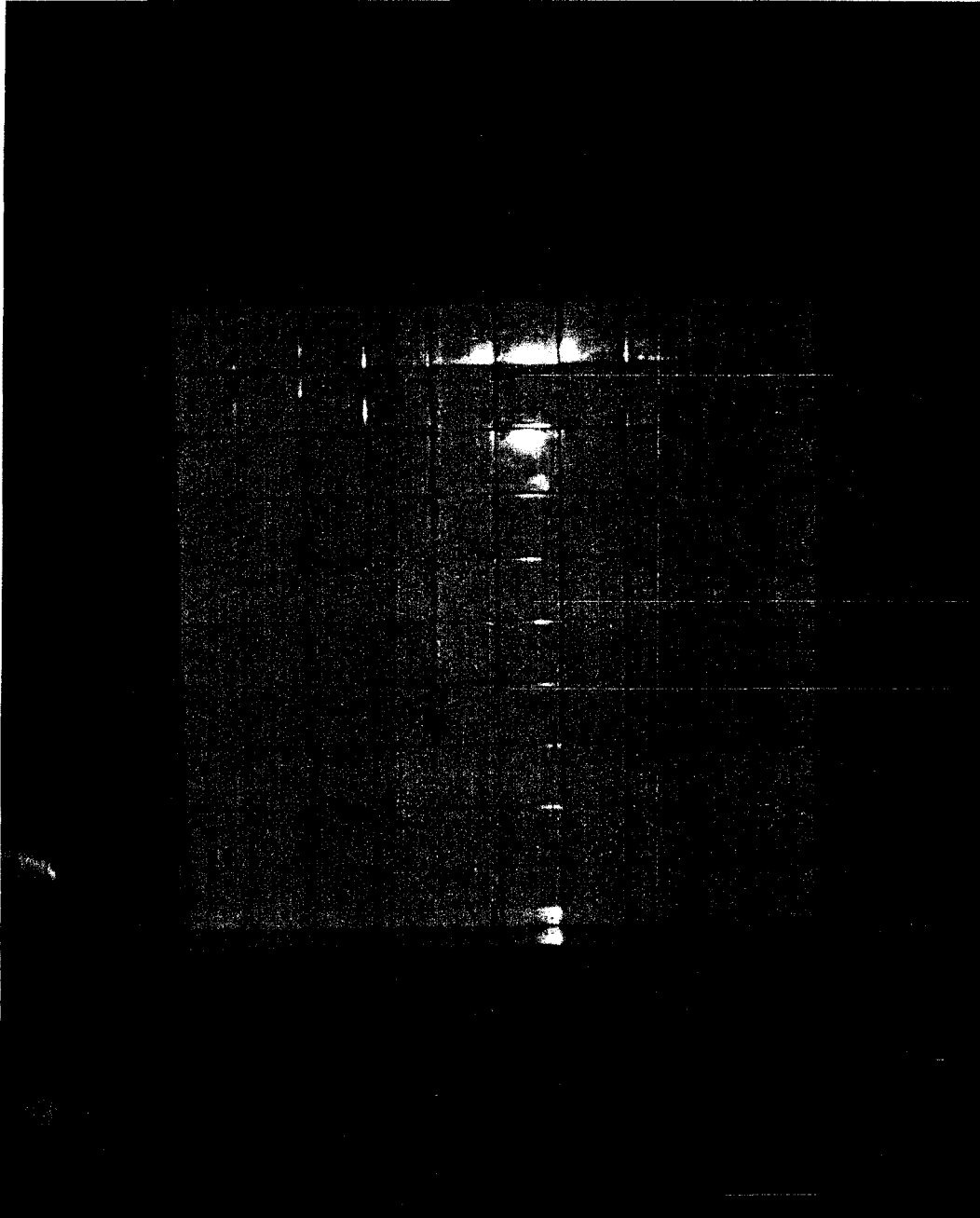


Photo 1 Exposed face of specimen before test.

Fire resistance test on an access panel door installed in a block wall.

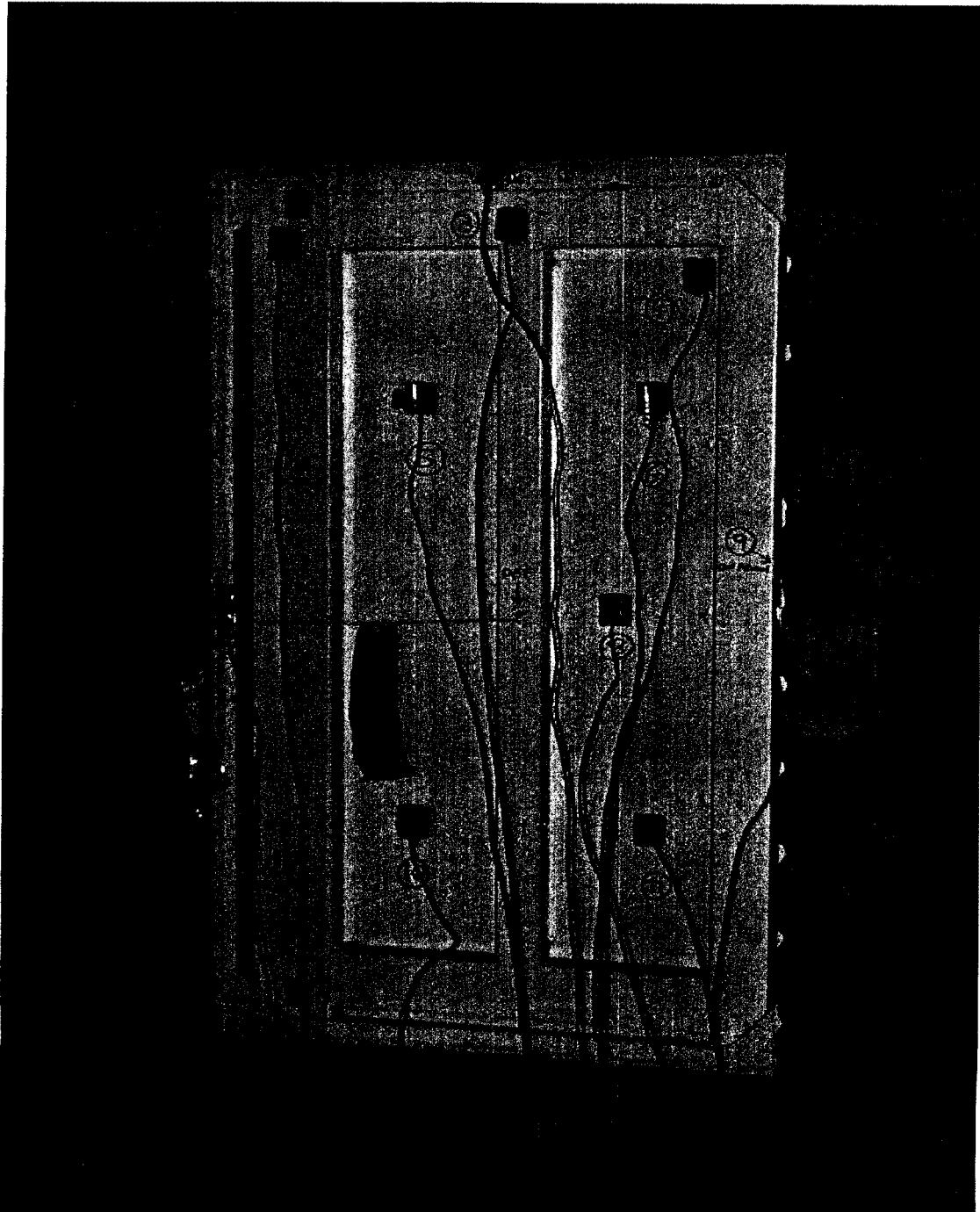
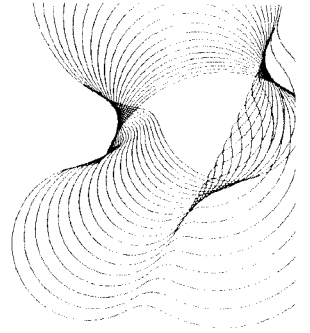


Photo 2 Unexposed face of specimen before test.

Fire resistance test on an access panel door installed in a block wall.

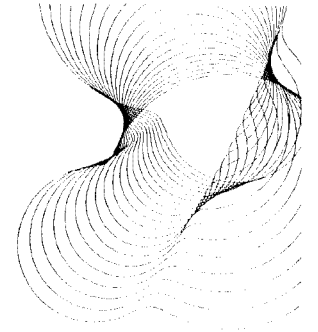


Photo 3 Unexposed face of specimen after 60 minutes.

Fire resistance test on an access panel door installed in a block wall.

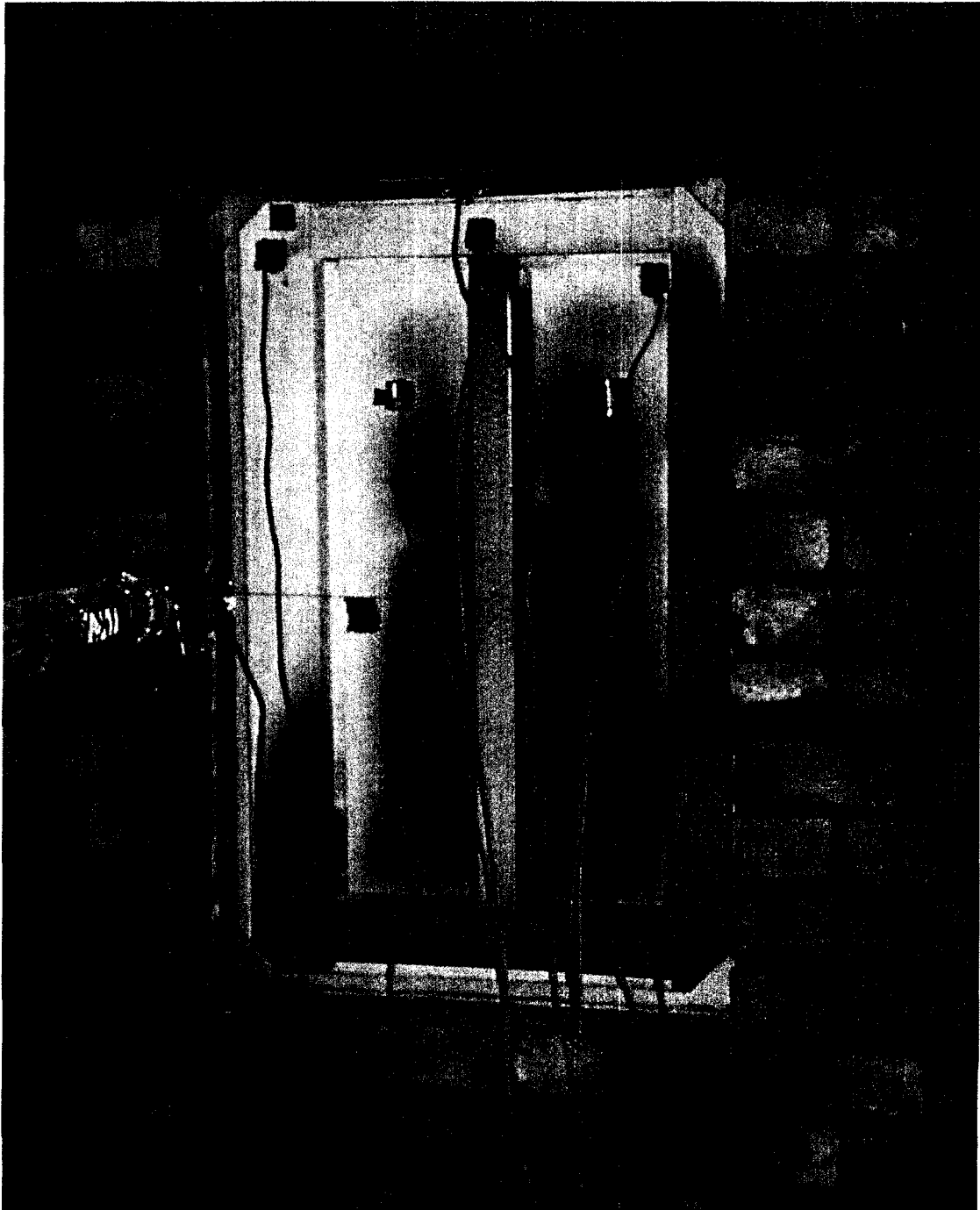
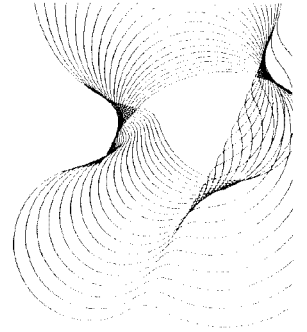


Photo 4 Unexposed face of specimen at termination of test (132 minutes).

Fire resistance test on an access panel door installed in a block wall.

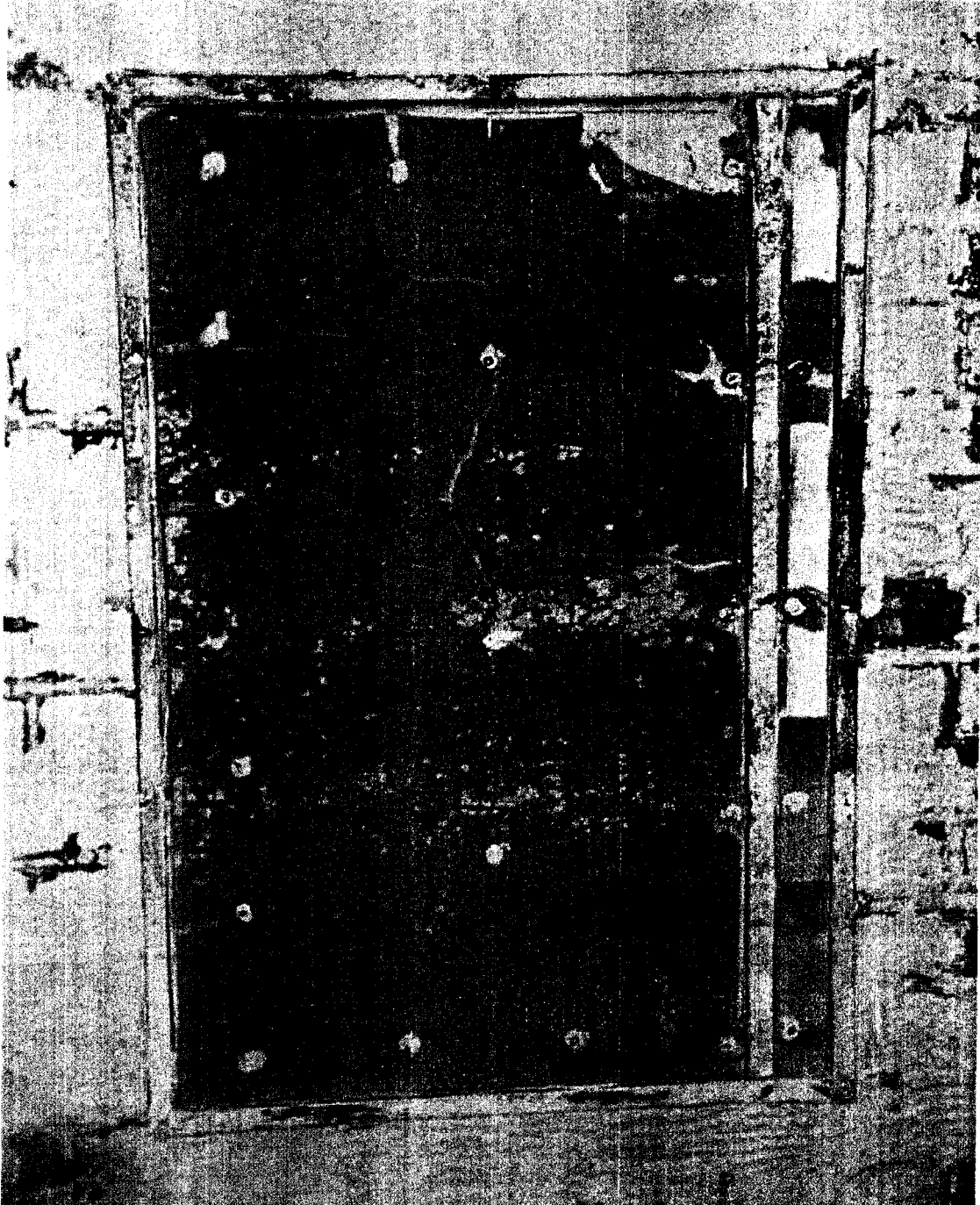
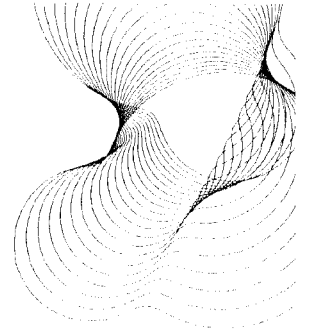


Photo 5 Exposed face of specimen after test.

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