The Building Test Centre
Fire Acoustics Structures

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Report Number **BTC 16702F**

A FIRE RESISTANCE TEST, ON TWO SINGLE ACTING SINGLE LEAF DOORSETS, INCORPORATING DOOR CLOSERS BY RUTLAND UK, CONSTRUCTED IN A STANDARD FLEXIBLE SUPPORTING CONSTRUCTION, AND CONDUCTED IN ACCORDANCE WITH BS EN 1634-1: 2008.

Test Date: 8th December 2009

www.btconline.co.uk

Customer: **Rutland UK**
Whittington Way
Chesterfield
S41 9AG

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TABLE OF CONTENTS

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1. FOREWORD

This test report details a fire resistance test conducted on two single leaf, timber based single acting doorsets. The doorsets were installed in a standard flexible supporting construction, which comprised a British Gypsum GypWall metal stud partition. The test sponsor was Rutland UK.

The construction of the partition and installation of the test specimens took place between the 2nd and 3rd December 2009 and was carried out by the Building Test Centre. The Building Test Centre played no role in the design or selection of the materials comprising the test specimen.

The test was witnessed on 8th December 2009 by Mr Rob Smith of Rutland UK Limited.

This report details the method of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedures outlined in EN 1363-1:1999, and where appropriate BS EN 1634-1: 2008. Any significant deviation with respect to size, constructional details, loads, stresses, edge or end conditions other than those allowed under the field of direct application in BS EN 1634-1: 2008 is not covered by this report.

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

2. REPORT AUTHORISATION

Report Author	Authorised by
Lynda Cooper *Technologist*	**Paul Miller** BSc. (Hons.) *Supervisor*

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3. TEST REPORT AMENDMENTS

Page	Amendments	Date

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4. TEST SPECIMEN CONSTRUCTION

Both doorsets were supplied by Alltone Limited at the request of Rutland UK.

Information Status Key

N/C	Not checked / cannot be checked
N/A	Not applicable
N/S	Not supplied
BTC	Checked by BTC
M	Supplied by manufacturer
C	Checked/ supplied by customer
( )	Nominal dimensions

4.1 Doorset A (FD60)
Doorset A refers to left-hand doorset viewed from the unexposed face.
See drawings 4.5.2, 4.5.3, and photos 9.1 to 9.8.

The doorset comprised the following:

Info Status	Description. (The laboratory has checked component details marked with BTC in the 'info status' column).

1	**Door leaf**	
BTC	Reference	Vicaima 54mm Solid Core FD60 Door
M	Nominal door leaf size	Height 1981mm Width 838mm Thickness 54mm
BTC	Actual door leaf size	Height 1981mm Width 837mm Thickness 54mm
N/S	Stated leaf mass / density	N/S
BTC	Actual leaf mass / density	56.10kg / 626kg/m^3 (calculated)
M	Door leaf finish	2 coats of factory applied matt UV acrylic lacquer to both faces and edges

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2	**Door leaf perimeter framework**	N/A

3	**Door leaf internal framework**	N/A

4	**Door leaf core**	
BTC	Reference (if non-timber)	Vicaima FD60
BTC	Manufacturer	Vicaima
M BTC	Material (species if timber)	Solid high density chipboard. Exposed core at top and bottom
M	Density	600kg/m^3 (stated)
N/S	Adhesive manufacturer	N/S
N/S	Adhesive type	N/S
N/S	Adhesive reference	N/S
N/S	Adhesive application method	N/S
N/S	Adhesive curing method	N/S

5	**Door leaf inner facings**	N/A

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6	Door leaf outer facings	
N/S	Reference	N/S
N/S	Manufacturer	N/S
M	Material	Natural veneer
N/S	Density	N/S
M	Thickness	0.6mm (stated)
N/S	Adhesive Manufacturer	N/S
N/S	Adhesive type	N/S
N/S	Adhesive Reference	N/S
N/S	Adhesive Application method	N/S
N/S	Adhesive Curing method	N/S

7	Door leaf lippings	
N/A	Reference (if non-timber)	N/A
N/A	Manufacturer (if non-timber)	N/A
M	Material (species if timber)	Hardwood
N/S	Density	N/S
M BTC	Number of edges applied to	Both vertical edges, concealed by face veneer
M BTC	Thickness of lipping at each edge	Hanging edge 10mm (9mm) Closing edge 10mm (9mm)
N/S	Adhesive manufacturer	N/S
N/S	Adhesive type	N/S
N/S	Adhesive reference	N/S
N/S	Adhesive application method	N/S
N/S	Adhesive curing method	N/S

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8	**Intumescent to door leaf**	
BTC	Head	None (see section 24. Door Closer, on page 14)
BTC	Hanging edge and closing edge	None
BTC	Base	None

9	**Door frame (head & jambs)**	
N/A	Reference (if non-timber)	N/A
N/A	Manufacturer (if non-timber)	N/A
M BTC	Material (species if timber)	Redwood
N/S	Density	N/S
N/C	Average moisture content (test lab)	N/C
BTC	Frame size	Width 32mm Thickness 100mm
BTC	Overall size	Height 2020mm Width 905mm
N/S	Jambs to head jointing method	N/S
BTC	Frame fixings used to attach to supporting construction / associated construction	75mm Gyproc Drywall countersunk screws
BTC	Number of frame fixings & positions	100mm from the head and base and at 600mm centres (4 screws per jamb). One 75mm Gyproc Drywall countersunk screw in the centre, through the head of the frame

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9	Door frame (head & jambs)	
BTC	Door stop	Screwed and glued Width 25mm Depth 32mm
BTC	Fixing for door stops	51mm Gyproc Drywall screws at 50mm from the corners and at 300mm centres (fixed from the back of the door frame)
BTC	Glue type	PVA wood glue
BTC	Architrave	None
BTC	Cill	None
BTC	Threshold (size & material)	6mm (thick) Glasroc MultiBoard extending 200mm to either side of the doorset & 200mm on both the exposed & unexposed faces.

10	Intumescent to frame head & jambs	
	Head	
BTC	Reference	Therm-A-Stop
BTC	Manufacturer	Intumescent Seals
BTC	Size and Quantity	Length Full Width 15mm Thickness 4mm Quantity 2
BTC	Fixing method	Self-adhesive
BTC	Position	9mm from exposed face edge of frame and 9mm apart
BTC	Colour	Black inside a brown sheath
BTC	Hanging edge	As head
BTC	Closing edge	As head
BTC	Base	None

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11	Overpanel	N/A
12	Overpanel perimeter framework	N/A
13	Overpanel core	N/A
14	Overpanel inner facings	N/A
15	Overpanel outer facings	N/A
17	Overpanel Intumescents	N/A
18	Glass	N/A
19	Glazing aperture lining	N/A
20	Glass edge seal / lining	N/A
21	Glazing beads	N/A

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22	**Hinges**	
BTC	Reference	Butt hinges (BS EN 1935, Grade 13)
BTC	Manufacturer	Eclipse Architectural Hinges
BTC	Quantity	3
BTC	Positions	Bottom and middle hinge centred at 279mm and 1024mm from base of door leaf Top hinge centred at 210mm from head of door leaf
BTC	Primary material	Steel
N/S	Bearing material	N/S
BTC	Hinge size	Height 102mm Width 76mm Thickness 2.9mm
BTC	Size of knuckle	14mm diameter
BTC	Size of blades	Height 100mm Width 30mm
BTC	Fixing size & type	32mm long x 5.5mm diameter screws to door leaf and to door frame
N/S	Fixing material	N/S
BTC	Number of fixings per flap	4 to door leaf 4 to door frame
BTC	Intumescent material behind hinge blades	2mm Therm-A-Flex to door leaf 1mm Therm-A-Flex to door frame
BTC	Intumescent material manufacturer	Intumescent Seals
BTC	Intumescent material thickness	2mm to door leaf 1mm to door frame

23	**Hinges bolts**	N/A

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24	**Door closer**	
C	Reference	ITS 11204 Concealed Door Closer (factory set at power size 3 to EN 1154). Drawings 4.5.2 and 4.5.3. Photos 9.3, 9.4, and 9.5.
C	Manufacturer	Rutland UK
N/S	Material	N/S
BTC	Overall size	<u>Closer:</u> Height 53mm Length 210mm (299mm overall) Depth 31mm <u>Closer arm concealed rail:</u> Length 460mm Width 30mm
C BTC	Fitting	As manufacturer's installation instructions. The door closer was fitted internally in a recess in head of door leaf, centred on the thickness of the door leaf. The door leaf opened into the furnace. The closer arm concealed rail fitted into the head of the door frame and had a 2mm thick Therm-A-Flex intumescent strip around it (on all vertical sides but not at the back of it).
	<u>Intumescent on face plate at head of door leaf</u>	
C BTC	Reference	Therm-A-Flex

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24	**Door closer**	
C N/C	Supplier	Intumescent Seals
C BTC	Size and Quantity	Length full length of rebate Width 15mm Thickness 2mm Quantity 1
C N/C	Fixing method	Self-adhesive
C BTC	Position	Along the top of the face plate of the door closer, flush to the exposed face edge of the door closer rebate, 10mm from the exposed face of the leaf
C BTC	Colour	Black
	<u>Intumescent around closer arm concealed rail, in head of door frame</u>	
C BTC	Reference	Therm-A-Flex
C N/C	Supplier	Intumescent Seals
C BTC	Size and Quantity	Length 460mm (2 pieces) 30mm (2 pieces) Width 19mm Thickness 2mm Quantity 4 pieces
C BTC	Fixing method	Self-adhesive
C BTC	Position	Two 460mm long pieces, each one inserted on edge, along both long sides of the rail. Two 30mm pieces, each one inserted on edge, along both short ends of the rail.
BTC	Colour	Black

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25	**Latch & associated furniture**	N/A

26	**Push plate**	N/A

27	**Flushbolts / barrel bolts**	N/A

28	**Door viewer**	N/A

29	**Letter plate**	N/A

30	**Other intumescents**	N/A

31	**Supporting / associated construction**	
	Opening size	Height 2020mm Width 910mm Depth 150mm
BTC	Details of supporting construction	See pages 26 and 27

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4.2 Doorset B (FD30)

Doorset B refers to right-hand doorset viewed from the unexposed face.
See drawing 4.5.4 and photos 9.1, 9.2, and 9.9 to 9.12.

The doorset comprised the following:

Info Status	Description. (The laboratory has checked component details marked with BTC in the 'info status' column).

1	**Door leaf**	
BTC	Reference	Vicaima 44mm Solid Core FD30 Door
M	Nominal door leaf size	Height 1981mm Width 838mm Thickness 44mm
BTC	Actual door leaf size	Height 1980mm Width 838mm Thickness 43.5mm
N/S	Stated leaf mass / density	N/S
BTC	Actual leaf mass / density	35.14k / 481kg/m^3 (calculated)
M	Door leaf finish	2 coats of factory applied matt UV acrylic lacquer to both faces and edges

2	**Door leaf perimeter framework**	
N/S	Reference (if non-timber)	N/S
N/S	Manufacturer (if non-timber)	N/S
N/S	Material (species if timber)	N/S
N/S	Density	N/S
M BTC	Sizes – Stiles	Width 38mm (33mm) Thickness 38mm (37mm) 1 at each edge
M N/C	Sizes – Rails (specify quantity & position)	Width 38mm Thickness 38mm 2 at top and 2 at bottom
N/S	Jointing method	N/S

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3	**Door leaf internal framework**	N/A

4	**Door leaf core**	
BTC	Reference (if non-timber)	Vicaima FD30
BTC	Manufacturer	Vicaima
M BTC	Material (species if timber)	Solid chipboard
M	Density	500kg/m^3 (stated)
N/S	Adhesive Manufacturer	N/S
N/S	Adhesive type	N/S
N/S	Adhesive Reference	N/S
N/S	Adhesive Application method	N/S
N/S	Adhesive Curing method	N/S

5	**Door leaf inner facings**	
N/S	Reference	N/S
N/S	Manufacturer	N/S
M BTC	Material	Hardboard
N/S	Density	N/S
M BTC	Thickness	3.2mm (2.5mm)
N/S	Adhesive Manufacturer	N/S
N/S	Adhesive type	N/S
N/S	Adhesive Reference	N/S
N/S	Adhesive Application method	N/S
N/S	Adhesive Curing method	N/S

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6	Door leaf outer facings	
N/S	Reference	N/S
N/S	Manufacturer	N/S
M	Material	Natural veneer
N/S	Density	N/S
M	Thickness	0.6mm (stated)
N/S	Adhesive Manufacturer	N/S
N/S	Adhesive type	N/S
N/S	Adhesive Reference	N/S
N/S	Adhesive Application method	N/S
N/S	Adhesive Curing method	N/S

7	Door leaf lippings	
N/A	Reference (if non-timber)	N/A
N/A	Manufacturer (if non-timber)	N/A
M	Material (species if timber)	Hardwood
N/S	Density	N/S
M BTC	Number of edges applied to	Both vertical edges, concealed by face veneer
M BTC	Thickness of lipping at each edge	Hanging edge 6mm (5mm) Closing edge 6mm (5mm)
N/S	Adhesive manufacturer	N/S
N/S	Adhesive type	N/S
N/S	Adhesive reference	N/S
N/S	Adhesive application method	N/S
N/S	Adhesive curing method	N/S

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8	Intumescent to door leaf	
BTC	**Head**	None
BTC	**Hanging edge and closing edge**	None
BTC	**Base**	None

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9	**Door frame (head & jambs)**	
N/A	Reference (if non-timber)	N/A
N/A	Manufacturer (if non-timber)	N/A
M BTC	Material (species if timber)	Redwood
N/S	Density	N/S
N/C	Average moisture content (test lab)	N/C
BTC	Frame size	Width 44mm Thickness 80mm
BTC	Overall size	Height 2020mm Width 910mm
N/S	Jambs to head jointing method	N/S
BTC	Frame fixings used to attach to supporting construction / associated construction	75mm Gyproc Drywall countersunk screws
BTC	Number of frame fixings & positions	100mm from the head and base and at 600mm centres (4 screws per jamb). None through the head of the frame
BTC	**Door stop**	Pinned and glued Width 14mm Depth 32mm
BTC	Fixing for door stops	38mm pins at 20-40mm from the corners and at 120-300mm centres
BTC	Glue type	PVA wood glue
BTC	**Architrave**	None
BTC	**Cill**	None
BTC	**Threshold** (size & material)	6mm (thick) Glasroc MultiBoard extending 200mm to either side of the doorset & 200mm on both the exposed & unexposed faces.

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10	**Intumescent to frame head & jambs**	
	Head	
BTC	Reference	Therm-A-Stop
BTC	Manufacturer	Intumescent Seals
BTC	Size and Quantity	Length Full Width 15mm Thickness 4mm Quantity 1
BTC	Fixing method	Self-adhesive
BTC	Position	Centrally in door frame (14mm from door stop and 15mm from the unexposed face)
BTC	Colour	Black inside a brown sheath
BTC	**Hanging edge**	As head
BTC	**Closing edge**	As head
BTC	**Base**	None

11	**Overpanel**	N/A

12	**Overpanel perimeter framework**	N/A

13	**Overpanel core**	N/A

14	**Overpanel inner facings**	N/A

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15	Overpanel outer facings	N/A
16	Overpanel lippings	N/A
17	Overpanel Intumescents	N/A
18	Glass	N/A
19	Glazing aperture lining	N/A
20	Glass edge seal / lining	N/A
21	Glazing beads	N/A

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22	**Hinges**	
BTC	Reference	Butt hinges (BS EN 1935, Grade 13)
BTC	Manufacturer	Eclipse Architectural Hinges
BTC	Quantity	3
BTC	Positions	Bottom and middle hinge centred at 280mm and 1030mm from base of door leaf Top hinge centred at 200mm from head of door leaf
BTC	Primary material	Steel
N/S	Bearing material	N/S
BTC	Hinge size	Height 102mm Width 76mm Thickness 2.9mm
BTC	Size of knuckle	14mm diameter
BTC	Size of blades	Height 100mm Width 30mm
BTC	Fixing size & type	32mm long x 5.5mm diameter screws to door leaf and to door frame
N/S	Fixing material	N/S
BTC	Number of fixings per flap	4 to door leaf 4 to door frame
BTC	Intumescent material	None behind hinge blades; in door leaf or door frame. 10mm x 4mm Therm-A-Seal in door frame (between edge of hinge blade and door stop)
BTC	Intumescent material manufacturer	Intumescent Seals
BTC	Intumescent material thickness	4mm in door frame

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23	**Hinges bolts**	N/A

24	**Door closer**	
C	Reference	TS 11204 Surface Mounted Door Closer (factory set at power size 3 to EN 1154). Drawing 4.5.4 Photos 9.9 and 9.10.
C	Manufacturer	Rutland UK
N/S	Material	N/S
BTC	Overall size	Height 54mm Length 210mm Depth 36mm
C BTC	Fitting	As manufacturer's installation instructions. The door closer was fitted to exposed face of door leaf (fire side). The door leaf opened out of the furnace. The closer arm rail fitted to underside of door stop, on the door frame.
BTC	Distance from hanging edge	Centred at 220mm

25	**Latch & associated furniture**	N/A

26	**Push plate**	N/A

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27	**Flushbolts / barrel bolts**	N/A

28	**Door viewer**	N/A

29	**Letter plate**	N/A

30	**Other intumescents**	N/A

31	**Supporting / associated construction**	
	Opening size	Height 2020mm Width 910mm Depth 150mm
BTC	Details of supporting construction	See pages 26 and 27

The descriptions of individual components making up the test specimen were provided by the customer and were checked for accuracy wherever possible.

4.3 Standard Supporting Construction

The doorsets were mounted in a British Gypsum GypWall metal stud partition, comprising a metal framework of 70S50 studs and 72C50 channels, clad on each face with three layers of 12.5mm Gyproc FireLine board. Both end studs were not fixed to the perimeter of the test frame (i.e. two free edges) and the gaps filled with 25mm thick, rock mineral fibre gasket.

The head channel was fixed with 60mm fire resistant fixings at 600mm centres. Each short run of base channel was fixed with four 60mm fire resistant fixings.
The two apertures were positioned in the partition at 393mm apart. The aperture for each doorset was 2020mm high x 910mm wide and was cloaked with 72C50 channel and a single layer of 12.5mm Gyproc FireLine board.

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Both the unexposed face and the exposed face of the specimen were clad with a triple layer of British Gypsum 12.5mm Gyproc FireLine boards. The inner layer boards were fixed with 25mm Gyproc Drywall Screws at 300mm centres around the perimeter of the boards only. The second layer boards were fixed with 36mm Gyproc Drywall Screws at 300mm centres around the perimeter of the boards only. The third layer boards were fixed with 50mm Gyproc Drywall Screws at 300mm centres around the perimeter and within the field of the boards.

All vertical joints were staggered between layers. A horizontal joint was positioned at 2400mm from the base on the outer layer boards and the inner layer boards, on both faces of the specimen. A horizontal joint was positioned at 600mm from the base on the middle layer boards, on both faces of the specimen. A Gypframe GFS1 fixing strap was used behind the horizontal outer layer board joint.

All external board joints were taped and filled using Gyproc Paper Joint Tape and Gyproc Joint Filler as appropriate. All screw heads were spotted using Gyproc Joint Filler.

The overall dimensions of each doorset were 2020m high x 910m wide. The gaps between the door frame and the partition were lightly packed with rock mineral fibre gasket and sealed with intumescent mastic on both sides of the partition.

4.4 Standard Supporting Construction Materials

1. Gypframe 72C50 Standard Floor & Ceiling Channel
2. Gypframe 70S50 'C' Studs
3. Gypframe Fixing Strap (GFS1)
4. 12.5mm Gyproc FireLine board, 2400 x 1200mm x 12.5mm
5. 25mm Gyproc Drywall screws
6. 36mm Gyproc Drywall screws
7. 50mm Gyproc Drywall screws
8. 60mm fire resistant fixings
9. Rock mineral wool gasket, 25mm thick
10. Intumescent mastic

All supporting construction components were supplied by the Building Test Centre.

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4.5 Test Construction Drawings

4.5.1 Unexposed face elevation of specimen

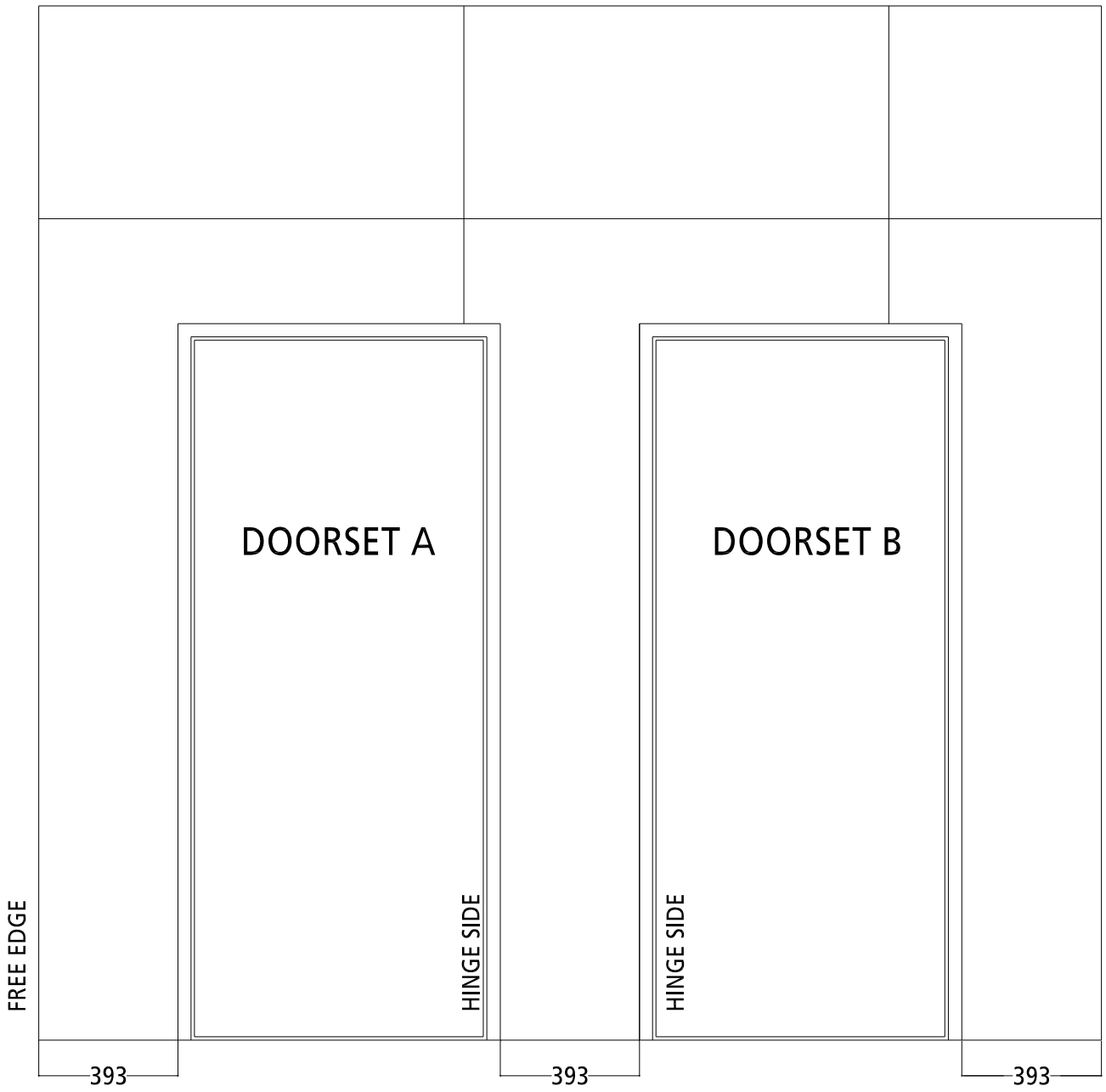

Figure 1. Elevation of unexposed face of specimen
Note that dimensions are nominal.

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4.5.2 A - Dimensions for ITS 11204 Concealed Door Closer

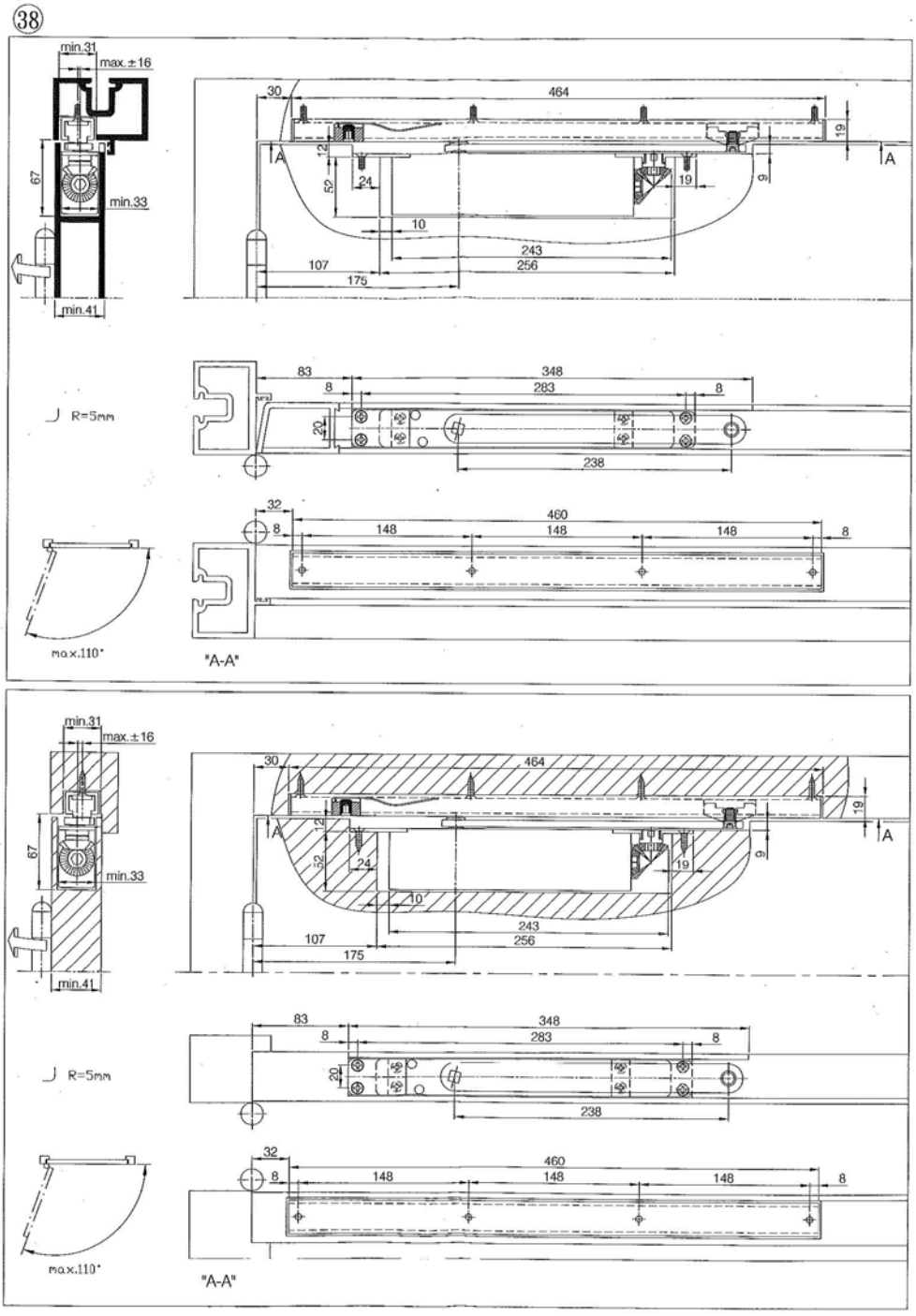

Figure 2. Door closer dimensions

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4.5.3 A - Fixing Instructions for ITS 11204 Concealed Door Closer

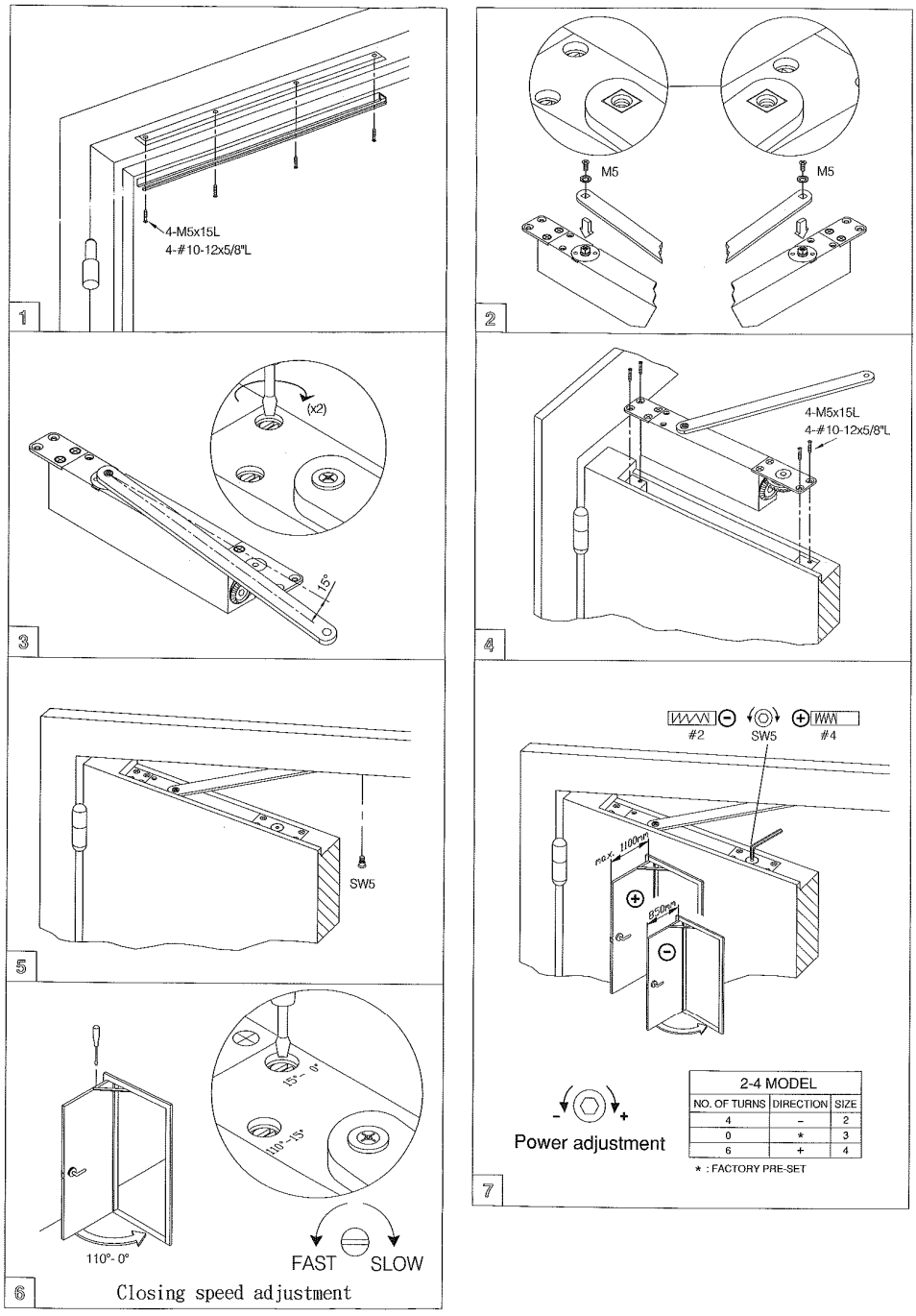

Figure 3. Fixing Instructions

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4.5.4 B – Fixing Instructions and Dimensions for TS 11204 Surface Mounted Door Closer

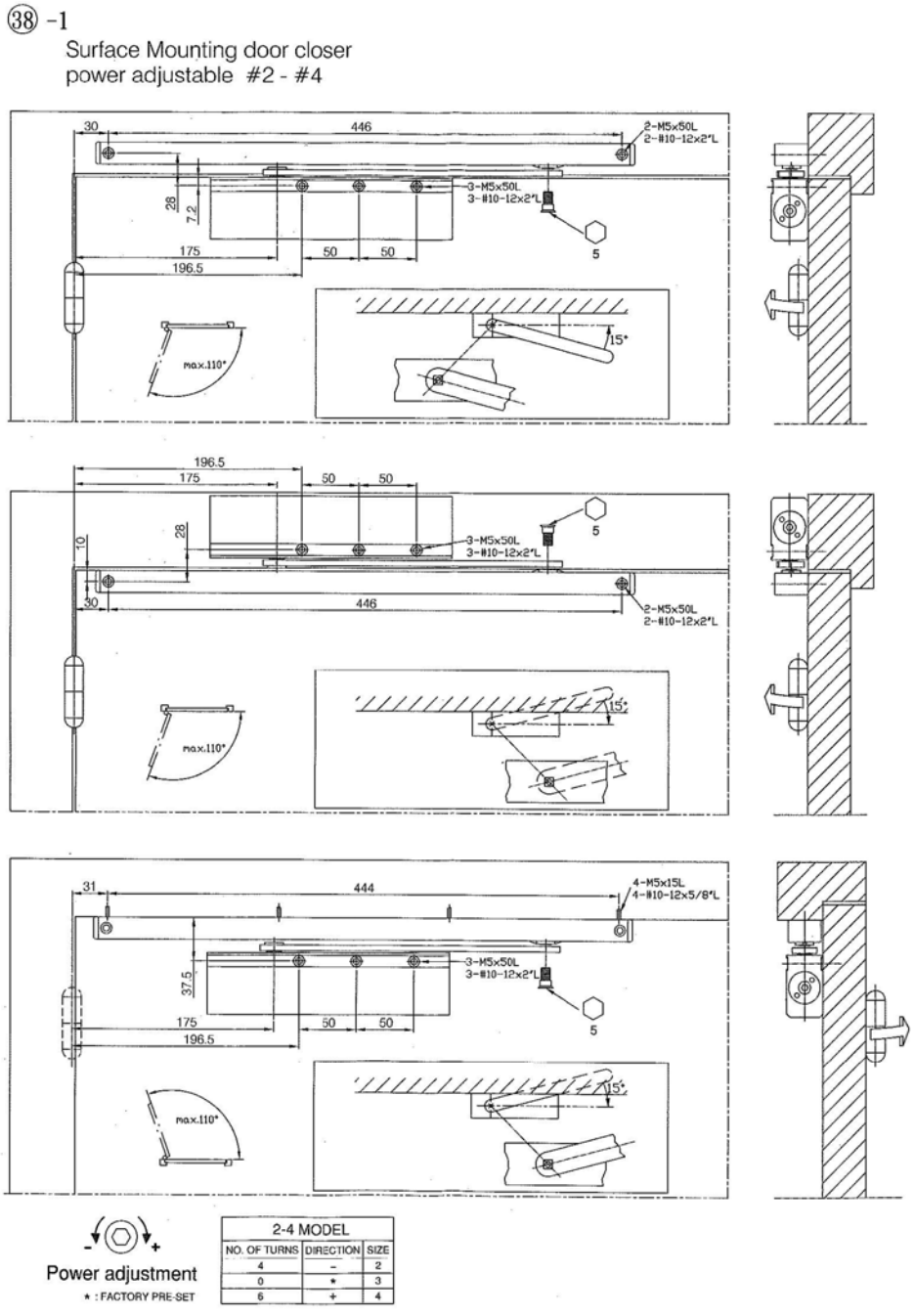

Figure 4. Fixing instructions and dimensions

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5. TEST PROCEDURE

The test was conducted in accordance with BS EN 1634-1: 2008.

The doorsets were installed in a standard metal stud partition supporting construction, at the request of the test sponsor.

The door leaf of doorset A (FD60) was hung to open into of the furnace and was fitted with an ITS 11204 Concealed Door Closer, manufactured by Rutland UK.
The door leaf of doorset B (FD30) was hung to open out of the furnace and was fitted on the exposed face with a TS 11204 Surface Mounted Door Closer, manufactured by Rutland UK.

No performance can be claimed for the system if installed with doorset A opening out of the furnace or doorset B opening into the furnace, without a separate test being undertaken to substantiate this orientation.

The doorsets were not fitted with latches.

Where areas of the test specification are ambiguous, or open to interpretation, the Fire Test Study Group Resolutions 43, 72, 83 and 85 and have been followed (where appropriate). These Resolutions provide the basis of common agreements between the fire test laboratories, which are members of this group.

The construction of the door leaves could not be verified in accordance with section 6.5 of BS EN 1634-1: 2008.
The construction details of the test specimen were provided by the customer and were checked for accuracy wherever possible.

The range of gaps for the door leaves was not supplied in advance by the customer. Therefore, the laboratory could not verify that the gaps were set in between the middle value and the maximum value, within this range of gaps, as specified in section 7.3 of BS EN 1634-1: 2008.

The specimen and associated construction were not conditioned in accordance with section 8 of EN 1363 -1: 1999.

The test procedure used was EN 1634-1 issue 4.

The ambient temperature at the start of the test was 14°C.

The furnace pressure was set to control at 21.25 Pascals positive with respect to atmosphere, at the head of the furnace, equating to 12.9 Pascals at the top of the doorsets. Furnace pressure data is shown in figure 6.

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6. TEST RESULTS

The requirements of the standard were satisfied for the following periods:

Doorset A (FD60)

Integrity	Sustained flaming	75 minutes
	6mm gap gauge	77 minutes
	25mm gap gauge	78 minutes
	Cotton Pad	No Failure (the test having been discontinued at the request of the sponsor)
Insulation		75 minutes (by virtue of integrity failure)

The test specimen was terminated at 82 minutes at the request of the sponsor.

Doorset B (FD30)

Integrity	Sustained flaming	48 minutes
	6mm gap gauge	No Failure (the test having been discontinued at the request of the sponsor)
	25mm gap gauge	No Failure (the test having been discontinued at the request of the sponsor)
	Cotton Pad	48 minutes
Insulation		48 minutes (by virtue of integrity failure)

The test specimen was boarded over at 48 minutes at the request of the sponsor.

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7. LIMITATIONS

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.

The specification and interpretation of fire test methods are 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 scope of the Field of Direct Application of the results and construction detailed in this test report is explained in BS EN 1634-1: 2008, section 13.

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8. TEST DATA

8.1 Observations

Observers: Unexposed face L Cooper and M Shortland
Exposed face F Ahatty

Time		*Observations* All observations refer to the exposed face unless otherwise stated. Leaf A (FD60) refers to left-hand leaf viewed from the unexposed face. Leaf B (FD30) refers to the right-hand leaf viewed from the unexposed face.
hours	mins	
0	0	Test started.
0	01	**Doorset A & Doorset B.** Both door leaves discoloured.
0	02	**Doorset B.** Facing started to peel away.
0	03	*Unexposed face* **Doorset B.** Smoke issued from hanging edge and closing edge, from mid-height upwards.
0	4	**Doorset A.** Leaf surface appeared crazed. **Doorset B.** Door closer discoloured brown. *Unexposed face* **Doorset A.** Smoke issued from head of door leaf, from mid-span to closing edge side. No smoke issued from above the concealed closer. **Doorset B.** Smoke issued for approximately 20 seconds, from base of door leaf at approximately 200mm from closing edge.

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Time		*Observations*
hours	mins	All observations refer to the exposed face unless otherwise stated. Leaf A (FD60) refers to left-hand leaf viewed from the unexposed face. Leaf B (FD30) refers to the right-hand leaf viewed from the unexposed face.
0	05	**Doorset B.** Door leaf started to flame. *Unexposed face* **Doorset B.** Glowing at closing edge of door leaf from base to approximately 1000mm height.
0	06	**Doorset A.** Intumescent around perimeter of door leaf had reacted. *Unexposed face* **Doorset B.** Flash flaming at closing edge of door leaf at approximately ¼ height. Flash flaming from closing edge of door leaf just below mid-height.
0	07	**Doorset B.** Oil started to drip out of door closer.
0	08	**Doorset B.** Oil gushed out of door closer continuously. *Unexposed face* **Doorset B.** Flash flaming from base of door leaf and at closing edge below 1000mm height.
0	09	**Doorset A.** Door frame appeared 'crazed.' **Doorset B.** Door closer completely darkened.

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Time		*Observations*
hours	mins	All observations refer to the exposed face unless otherwise stated. Leaf A (FD60) refers to left-hand leaf viewed from the unexposed face. Leaf B (FD30) refers to the right-hand leaf viewed from the unexposed face.
0	10	**Doorset B.** Door frame appeared 'crazed.' *Unexposed face* **Doorset A.** Door leaf tight in door frame, around whole perimeter.
0	11	**Doorset A.** Gap of approximately 6-10mm between head of door leaf and frame (not a through gap).
0	12	*Unexposed face* **Doorset B.** Glow at closing edge of door leaf decreased to below 1000mm height.
0	14	*Unexposed face* **Doorset B.** Glow on hanging edge from top of lower hinge to approximately 1000mm height. No glow visible at closing edge.
0	15	**Doorset B.** Door core started to fall away. *Unexposed face* **Doorset A.** Smoke issued from head of door leaf, at approximately 100mm from closing edge, for a length of approximately 300mm. No smoke issued from other edges of door leaf.
0	17	*Unexposed face* **Doorset A.** Smoke issued from the head of the door leaf, at approximately 75mm from the top hanging edge corner. **Doorset B.** Smoke issued from hanging edge only, from mid-height upwards.

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Time		*Observations*
hours	mins	All observations refer to the exposed face unless otherwise stated. Leaf A (FD60) refers to left-hand leaf viewed from the unexposed face. Leaf B (FD30) refers to the right-hand leaf viewed from the unexposed face.
0	18	**Doorset A & Doorset B**. No visible change. *Unexposed face* **Doorset B.** No glow visible on either vertical edge of door leaf. Glow only visible along the base of door leaf.
0	19	*Unexposed face* **Doorset A.** Door leaf bowed into furnace away from door frame by approximately 1-2mm, at mid-height at closing edge and hanging edge.
0	20	**Doorset B.** Closer arm started to melt away at both ends.
0	21	**Doorset B.** Approximately one fifth of closer arm had fallen.
0	23	*Unexposed face* **Doorset A.** No smoke from above concealed closer position, at head of door leaf. Smoking continued from head of door leaf, at approximately 100mm from closing edge, for a length of approximately 300mm. Smoking continued from the head of the door leaf, at approximately 75mm from the top hanging edge corner.
0	24	**Doorset B.** Door closer continued to melt away. *Unexposed face* **Doorset B.** Increased smoke emissions from head of door leaf and from hanging edge at mid-height and adjacent to middle hinge.

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Time		*Observations*
hours	mins	All observations refer to the exposed face unless otherwise stated. Leaf A (FD60) refers to left-hand leaf viewed from the unexposed face. Leaf B (FD30) refers to the right-hand leaf viewed from the unexposed face.
0	25	**Doorset B.** Approximately one third of door closer had melted away.
0	26	**Doorset B.** Door closer and closer arm had completely fallen.
0	27	*Unexposed face* **Doorset A.** No visible change in smoking from head of door leaf. Closing edge of door leaf, from mid-height to base, bowed into furnace away from door frame by approximately 2-3mm.
0	29	**Doorset B.** Door core continued to fall.
0	32	**Doorset A.** Door leaf surface started to flame.
0	33	*Unexposed face* **Doorset A.** Door leaf dropped by approximately 3mm in relation to door frame.
0	34	*Unexposed face* **Doorset B.** Smoke issued from hanging edge, adjacent to middle and upper hinges. Hanging edge of door leaf discoloured from mid-height upwards.
0	37	**Doorset B.** Door core continued to fall. *Unexposed face* **Doorset A.** No visible change.

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Time		*Observations*
hours	mins	All observations refer to the exposed face unless otherwise stated. Leaf A (FD60) refers to left-hand leaf viewed from the unexposed face. Leaf B (FD30) refers to the right-hand leaf viewed from the unexposed face.
0	38	*Unexposed face* **Doorset A.** Smoke issued from meeting edge side of door leaf head and from above the concealed closer. Smoking ceased from at closing edge side, at head of door leaf.
0	40	*Unexposed face* **Doorset B.** Door leaf 'cupping' (bowing out of furnace in the middle and bowing into furnace at both edges).
0	43	*Unexposed face* **Doorset A.** Head of door leaf bowed into furnace, away from door frame by approximately 2-3mm.
0	45	**Doorset A & Doorset B**. No visible change. *Unexposed face* **Doorset B.** No visible change.
0	47	*Unexposed face* **Doorset B.** Gaps visible between door leaf and frame at approximately 800mm height, at closing edge of leaf. Flash flaming at closing edge of door leaf.

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Time		*Observations*
hours	mins	All observations refer to the exposed face unless otherwise stated. Leaf A (FD60) refers to left-hand leaf viewed from the unexposed face. Leaf B (FD30) refers to the right-hand leaf viewed from the unexposed face.
0	48	*Unexposed face* **Doorset B. INTEGRITY FAILURE**. The cotton pad ignited when held over the closing edge of the door leaf at approximately 600mm height. **FURTHER INTEGRITY FAILURE**. Continuous flaming, in excess of 10 seconds, at approximately 600mm height at the closing edge of the door leaf. **THE UNEXPOSED FACE OF DOORSET B WAS BOARDED OVER AT THE AT THE REQUEST OF THE SPONSOR AND THE TEST CONTINUED FOR DOORSET A.**
0	50	**Doorset A.** Door core 'crazed' over the whole surface and continued to flame.
0	52	*Unexposed face* **Doorset A.** Smoking decreased across head of door leaf. Door leaf looked stable.
0	55	**Doorset A.** Pieces of the vertical door frame started to fall.
0	58	*Unexposed face* **Doorset A.** Head of door leaf bowed into furnace away from frame. Black intumescent visible in places across head of door leaf.
1	00	**Doorset A.** Piece of the frame adjacent to top hinge fell away.
1	07	*Unexposed face* **Doorset A.** Glow visible in top hanging edge corner of door leaf. Door leaf was eroding, adjacent to top hinge.

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Time		*Observations*
hours	mins	All observations refer to the exposed face unless otherwise stated. Leaf A (FD60) refers to left-hand leaf viewed from the unexposed face. Leaf B (FD30) refers to the right-hand leaf viewed from the unexposed face.
1	10	**Doorset A.** Pieces of door frame fell away above head of door leaf, exposing door closer. *Unexposed face* **Doorset A.** Cotton pad attempt at top hanging edge corner – no failure. Smoking increased across full width of door leaf head.
1	11	*Unexposed face* **Doorset A.** Glow visible in top closing edge corner of door leaf.
1	12	**Doorset A.** Door closer on door leaf A appeared buckled. *Unexposed face* **Doorset A.** Cotton pad attempt at top hanging edge corner – no failure.
1	13	**Doorset A.** Door closer had almost completely melted away.
1	14	*Unexposed face* **Doorset A.** Pieces of black intumescent were falling from head of door leaf. Aluminium was dripping from top hanging edge corner of door leaf.

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Time		*Observations*
hours	mins	All observations refer to the exposed face unless otherwise stated. Leaf A (FD60) refers to left-hand leaf viewed from the unexposed face. Leaf B (FD30) refers to the right-hand leaf viewed from the unexposed face.
1	15	**Doorset A.** A gap of approximately 40-45mm appeared at top hanging edge side of door leaf head, at the door closer position. *Unexposed face* **Doorset A.** **INTEGRITY FAILURE**. Sustained flaming, exceeding 10 seconds, across the full width of the door leaf head, starting from the top hanging edge corner.
1	16	**Doorset A.** Top hanging edge corner bowed into furnace.
1	17	**Doorset A.** Approximately 70% of door closer on leaf A had melted away. *Unexposed face* **Doorset A.** **FURTHER INTEGRITY FAILURE**. The gap at the closing edge corner of the door leaf exceeded 6mm x 150mm (visual). Continuous flaming from mid-height upwards at closing edge of door leaf.
1	18	**Doorset A.** Through gap visible at head of door leaf. *Unexposed face* **Doorset A.** **FURTHER INTEGRITY FAILURE**. The gap at the closing edge corner of the door leaf exceeded 25mm diameter (visual).
1	20	*Unexposed face* **Doorset A.** Top edge of door leaf bowed and started to fall into the furnace.
1	22	**TEST TERMINATED** at the request of the sponsor.

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8.2 Door Retention Forces

Door Leaf A (FD60)

Opening force (into furnace): 29.0

Door Leaf B (FD30)

Opening force (out of furnace): 32.3

The door retention forces were measured following the methodology of BS EN 1634-1:2008. The forces were measured from approximately 40mm open to approximately 140mm (moving a distance of 100mm). As there was no handle on either of the door leaves, it was assumed that the position of the handle was 60mm from the closing edge.

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8.3 Furnace Temperature Graph

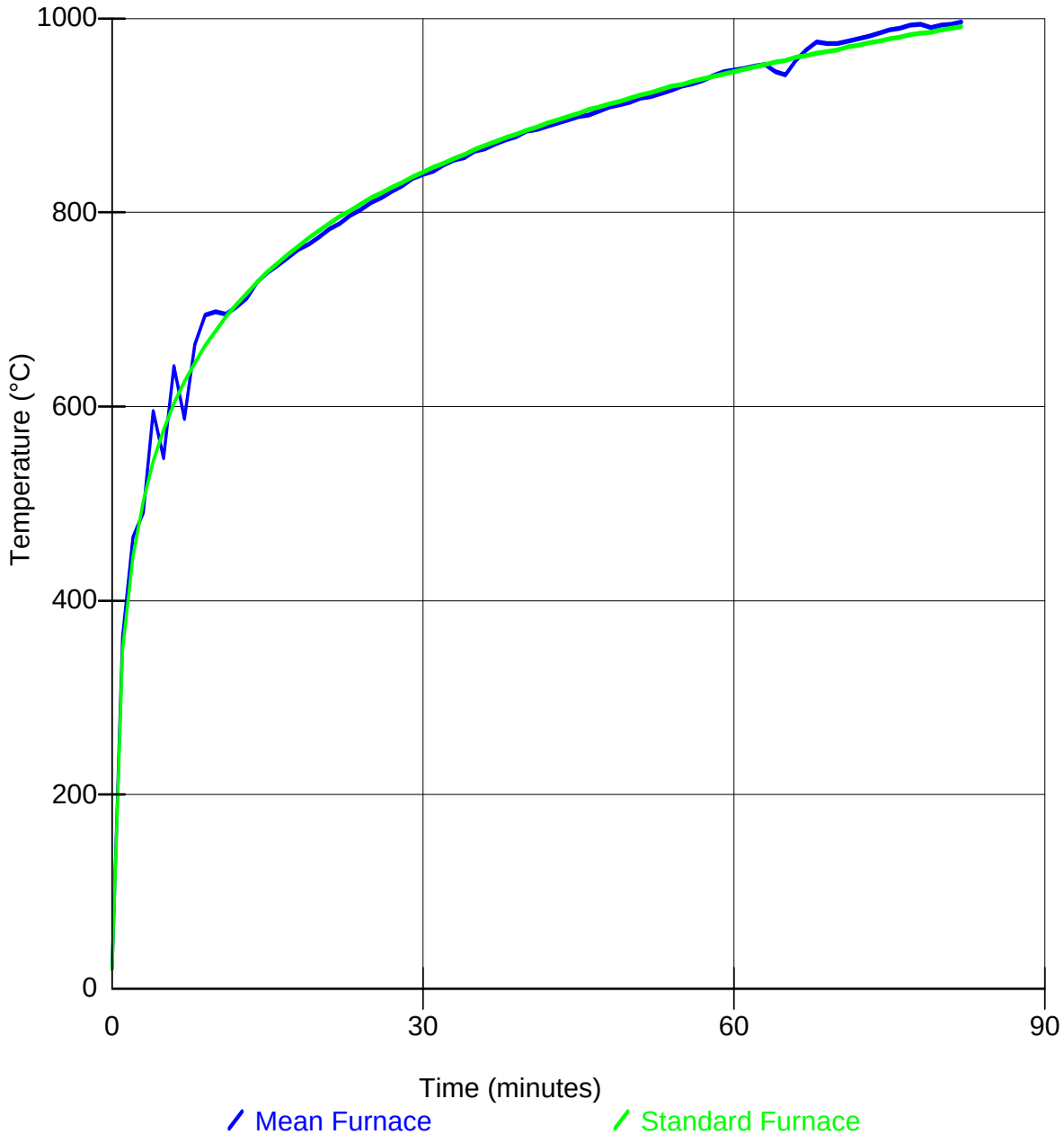

Figure 5. Furnace temperature graph.

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8.4 Furnace Pressure Graph

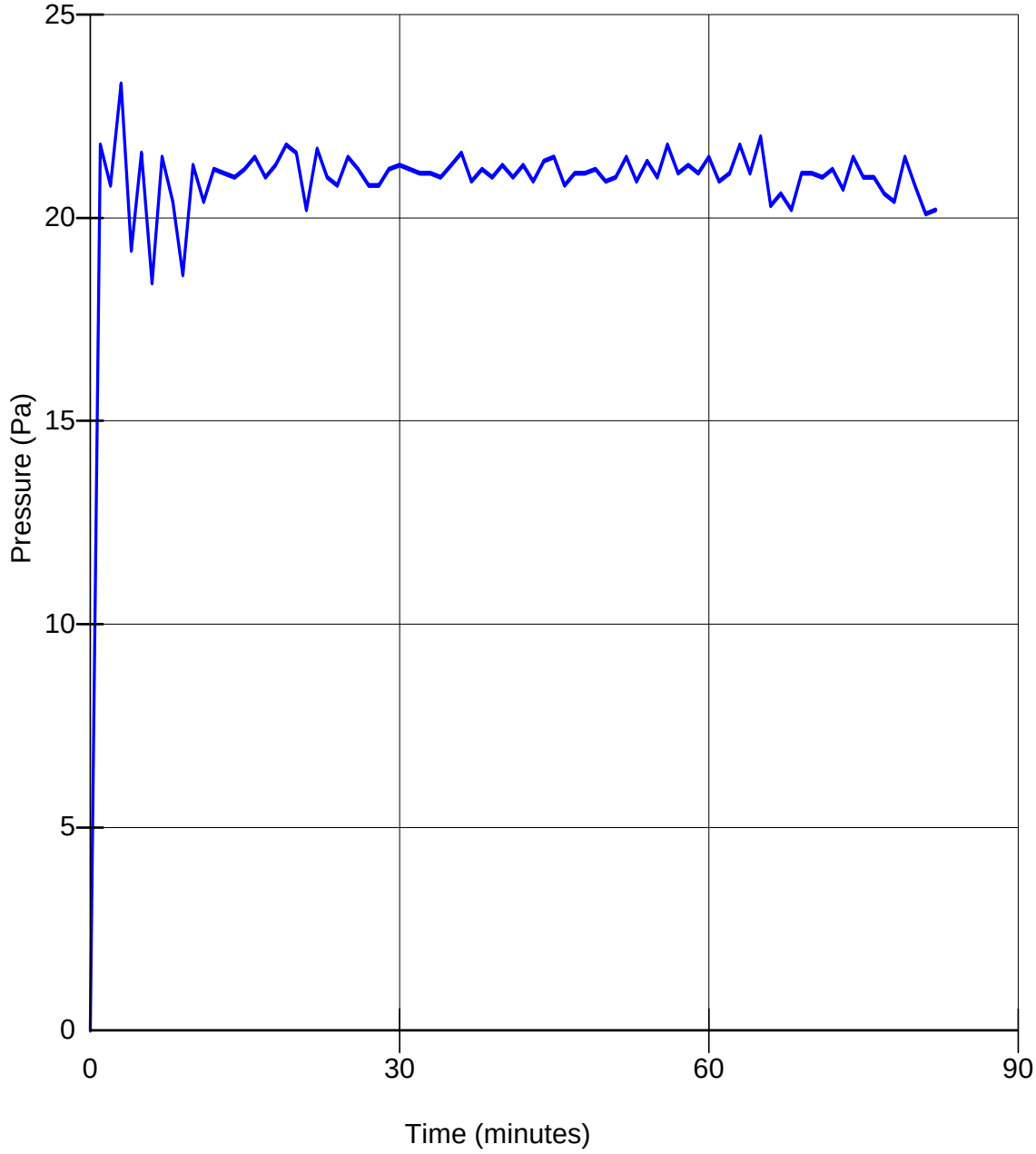

Figure 6. Pressure Graph.

The pressure was recorded at the top of the furnace. (The furnace pressure was set to control at 21.25 Pa at the top of the furnace, equating to 12.9 Pascals at the top of the doorsets).

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8.5 Doorset A Temperature Graph

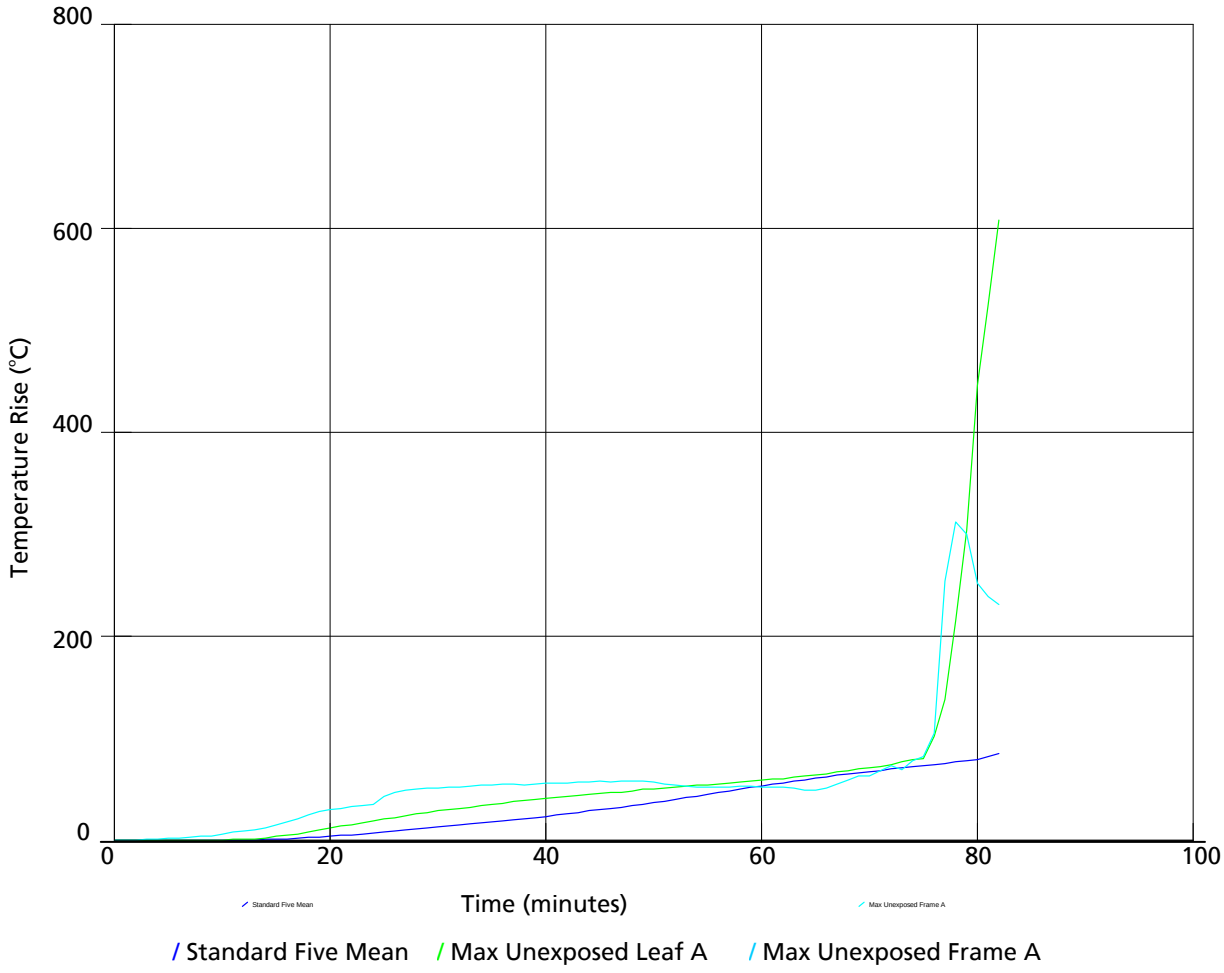

Figure 7. Doorset temperature graph.

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8.6 Doorset B Temperature Graph

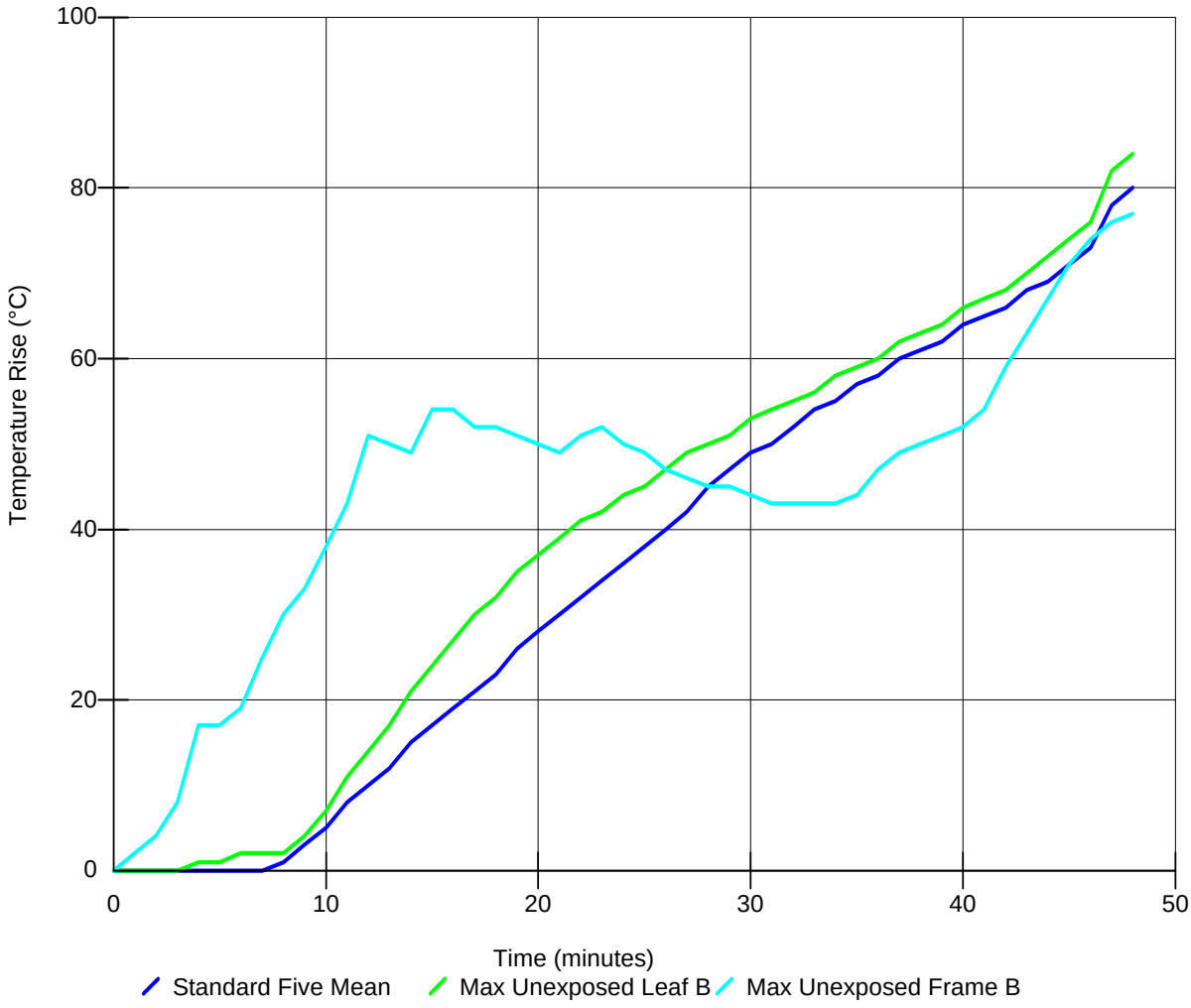

Figure 8. Doorset temperature graph.

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8.7 Unexposed Face Thermocouple Layout

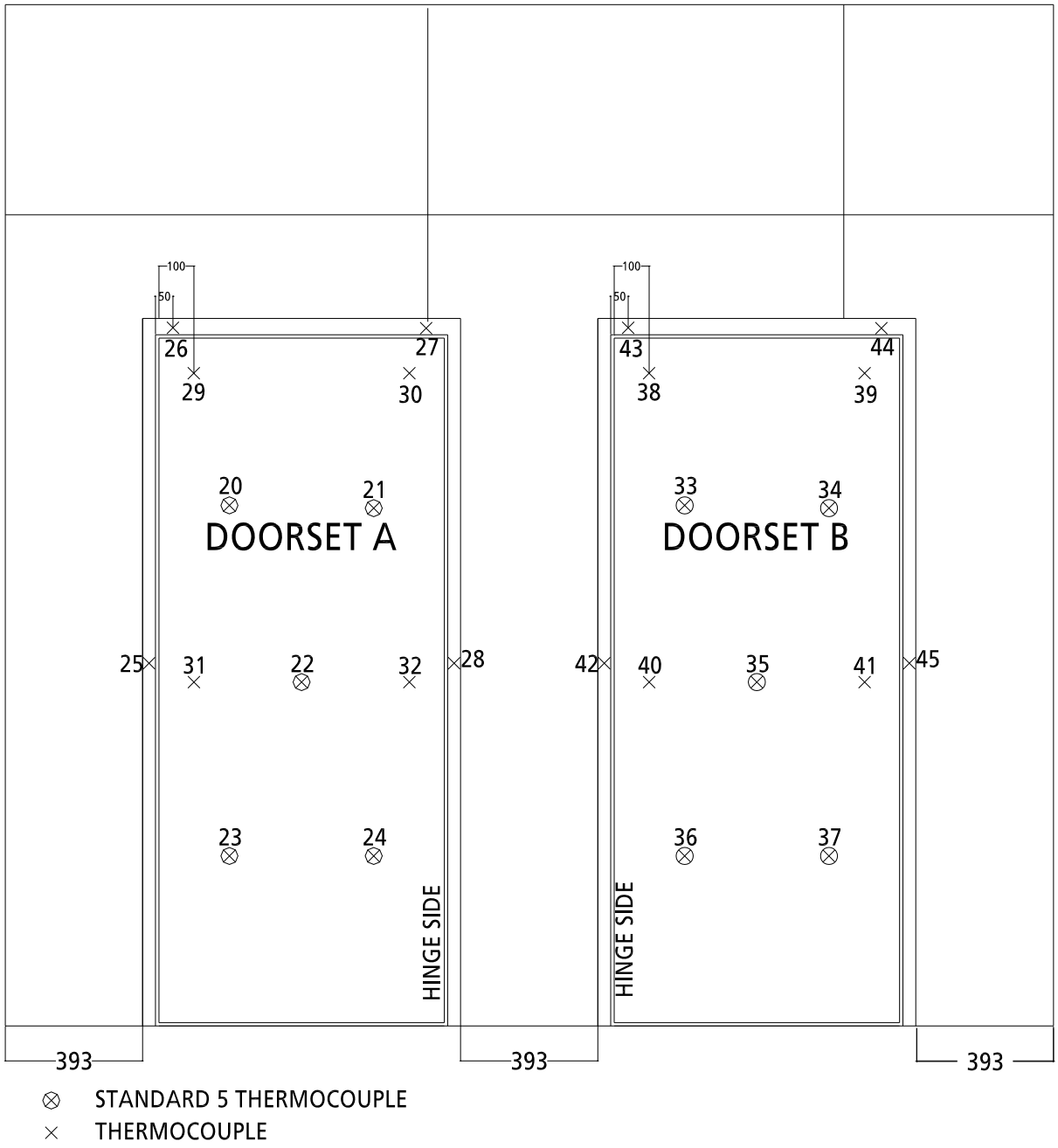

Figure 9. Thermocouple layout.

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8.8 Doorset A - Unexposed Face Standard Five Temperature Data

Time (mins)	Temperature Rise (°C)					
	Thermocouple No. 20	Thermocouple No. 21	Thermocouple No. 22	Thermocouple No. 23	Thermocouple No. 24	Mean Standard 5
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	1	0
12	0	0	0	1	1	0
13	0	0	0	1	1	0
14	0	1	0	2	2	1
15	1	1	1	3	3	1
16	1	1	1	3	3	1
17	2	1	1	4	4	2
18	2	2	1	5	5	3
19	3	2	2	6	6	3
20	3	3	2	7	7	4
21	4	3	3	8	9	5
22	4	4	3	9	9	5
23	5	4	4	10	11	6
24	6	5	4	11	12	7
25	7	6	5	12	13	8
26	7	7	5	13	14	9
27	8	8	6	15	15	10
28	9	8	7	15	16	11
29	10	9	8	16	17	12
30	11	10	9	18	18	13
31	12	11	10	19	19	14
32	13	12	11	20	20	15
33	13	13	12	21	21	16
34	15	15	13	22	22	17
35	16	16	14	23	23	18

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Time (mins)	Temperature Rise (°C)					
	Thermocouple No. 20	Thermocouple No. 21	Thermocouple No. 22	Thermocouple No. 23	Thermocouple No. 24	Mean Standard 5
36	16	17	15	23	24	19
37	18	18	17	25	25	20
38	19	20	18	26	26	21
39	20	21	19	27	27	22
40	21	22	20	28	28	23
41	22	23	22	29	29	25
42	24	25	23	30	31	26
43	25	26	25	31	32	27
44	26	28	26	32	33	29
45	28	29	27	33	34	30
46	29	30	29	34	35	31
47	30	32	30	36	36	32
48	32	34	32	37	38	34
49	33	35	34	38	39	35
50	34	37	36	39	40	37
51	36	38	38	40	41	38
52	38	40	40	41	43	40
53	39	42	42	43	44	42
54	41	44	44	44	46	43
55	42	45	46	45	47	45
56	44	47	48	47	49	47
57	45	49	50	48	51	48
58	47	51	52	49	52	50
59	49	53	54	51	54	52
60	50	54	55	52	56	53
61	52	56	57	53	57	55
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63	55	59	60	56	60	58
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66	60	62	65	60	64	62
67	62	64	67	62	66	64
68	64	65	68	63	67	65
69	65	66	70	64	68	66
70	66	67	71	65	69	67
71	67	68	72	66	70	68
72	68	69	74	67	72	70
73	69	71	75	68	73	71

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Time (mins)	Temperature Rise (°C)					
	Thermocouple No. 20	Thermocouple No. 21	Thermocouple No. 22	Thermocouple No. 23	Thermocouple No. 24	Mean Standard 5
74	70	72	76	69	74	72
75	71	73	77	70	75	73
76	73	75	78	71	76	74
77	74	76	79	72	77	75
78	76	78	80	73	78	77
79	77	80	81	74	79	78
80	79	82	83	75	80	79
81	82	85	85	76	82	82
82	87	91	89	77	84	85

See figure 9 for the location of the thermocouples.

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8.9 Doorset A - Door Frame Temperature Data

Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	1	0	0
4	0	1	0	0
5	0	2	0	0
6	0	2	0	0
7	0	3	0	0
8	0	4	1	0
9	0	4	3	0
10	0	5	6	0
11	0	5	8	0
12	0	6	9	0
13	0	7	10	0
14	0	7	12	0
15	0	8	15	0
16	0	8	18	0
17	0	10	21	0
18	0	10	25	0
19	0	13	28	0
20	1	15	30	0
21	1	18	31	0
22	1	20	33	0
23	1	22	34	0
24	1	32	35	0
25	1	43	36	0
26	1	47	37	0
27	2	49	37	0
28	2	50	37	1
29	2	51	38	1
30	2	51	38	1
31	3	52	39	1
32	3	52	40	1
33	3	53	40	1
34	4	54	41	1
35	4	54	41	2

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Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28
36	4	55	42	2
37	5	55	43	2
38	5	54	43	2
39	6	55	44	3
40	6	56	45	3
41	7	56	45	3
42	7	56	47	4
43	8	57	48	4
44	8	57	49	5
45	9	58	49	5
46	9	57	50	6
47	10	58	50	6
48	10	58	50	7
49	11	58	51	8
50	11	57	51	8
51	12	55	52	9
52	13	54	52	10
53	13	53	52	11
54	14	52	52	12
55	14	52	52	13
56	15	52	52	15
57	16	52	51	16
58	16	53	50	17
59	17	53	49	18
60	18	52	48	20
61	19	52	47	21
62	19	52	47	23
63	20	51	48	24
64	21	49	48	26
65	22	49	49	27
66	23	47	51	28
67	24	46	55	30
68	25	45	59	31
69	26	45	63	32
70	26	46	63	33
71	27	52	68	35
72	27	58	73	36
73	28	65	69	36

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Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28
74	28	71	78	37
75	28	74	82	38
76	29	104	105	39
77	29	254	246	40
78	30	308	312	41
79	30	299	300	42
80	31	245	252	43
81	32	207	239	43
82	34	210	231	45

See figure 9 for the location of the thermocouples.

Thermocouple no.27 was affected by hot gases after 58 minutes.

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8.10 Doorset A - Additional Leaf Temperature Data (100mm from edge)

Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 29	Thermocouple No. 30	Thermocouple No. 31	Thermocouple No. 32
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	1	1	0	0
13	1	1	0	0
14	2	2	1	0
15	3	4	1	1
16	5	5	1	1
17	5	6	2	1
18	6	8	2	2
19	8	10	2	2
20	9	12	3	2
21	10	14	4	3
22	11	15	4	3
23	12	17	5	4
24	14	19	5	4
25	14	21	6	5
26	16	22	7	5
27	17	24	8	6
28	18	26	8	7
29	19	27	9	8
30	20	29	10	9
31	21	30	11	10
32	22	31	12	11
33	22	32	13	12
34	23	34	14	14
35	24	35	15	15

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Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 29	Thermocouple No. 30	Thermocouple No. 31	Thermocouple No. 32
36	25	36	16	16
37	26	38	17	17
38	27	39	18	19
39	28	40	19	20
40	29	41	21	22
41	30	42	22	23
42	31	43	23	25
43	32	44	24	26
44	33	45	26	28
45	34	46	27	29
46	34	47	28	31
47	35	47	30	32
48	36	48	31	34
49	37	50	32	36
50	38	50	34	38
51	39	51	36	40
52	40	52	37	42
53	41	53	39	44
54	42	54	41	46
55	43	54	43	47
56	45	55	45	49
57	46	56	47	51
58	47	57	49	53
59	49	58	51	55
60	50	59	52	56
61	51	60	54	58
62	52	60	56	59
63	54	62	58	61
64	55	63	59	62
65	56	64	61	63
66	57	65	62	65
67	59	66	64	66
68	60	68	65	67
69	61	69	66	68
70	62	70	67	69
71	64	71	68	69
72	65	73	69	71
73	66	77	70	72

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Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 29	Thermocouple No. 30	Thermocouple No. 31	Thermocouple No. 32
74	68	79	71	73
75	71	80	72	74
76	84	102	73	75
77	117	138	75	76
78	138	215	76	77
79	168	304	77	78
80	206	446	79	80
81	312	525	80	81
82	455	608	82	82

See figure 9 for the location of the thermocouples.

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8.11 Doorset B - Unexposed Face Standard Five Temperature Data

Time (mins)	Temperature Rise (°C)					
	Thermocouple No. 33	Thermocouple No. 34	Thermocouple No. 35	Thermocouple No. 36	Thermocouple No. 37	Mean Standard 5
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	1	1	1	0	1	0
7	0	1	1	0	1	0
8	1	2	1	1	1	1
9	4	3	3	3	4	3
10	7	5	4	6	5	5
11	11	7	6	9	8	8
12	14	9	7	12	10	10
13	17	11	9	14	11	12
14	21	14	10	17	13	15
15	24	16	12	20	15	17
16	26	18	14	22	17	19
17	29	20	16	24	19	21
18	31	23	18	26	21	23
19	34	25	21	28	23	26
20	36	27	23	30	25	28
21	38	29	25	32	28	30
22	39	32	28	34	30	32
23	41	34	30	35	32	34
24	43	36	33	38	34	36
25	44	38	36	39	37	38
26	46	40	38	41	39	40
27	47	42	41	43	41	42
28	49	44	43	45	44	45
29	50	46	46	47	46	47
30	52	48	48	49	48	49
31	53	50	50	50	50	50
32	54	52	52	52	52	52
33	56	53	54	54	53	54
34	57	55	56	55	55	55
35	58	57	58	57	57	57

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Time (mins)	Temperature Rise (°C)					
	Thermocouple No. 33	Thermocouple No. 34	Thermocouple No. 35	Thermocouple No. 36	Thermocouple No. 37	Mean Standard 5
36	59	58	60	58	59	58
37	61	60	62	60	61	60
38	62	61	63	61	62	61
39	63	62	64	62	63	62
40	64	63	66	64	65	64
41	65	65	67	65	66	65
42	66	66	68	66	67	66
43	68	68	70	68	68	68
44	68	69	72	70	70	69
45	69	72	74	71	72	71
46	70	74	76	73	74	73
47	71	79	82	76	82	78
48	72	82	84	80	84	80

See figure 9 for the location of the thermocouples.

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8.12 Doorset B - Door Frame Temperature Data

Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 42	Thermocouple No. 43	Thermocouple No. 44	Thermocouple No. 45
0	0	-	0	0
1	2	-	0	0
2	4	-	2	0
3	8	-	8	0
4	9	-	17	1
5	10	-	17	4
6	13	-	19	7
7	15	-	25	12
8	17	-	30	15
9	18	-	33	14
10	18	-	38	17
11	18	-	43	18
12	18	-	51	19
13	19	-	50	20
14	19	-	49	19
15	19	-	54	19
16	20	-	54	19
17	20	-	52	19
18	19	-	52	20
19	19	-	51	20
20	21	-	50	21
21	20	-	49	23
22	19	-	51	24
23	18	-	52	25
24	18	-	50	26
25	18	-	49	27
26	18	-	47	28
27	20	-	46	29
28	21	-	45	31
29	22	-	45	32
30	23	-	44	34
31	25	-	43	35
32	27	-	43	35
33	28	-	43	42
34	31	-	43	38
35	33	-	43	44

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Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 42	Thermocouple No. 43	Thermocouple No. 44	Thermocouple No. 45
36	36	-	42	47
37	39	-	42	49
38	42	-	44	50
39	46	-	45	51
40	49	-	46	52
41	54	-	47	53
42	59	-	48	54
43	63	-	49	55
44	67	-	50	57
45	71	-	50	59
46	74	-	52	60
47	76	-	48	62
48	77	-	52	65

See figure 9 for the location of the thermocouples.

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8.13 Doorset B - Additional Leaf Temperature Data (100mm from edge)

Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 38	Thermocouple No. 39	Thermocouple No. 40	Thermocouple No. 41
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	1	0	0	0
5	1	1	0	1
6	1	2	0	2
7	1	2	0	1
8	1	2	0	2
9	1	3	1	3
10	2	6	3	5
11	4	9	4	7
12	7	13	7	9
13	10	17	9	12
14	13	21	12	15
15	16	24	15	18
16	19	27	18	21
17	23	30	21	24
18	26	32	24	27
19	29	35	27	29
20	31	37	29	32
21	34	39	32	35
22	36	41	34	37
23	38	42	37	39
24	40	44	39	41
25	42	45	41	43
26	44	47	42	45
27	45	49	44	47
28	47	50	46	49
29	48	51	48	50
30	49	53	50	52
31	51	54	51	53
32	52	55	53	55
33	53	56	54	56
34	54	57	56	58
35	55	58	57	59

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Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 38	Thermocouple No. 39	Thermocouple No. 40	Thermocouple No. 41
36	56	59	58	60
37	57	60	60	62
38	58	61	61	63
39	59	62	62	64
40	60	63	64	65
41	61	64	65	66
42	62	65	66	67
43	63	66	67	68
44	64	68	68	70
45	65	73	69	72
46	66	76	72	74
47	67	78	78	78
48	72	79	81	81

See figure 9 for the location of the thermocouples.

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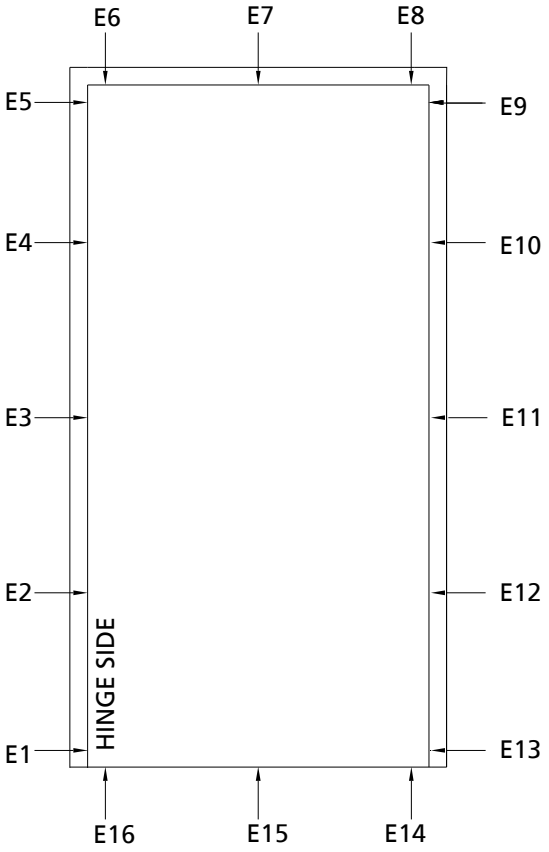
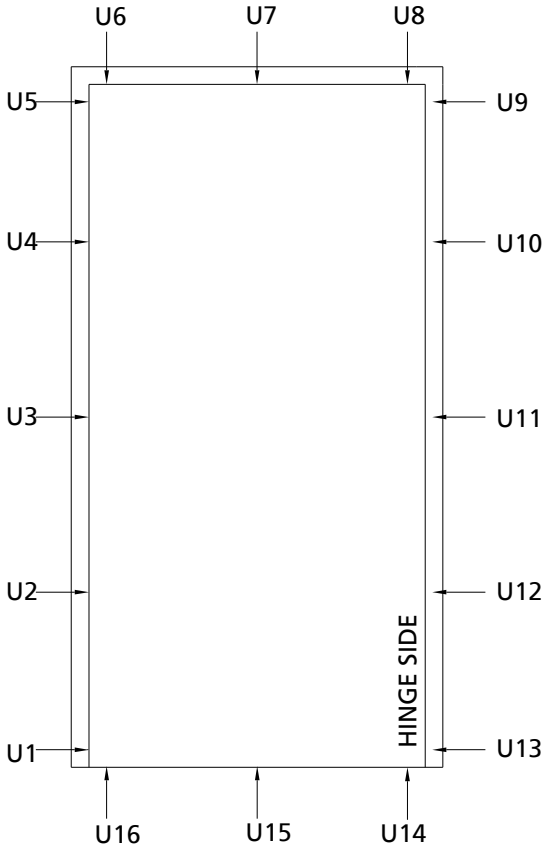
8.14 Doorset A Perimeter Gap Measurements



EXPOSED FACE



UNEXPOSED FACE

Position	Gap (mm)	Position	Gap (mm)	Position	Gap (mm)	Position	Gap (mm)
E1	2.50	E9	3.60	U1	0.00	U9	0.45
E2	3.00	E10	4.00	U2	0.00	U10	1.00
E3	2.90	E11	3.60	U3	0.00	U11	2.50
E4	3.40	E12	4.90	U4	0.45	U12	1.00
E5	4.10	E13	5.20	U5	0.45	U13	1.25
E6	4.40	E14	6.30	U6	1.35	U14	6.70
E7	4.30	E15	5.80	U7	2.00	U15	4.80
E8	4.80	E16	6.40	U8	0.55	U16	5.50

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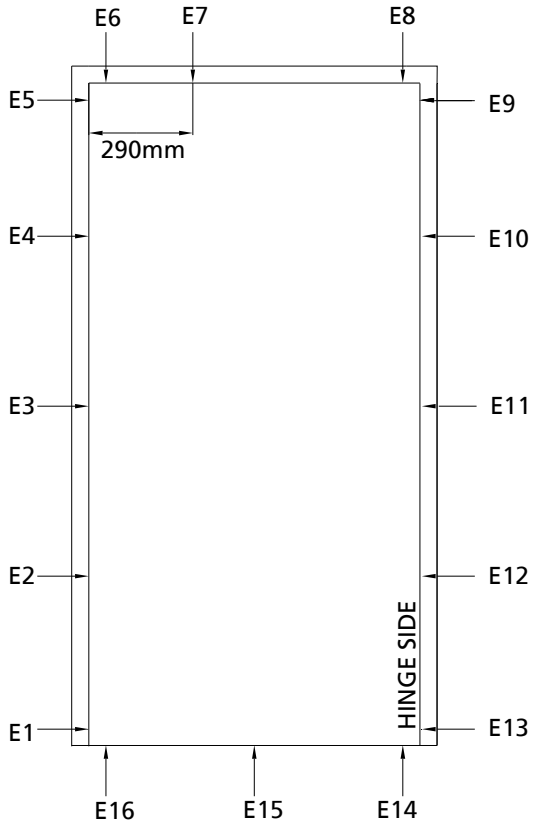
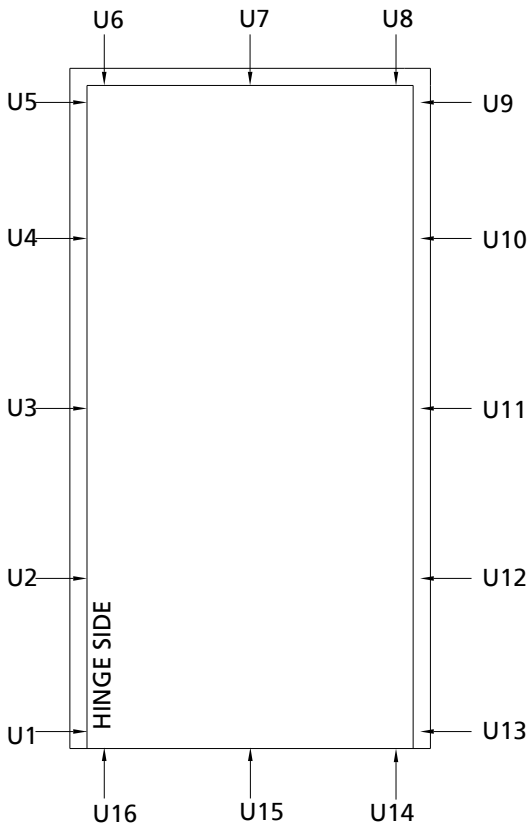
8.15 Doorset B Perimeter Gap Measurements





EXPOSED FACE

UNEXPOSED FACE

Position	Gap (mm)	Position	Gap (mm)	Position	Gap (mm)	Position	Gap (mm)
E1	0.05	E9	0.60	U1	3.20	U9	3.60
E2	0.45	E10	1.15	U2	4.10	U10	3.70
E3	1.30	E11	1.00	U3	4.00	U11	3.80
E4	1.35	E12	1.90	U4	3.50	U12	4.90
E5	1.25	E13	0.55	U5	4.00	U13	4.10
E6	1.65	E14	6.10	U6	3.80	U14	6.40
E7	0.75	E15	6.20	U7	3.70	U15	6.40
E8	*	E16	6.40	U8	3.80	U16	5.80

*Gap could not be measured due to the position of the closer box and arm on the exposed face.

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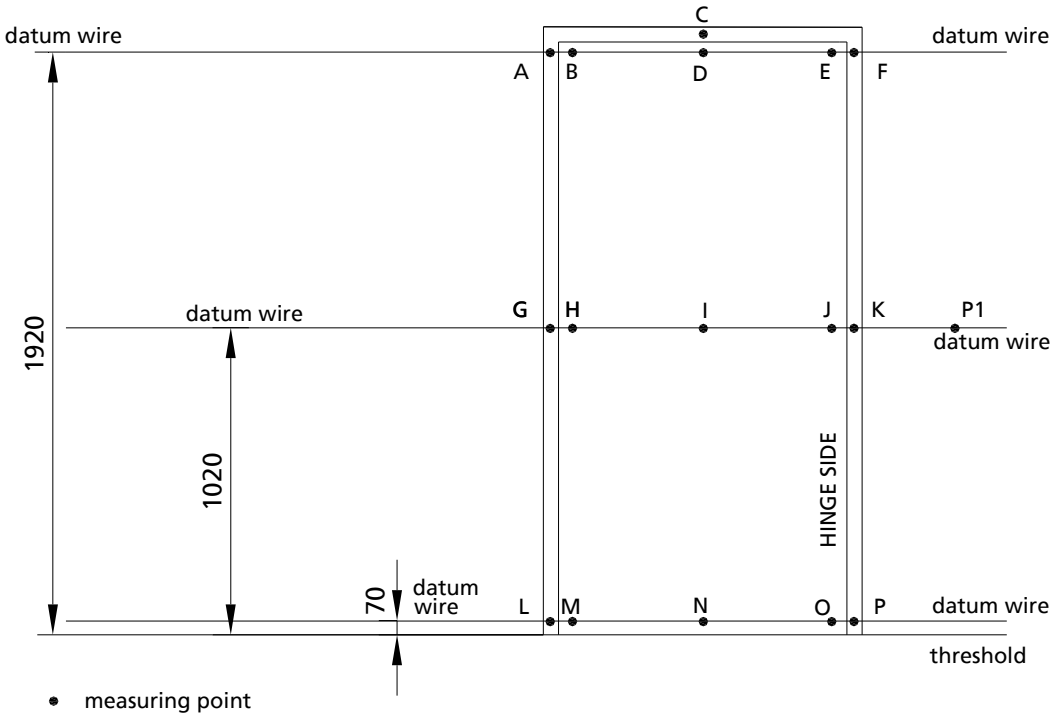
8.16 Doorset A Deflection Measurements



Time	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	P1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	3	1	-5	2	0	4	3	3	5	4	4	-1	-4	-3	-1	10	3
11	4	3	1	4	2	4	3	6	6	6	4	-2	-3	-3	-1	9	4
16	5	4	4	4	2	6	3	6	7	5	4	-1	-3	-2	-1	12	4
20	6	4	3	5	4	7	4	7	7	5	5	0	0	-1	-2	9	4
25	5	6	4	5	4	6	5	8	8	6	6	0	0	-1	-2	9	4
30	5	7	-1	5	3	6	5	8	9	5	4	0	0	-2	-2	9	4
35	5	5	-1	4	2	6	3	10	9	5	4	0	1	-1	-2	10	3
41	5	6	-1	4	2	4	3	8	7	4	2	0	1	-3	-2	10	2
46	5	5	-2	4	2	4	3	7	5	3	2	0	0	-3	-2	10	2
53	5	5	-2	2	1	5	3	5	-2	-1	0	0	2	-3	-1	9	-
60	5	9	1	0	4	4	3	1	-13	-4	1	-1	4	-7	-1	13	-
65	5	10	-2	1	9	6	3	-2	-19	-5	2	0	5	-7	0	9	-
70	5	18	-1	2	11	7	3	-2	-23	-6	0	0	7	-8	2	10	-

The measurements were in mm and the time in minutes.

Deflection readings were taken between the datum wires and the set positions on the door leaf and the frame.

Negative readings indicate deflection out of the furnace.

- indicates that readings were not taken at P1 (mid-span of the partition) after 46 minutes.

Customer: **Rutland UK**

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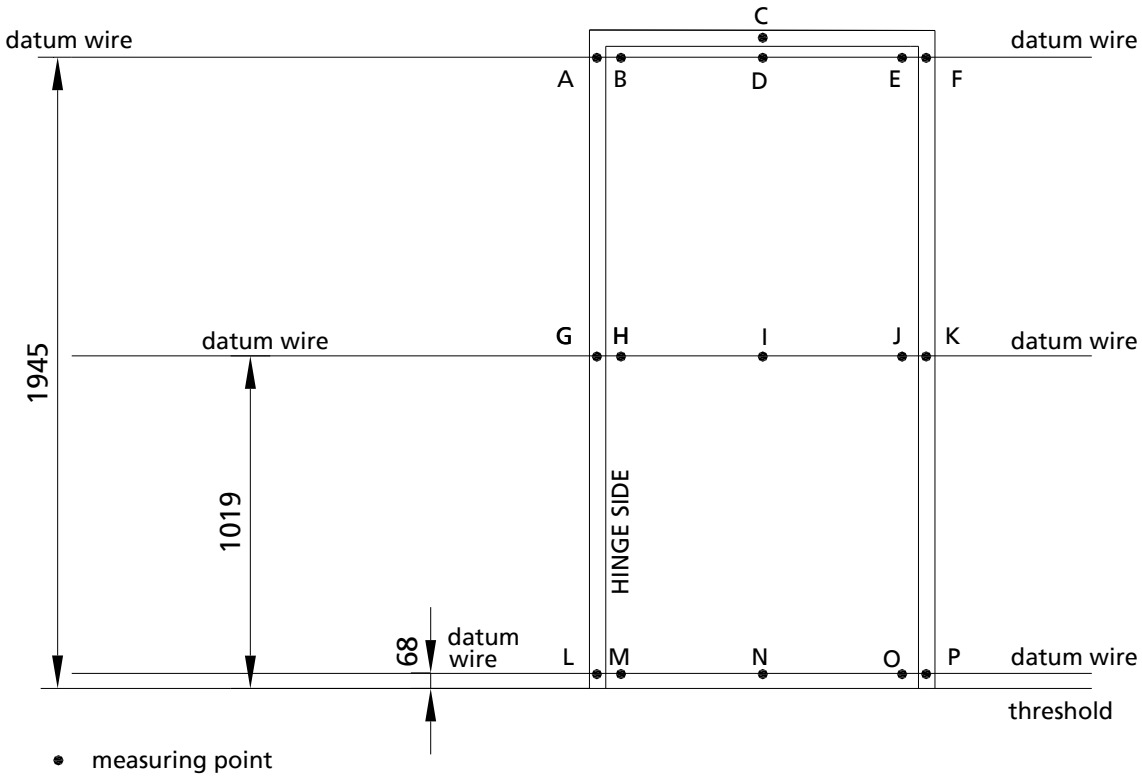
8.17 Doorset B Deflection Measurements



Time	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	3	1	1	0	0	2	2	2	3	1	11	0	-2	-4	-4	0
12	4	4	2	0	-2	0	2	1	4	-2	11	0	0	-3	-4	0
17	4	5	3	2	3	4	3	3	4	-1	13	-3	-1	-1	-1	0
22	4	6	3	4	4	5	2	3	2	-2	12	0	0	-1	0	0
25	5	6	2	4	4	5	2	1	-2	-2	14	0	0	-3	0	0
32	4	4	2	1	5	5	2	0	-3	-4	14	-1	-2	-7	0	0
37	3	4	1	-1	4	4	2	-6	-24	-7	14	0	-6	-16	-4	0
42	3	1	2	-3	3	4	1	-10	-31	-7	14	-1	-11	-25	-7	0
47	2	0	2	-6	2	-	-	-	-	-	-	-	-	-	-	-

The measurements were in mm and the time in minutes.

Deflection readings were taken between the datum wires and the set positions on the door leaf and the frame.

Negative readings indicate deflection out of the furnace.

- indicates that readings were discontinued after 47 minutes due to flaming.

Customer: **Rutland UK**

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9. PHOTOGRAPHS

9.1 Exposed face prior to test

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9.2 Unexposed face prior to test

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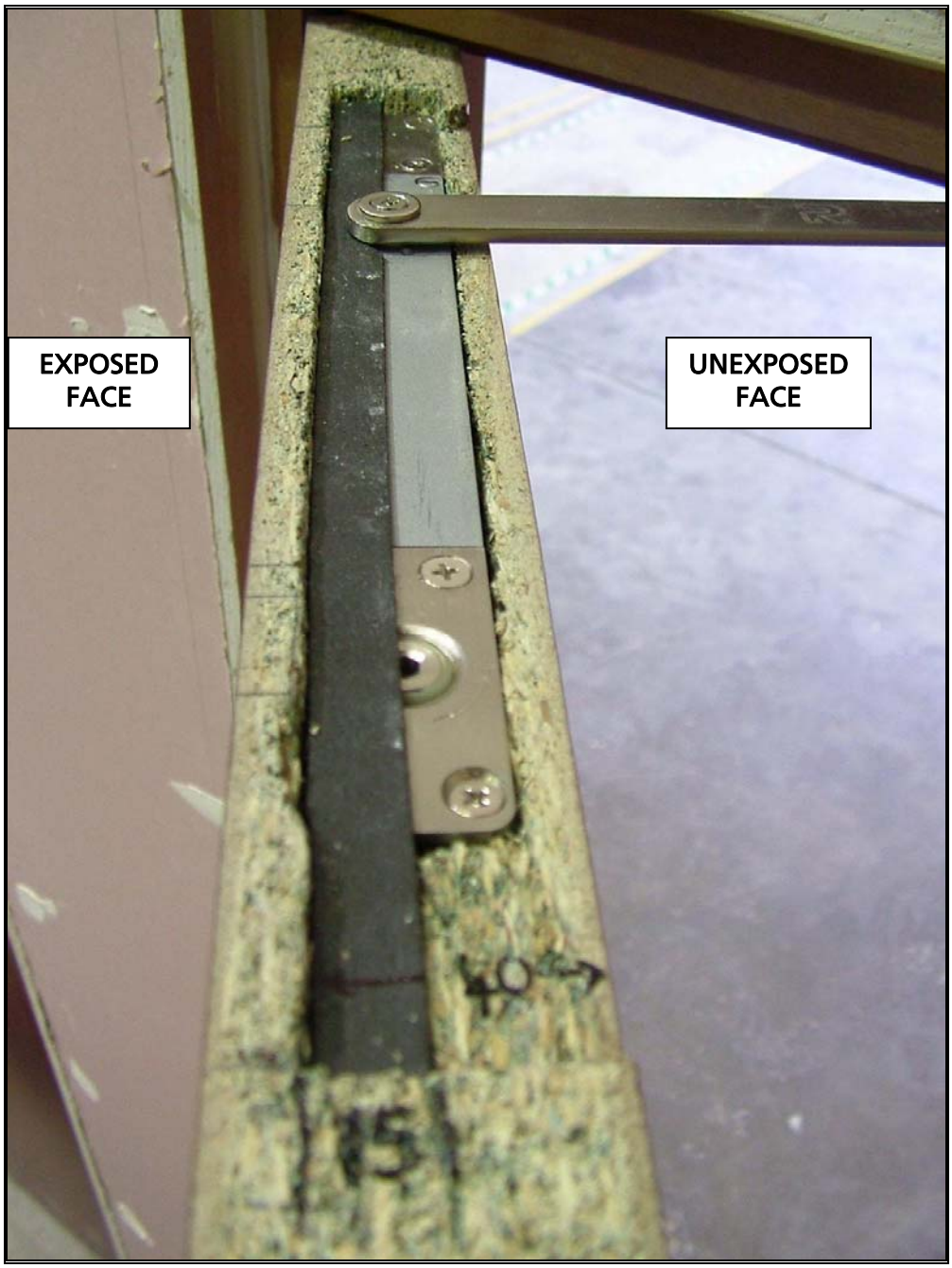
9.3 Doorset A – hanging edge head of door leaf, showing door closer and intumescent



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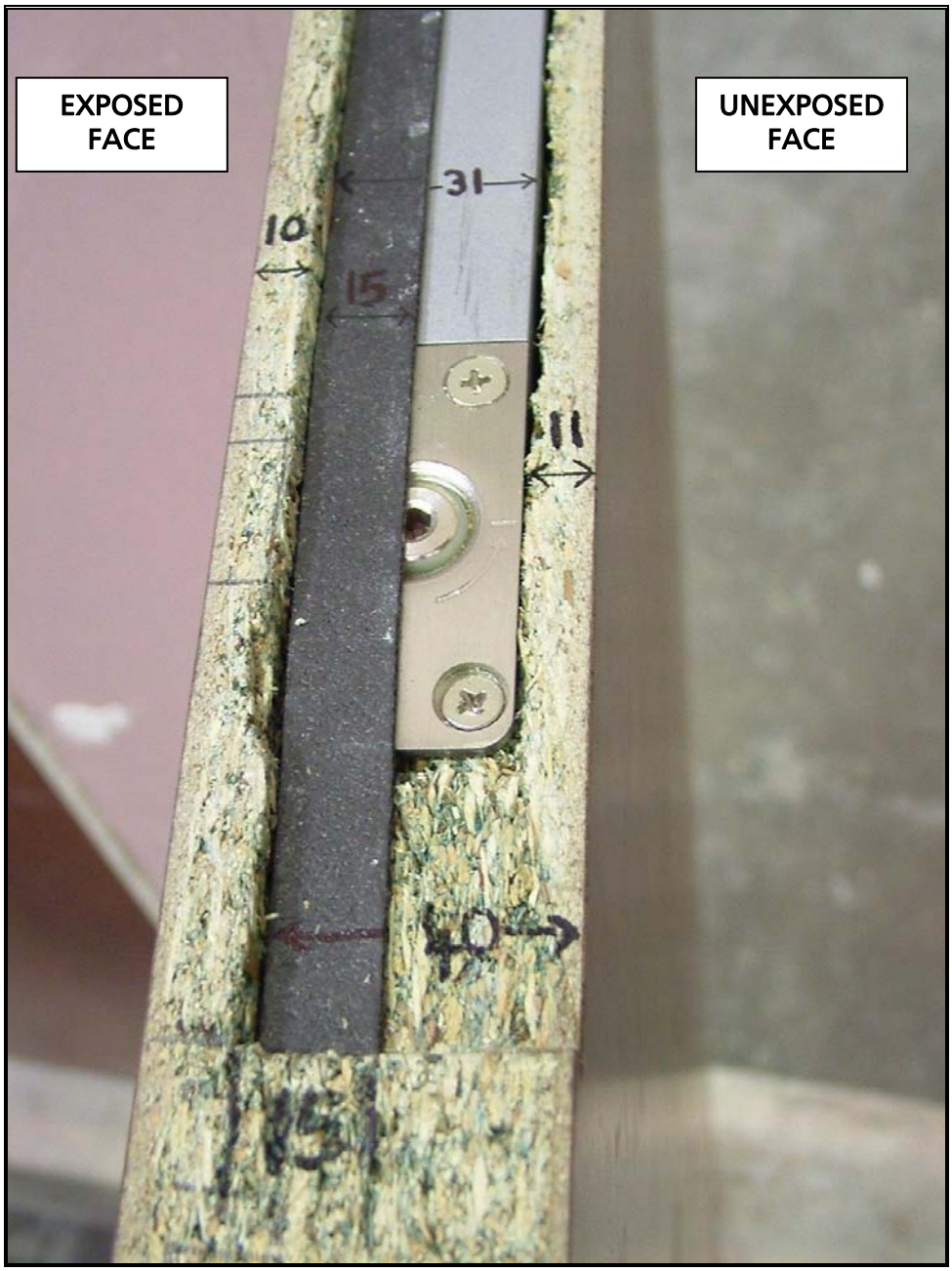
9.4 Doorset A - head of door leaf at hanging edge, showing dimensions



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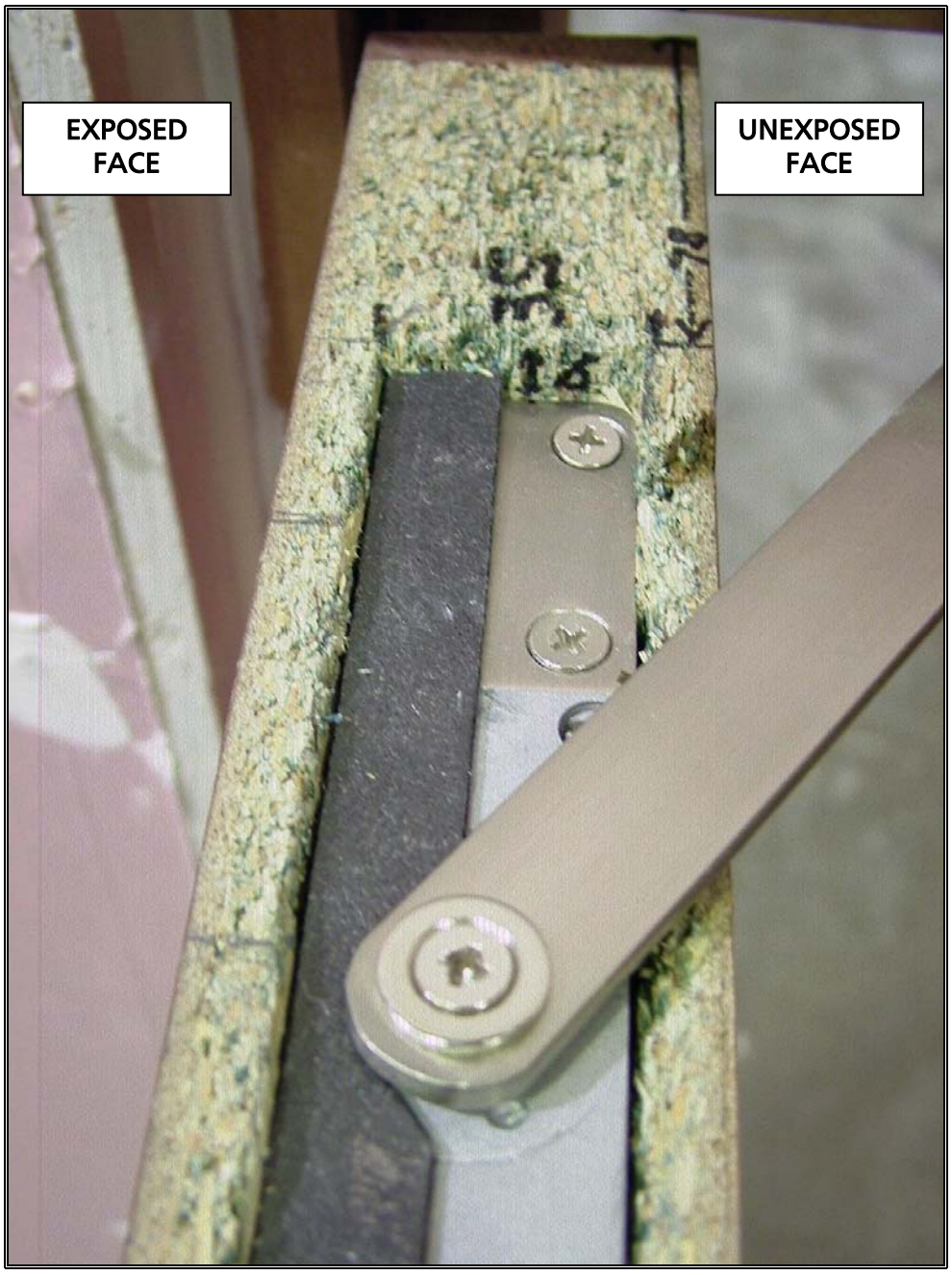
9.5 Doorset A – head of door leaf at hanging edge, showing dimensions



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9.6 Doorset A – closing edge head of door leaf

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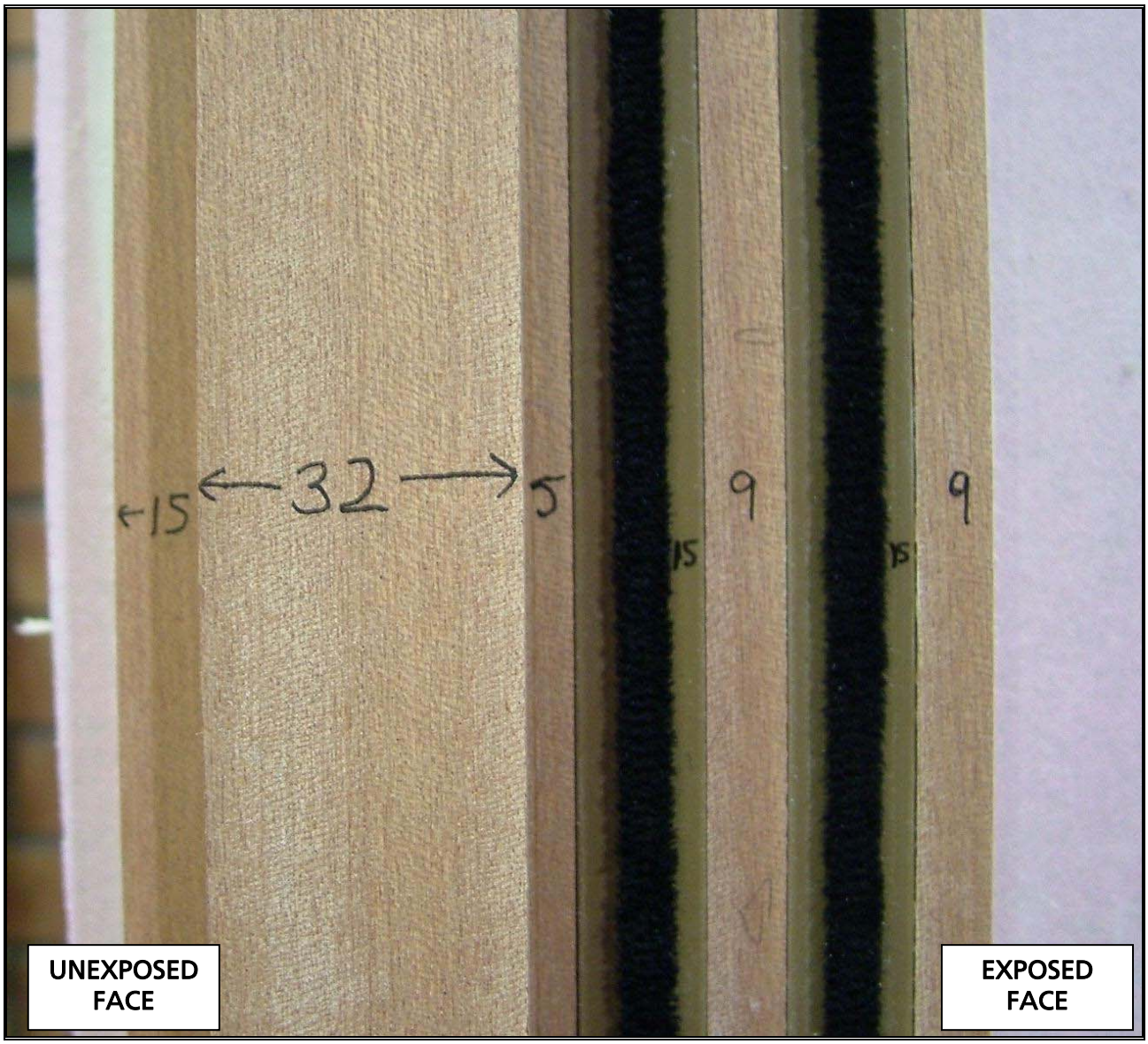
9.7 Doorset A – closing jamb of door frame showing doorstop and intumescent strips



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9.8 Doorset A – hinge and intumescent strips in door frame

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9.9 Doorset B – door closer on exposed face of door leaf

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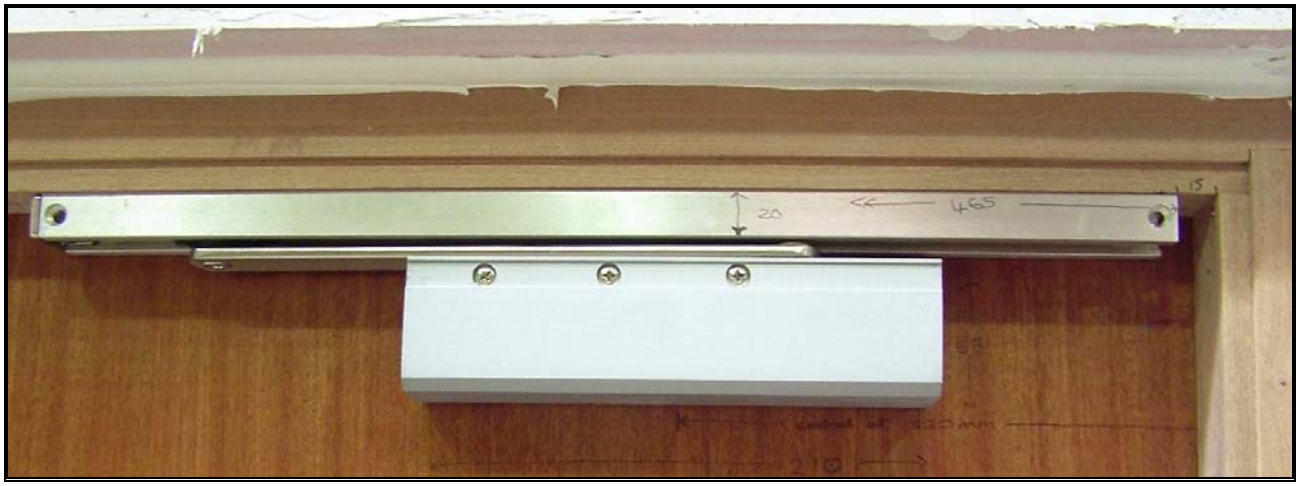
9.10 Doorset B – door closer, showing dimensions



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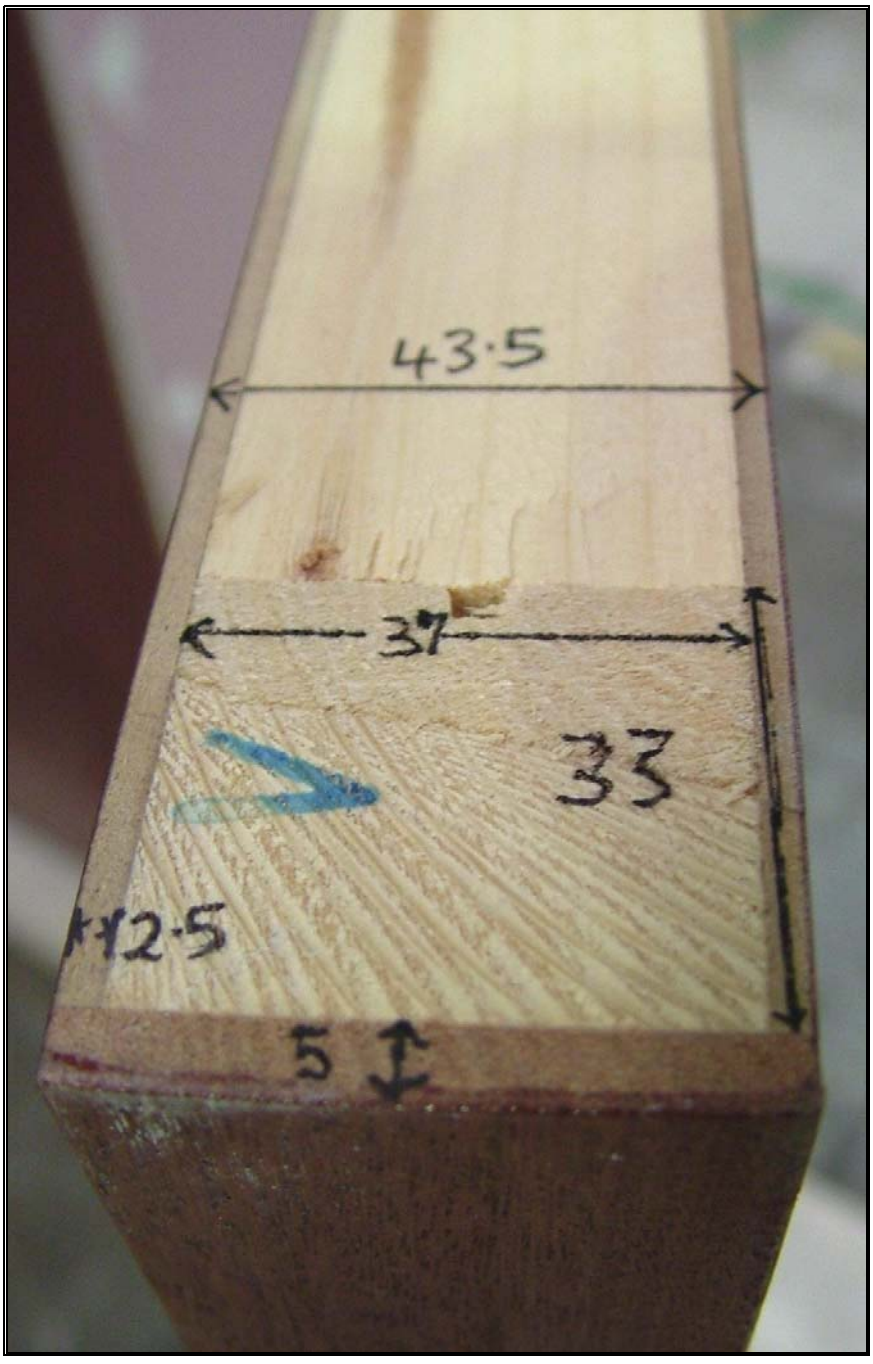
9.11 Doorset B - closing edge head of door leaf



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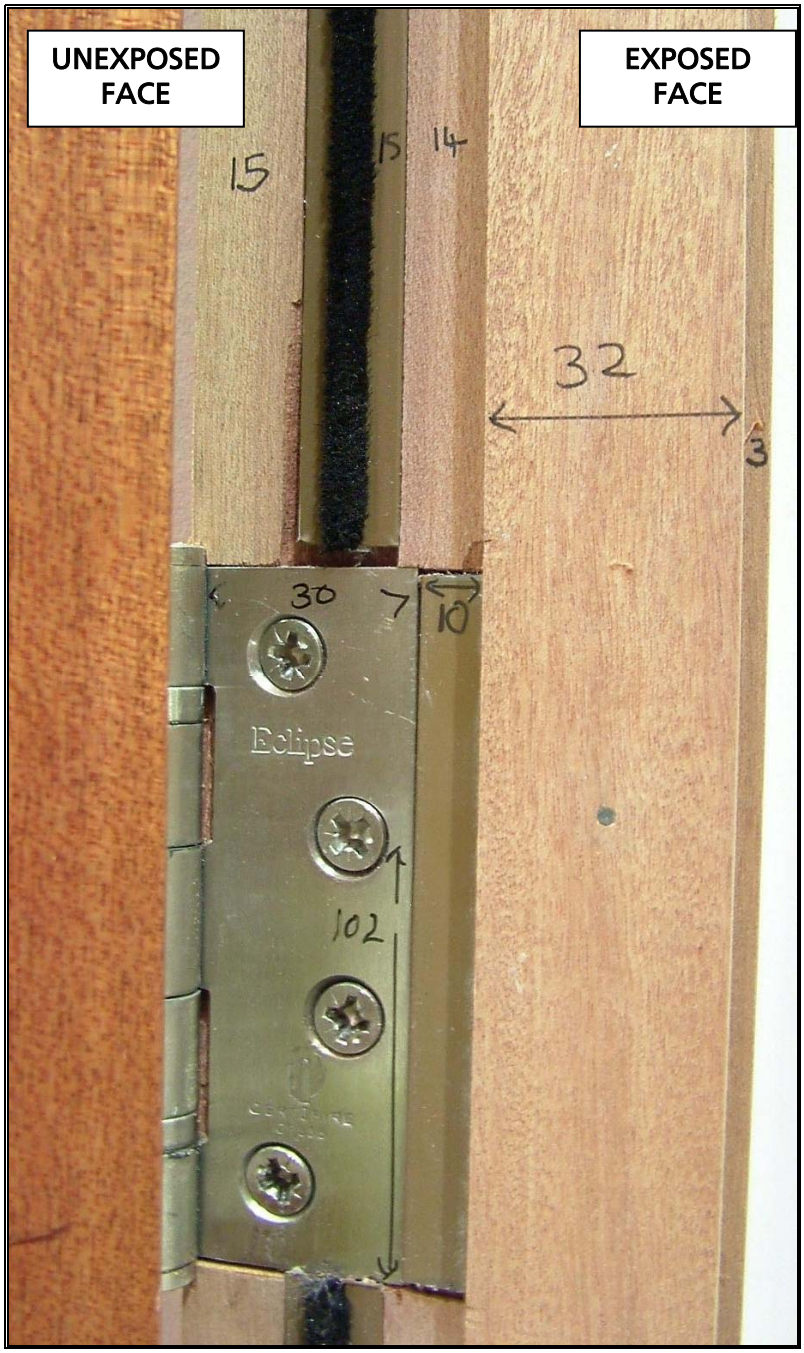
9.12 Doorset B - hinge and intumescent strips in door frame



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9.13 Doorset A - head of door leaf at 30 minutes

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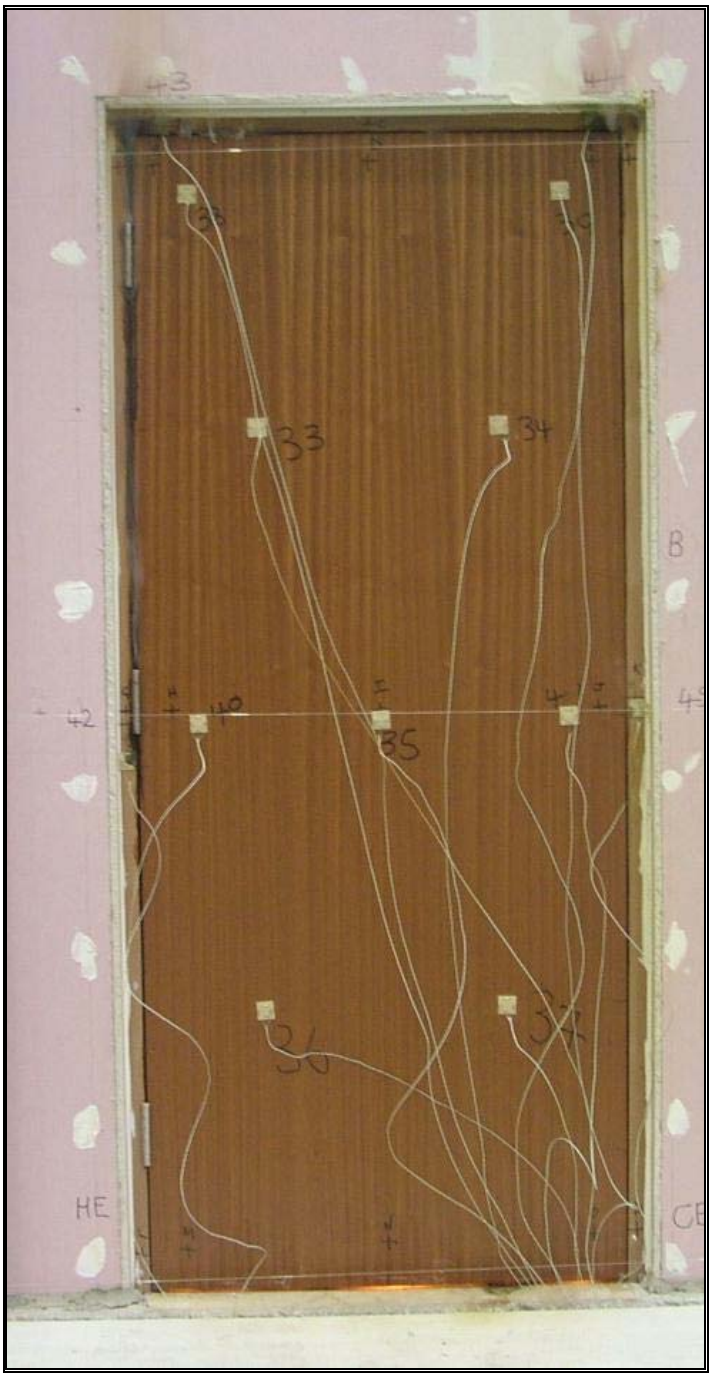
9.14 Doorset B – door leaf at 30 minutes



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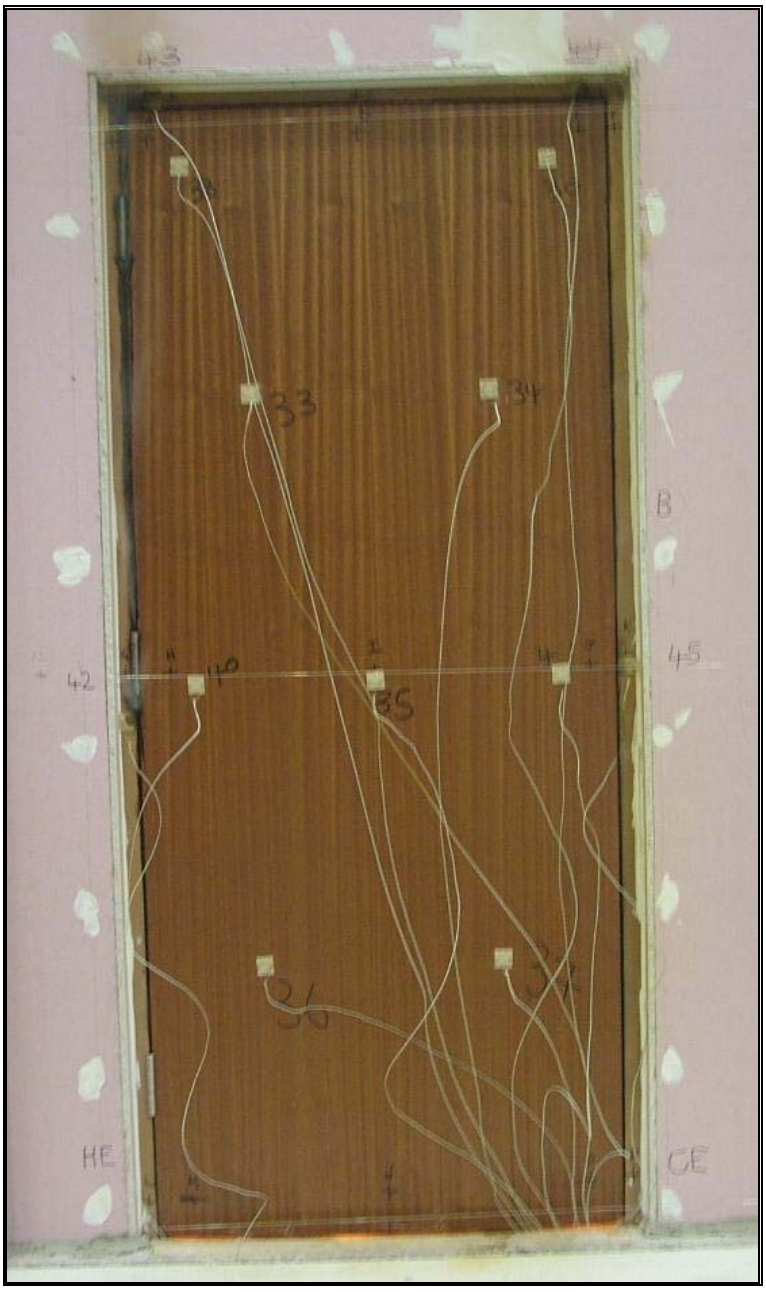
9.15 Doorset B – door leaf at 40 minutes



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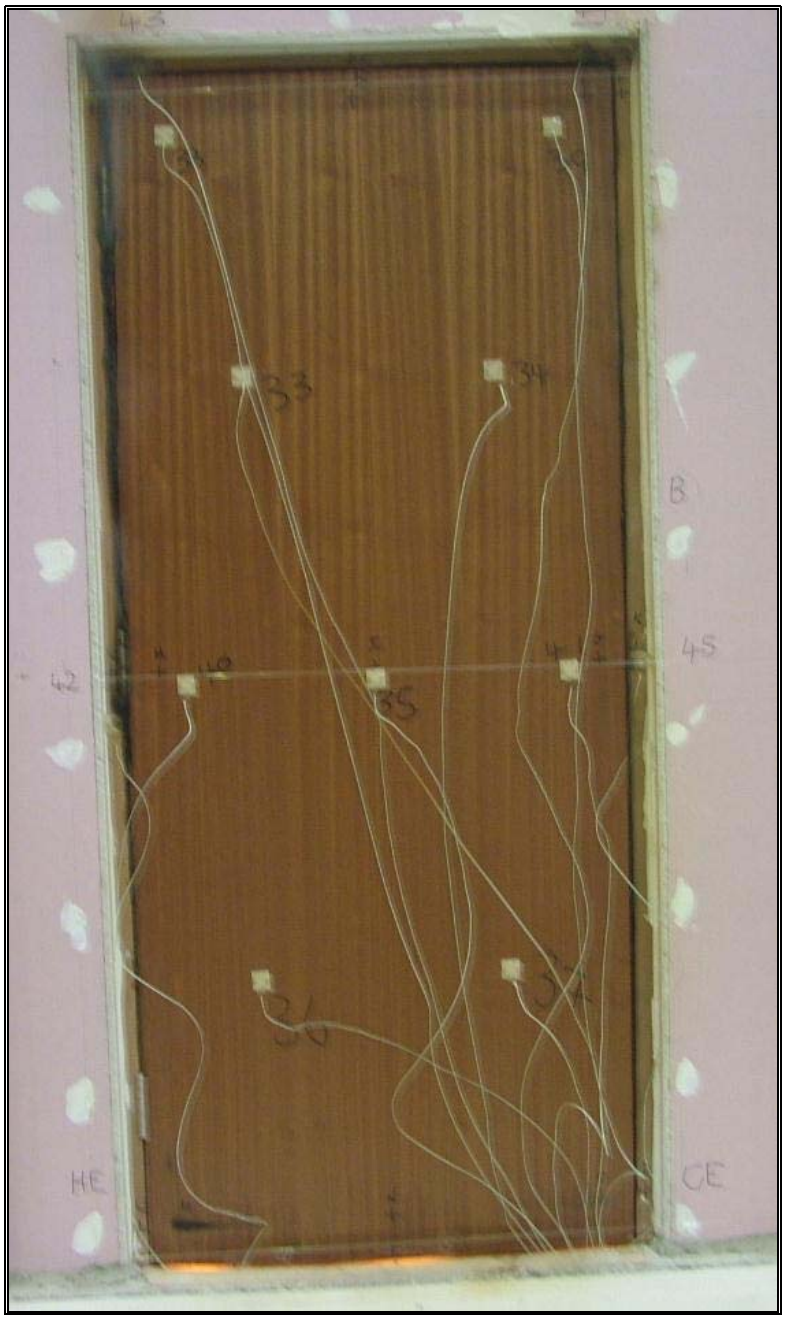
9.16 Doorset B – door leaf at 45 minutes



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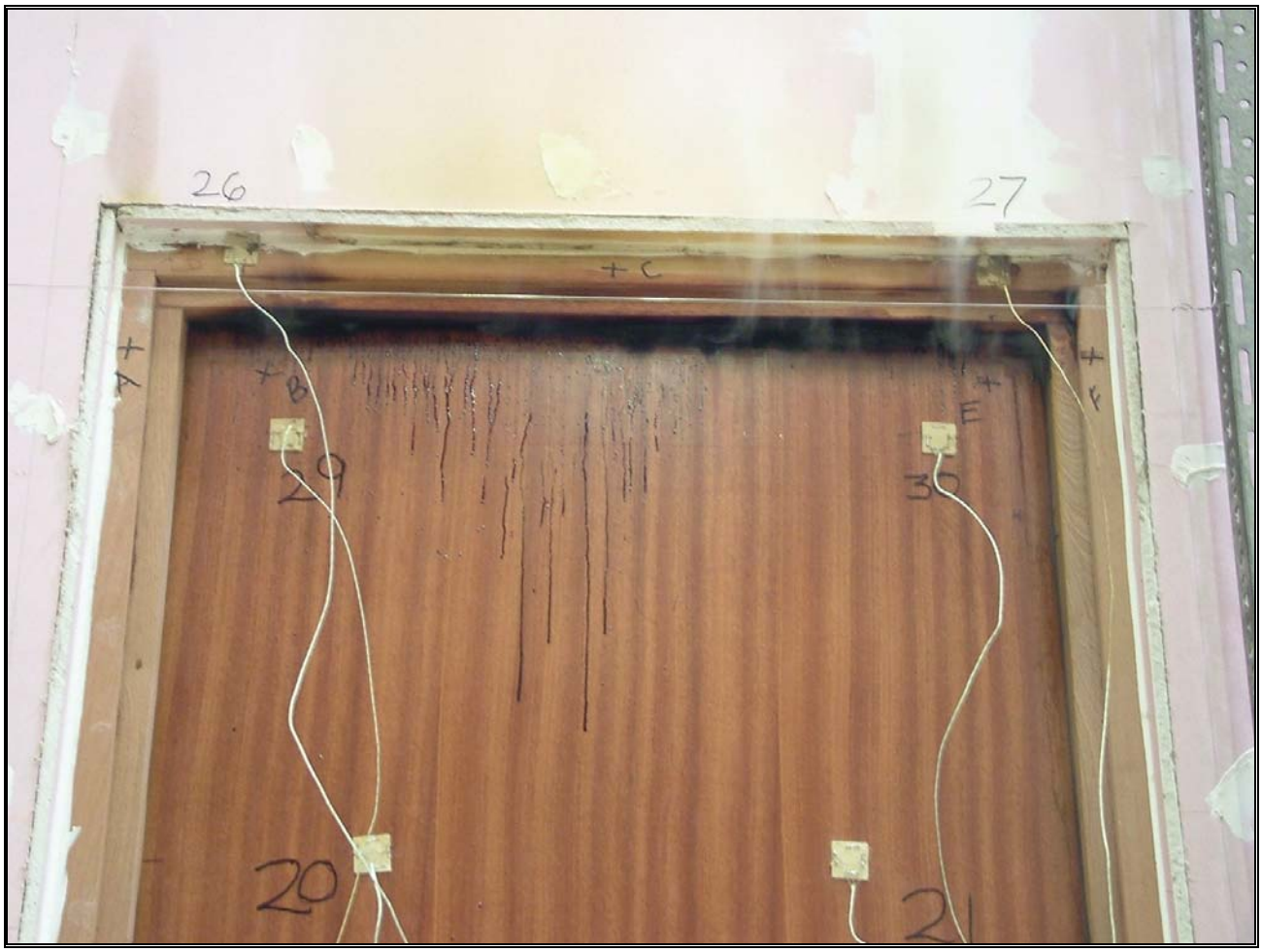
9.17 Doorset A - head of door leaf at 1 hour



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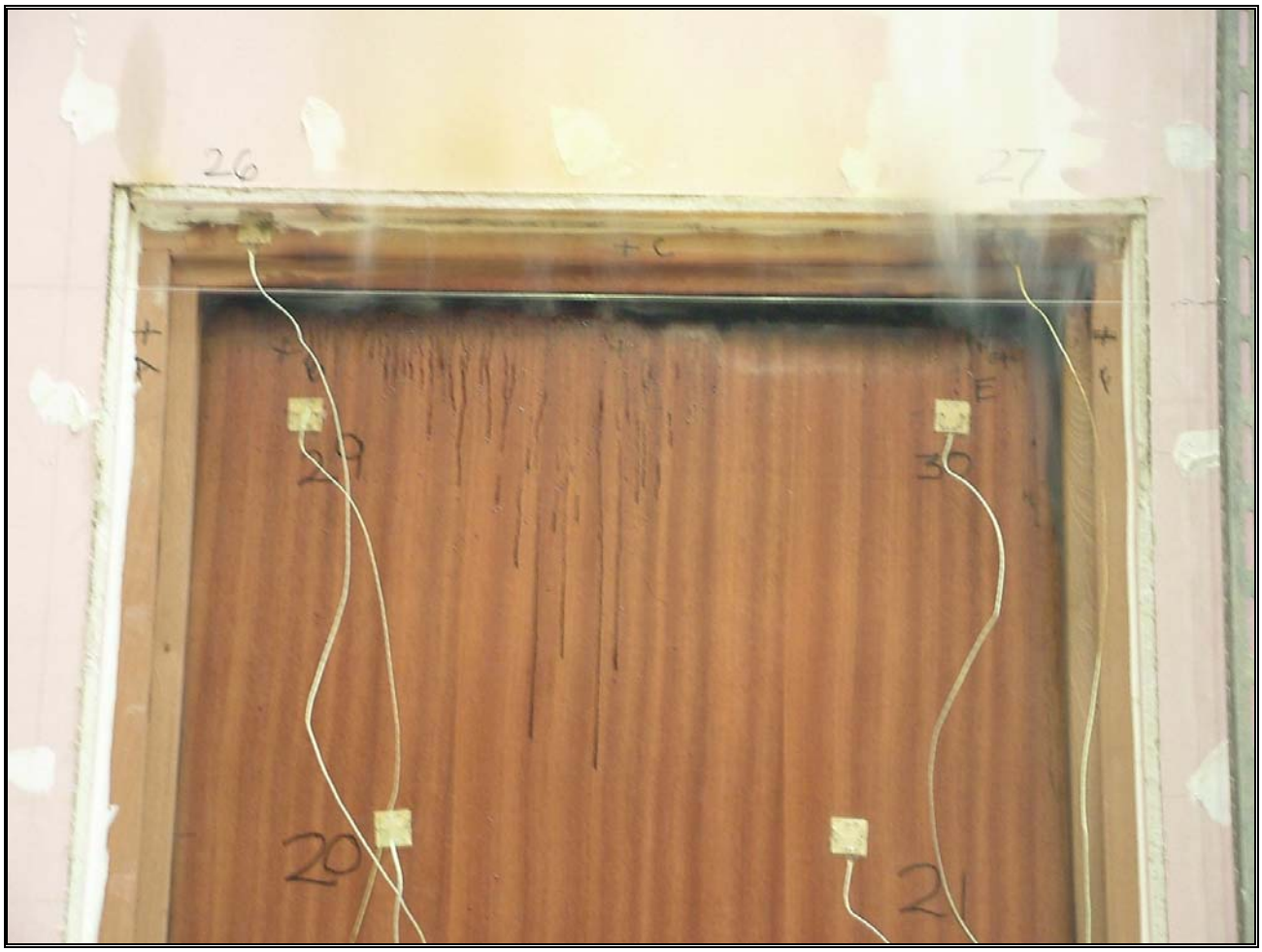
9.18 Doorset A - head of door leaf at 1 hour, 5 minutes



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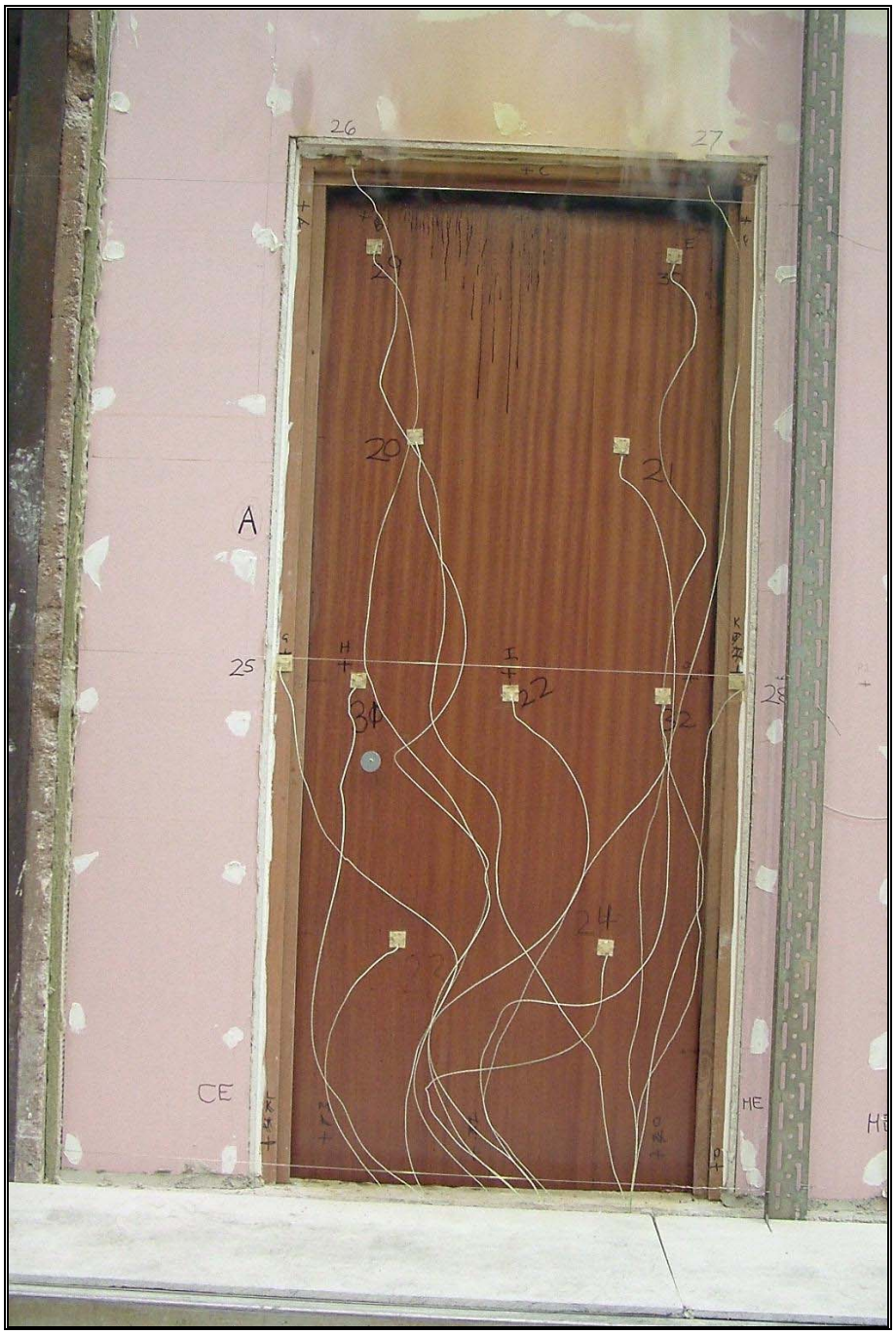
9.19 Doorset A – unexposed face at 1 hour, 5 minutes



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9.20 Doorset A – glow visible at hanging edge corner, at 1 hour, 7 minutes

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9.21 Doorset A – glow at corner and adjacent to top hinge, at 1 hour, 7 minutes

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9.22 Doorset A – unexposed face at 1 hour, 11 minutes

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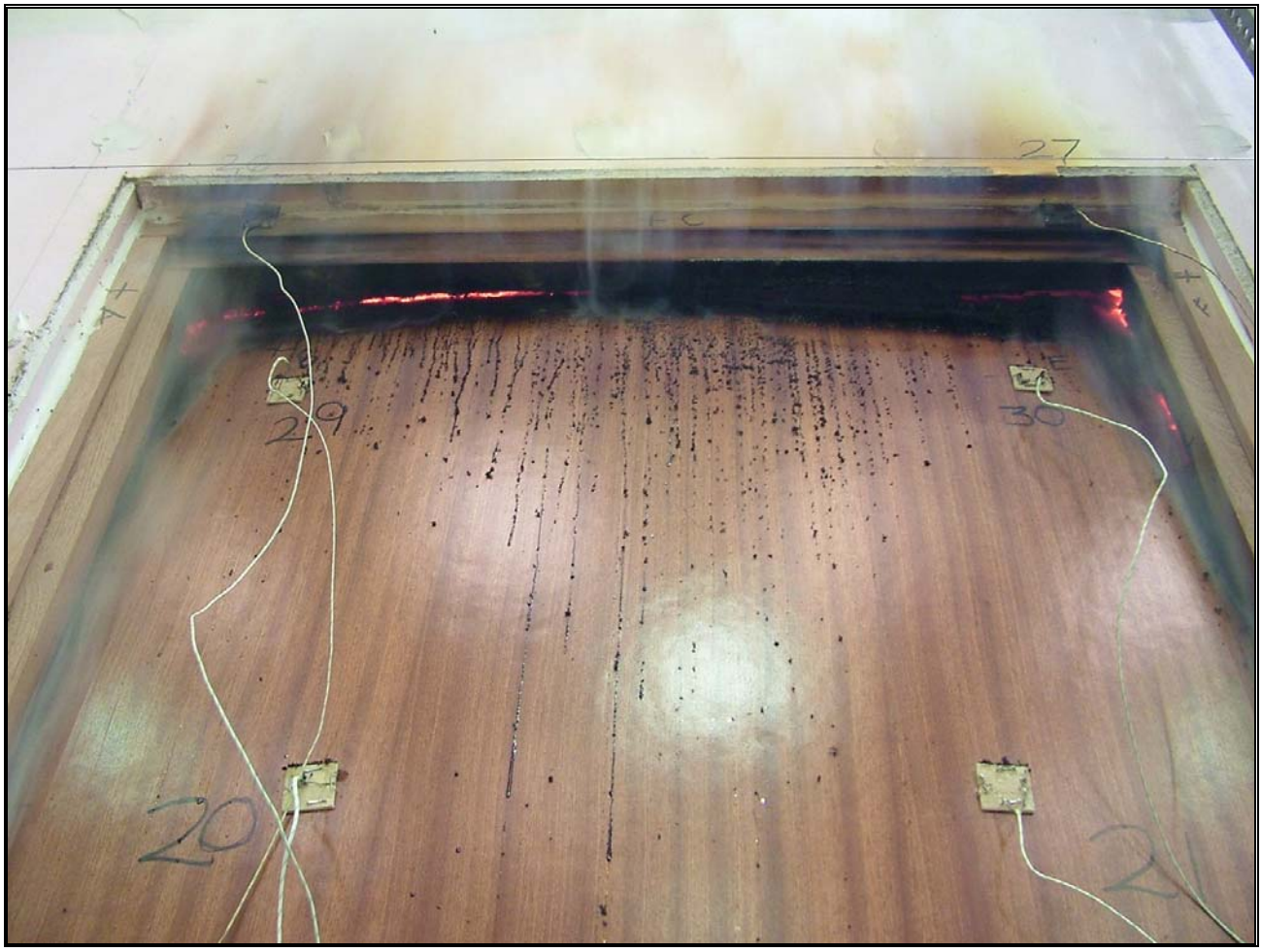
9.23 Doorset A – head of door leaf at 1 hour, 11 minutes



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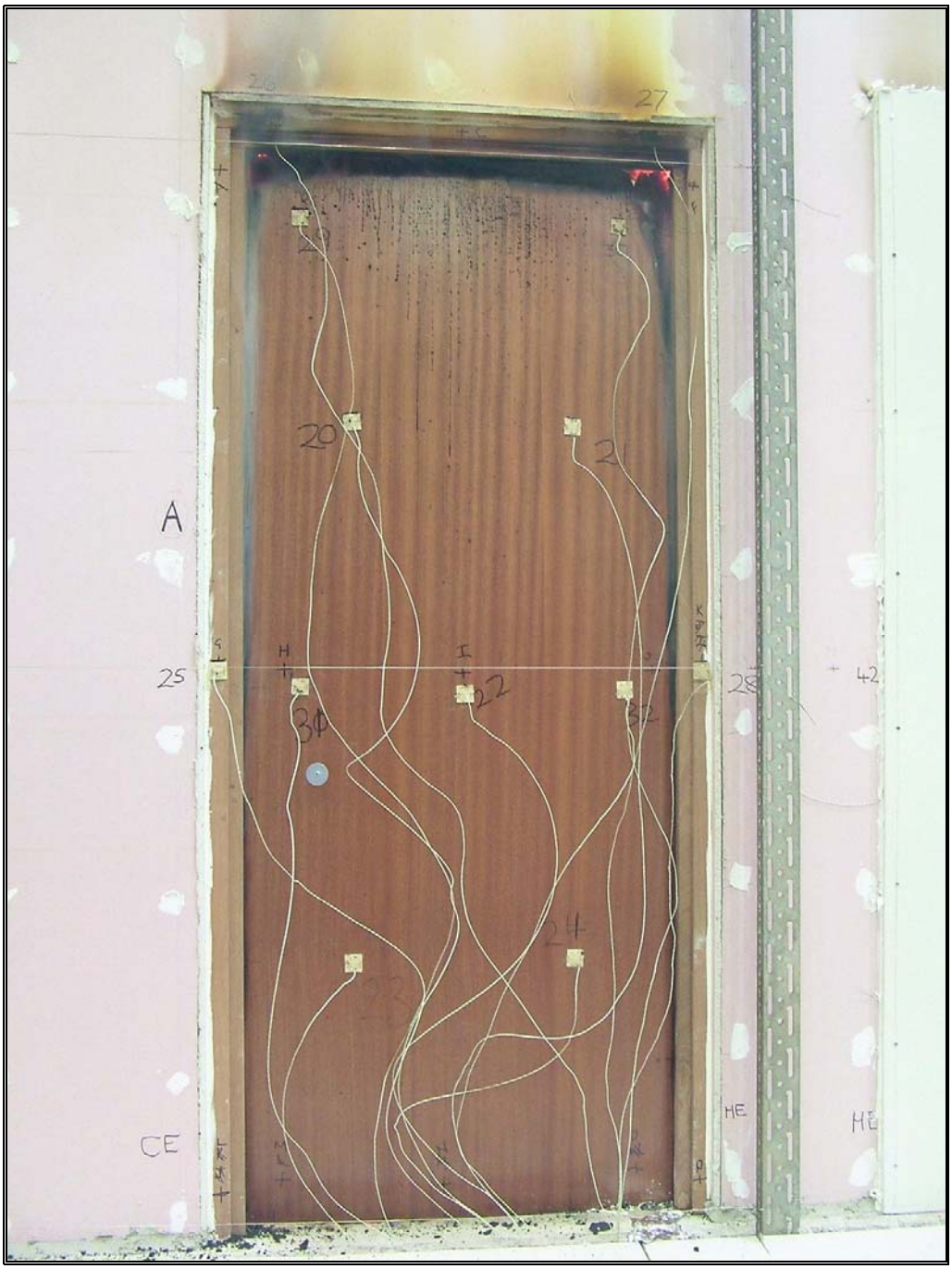
9.24 Doorset A – unexposed face at 1 hour, 15 minutes



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9.25 Doorset A – door leaf showing integrity failure, at 1 hour, 15 minutes

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9.26 Doorset A – head of door leaf bowing into furnace at 1 hour, 20 minutes