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**Title:**

The fire resistance performance of two specimens of double-acting, single-leaf doorsets incorporating various items of building hardware in accordance with BS EN 1634-1: 2008

**Report No:**

324188

**Prepared for:**

**D&E Architectural Hardware Limited**

17 Royce Road  
Carr Road Industrial Estate  
Peterborough  
Cambridgeshire  
PE1 5YB

**Date: 6<sup>th</sup> May 2013**

**Notified Body No:**

0833



## Summary

**Objective** To determine the fire resistance performance of two double-acting, single-leaf timber based doorsets incorporating various building hardware, mounted within a low-density rigid supporting construction, in accordance with BS EN 1634-1: 2008.

**Test Sponsor** **D&E Architectural Hardware Limited**, 17 Royce Road, Carr Road Industrial Estate, Peterborough, Cambridgeshire, PE1 5YB.

**Summary of Tested Specimen** For the purposes of the test, the doorsets were referenced Doorset A and Doorset B.

**Doorset A** had overall dimensions of 2020 mm high by 1025 mm wide and incorporated a door leaf of overall dimensions 1975 mm high by 932 mm wide by 44 mm thick. The door leaf was hung within a softwood door frame on three Double Action Spring Hinges referenced 'LIOBEX – DELDA06 / No.36 / 126101'. The door leaf comprised a three layer particle board Halspan core, timber stiles and rails and hardwood lippings to the vertical edges. The doorset incorporated three door viewers referenced 'DE3850 SI', 'DESWLAFNP EI30' and 'DEC2AFNP EI30'.

**Doorset B** had overall dimensions of 2018 mm high by 1032 mm wide and incorporated a door leaf of overall dimensions 1975 mm high by 930 mm wide by 54 mm thick. The door leaf was hung within a hardwood door frame on two Double Action Spring Hinges referenced 'LIOBEX – DELDA08 / No.42 / 128101'. The door leaf comprised a three layer particle board Halspan core, timber stiles and rails and hardwood lippings to the vertical edges. The doorset incorporated two door viewers referenced 'DE3850 GD' and 'DESWLAFNP EI60'.

| Test Results:          |                   | Doorset A  | Doorset B   |
|------------------------|-------------------|------------|-------------|
| Integrity performance  | Sustained flaming | 36 minutes | 61 minutes  |
|                        | Gap gauge         | 36 minutes | 66 minutes* |
|                        | Cotton Pad        | 36 minutes | 61 minutes  |
| Insulation performance |                   | 36 minutes | 61 minutes  |

\* The test duration. The test was discontinued after a period of 66 minutes.

**Date of Test** 9<sup>th</sup> January 2013.

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## Signatories

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**N. Howard\***  
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Approved  
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Principal Certification Engineer



Head of Department  
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Operations Manager

\* For and on behalf of **Exova Warringtonfire**.

Report Issued

**Date** : 6<sup>th</sup> May 2013

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# Test Procedure

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## Introduction

The doorsets are required to provide a fire separating function and were therefore tested in accordance with BS EN 1634-1: 2008 'Fire resistance tests for doors and shutter assemblies - Part 1: Fire doors and shutters'. This test report should be read in conjunction with that Standard and with BS EN 1363-1: 1999, 'Fire resistance tests - Part 1: General requirements' and BS EN 1363-2: 1999, 'Fire resistance tests - Part 2: Alternative and additional procedures'.

The specimens were judged on their ability to comply with the performance criteria for integrity and insulation, as required by BS EN 1634-1: 2008.

The specific purpose of the test was to evaluate the effects of the inclusion of various items of building hardware into a previously tested doorset construction. Because of this, no direct field of application for the doorsets are included in this report.

## Fire Test Study Group/EGOLF

Certain aspects of some fire test specifications are open to different interpretations. The Fire Test Study Group and EGOLF have identified a number of such areas and have agreed Resolutions, which define common agreement of interpretations between fire test laboratories, which are members of the Groups. Where such Resolutions are applicable to this test they have been followed.

## Instruction To test

The test was conducted on the 9<sup>th</sup> January 2013 on behalf of **D&E Architectural Hardware Limited**, the sponsor of the test.

## Test Specimen Construction

A comprehensive description of the test construction is given in the Schedule of Components. The description is based on a detailed survey of the specimen and information supplied by the sponsor of the test.

The doorsets installation and test preparation took place in the test laboratory between the 7<sup>th</sup> and 9<sup>th</sup> January 2013.

## Sampling

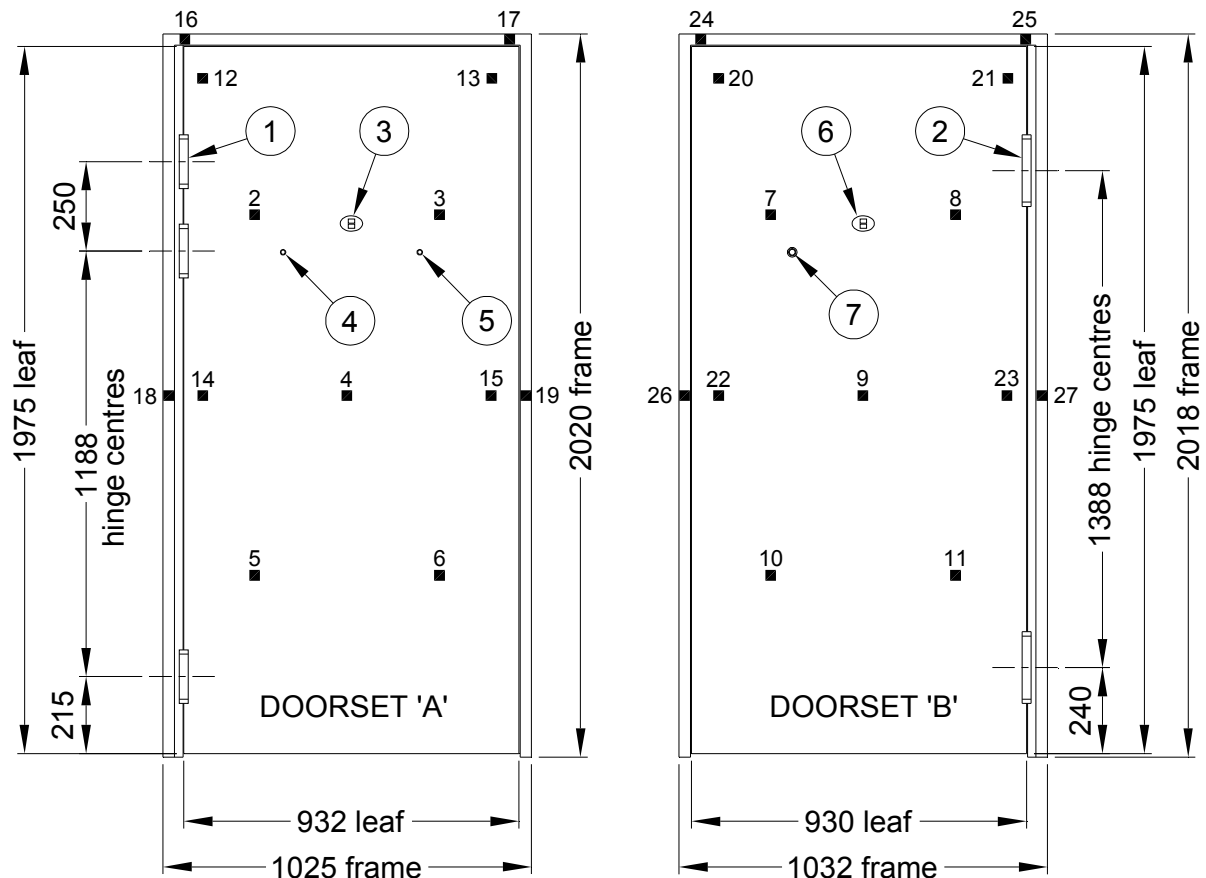
**Exova Warringtonfire** was not involved in any selection or sampling procedures of the building hardware.

## Conditioning

The specimens' storage, construction, and test preparation took place in the test laboratory over a total, combined time of 5 days. Throughout this period of time both the temperature and the humidity of the laboratory were measured and recorded as being within a range of from 10°C to 19°C and 57% to 86% respectively.

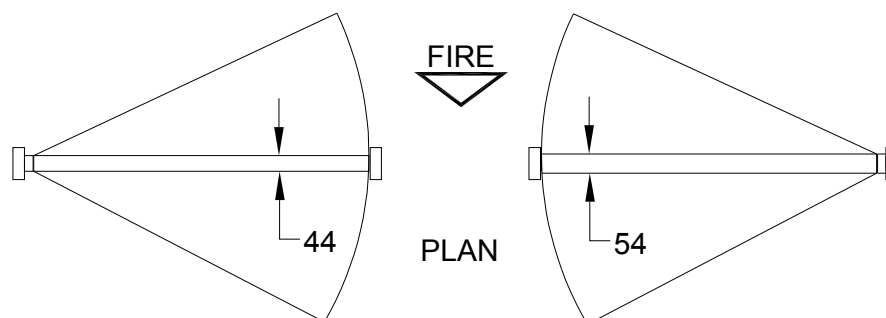
# Test Specimen

Figure 1- General Elevation of Test Specimens and Unexposed Face Thermocouples



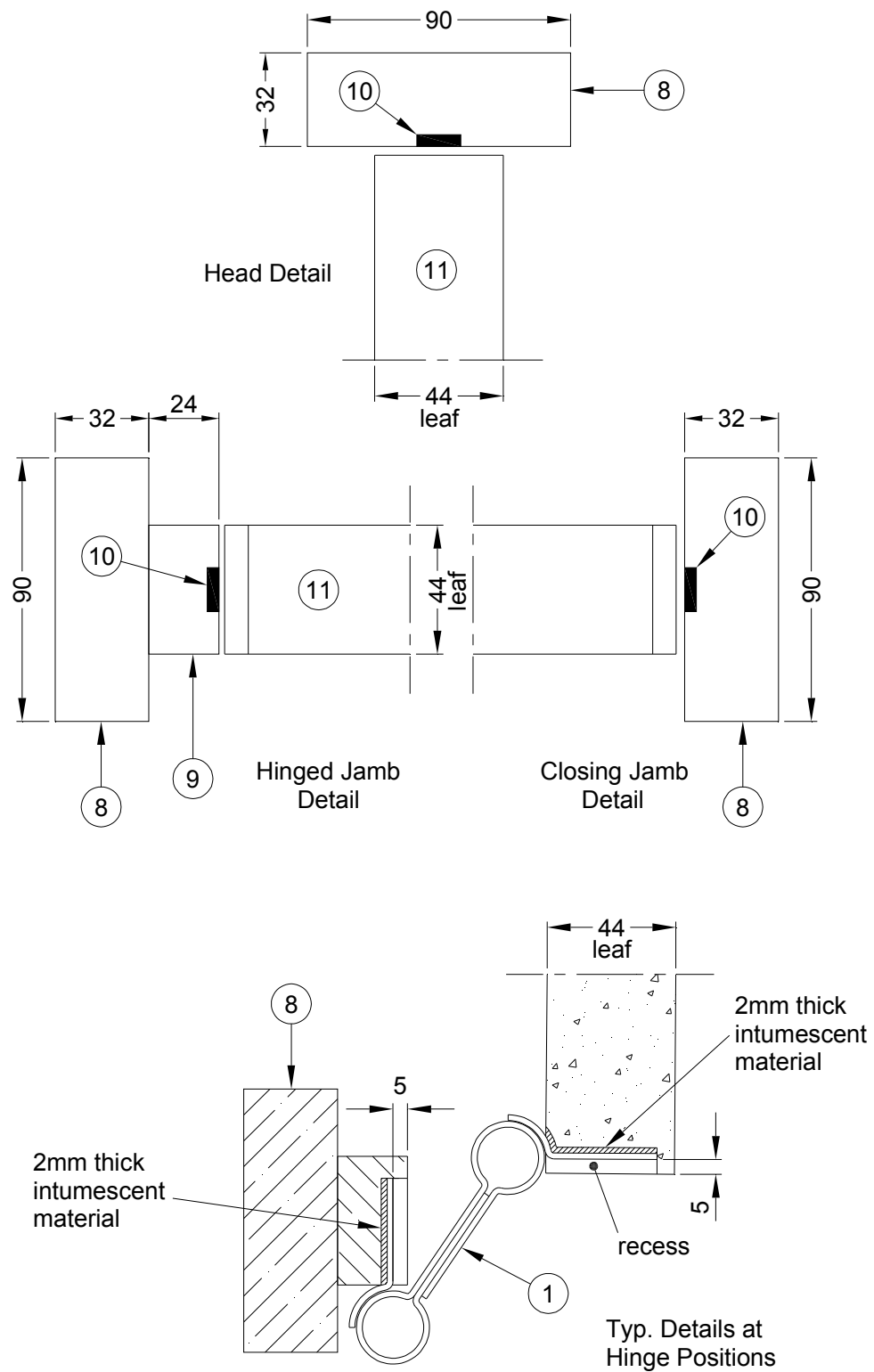
GENERAL ELEVATION  
OF UNEXPOSED FACE

■ Positions of thermocouples



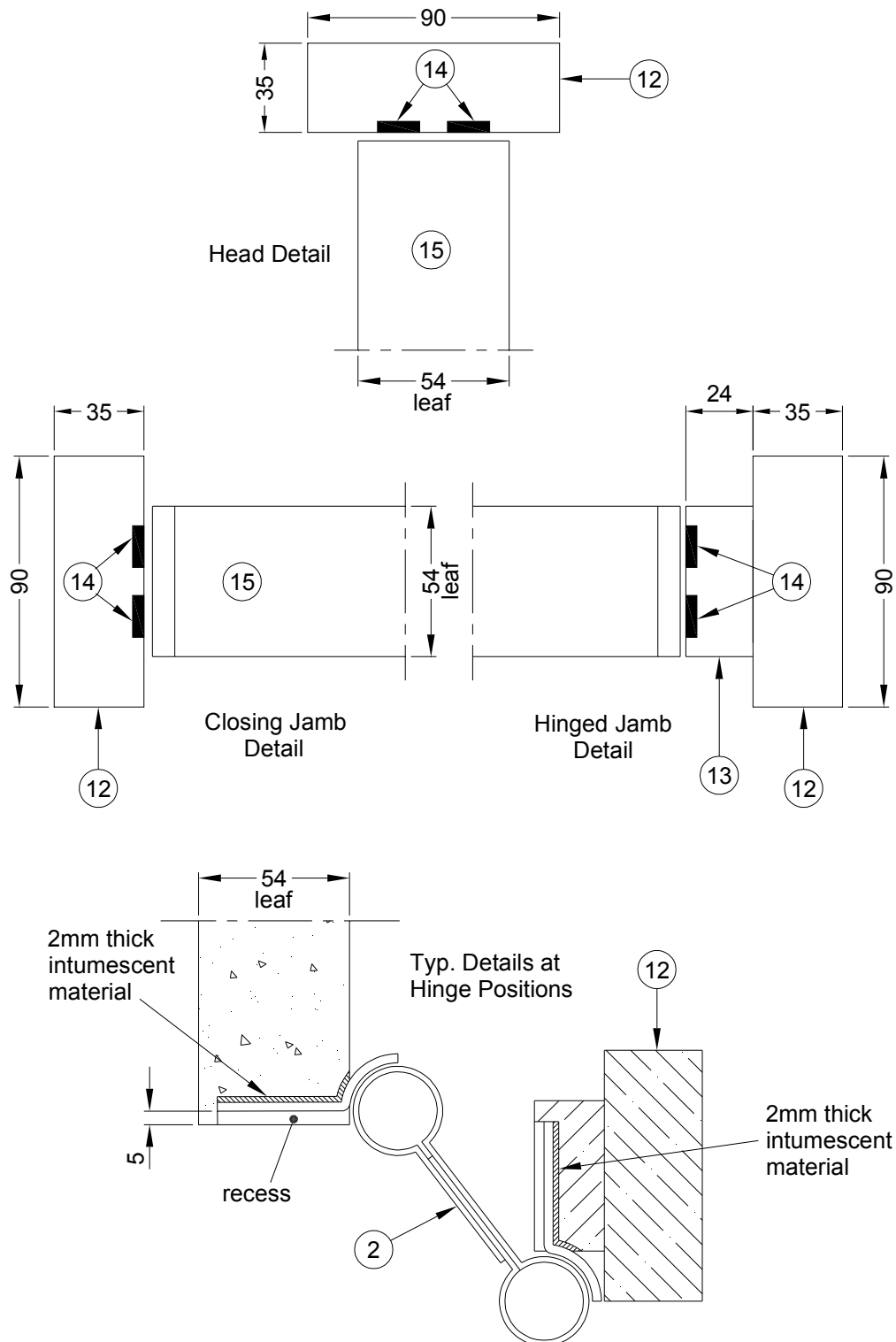
Do not scale. All dimensions are in mm

**Figure 2 – Typical Details of Doorset 'A'**



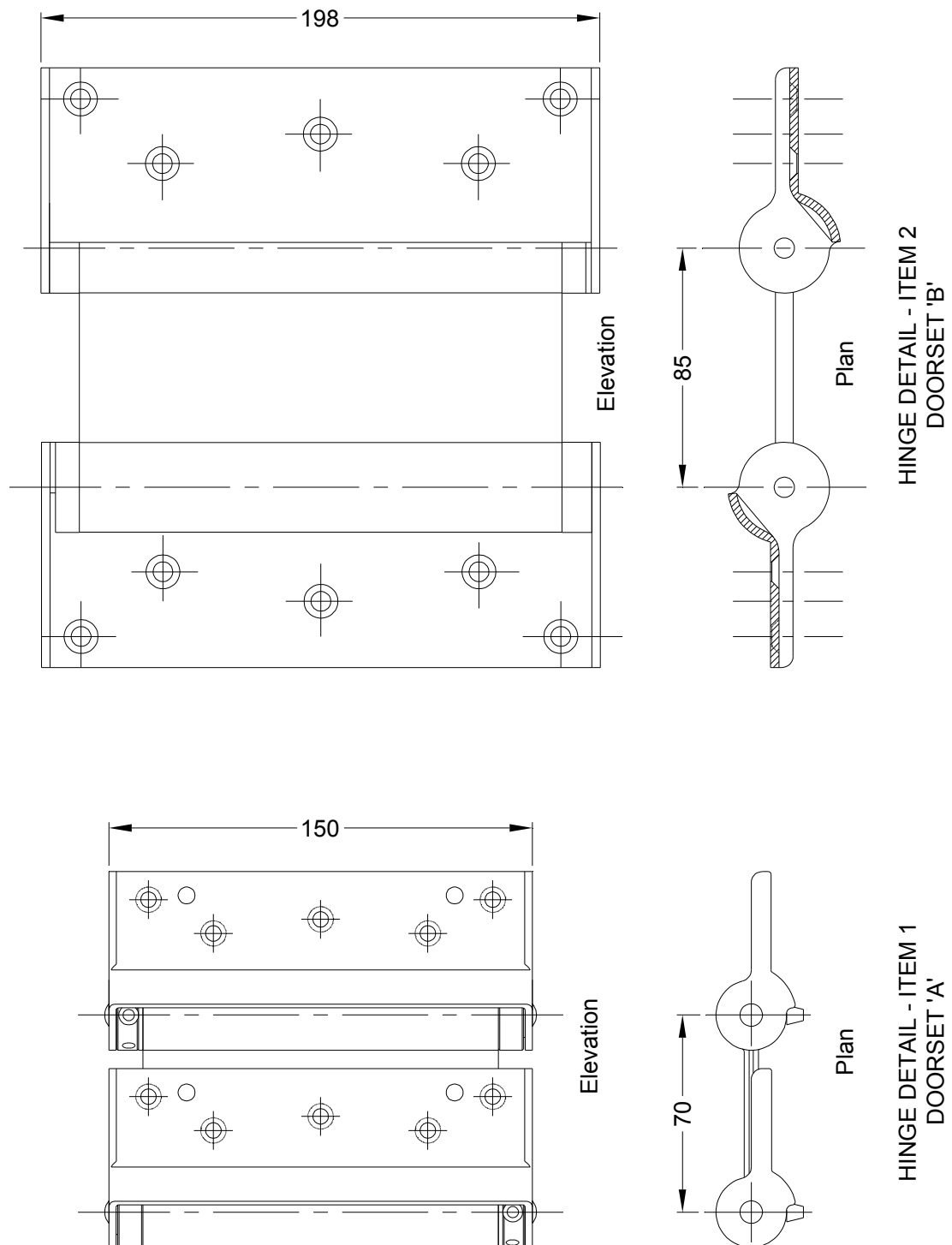
Do not scale. All dimensions are in mm

**Figure 3 – Typical Details of Doorset 'B'**



Do not scale. All dimensions are in mm

Figure 4 – Hinge Details



Do not scale. All dimensions are in mm

# Schedule of Components

(Refer to Figures 1 to 4)  
(All values are nominal unless stated otherwise)  
(All other details are as stated by the sponsor)

| <u>Item</u>                             | <u>Description</u>                                                                                                                           |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. Hinges – Doorset ‘A’</b>          |                                                                                                                                              |
| Manufacturer                            | : D&E Architectural Hardware Limited                                                                                                         |
| Reference                               | : LIOBEX – DELDA06 / No.36 / 126101                                                                                                          |
| Type                                    | : Double Action Spring Hinge                                                                                                                 |
| Material                                | : Mild steel                                                                                                                                 |
| Quantity                                | : 3 no. hinges, at positions shown on Figure 1                                                                                               |
| Overall size                            | : 150 mm long blade. See Figure 4.                                                                                                           |
| Fixing method                           | : Hinge blades screw fixed and bedded within a recess in both door frame and door leaf.                                                      |
| Details of Fixings                      |                                                                                                                                              |
| i. type                                 | : Countersunk head woodscrews                                                                                                                |
| ii. material                            | : Steel                                                                                                                                      |
| iii. size                               | : 30 mm long x 5 mm diameter                                                                                                                 |
| iv. number off per blade                | : 5 no. screws                                                                                                                               |
| Details of intumescent bedding material |                                                                                                                                              |
| i. reference                            | : The sponsor has provided details of the intumescent material used and this is retained within our confidential files relating to the test. |
| ii. thickness                           | : 2 mm                                                                                                                                       |
| iii. location                           | : Fitted beneath full length of each hinge blade in contact with the door leaf and door frame.                                               |
| <b>2. Hinges – Doorset ‘B’</b>          |                                                                                                                                              |
| Manufacturer                            | : D&E Architectural Hardware Limited                                                                                                         |
| Reference                               | : LIOBEX – DELDA08 / No.42 / 128101                                                                                                          |
| Type                                    | : Double Action Spring Hinge                                                                                                                 |
| Material                                | : Mild steel                                                                                                                                 |
| Quantity                                | : 2 no. hinges, at positions shown on Figure 1                                                                                               |
| Overall size                            | : 198 mm long blade. See Figure 4.                                                                                                           |
| Fixing method                           | : Hinge blades screw fixed and bedded within a recess in both door frame and door leaf.                                                      |
| Details of Fixings                      |                                                                                                                                              |
| i. type                                 | : Countersunk head woodscrews                                                                                                                |
| ii. material                            | : Steel                                                                                                                                      |
| iii. size                               | : 30 mm long x 5 mm diameter                                                                                                                 |
| iv. number off per blade                | : 5 no. screws                                                                                                                               |
| Details of intumescent bedding material |                                                                                                                                              |
| i. reference                            | : The sponsor has provided details of the intumescent material used and this is retained within our confidential files relating to the test. |
| ii. thickness                           | : 2 mm                                                                                                                                       |
| iii. location                           | : Fitted beneath full length of each hinge blade in contact with the door leaf and door frame.                                               |
| <b>3. Door Viewer – Doorset ‘A’</b>     |                                                                                                                                              |
| Manufacturer                            | : D&E Architectural Hardware Limited                                                                                                         |
| Reference                               | : DE3850 SI                                                                                                                                  |
| Material                                | : ABS plastic (silver finish)                                                                                                                |

| <b><u>Item</u></b>                      | <b><u>Description</u></b>                                                                                                                                               |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>3. Door Viewer – continued</b>       |                                                                                                                                                                         |
| Drill hole size                         | : 42 mm diameter                                                                                                                                                        |
| Fixing method to door leaf              | : Components screwed together                                                                                                                                           |
| Details of intumescent bedding material |                                                                                                                                                                         |
| i. reference                            | : The sponsor has provided details of the intumescent material used and this is retained within our confidential files relating to the test.                            |
| ii. size                                | : 2 mm thick x 23 mm wide x 101 mm long strip fitted inside viewer body, behind viewing lens.<br>2 mm thick x 44 mm wide x 132 mm long strip fitted around viewer body. |
| <b>4. Door Viewer – Doorset ‘A’</b>     |                                                                                                                                                                         |
| Manufacturer                            | : D&E Architectural Hardware Limited                                                                                                                                    |
| Reference                               | : DESWLAFNP EI30                                                                                                                                                        |
| Material                                | : Nickel plated brass, glass lens                                                                                                                                       |
| Drill hole size                         | : 14 mm diameter                                                                                                                                                        |
| Fixing method to door leaf              | : Components screwed together, with interior cover to exposed face.                                                                                                     |
| Details of Bedding material             | : None fitted                                                                                                                                                           |
| <b>5. Door Viewer – Doorset ‘A’</b>     |                                                                                                                                                                         |
| Manufacturer                            | : D&E Architectural Hardware Limited                                                                                                                                    |
| Reference                               | : DEC2AFNP EI30                                                                                                                                                         |
| Material                                | : Nickel plated brass, glass lens                                                                                                                                       |
| Drill hole size                         | : 12 mm diameter                                                                                                                                                        |
| Fixing method to door leaf              | : Components screwed together, with interior cover to exposed face.                                                                                                     |
| Details of Bedding material             | : None fitted                                                                                                                                                           |
| <b>6. Door Viewer – Doorset ‘B’</b>     |                                                                                                                                                                         |
| Manufacturer                            | : D&E Architectural Hardware Limited                                                                                                                                    |
| Reference                               | : DE3850 GD                                                                                                                                                             |
| Material                                | : ABS plastic (gold finish)                                                                                                                                             |
| Drill hole size                         | : 42 mm diameter                                                                                                                                                        |
| Fixing method to door leaf              | : Components screwed together                                                                                                                                           |
| Details of intumescent bedding material |                                                                                                                                                                         |
| i. reference                            | : The sponsor has provided details of the intumescent material used and this is retained within our confidential files relating to the test.                            |
| ii. size                                | : 2 mm thick x 23 mm wide x 101 mm long strip fitted inside viewer body, behind viewing lens.<br>2 mm thick x 54 mm wide x 132 mm long strip fitted around viewer body. |
| <b>7. Door Viewer – Doorset ‘B’</b>     |                                                                                                                                                                         |
| Manufacturer                            | : D&E Architectural Hardware Limited                                                                                                                                    |
| Reference                               | : DESWLAFNP EI60                                                                                                                                                        |
| Material                                | : Nickel plated brass, glass lens                                                                                                                                       |
| Drill hole size                         | : 14 mm diameter                                                                                                                                                        |
| Fixing method to door leaf              | : Components screwed together, with interior cover to exposed face.                                                                                                     |
| Details of Bedding material             | : None fitted                                                                                                                                                           |

**Timber Doorset 'A' (supplied by Exova Warringtonfire) consisting of items 8 to 11****8. Door frame Jambs and Head**

|                                   |                                                                     |
|-----------------------------------|---------------------------------------------------------------------|
| Material                          | : Timber, softwood                                                  |
| Nominal Density                   | : 510 kg/m <sup>3</sup>                                             |
| Overall section size              | : 90 mm x 32 mm                                                     |
| Jambs to head jointing method     | : Jointed and screwed                                               |
| Fixing method to masonry surround |                                                                     |
| i. type                           | : Countersunk head steel screws into plastic plugs along each jamb. |
| ii. size                          | : 100 mm long x 5.6 mm (No.12) diameter screws                      |

**9. Planted Stop**

|                      |                                            |
|----------------------|--------------------------------------------|
| Material             | : Timber, softwood                         |
| Nominal Density      | : 510 kg/m <sup>3</sup>                    |
| Overall section size | : 44 mm x 24 mm                            |
| Fixing method        | : Pinned along door frame hinged jamb only |

**10. Door Frame Intumescent seal**

|                      |                                                                                                                                             |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Manufacturer         | : Intumescent Seals Limited                                                                                                                 |
| Material             | : Graphite based intumescent within a polyvinyl chloride (PVC) carrier.                                                                     |
| Overall section size | : 15 mm wide x 4 mm deep carrier                                                                                                            |
| Fixing method        | : Single seal self-adhesive fixed within a central groove along door frame jambs and head. The seal was interrupted at each hinge position. |

**11. Door Leaf**

|              |                                                                                                                                                                          |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Manufacturer | : Halspan                                                                                                                                                                |
| Reference    | : 'Optima' door blank                                                                                                                                                    |
| Material     | : 3-layer particle board. Door blank fitted with 8 mm thick Sapele hardwood lipping along the vertical edges by <b>Exova Warringtonfire</b> using formaldehyde adhesive. |
| Thickness    | : 44 mm                                                                                                                                                                  |

**Timber Doorset 'B' (supplied by Exova Warringtonfire) consisting of items 12 to 15****12. Door frame Jambs and Head**

|                                   |                                                                     |
|-----------------------------------|---------------------------------------------------------------------|
| Material                          | : Hardwood, species Sapele                                          |
| Overall section size              | : 90 mm x 35 mm                                                     |
| Jambs to head jointing method     | : Jointed and screwed                                               |
| Fixing method to masonry surround |                                                                     |
| i. type                           | : Countersunk head steel screws into plastic plugs along each jamb. |
| ii. size                          | : 100 mm long x 5.6 mm (No.12) diameter screws                      |

**13. Planted Stop**

|                      |                                            |
|----------------------|--------------------------------------------|
| Material             | : Hardwood, species Sapele                 |
| Overall section size | : 55 mm x 24 mm                            |
| Fixing method        | : Pinned along door frame hinged jamb only |

**14. Door Frame Intumescent seal**

|                      |                                                                                                                                              |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Manufacturer         | : Intumescent Seals Limited                                                                                                                  |
| Material             | : Graphite based intumescent within a polyvinyl chloride (PVC) carrier.                                                                      |
| Overall section size | : 15 mm wide x 4 mm deep carrier                                                                                                             |
| Fixing method        | : 2 no. seals self-adhesive fixed within grooves 10 mm apart along the door frame jambs and head. Both seals were interrupted at the hinges. |

**Item**

**Description**

**15. Door Leaf**

Manufacturer

: Halspan

Reference

: 'Prima' door blank

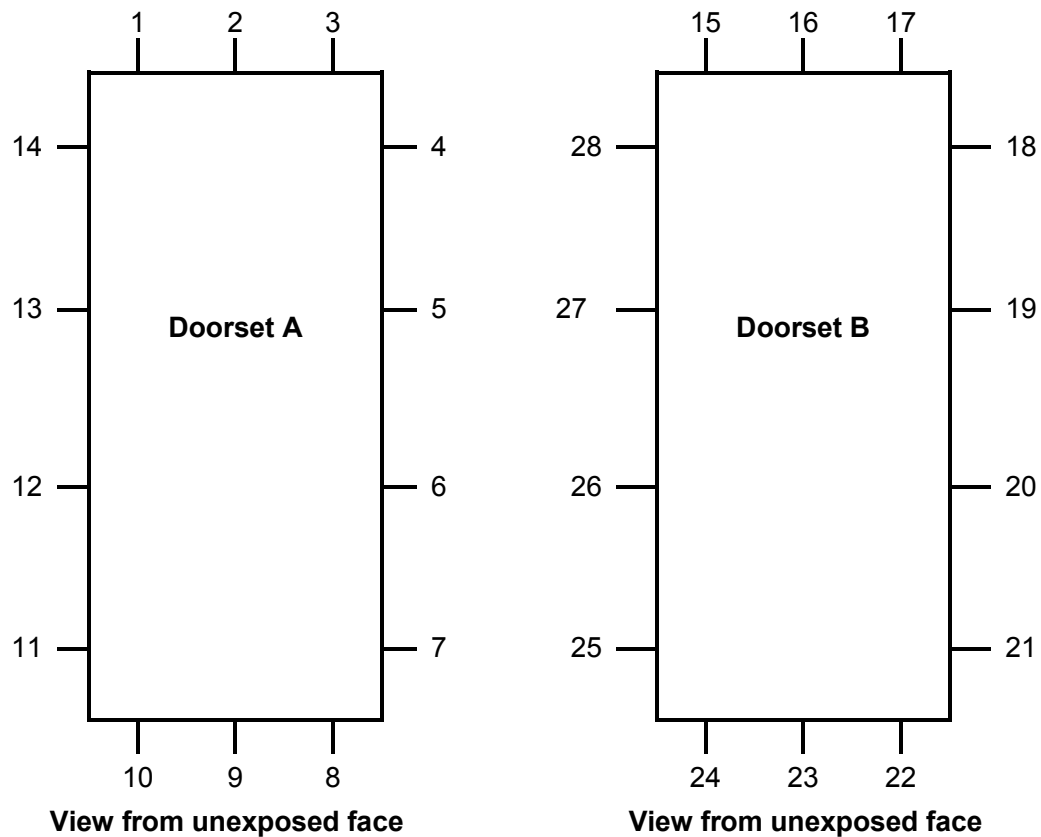
Material

: 3-layer particle board. Door blank fitted with 8 mm thick  
Sapele hardwood lipping along the vertical edges by  
**Exova Warringtonfire** using formaldehyde adhesive.

Thickness

: 54 mm

## Doorset clearance gaps



| Door Ref | Gap Dimension in mm at Positions |     |     |     |         |     |     |      |      |         |     |     |     |     |
|----------|----------------------------------|-----|-----|-----|---------|-----|-----|------|------|---------|-----|-----|-----|-----|
| A        | 1                                | 2   | 3   | 4   | 5       | 6   | 7   | 8*   | 9*   | 10*     | 11  | 12  | 13  | 14  |
|          | 3.4                              | 3.9 | 3.8 | 2.0 | 1.5     | 2.6 | 5.6 | 9.8  | 10.7 | 11.0    | 2.5 | 2.1 | 2.2 | 3.3 |
| B        | 15                               | 16  | 17  | 18  | 19      | 20  | 21  | 22*  | 23*  | 24*     | 25  | 26  | 27  | 28  |
|          | 2.3                              | 2.5 | 4.3 | 3.8 | 3.9     | 3.8 | 3.6 | 10.0 | 19.0 | 11.0    | 4.0 | 3.6 | 3.6 | 3.5 |
| A        | Mean                             |     | 3.0 |     | Maximum |     |     | 5.6  |      | Minimum |     |     | 1.5 |     |
| B        | Mean                             |     | 3.5 |     | Maximum |     |     | 4.3  |      | Minimum |     |     | 2.3 |     |

\* Dimension not included in calculations

# Gap not measured

DO NOT SCALE

ALL DIMENSIONS ARE IN mm

# Instrumentation

---

|                            |                                                                                                                                                                                                                                                                                               |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>General</b>             | The instrumentation was provided in accordance with the requirements of the Standard.                                                                                                                                                                                                         |
| <b>Furnace</b>             | The furnace was controlled so that its mean temperature complied with the requirements of BS EN 1363-1: 1999 Clause 5.1 using six plate thermometers, distributed over a plane 100 mm from the surface of the test construction.                                                              |
| <b>General</b>             | <p>Thermocouples were provided to monitor the unexposed surface of the specimen and the output of all instrumentation was recorded at no less than one minute intervals.</p> <p>The locations and reference numbers of the various unexposed surface thermocouples are shown in Figure 1.</p> |
| <b>Roving Thermocouple</b> | A roving thermocouple was available to measure temperatures on the unexposed surface of the specimen at any position, which might appear to be hotter than the temperatures indicated by the fixed thermocouples.                                                                             |
| <b>Integrity Criteria</b>  | Cotton pads and gap gauges were available to evaluate the integrity of the specimen.                                                                                                                                                                                                          |
| <b>Furnace Pressure</b>    | The furnace atmospheric pressure was controlled so that it complied with the requirements of BS EN 1363-1: 1999. Clause 5.2. The calculated pressure differential relative to the laboratory atmosphere at the top of the specimens was 13.6 ( $\pm 3$ ) Pa.                                  |

## Test Observations

| Time |      | All observations are from the unexposed face unless noted otherwise.                                                                                                                                                        |
|------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mins | Secs |                                                                                                                                                                                                                             |
|      |      | The ambient air temperature in the vicinity of the test construction was 12°C at the start of the test with a maximum variation of -1°C during the test.                                                                    |
| 00   | 00   | <b>The test commences.</b>                                                                                                                                                                                                  |
| 00   | 45   | Smoke issues from the head of Doorset A.                                                                                                                                                                                    |
| 01   | 50   | Smoke issues form the head of Doorset B.                                                                                                                                                                                    |
| 02   | 10   | The smoke release increases from each Doorset A and B now descending along each vertical edge.                                                                                                                              |
| 03   | 45   | Smoke issues from the two large plastic eye viewers on each doorset.                                                                                                                                                        |
| 05   | 40   | Large volumes of smoke issues from the top two hinges of Doorset A and the top hinge of Doorset B.                                                                                                                          |
| 09   | 00   | The smoke release from each Doorset A and B lessens.                                                                                                                                                                        |
| 10   | 20   | Smoke issues from the bottom left eye viewer position on Doorset A.                                                                                                                                                         |
| 12   | 00   | The exposed surface of each doorset is charred and cracked.                                                                                                                                                                 |
| 15   | 30   | The smoke release from the top hinge positions of each doorset lessens.                                                                                                                                                     |
| 17   | 30   | Very faint smoke release is evident from the bottom right eye viewer of Doorset A, the smoke release from the bottom left eye viewer increase in volume.                                                                    |
| 21   | 45   | The central plastic eye viewers of each doorset begin to pull away form the leaf as the intumescent backing expands.                                                                                                        |
| 26   | 00   | Smoke release is evident from the bottom hinge position of Doorset A.                                                                                                                                                       |
| 29   | 30   | The plastic eye viewer of Doorset A falls away.                                                                                                                                                                             |
| 30   | 00   | Each Doorset A and B continues to satisfy the integrity and insulation criteria of the test.                                                                                                                                |
| 30   | 20   | The plastic eye viewer of Doorset B falls away.                                                                                                                                                                             |
| 36   | 05   | Sustained flames issue from the bottom left eye viewer of Doorset A. <b>Sustained flaming integrity failure of Doorset A is deemed to occur</b> , glowing is evident at the bottom hinge position of the leaf of Doorset A. |
| 42   | 00   | Sustained flames issues from the leading edge of Doorset A.                                                                                                                                                                 |

| Time |      |                                                                                                                                                                      |
|------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mins | Secs |                                                                                                                                                                      |
| 43   | 20   | Sustained flames issues from the head of Doorset A.                                                                                                                  |
| 44   | 00   | Sustained flames issue from the 2 <sup>nd</sup> hinge down from the head of Doorset A. the door is blanked and sealed to allow for further examination of Doorset B. |
| 55   | 00   | Glowing is evident along the hardwood frame coincident with the bottom hinge of Doorset B.                                                                           |
| 60   | 00   | Doorset B continues to satisfy the integrity and insulation criteria of the test.                                                                                    |
| 61   | 40   | Sustained flames issue from the lower 500 mm of the leading edge of the leaf of Doorset B. <b>Sustained flame integrity failure of Doorset B is deemed to occur.</b> |
| 66   | 30   | <b>Test is discontinued at the sponsor's request.</b>                                                                                                                |

## Temperature and Deflection Data

Mean furnace temperature, together with the temperature/time relationship specified in the Standard

| Time<br>Mins | Specified<br>Furnace<br>Temperature<br>Deg. C | Actual<br>Furnace<br>Temperature<br>Deg. C |
|--------------|-----------------------------------------------|--------------------------------------------|
| 0            | 20                                            | 18                                         |
| 2            | 445                                           | 384                                        |
| 4            | 544                                           | 633                                        |
| 6            | 603                                           | 592                                        |
| 8            | 646                                           | 633                                        |
| 10           | 678                                           | 686                                        |
| 12           | 706                                           | 704                                        |
| 14           | 728                                           | 725                                        |
| 16           | 748                                           | 743                                        |
| 18           | 766                                           | 771                                        |
| 20           | 781                                           | 783                                        |
| 22           | 796                                           | 790                                        |
| 24           | 809                                           | 810                                        |
| 26           | 820                                           | 822                                        |
| 28           | 832                                           | 832                                        |
| 30           | 842                                           | 841                                        |
| 32           | 852                                           | 847                                        |
| 34           | 860                                           | 863                                        |
| 36           | 869                                           | 874                                        |
| 38           | 877                                           | 875                                        |
| 40           | 885                                           | 884                                        |
| 42           | 892                                           | 891                                        |
| 44           | 899                                           | 893                                        |
| 46           | 906                                           | 902                                        |
| 48           | 912                                           | 917                                        |
| 50           | 918                                           | 928                                        |
| 52           | 924                                           | 929                                        |
| 54           | 930                                           | 934                                        |
| 56           | 935                                           | 935                                        |
| 58           | 940                                           | 958                                        |
| 60           | 945                                           | 934                                        |
| 62           | 950                                           | 938                                        |
| 64           | 955                                           | 950                                        |
| 66           | 960                                           | 956                                        |
| 67           | 962                                           | 958                                        |

**Individual and mean temperatures recorded on the unexposed surface of Doorset A**

| Time<br>Mins | T/C<br>Number<br>2<br>Deg. C | T/C<br>Number<br>3<br>Deg. C | T/C<br>Number<br>4<br>Deg. C | T/C<br>Number<br>5<br>Deg. C | T/C<br>Number<br>6<br>Deg. C | Mean<br>Temp<br>Deg. C |
|--------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------|
| 0            | 14                           | 14                           | 14                           | 14                           | 15                           | 14                     |
| 2            | 14                           | 14                           | 14                           | 14                           | 15                           | 14                     |
| 4            | 14                           | 15                           | 15                           | 15                           | 16                           | 15                     |
| 6            | 14                           | 15                           | 15                           | 15                           | 16                           | 15                     |
| 8            | 16                           | 16                           | 15                           | 15                           | 16                           | 16                     |
| 10           | 19                           | 18                           | 17                           | 16                           | 17                           | 17                     |
| 12           | 27                           | 24                           | 20                           | 19                           | 20                           | 22                     |
| 14           | 37                           | 32                           | 26                           | 23                           | 25                           | 29                     |
| 16           | 44                           | 39                           | 32                           | 29                           | 31                           | 35                     |
| 18           | 50                           | 46                           | 38                           | 34                           | 37                           | 41                     |
| 20           | 55                           | 51                           | 43                           | 40                           | 42                           | 46                     |
| 22           | 61                           | 54                           | 48                           | 45                           | 46                           | 51                     |
| 24           | 73                           | 57                           | 52                           | 49                           | 50                           | 56                     |
| 26           | 80                           | 60                           | 55                           | 54                           | 54                           | 61                     |
| 28           | 88                           | 62                           | 58                           | 58                           | 58                           | 65                     |
| 30           | 96                           | 64                           | 61                           | 61                           | 61                           | 69                     |
| 32           | 102                          | 66                           | 64                           | 65                           | 64                           | 72                     |
| 34           | 106                          | 68                           | 67                           | 68                           | 67                           | 75                     |
| 36           | 108                          | 70                           | 69                           | 70                           | 70                           | 77                     |

**Individual and mean temperatures recorded on the unexposed surface of Doorset B**

| Time<br>Mins | T/C<br>Number<br>7<br>Deg. C | T/C<br>Number<br>8<br>Deg. C | T/C<br>Number<br>9<br>Deg. C | T/C<br>Number<br>10<br>Deg. C | T/C<br>Number<br>11<br>Deg. C | Mean<br>Temp<br>Deg. C |
|--------------|------------------------------|------------------------------|------------------------------|-------------------------------|-------------------------------|------------------------|
| 0            | 15                           | 16                           | 16                           | 16                            | 16                            | 16                     |
| 2            | 15                           | 16                           | 16                           | 16                            | 16                            | 16                     |
| 4            | 15                           | 16                           | 16                           | 16                            | 16                            | 16                     |
| 6            | 16                           | 17                           | 16                           | 16                            | 16                            | 16                     |
| 8            | 18                           | 17                           | 16                           | 16                            | 16                            | 16                     |
| 10           | 16                           | 17                           | 16                           | 16                            | 16                            | 16                     |
| 12           | 16                           | 17                           | 17                           | 17                            | 17                            | 17                     |
| 14           | 20                           | 19                           | 18                           | 18                            | 18                            | 18                     |
| 16           | 23                           | 22                           | 19                           | 19                            | 20                            | 20                     |
| 18           | 26                           | 25                           | 21                           | 22                            | 22                            | 22                     |
| 20           | 30                           | 28                           | 23                           | 24                            | 24                            | 24                     |
| 22           | 33                           | 31                           | 26                           | 26                            | 27                            | 27                     |
| 24           | 36                           | 33                           | 28                           | 29                            | 29                            | 29                     |
| 26           | 39                           | 36                           | 31                           | 31                            | 32                            | 32                     |
| 28           | 41                           | 38                           | 33                           | 34                            | 34                            | 34                     |
| 30           | 44                           | 40                           | 36                           | 36                            | 36                            | 36                     |
| 32           | 46                           | 43                           | 38                           | 38                            | 39                            | 39                     |
| 34           | 49                           | 45                           | 41                           | 40                            | 41                            | 41                     |
| 36           | 52                           | 47                           | 43                           | 43                            | 43                            | 43                     |
| 38           | 54                           | 50                           | 46                           | 45                            | 45                            | 45                     |
| 40           | 56                           | 52                           | 49                           | 48                            | 48                            | 48                     |
| 42           | 59                           | 55                           | 52                           | 50                            | 50                            | 50                     |
| 44           | 61                           | 57                           | 55                           | 53                            | 53                            | 53                     |
| 46           | 63                           | 60                           | 58                           | 55                            | 56                            | 56                     |
| 48           | 66                           | 62                           | 61                           | 58                            | 58                            | 58                     |
| 50           | 68                           | 65                           | 63                           | 60                            | 61                            | 61                     |
| 52           | 72                           | 67                           | 66                           | 63                            | 64                            | 64                     |
| 54           | 74                           | 69                           | 69                           | 66                            | 66                            | 66                     |
| 56           | 77                           | 72                           | 71                           | 69                            | 69                            | 69                     |
| 58           | 81                           | 74                           | 73                           | 71                            | 71                            | 71                     |
| 60           | 84                           | 76                           | 76                           | 74                            | 73                            | 73                     |
| 62           | 87                           | 79                           | 78                           | 76                            | 76                            | 76                     |
| 64           | 89                           | 81                           | 80                           | 78                            | 78                            | 78                     |
| 66           | 93                           | 83                           | 82                           | 81                            | 80                            | 80                     |
| 67           | 95                           | 85                           | 83                           | 82                            | 81                            | 81                     |

**Individual temperatures recorded on the unexposed surface of Doorset A**

| Time<br>Mins | T/C<br>Number<br>12<br>Deg. C | T/C<br>Number<br>13<br>Deg. C | T/C<br>Number<br>14<br>Deg. C | T/C<br>Number<br>15<br>Deg. C |
|--------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| 0            | 17                            | 17                            | 17                            | 12                            |
| 2            | 17                            | 17                            | 17                            | 12                            |
| 4            | 21                            | 19                            | 17                            | 14                            |
| 6            | 22                            | 19                            | 17                            | 14                            |
| 8            | 24                            | 20                            | 17                            | 14                            |
| 10           | 30                            | 23                            | 18                            | 15                            |
| 12           | 37                            | 30                            | 22                            | 17                            |
| 14           | 44                            | 38                            | 28                            | 21                            |
| 16           | 50                            | 46                            | 35                            | 26                            |
| 18           | 55                            | 52                            | 41                            | 32                            |
| 20           | 59                            | 57                            | 46                            | 37                            |
| 22           | 62                            | 60                            | 50                            | 42                            |
| 24           | 64                            | 63                            | 54                            | 47                            |
| 26           | 65                            | 65                            | 58                            | 51                            |
| 28           | 66                            | 67                            | 61                            | 55                            |
| 30           | 68                            | 69                            | 64                            | 58                            |
| 32           | 69                            | 71                            | 67                            | 62                            |
| 34           | 70                            | 73                            | 69                            | 64                            |
| 36           | 72                            | 74                            | 71                            | 67                            |

**Individual temperatures recorded on the unexposed surface of Doorset B**

| Time<br>Mins | T/C<br>Number<br>20<br>Deg. C | T/C<br>Number<br>21<br>Deg. C | T/C<br>Number<br>22<br>Deg. C | T/C<br>Number<br>23<br>Deg. C |
|--------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| 0            | 13                            | 13                            | 14                            | 15                            |
| 2            | 13                            | 13                            | 15                            | 15                            |
| 4            | 15                            | 14                            | 15                            | 15                            |
| 6            | 15                            | 14                            | 16                            | 15                            |
| 8            | 16                            | 14                            | 16                            | 16                            |
| 10           | 15                            | 14                            | 16                            | 16                            |
| 12           | 16                            | 15                            | 17                            | 16                            |
| 14           | 19                            | 18                            | 19                            | 18                            |
| 16           | 23                            | 22                            | 21                            | 21                            |
| 18           | 28                            | 27                            | 25                            | 24                            |
| 20           | 33                            | 31                            | 29                            | 27                            |
| 22           | 37                            | 35                            | 32                            | 30                            |
| 24           | 41                            | 39                            | 35                            | 34                            |
| 26           | 44                            | 42                            | 38                            | 37                            |
| 28           | 47                            | 44                            | 41                            | 39                            |
| 30           | 50                            | 47                            | 44                            | 42                            |
| 32           | 52                            | 49                            | 46                            | 45                            |
| 34           | 54                            | 50                            | 49                            | 47                            |
| 36           | 56                            | 52                            | 51                            | 50                            |
| 38           | 57                            | 54                            | 54                            | 53                            |
| 40           | 59                            | 55                            | 56                            | 55                            |
| 42           | 60                            | 56                            | 58                            | 57                            |
| 44           | 62                            | 57                            | 60                            | 59                            |
| 46           | 63                            | 59                            | 62                            | 61                            |
| 48           | 64                            | 60                            | 65                            | 63                            |
| 50           | 66                            | 61                            | 66                            | 65                            |
| 52           | 67                            | 62                            | 68                            | 67                            |
| 54           | 69                            | 64                            | 70                            | 69                            |
| 56           | 70                            | 65                            | 72                            | 71                            |
| 58           | 71                            | 66                            | 74                            | 73                            |
| 60           | 74                            | 66                            | 76                            | 74                            |
| 62           | 76                            | 67                            | 78                            | 76                            |
| 64           | 78                            | 68                            | 81                            | 78                            |
| 66           | 80                            | 70                            | 83                            | 80                            |
| 67           | 81                            | 72                            | 84                            | 81                            |

**Individual temperatures recorded on the unexposed surface of the frame of Doorset A**

| Time<br>Mins | T/C<br>Number<br>16<br>Deg. C | T/C<br>Number<br>17<br>Deg. C | T/C<br>Number<br>18<br>Deg. C | T/C<br>Number<br>19<br>Deg. C |
|--------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| 0            | 12                            | 12                            | 12                            | 11                            |
| 2            | 26                            | 17                            | 12                            | 12                            |
| 4            | 39                            | 27                            | 12                            | 22                            |
| 6            | 40                            | 28                            | 12                            | 23                            |
| 8            | 43                            | 28                            | 12                            | 24                            |
| 10           | 45                            | 28                            | 12                            | 25                            |
| 12           | 44                            | 28                            | 13                            | 23                            |
| 14           | 42                            | 27                            | 13                            | 23                            |
| 16           | 40                            | 27                            | 14                            | 23                            |
| 18           | 39                            | 26                            | 16                            | 23                            |
| 20           | 38                            | 26                            | 17                            | 23                            |
| 22           | 39                            | 27                            | 18                            | 24                            |
| 24           | 40                            | 27                            | 19                            | 24                            |
| 26           | 42                            | 28                            | 21                            | 25                            |
| 28           | 44                            | 29                            | 23                            | 27                            |
| 30           | 46                            | 31                            | 25                            | 29                            |
| 32           | 49                            | 33                            | 28                            | 31                            |
| 34           | 52                            | 35                            | 30                            | 34                            |
| 36           | 55                            | 37                            | 33                            | 36                            |

**Individual temperatures recorded on the unexposed surface of the frame of Doorset B**

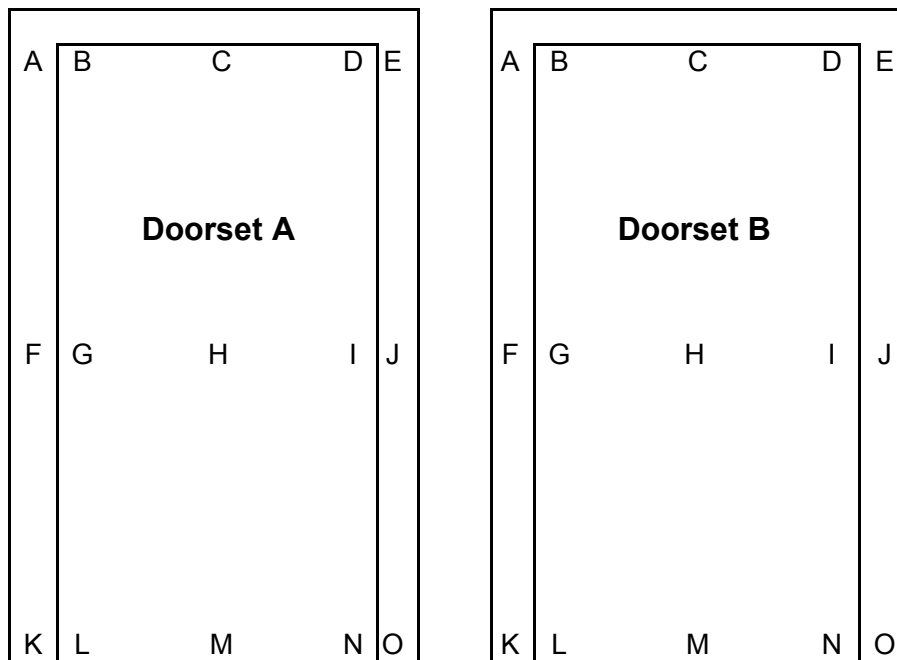
| Time<br>Mins | T/C<br>Number<br>24<br>Deg. C | T/C<br>Number<br>25<br>Deg. C | T/C<br>Number<br>26<br>Deg. C | T/C<br>Number<br>27<br>Deg. C |
|--------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| 0            | 15                            | 15                            | 14                            | 12                            |
| 2            | 18                            | 29                            | 14                            | 13                            |
| 4            | 31                            | 40                            | 20                            | 20                            |
| 6            | 37                            | 49                            | 24                            | 18                            |
| 8            | 39                            | 47                            | 27                            | *                             |
| 10           | 40                            | 43                            | 27                            |                               |
| 12           | 41                            | 42                            | 26                            |                               |
| 14           | 43                            | 40                            | 25                            |                               |
| 16           | 44                            | 38                            | 24                            |                               |
| 18           | 44                            | 37                            | 24                            |                               |
| 20           | 45                            | 38                            | 24                            |                               |
| 22           | 48                            | 36                            | 24                            |                               |
| 24           | 51                            | 37                            | 24                            |                               |
| 26           | 51                            | 38                            | 24                            |                               |
| 28           | 52                            | 40                            | 25                            |                               |
| 30           | 52                            | 42                            | 27                            |                               |
| 32           | 52                            | 45                            | 28                            |                               |
| 34           | 53                            | 47                            | 30                            |                               |
| 36           | 54                            | 49                            | 33                            |                               |
| 38           | 55                            | 51                            | 34                            |                               |
| 40           | 55                            | 53                            | 36                            |                               |
| 42           | 55                            | 56                            | 38                            |                               |
| 44           | 55                            | 59                            | 40                            |                               |
| 46           | 56                            | 61                            | 41                            |                               |
| 48           | 57                            | 64                            | 43                            |                               |
| 50           | 58                            | 67                            | 44                            |                               |
| 52           | 59                            | 69                            | 45                            |                               |
| 54           | 61                            | 71                            | 46                            |                               |
| 56           | 62                            | 75                            | 48                            |                               |
| 58           | 66                            | 79                            | 50                            |                               |
| 60           | 69                            | 83                            | 52                            |                               |
| 62           | 73                            | 88                            | 54                            |                               |
| 64           | 78                            | 94                            | 58                            |                               |
| 66           | 85                            | 101                           | 61                            |                               |
| 67           | 87                            | 105                           | 63                            |                               |

\* Thermocouple malfunction

**Furnace pressure recorded at the head of the doorsets during the test**

| Time<br>Mins | Recorded<br>Furnace<br>Pressure<br>Pascals |
|--------------|--------------------------------------------|
| 0            | 0                                          |
| 2            | 13                                         |
| 4            | 12                                         |
| 6            | 14                                         |
| 8            | 16                                         |
| 10           | 15                                         |
| 12           | 15                                         |
| 14           | 14                                         |
| 16           | 15                                         |
| 18           | 14                                         |
| 20           | 14                                         |
| 22           | 14                                         |
| 24           | 15                                         |
| 26           | 14                                         |
| 28           | 15                                         |
| 30           | 14                                         |
| 32           | 15                                         |
| 34           | 13                                         |
| 36           | 12                                         |
| 38           | 14                                         |
| 40           | 15                                         |
| 42           | 14                                         |
| 44           | 15                                         |
| 46           | 13                                         |
| 48           | 15                                         |
| 50           | 12                                         |
| 52           | 14                                         |
| 54           | 12                                         |
| 56           | 14                                         |
| 58           | 14                                         |
| 60           | 13                                         |
| 62           | 14                                         |
| 64           | 13                                         |
| 66           | 13                                         |
| 67           | 15                                         |

### Horizontal deflections of the door leaves

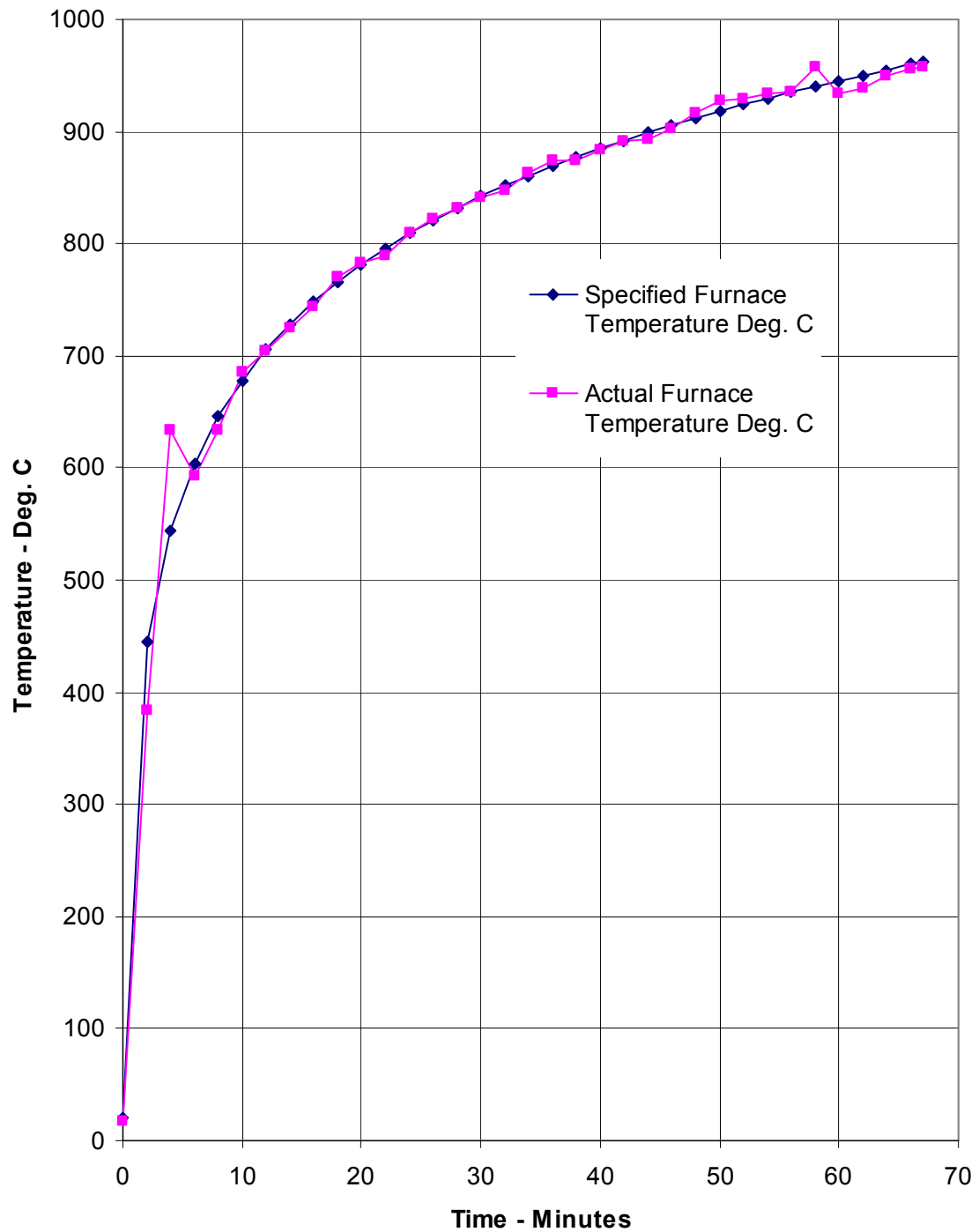


| Doorset A        |     |     |    |    |     |    |    |     |    |    |    |    |    |    |    |
|------------------|-----|-----|----|----|-----|----|----|-----|----|----|----|----|----|----|----|
| Deflections – mm |     |     |    |    |     |    |    |     |    |    |    |    |    |    |    |
| Time Mins        | A   | B   | C  | D  | E   | F  | G  | H   | I  | J  | K  | L  | M  | N  | O  |
| 0                | 0   | 0   | 0  | 0  | 0   | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 5                | -8  | -5  | 0  | *  | *   | -4 | 2  | -1  | -6 | 3  | -2 | -3 | -2 | -1 | 0  |
| 10               | 3   | -11 | 6  | 0  | -8  | 0  | -3 | -3  | 1  | -8 | -4 | -3 | -1 | 0  | 0  |
| 15               | 7   | 0   | 3  | -3 | -8  | -4 | -2 | -4  | 2  | -1 | -3 | -1 | 1  | 8  | -1 |
| 20               | -5  | 5   | 6  | 4  | -11 | -2 | 0  | -8  | 2  | 1  | -1 | 3  | 4  | 15 | -1 |
| 25               | -12 | 2   | 8  | -4 | -15 | -2 | 1  | -12 | -2 | 0  | -2 | 5  | 6  | 18 | -2 |
| 30               | -12 | *   | 1  | 4  | -15 | 11 | 11 | -21 | -1 | 4  | -4 | 7  | 5  | 20 | -1 |
| 35               | -12 | *   | -3 | 2  | *   | -2 | 2  | -30 | -4 | -1 | -2 | 6  | 2  | 23 | -3 |

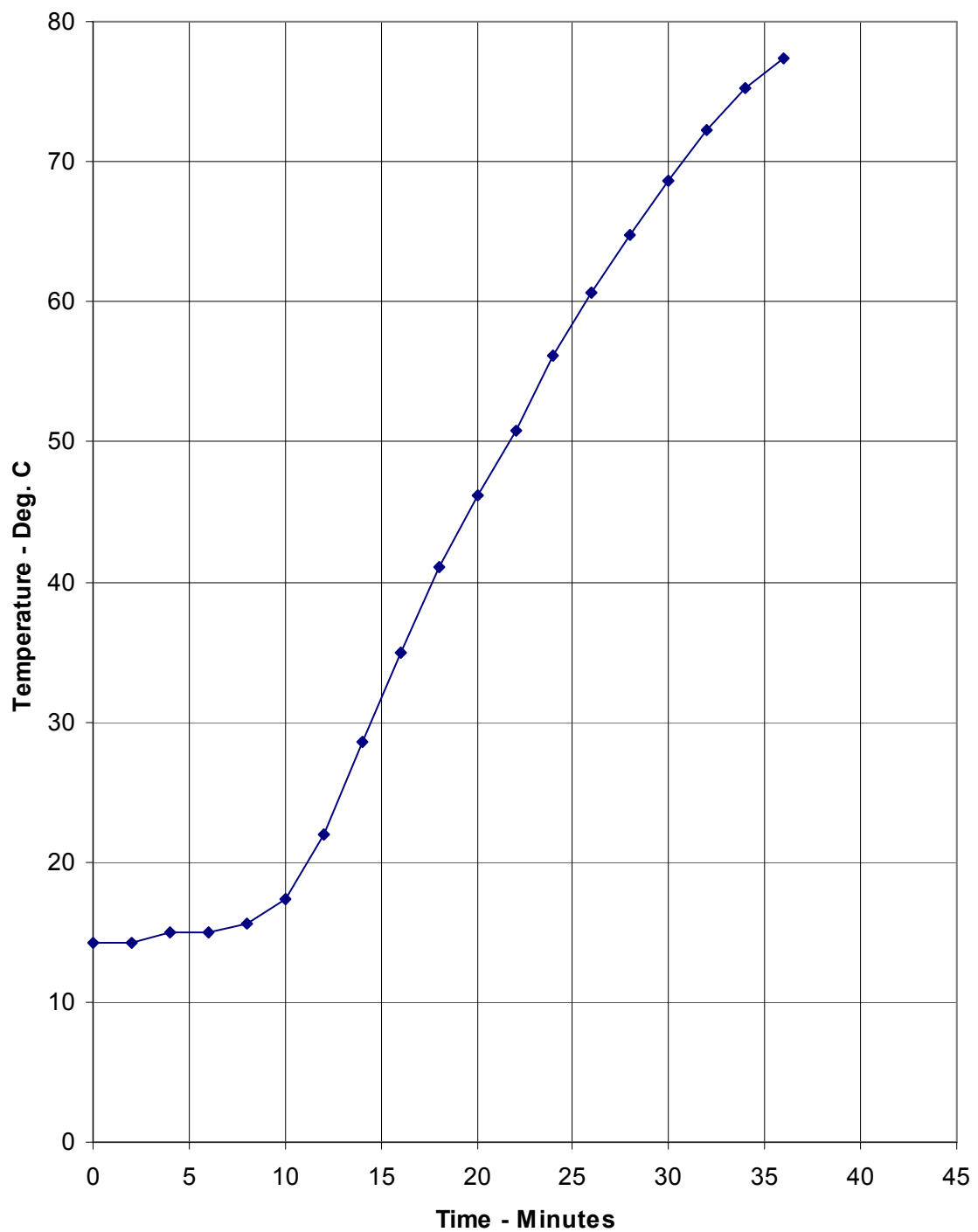
| Doorset B        |    |    |     |    |     |    |     |     |     |   |    |    |    |    |    |
|------------------|----|----|-----|----|-----|----|-----|-----|-----|---|----|----|----|----|----|
| Deflections – mm |    |    |     |    |     |    |     |     |     |   |    |    |    |    |    |
| Time Mins        | A  | B  | C   | D  | E   | F  | G   | H   | I   | J | K  | L  | M  | N  | O  |
| 0                | 0  | 0  | 0   | 0  | 0   | 0  | 0   | 0   | 0   | 0 | 0  | 0  | 0  | 0  | 0  |
| 10               | -6 | 1  | 3   | -2 | *   | 1  | -4  | -12 | -5  | 5 | -1 | 7  | 4  | -2 | 0  |
| 20               | -4 | -1 | -2  | -7 | -6  | -2 | -4  | -16 | -1  | 8 | -1 | 7  | 3  | 0  | -1 |
| 30               | -8 | 0  | -9  | 5  | -20 | 12 | -4  | -15 | -13 | 5 | 3  | 14 | 8  | -1 | -1 |
| 40               | 0  | -5 | -11 | -4 | -15 | 0  | -3  | -18 | -13 | 2 | 4  | 14 | 2  | 4  | -6 |
| 50               | -7 | 2  | -6  | *  | -15 | -3 | -6  | -39 | -9  | 2 | 3  | 22 | 2  | 6  | -7 |
| 60               | -6 | 0  | -14 | -7 | -12 | -5 | -12 | -43 | -10 | 6 | 2  | 22 | -4 | 5  | -4 |

Negative values indicate movement away from the furnace

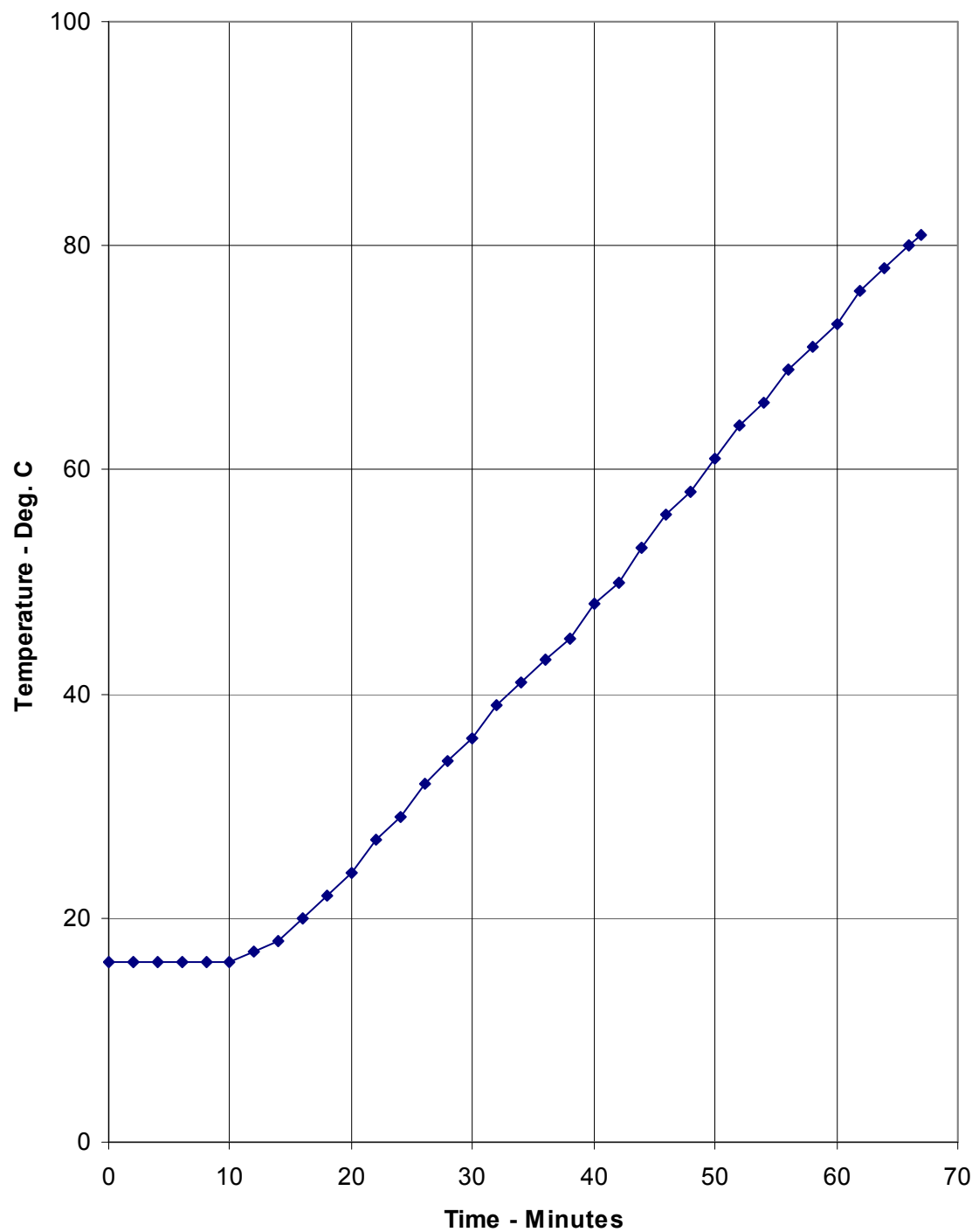
Graph showing mean furnace temperature, together with the temperature/time relationship specified in the Standard



Graph showing mean temperatures recorded on the unexposed surface of Doorset A



Graph showing mean temperatures recorded on the unexposed surface of Doorset B



## Performance Criteria and Test Results

**Integrity** It is required that the specimen retains its separating function, without either causing ignition of a cotton pad when applied, or permitting the penetration of a gap gauge as specified in BS EN 1634-1: 2008, or resulting in sustained flaming on the unexposed surface. **These requirements were satisfied for the periods shown below:**

|                   | Doorset A  | Doorset B   |
|-------------------|------------|-------------|
| Sustained flaming | 36 minutes | 61 minutes  |
| Gap gauge         | 36 minutes | 66 minutes* |
| Cotton pad        | 36 minutes | 61 minutes  |

**Insulation** The mean temperature rise of the unexposed surface shall not be greater than 140°C and that the maximum temperature rise shall not be greater than 180°C (except on the door frame, where the maximum temperature rise shall not exceed 360°C). Insulation failure also occurs simultaneously with integrity failure as specified in BS EN 1634-1: 2008. **These requirements were satisfied for the periods shown below:**

|            | Doorset A  | Doorset B  |
|------------|------------|------------|
| Insulation | 36 minutes | 61 minutes |

\*The test duration. The test was discontinued after a period of 66 minutes.

## Ongoing Implications

**Limitations** 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 procedure outlined in BS EN 1363-1: 1999, and where appropriate BS EN 1363-2: 1999. 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 the relevant test method is not covered by this report. Annex A of BS EN 1363-1: 1999, provides guidance information on the application of fire resistance tests and the interpretation of test data.

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.

## Conclusions

**Evaluation against objective** Two specimens of double-acting, single-leaf timber doorsets have been subjected to a fire resistance test in accordance with BS EN 1634-1: 2008, Fire resistance tests for door and shutter assemblies, BS EN 1363-1: 1999, General requirements and BS EN 1363-2: 1999, Alternative and additional procedures.

The evaluation of the doorsets against the requirements of BS EN 1634-1: 2008 showed that the doorsets satisfied the requirements for the following periods.

| Test Results:          |                   | Doorset A  | Doorset B   |
|------------------------|-------------------|------------|-------------|
| Integrity performance  | Sustained flaming | 36 minutes | 61 minutes  |
|                        | Gap gauge         | 36 minutes | 66 minutes* |
|                        | Cotton Pad        | 36 minutes | 61 minutes  |
| Insulation performance |                   | 36 minutes | 61 minutes  |

\* The test duration. The test was discontinued after a period of 66 minutes.