

**SAMUEL HEATH**

since 1820

**Fire resistance test in accordance with BS 476  
Perko (R1, R2 & R21) and Perkomatic (R85)  
concealed door closers**

Independent fire assessments for all products are effective for a five year period.

Where products have not been subject to changes in specification and there have been no changes in the performance standard against which the original assessment was made, it is common practice for the assessment to be reviewed by the independent authority, rather than a completely new assessment being conducted.

In such cases, the authority issues a report which extends the assessments validity, normally for a further five years.

This document contains both the original assessment and appropriate review report.

Testing. Advising. Assuring.

WF Report No. 338544  
Page 1 of 2  
5th March 2014

**Mr M. Stonelake**  
**Samuel Heath & Sons PLC**  
Leopold Street  
Birmingham  
B12 0UJ

### **Review of Fire Test Report Referenced WARRES No. 63269**

## **1 Introduction**

The report referenced WARRES No. 63269 relates to a fire resistance test performed in accordance with BS 476: Part 22: 1987, clause 6 on two specimens of fully insulated single-acting, single-leaf timber based doorsets.

The doorsets were referenced Doorset A and Doorset B for the purpose of the test. Each doorset had overall nominal dimensions of height 2034 mm and width 850 mm and incorporated a leaf of size 1981 mm high by 762 mm wide by 44 mm thick. The leaf of Doorset A included a tubular chipboard core whilst the core of Doorset B was of a solid flaxboard construction. Each doorset was fitted with a 'Perko' concealed door closer and a 'Perkomatic' concealed door closer.

The doorsets were mounted within apertures in a masonry wall assembly such that their door leaves opened toward the heating conditions of the test. Each door leaf was secured in the closed position with a surface mounted shoot bolt.

Each specimen satisfied the performance requirements specified in clause 6 of BS 476: Part 22: 1987 for fully insulated doorsets for the following periods:

	<b>Doorset A</b>	<b>Doorset B</b>
<b>Integrity</b>	28 minutes*	29 minutes*
<b>Insulation</b>	28 minutes*	29 minutes*

The test was discontinued after a period of 32 minutes.

\* Integrity failure of both doorsets occurred remotely from the door closers. The integrity of the doors in the immediate vicinity of the door closers was maintained for the full duration of the test with respect to BS 476: Part 20: 1987.

## 2 Confirmation of Specification

It has been confirmed by Samuel Heath & Sons PLC that there have been no changes to the specification of the 'Perko' and 'Perkomatic' concealed door closers or their methods of installation since the test was conducted.

## 3 Conclusions

The procedures adopted for the original test have been re-examined and are similar to those currently in use. Therefore, with respect to the fire resistance test report referenced WARRES No. 63269 the contents should remain valid until the 1<sup>st</sup> April 2019.

## 4 Validity

This review is based on information used to formulate the original test report. No other information or data has been provided by Samuel Heath & Sons PLC which could affect this review.


Performed by:



**D Forshaw**

Principal Certification Engineer

Reviewed By:



**A Kearns**

Technical Manager

**Exova Warringtonfire**

This copy has been produced from a .pdf format electronic file that has been provided by Exova Warringtonfire to the sponsor of the report and must only be reproduced in full. Extracts or abridgements of reports must not be published without permission of Exova Warringtonfire. The pdf copy supplied is the sole authentic version of this document. All pdf versions of this report bear authentic signatures of the responsible Exova Warringtonfire staff.

## TEST REPORT

FIRE RESISTANCE TEST IN ACCORDANCE  
WITH CLAUSE 6 OF BS 476: PART 22: 1987,  
ON TWO DIFFERENT SPECIMENS OF  
SINGLE-ACTING, SINGLE-LEAF DOORSETS

THE PROFESSIONALS IN FIRE SAFETY •

**W**arrington  
**FIRE**  
*research*  
CONSULTANCY • TESTING

## TEST REPORT

**TEST SPONSOR :** SAMUEL HEATH & SONS PLC, Cobden Works, Leopold Street, Birmingham, B12 0UJ.

**SUMMARY :** Two different specimens of fully insulated single-acting, single-leaf doorsets, have been subjected to a test in accordance with BS 476: Part 22: 1987, Clause 6 to determine their fire resistance performance. Each door was fitted with 'Perko' and 'Perkomatic' concealed door closers as manufactured by Samuel Heath & Sons Plc. The specimens were mounted within a masonry wall such that the door leaves opened towards the heating conditions of the test.

Each doorset had overall dimensions of height 2034 mm and width 850 mm and incorporated a leaf of size 1981 mm high by 762 mm wide by 44 mm thick. The doorsets were referenced Specimen A and Specimen B for the purposes of the test. The doorsets differed in that the leaf of Doorset A incorporated a tubular chipboard core and the leaf of Doorset B incorporated a flaxboard core. Each door leaf was secured in the closed position by a shoot bolt.

Each specimen satisfied the performance requirements specified in Clause 6 of BS 476: Part 22: 1987, for fully insulated doorsets, for the following periods:

	DOORSET A	DOORSET B
Integrity	28 minutes*	29 minutes*
Insulation	28 minutes*	29 minutes*

The test was discontinued after a period of 32 minutes.

\* Integrity failure of both doorsets occurred remote from the door closers. The integrity of the doorsets in the immediate vicinity of the door closers was maintained for the full duration of the test with respect to the performance requirements given in BS 476: Part 20: 1987.

**DATE OF TEST :** 3rd January 1995

**REPORT ISSUED :** 23rd May 1995

This report may only be reproduced in full. Extracts or abridgements of reports shall not be published without permission of Warrington Fire Research Centre.

KC(3786)

## CONTENTS

	<b>Page</b>
Summary	2
Contents	3
Purpose of the test	4
Introduction	4
Test specimen construction	4
Instrumentation and measuring equipment	5
Test procedure	5
Test data and information	6
Evaluation against the performance criteria	6
Conclusions	7
Limitations	7
Review	8
 <b>ANNEXES</b>	
Annex A      Specification of test construction	9
Annex B      Data Recorded during test	20
Annex C      Observations on the performance of the specimen during the test	28
Annex D      Photographs	29

## 1. PURPOSE OF THE TEST

- 1.1 To determine the fire resistance of two different specimens of fully insulated doorsets in accordance with BS 476: Part 22: 1987.

## 2. INTRODUCTION

- 2.1 The doorsets were of a fully insulated construction and the test was therefore conducted in accordance with Clause 6 of BS 476: Part 22: 1987 'Methods for determination of the fire resistance of non-loadbearing elements of construction'. This test report should be read in conjunction with that Standard and with BS 476: Part 20: 1987, 'Methods for determination of the fire resistance of elements of construction (general principles)'.
- 2.2 The doorsets were asymmetrical and incorporated single-acting, single-leaves. BS 476: Part 22: 1987 requires asymmetrical doorsets to be tested from both directions unless certain conditions apply. At the request of the sponsor each doorset was mounted within a masonry wall construction such that the door leaf opened towards the heating conditions of the test. The test results, therefore, may not be appropriate to situations where the door leaf opens away from the fire hazard.
- 2.3 Two specimens referenced A and B for the purpose of the test were incorporated into the construction. The doorsets differed in that the leaf of Doorset A incorporated a tubular chipboard core and the leaf of Doorset B incorporated a solid flaxboard core. Each specimen was judged on its ability to comply with the performance criteria for integrity and insulation, as required by BS 476: Part 22: 1987, Clause 6.
- 2.4 Certain aspects of some fire test specifications are open to different interpretations. The Fire Test Study Group has identified a number of such areas and has agreed Resolutions which define common agreement of interpretations between fire test laboratories which are members of the Group. Where such Resolutions are applicable to this test they have been followed.
- 2.5 The test was conducted on the 3rd January 1995, at the request of Samuel Heath and Sons Plc, the sponsor of the test.
- 2.6 The test was witnessed by Mr. D. Pick and Mr. R. Jeynes, representatives of the test sponsor.

## 3. TEST SPECIMEN CONSTRUCTION

- 3.1 A comprehensive description of the test construction is given in Annex A. The description is based on a detailed survey of the specimen and information supplied by the sponsor of the test.
- 3.2 The concealed door closers were stated to have been manufactured by the sponsor.
- 3.3 The specimens were supplied as complete assemblies by the sponsor on the 19th December 1994. Warrington Fire Research Centre was not involved in any selection or sampling procedures of the doorsets or any of the components.

- 3.4 The specimen doorsets were installed into an unplastered masonry wall, to form the test construction. The specimens were mounted into position within prepared apertures after construction of the wall. Installation was conducted by representatives of Warrington Fire Research Centre on the 21st December 1994.

#### 4. INSTRUMENTATION AND MEASURING EQUIPMENT

- 4.1 The instrumentation was provided in accordance with the requirements of the Standard.
- 4.2 Six thermocouples distributed over a plane 100 mm from the surface of the test construction, were provided to monitor the temperature of the furnace atmosphere.
- 4.3 Pressure sensors were provided within the furnace to monitor the furnace atmospheric pressure.
- 4.4 Thermocouples were provided to monitor the temperature of the unexposed face of the specimen as follows:
- 4.4.1 At five positions on each doorset, one approximately at the centre of the doorset and one at approximately the centre of each quarter section of the doorset. (Thermocouples 11 to 15 for doorset A and 16 to 20 for doorset B.)
- 4.4.2 At three positions on the surface of each door frame, one at the approximate mid-point above the door leaf and one at approximately mid-height on each of the vertical frame members. (Thermocouples 21, 22 and 24 for doorset A and 25 to 27 for doorset B.)
- 4.4.3 The locations and reference numbers of the various unexposed surface thermocouples are shown in Figure 1 of Annex A.
- 4.5 A roving thermocouple was available to measure temperatures on the unexposed surface of the specimens at any position which might appear to be hotter than temperatures indicated by the fixed thermocouples.
- 4.6 Cotton pads and gap gauges were available to evaluate the impermeability of the specimens to hot gases.

#### 5. TEST PROCEDURE

- 5.1 The test was conducted in accordance with the procedure specified in BS 476: Part 22: 1987.
- 5.2 The furnace was controlled so that its mean temperature complied with the requirements of BS 476: Part 20: 1987, Clause 3.1.
- 5.3 After the first five minutes of testing and for the remainder of the test, the furnace atmospheric pressure was controlled so that it complied with the requirements of BS 476: Part 20: 1987, Clause 3.2.2. The calculated pressure differential relative to the laboratory atmosphere at the top of the doorsets was 8.8 ( $\pm 2$ ) Pa.



- 5.4 Throughout the test the temperatures indicated by the thermocouples provided to monitor the furnace and the specimens were continuously monitored and were recorded at one minute intervals.
- 5.5 The thermocouples referred to in 4.2 were used to determine the mean furnace temperature.
- 5.6 The thermocouples referred to in 4.4.1 were used for each specimen to determine the mean temperature of the unexposed surface of the specimen and compliance with the mean unexposed face temperature rise criterion of the Standard.
- 5.7 The thermocouples referred to in 4.4.1 and 4.4.2 for each specimen were used to determine compliance with the maximum unexposed face temperature rise criterion of the Standard. The roving thermocouple was also used, if considered appropriate, to determine compliance with this criterion.
- 5.8 The cotton pads and gap gauges were used, if considered appropriate, to determine compliance with the integrity criterion of the Standard. The occurrence of any sustained flaming on the unexposed surface was also recorded to determine compliance with this criterion.

## 6. TEST DATA AND INFORMATION

- 6.1 The following data, which was recorded during the test, is given in Annex B:
  - 6.1.1 Mean furnace temperature, together with a comparison with the specified temperature/time relationship specified in the Standard.
  - 6.1.2 The mean and individual temperatures recorded by the thermocouples fixed to the unexposed surface of the specimens.
- 6.2 A summary of the observations made on the general behaviour of the specimens is given in Annex C.
- 6.3 Photographs taken of the specimens before, during and after the test are given in Annex D.
- 6.4 The ambient air temperature in the vicinity of the test construction was 14°C at the start of the test with no variation during the test.
- 6.5 The test was discontinued after a period of 32 minutes at the request of the sponsor.

## 7. EVALUATION AGAINST THE PERFORMANCE CRITERIA

- 7.1 The performance of each specimen was judged against the following criteria of BS 476: Part 20: 1987:
  - 7.1.1 **Integrity** - It is required that there is no collapse of the specimen, no sustained flaming on the unexposed surface and no loss of impermeability. These requirements were satisfied for periods of 28 minutes for doorset A and 29 minutes for doorset B. Failure in each case was due to sustained flaming on the unexposed surface of the specimen at a position remote from the door closers.

- 7.1.2 **Insulation** - It is required that 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. Insulation failure also occurs simultaneously with integrity failure. These requirements were satisfied for a period of 28 minutes for doorset A and 29 minutes for doorset B when integrity failure occurred. At this time the mean unexposed face temperature rises were 85°C and 44°C and the maximum temperature rises were 132°C and 48°C respectively.

## 8. CONCLUSIONS

- 8.1 Two different specimens of fully insulated, single-acting, single-leaf doorsets mounted in a masonry wall have been subjected to a fire resistance test in accordance with BS 476: Part 22: 1987, Clause 6.
- 8.2 The specimens satisfied the performance requirements specified in the Standard for the periods stated below:

	DOORSET A	DOORSET B
<b>Integrity</b>	28 minutes*	29 minutes*
<b>Insulation</b>	28 minutes*	29 minutes*

The test was discontinued after a period of 32 minutes.

\* Integrity failure of both doorsets occurred remote from the door closers. The integrity of the doorsets in the immediate vicinity of the door closers was maintained for the full duration of the test with respect to the performance requirements given in BS 476: Part 20: 1987.

## 9. LIMITATIONS

- 9.1 The results relate only 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 elements in use, nor do they reflect the actual behaviour in fires.
- 9.2 The test results relate only to the specimen tested. Appendix A of BS 476: Part 20: 1987 provides guidance information on the application of fire resistance tests and the interpretation of test data. Application of the results to doorsets of different dimensions supported other than by a masonry wall or incorporating different components should be the subject of a design appraisal.
- 9.3 The tested assemblies were asymmetrical and were tested such that the door leaves opened towards the heating conditions of the test. The test results may not be appropriate to situations where the leaves open away from the fire hazard.
- 9.4 The dimensions of the gaps between the door leaves and the frame were less than 3 mm at some positions. The results of this test are, therefore, limited to doorsets where the gap dimensions are similar to but do not exceed those which are detailed in this report.

10. **REVIEW**

- 10.1 The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over five 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.

**Responsible Officer**



**C.W. MILES**  
Technical Officer  
Structural Fire Protection

**Approved**



pp

**R.J. SHAW**  
Director  
For and on behalf of  
**WARRINGTON FIRE RESEARCH CENTRE**

23rd May 1995

**KC(3786)**

## ANNEX A

### SPECIFICATION OF THE TEST CONSTRUCTION

#### 1. GENERAL DESCRIPTION

The specimen was of two proprietary single-acting, single-leaf timber doorsets fitted with concealed door closers which were manufactured by Samuel Heath. The doorsets were referenced as A and B for the purpose of this test and were built into a masonry wall to form the test construction, such that the door leaves opened towards the heating conditions of the test.

#### 2. SPECIMEN

2.1 The specimen was constructed as follows:

##### 2.1.1 Door Frame (Both doorsets)

Softwood frame

##### 2.1.2 Door Leaf (Doorset A)

Core material of tubular chipboard. Intumescent strip was fitted along all four edges of the leaf. Details relating to the manufacture of the door leaf is retained on our confidential file at the request of the sponsor.

##### 2.1.3 Door Leaf (Doorset B)

Core material flaxboard. Intumescent strip was fitted along the top edge and both vertical edges of the leaf. Details relating to the manufacture of the door leaf is retained on our confidential file at the request of the sponsor.

##### 2.1.4 Door Furniture

The door leaves were hung from the frame by three steel hinges. The door leaves included a surface mounted barrel bolt. Each leaf was provided with two concealed door closers fitted into mortices in the hanging edge of the leaf.

2.2 Both doorsets had the following dimensions:

##### 2.2.1 Door Frame

Height : 2034 mm  
Width : 850 mm  
Thickness : 93 mm

##### 2.2.2 Door Leaf

Height : 1981 mm  
Width : 762 mm  
Thickness : 44 mm

**Annex A (Continued)**

**3. ASSOCIATED CONSTRUCTION**

- 3.1 The door frames were installed into an unplastered masonry wall comprising 100 mm thick aerated concrete blocks with a central 210 mm square pillar of common bricks, and a concrete lintel all bonded together with a sand and cement mortar. The door frames were mounted into position and the wall was constructed around it. The door frames were retained by four steel fish tail wall anchors positioned along the height of each vertical frame member. The wall anchors were secured to the frame with screws and were built into appropriate joints in the wall.

**Annex A (Continued)**

**SCHEDULE OF COMPONENTS**

(Refer to Figures 1 to 6)

(All values are nominal unless stated otherwise)

(All references are as stated by the sponsor)

<b><u>Item</u></b>	<b><u>Description</u></b>
1.	Door frame jambs and head of softwood of section sizes as detailed on Figure 2.
2.	Door leaf A, incorporating a core material of tubular chipboard.
3.	Door leaf B, incorporating a core material of flaxboard.
4.	Intumescent strip, 10 mm wide by 4 mm thick referenced 'LP 1004', as manufactured by Lorient Polyproducts Limited, fitted centrally along all four edges of door leaf A and along the top edge and both vertical edges only of door leaf B. The strip was interrupted at the hinges (item 5) and the door closers (items 6 and 7).
5.	Hinges, three mild steel butt hinges per doorset, 105 mm by 32 mm blades recessed into leaf and frame and each blade fixed with four countersunk head steel screws.
6.	Door closer, referenced 'Perkomatic R85' as manufactured by Samuel Heath & Sons Plc., one per doorset fitted into a mortice in the hinged edge of each leaf, as shown on Figure 6.
7.	Door closer, referenced 'Perko R1' as manufactured by Samuel Heath & Sons Plc., one per doorset fitted into a mortice in the hinged edge of each leaf, as shown on Figure 6.
8.	Surface mounted steel barrel bolt, one screw fixed to the non-fire side face of each leaf and engaged for the full duration of the test.

Annex A (Continued)PROPERTIES OF MATERIALS1. DENSITY

The specimens were delivered completely assembled. No samples were therefore available to enable determination of the densities of the component materials to be made before testing.

2. MOISTURE CONTENT

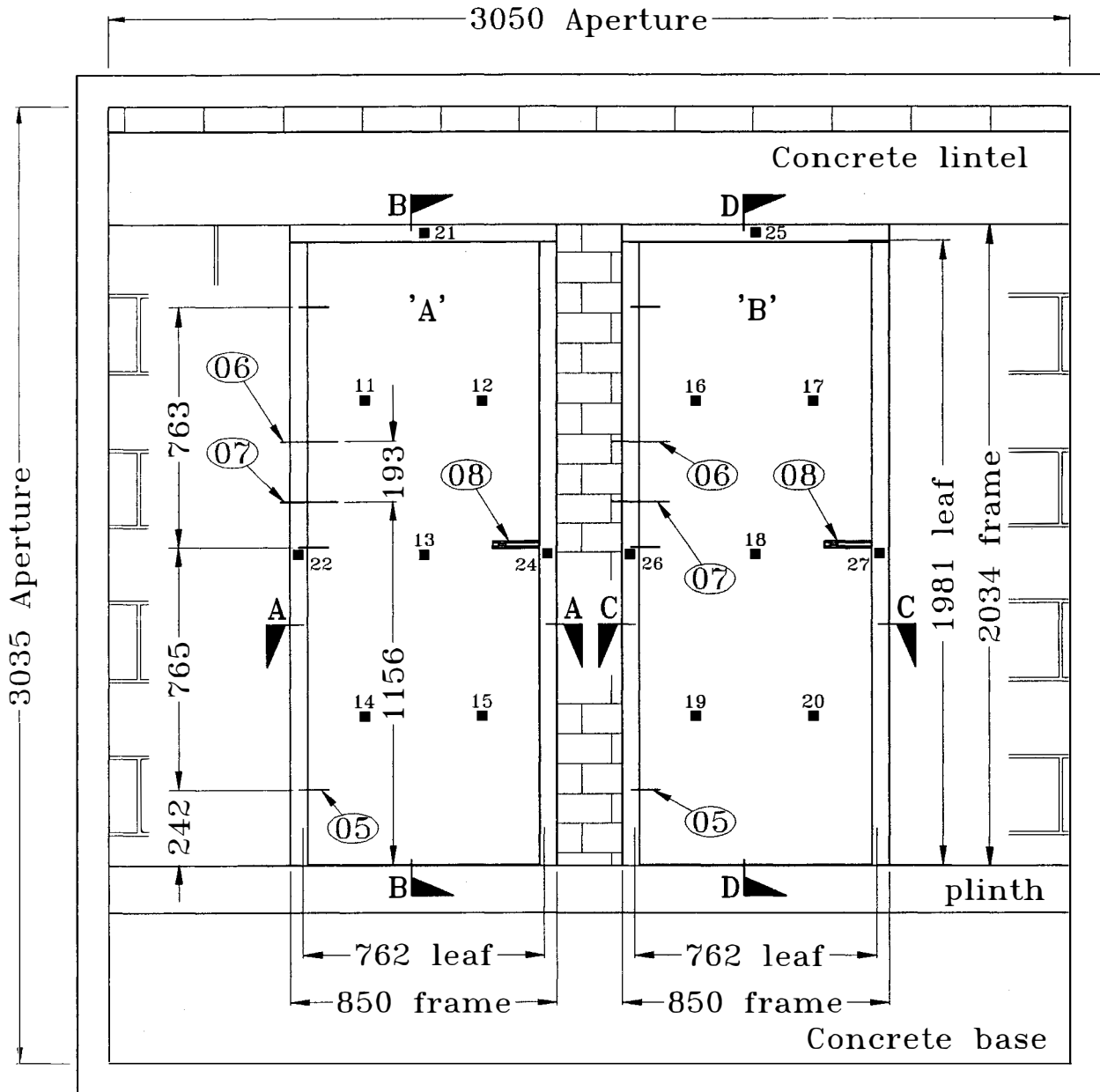
Measurements were taken on the day of test to determine the moisture content of the timber components of the doorsets and the following average levels were recorded:

**Door Frame A : 12.4%**

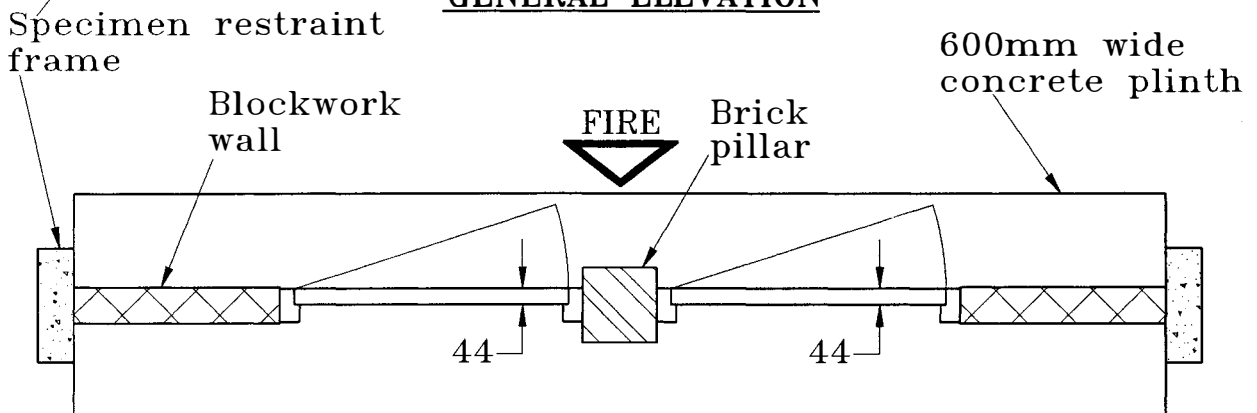
**Door Frame B : 11.9%**

Measurements were made using a Protimeter moisture meter.

As the door leaf cores consisted of chipboard and flaxboard, the moisture content of the door leaves could not be determined.



## GENERAL ELEVATION



### HORIZONTAL CROSS SECTION

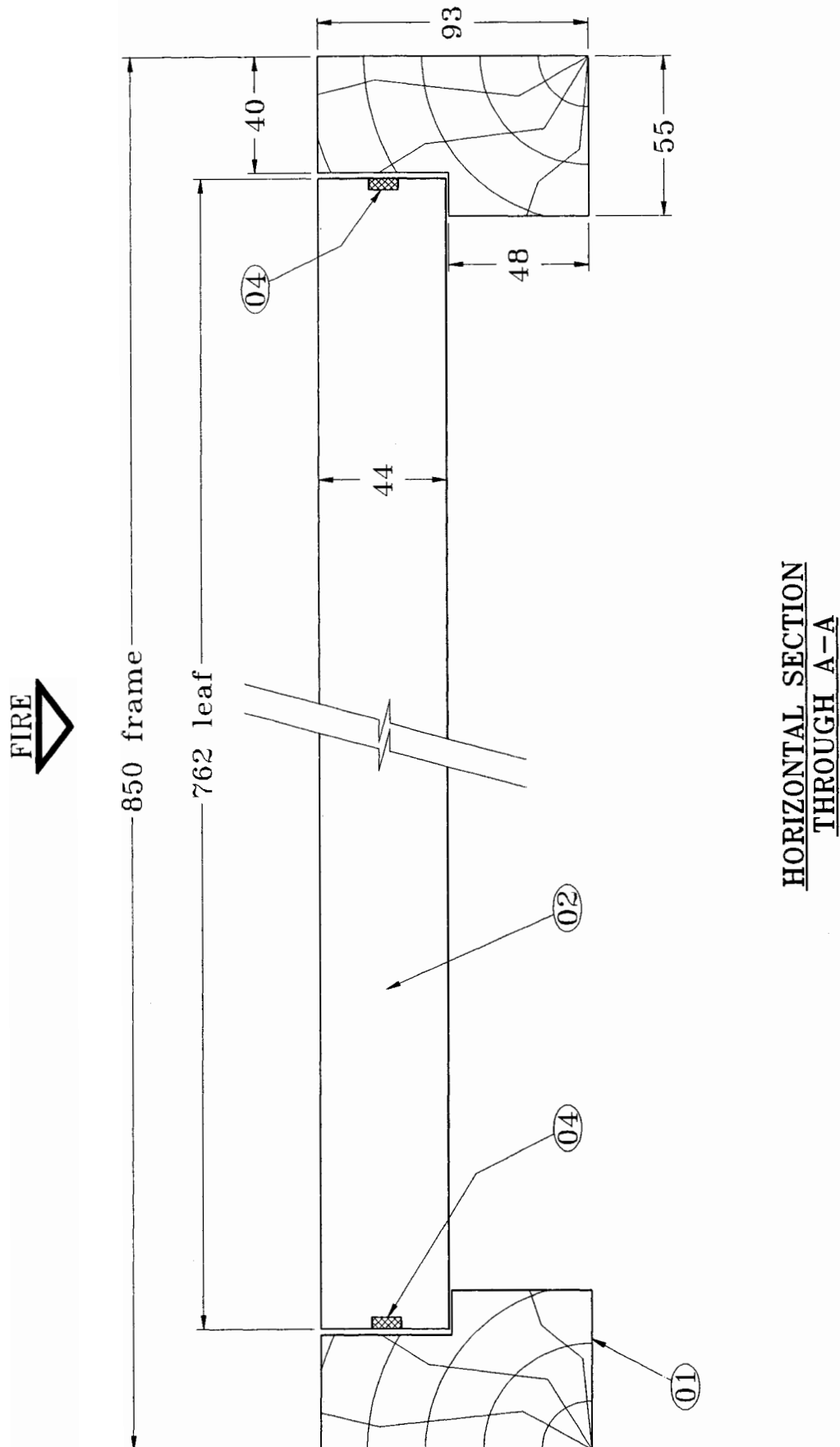
- ### ■ Positions of thermocouples

All dimensions are in mm

See Annex A for schedule

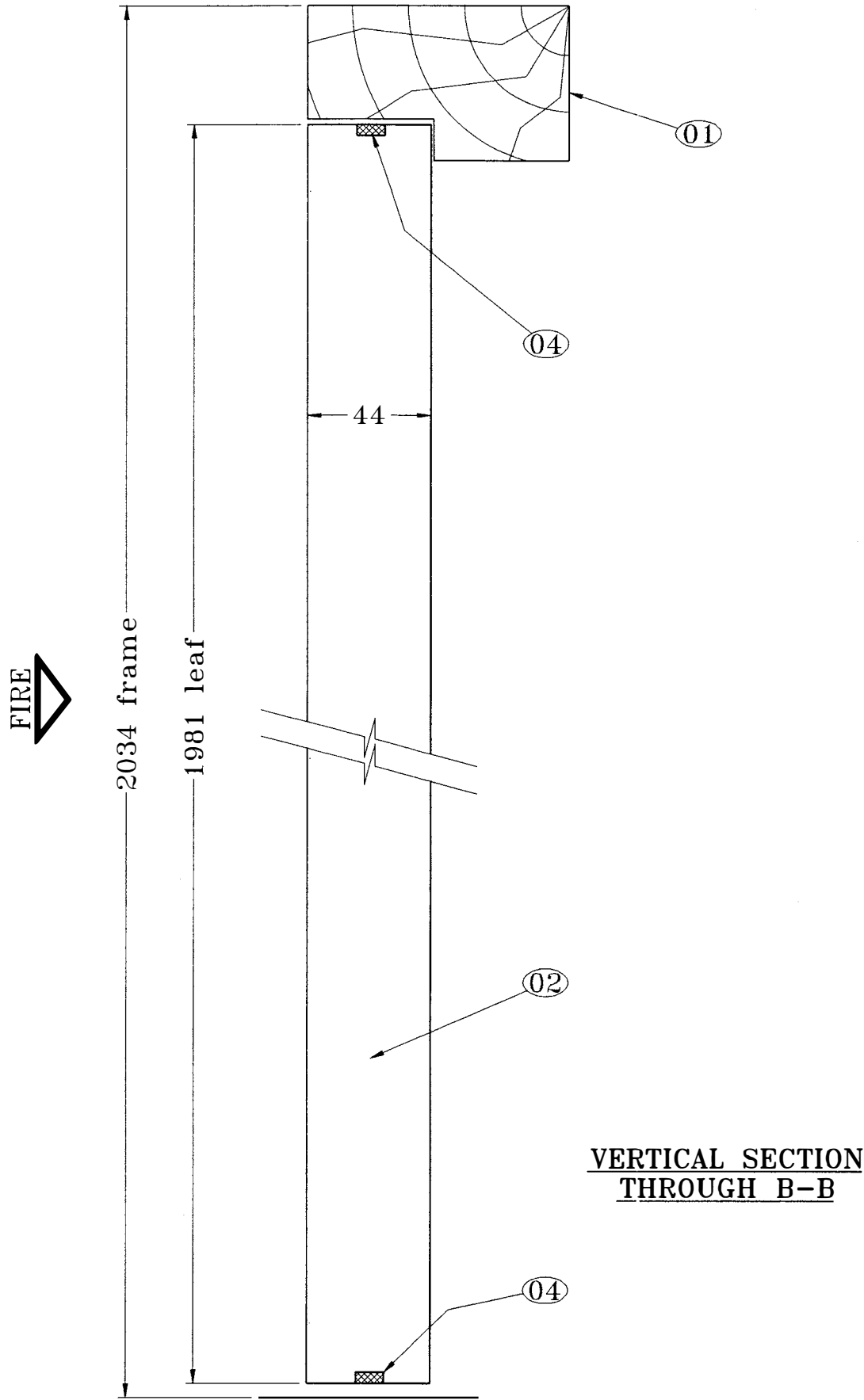
FIGURE 1





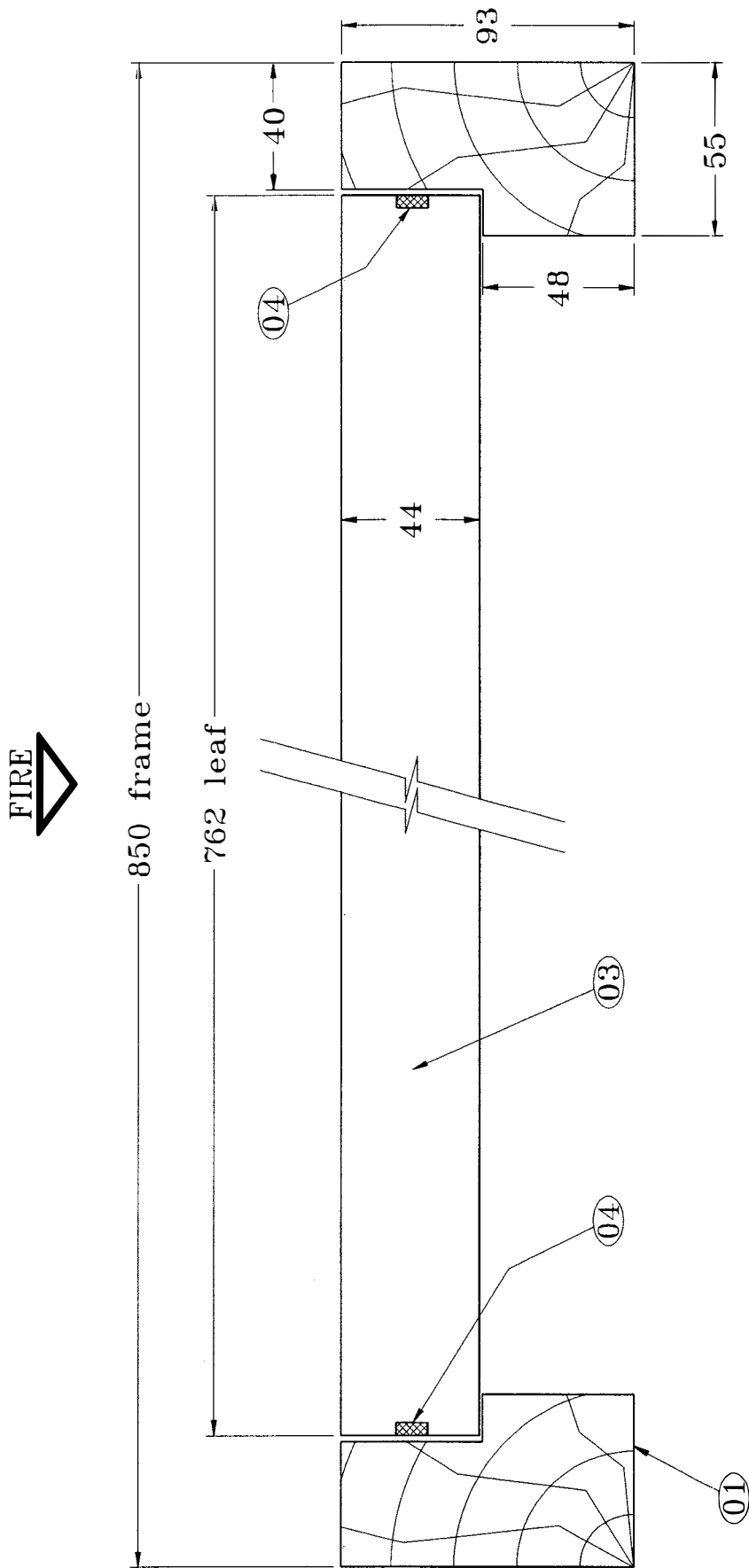
All dimensions are in mm.  
See Annex A for schedule.  
Do not scale

FIGURE 2



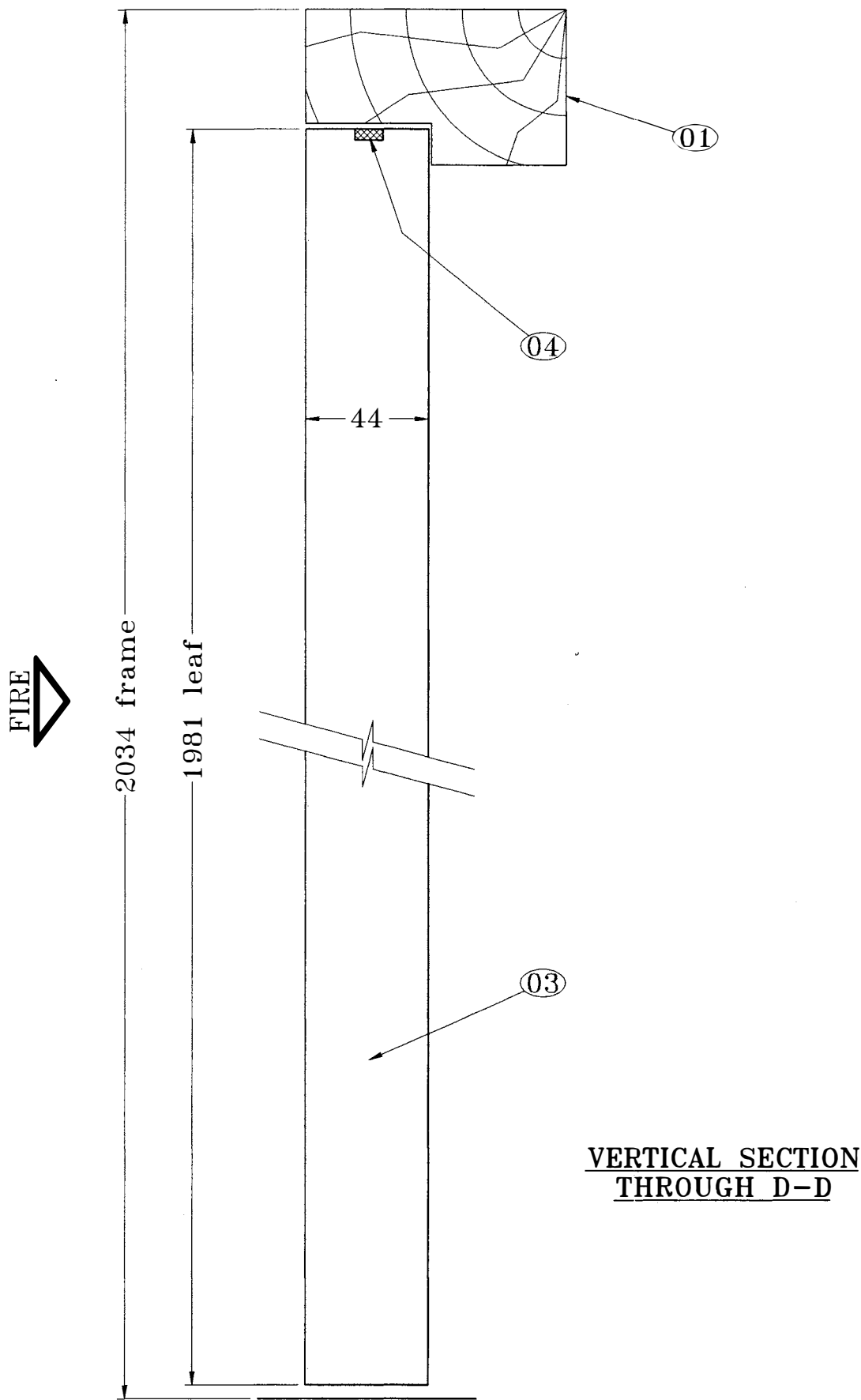
All dimensions are in mm.  
See Annex A for schedule.  
Do not scale

FIGURE 3



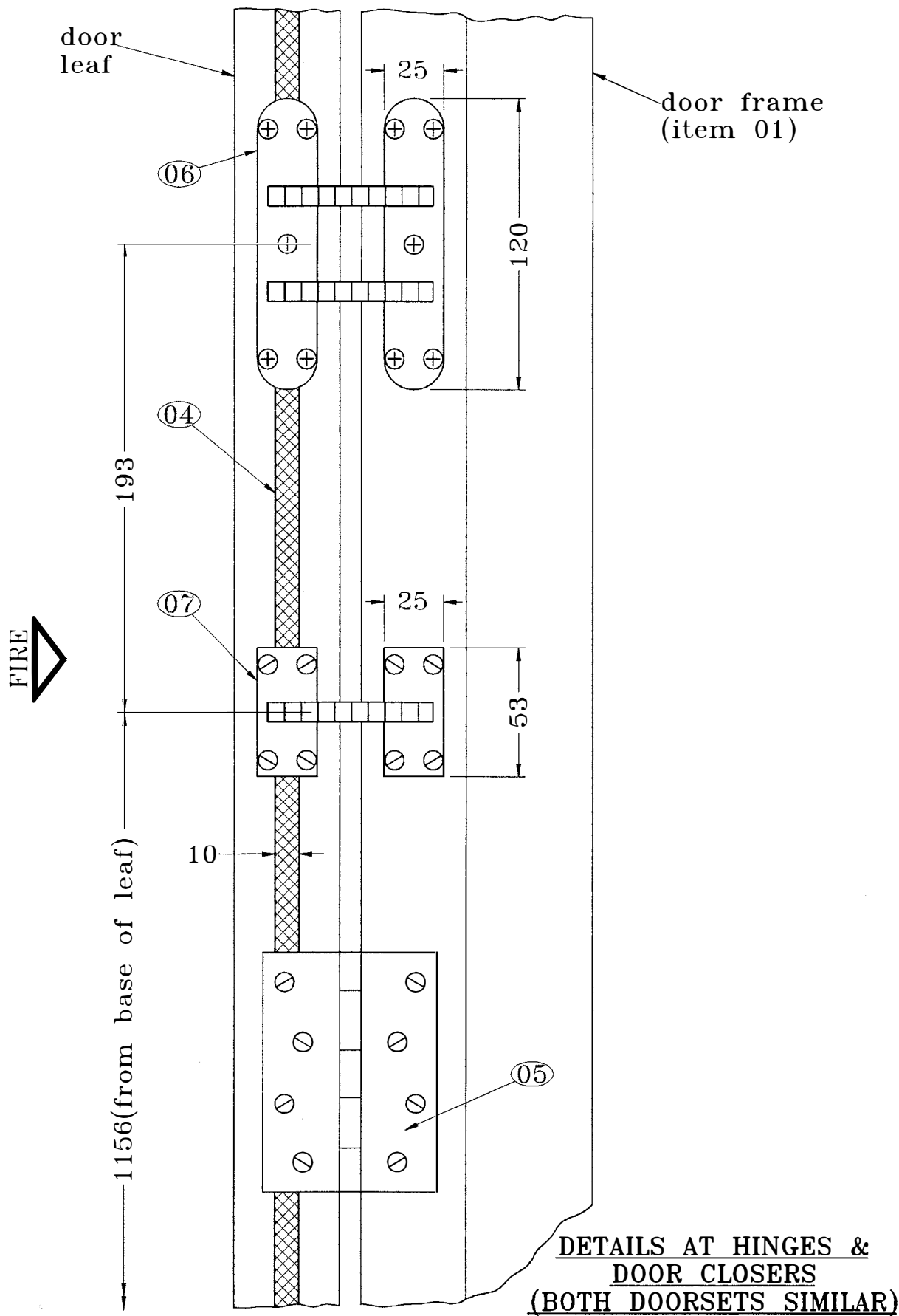
All dimensions are in mm.  
See Annex A for schedule.  
Do not scale

FIGURE 4

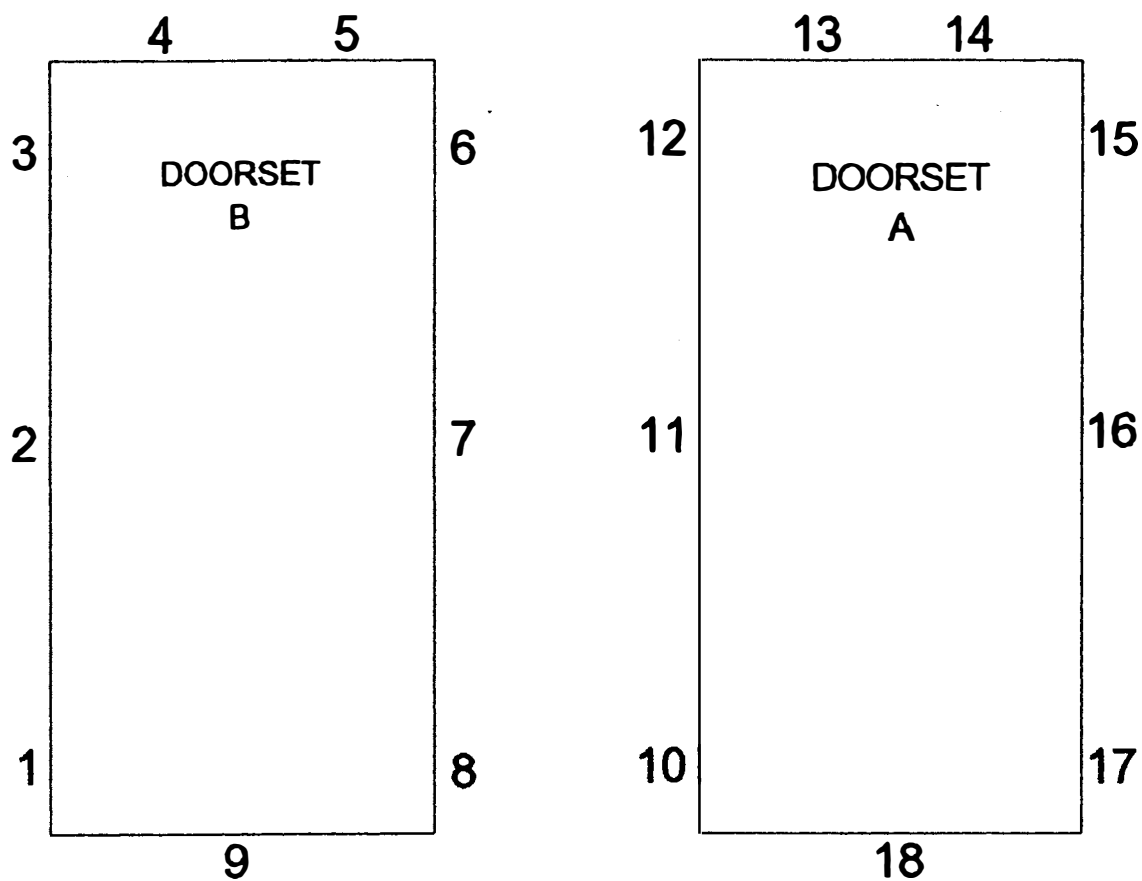


All dimensions are in mm.  
See Annex A for schedule.  
Do not scale

FIGURE 5



All dimensions are in mm.  
See Annex A for schedule.  
Do not scale



Mean:	2.70	1.	1.95	10.	4.15	Mean:	4.05
Minimum:	1.70	2.	1.70	11.	3.00	Minimum:	3.00
Maximum:	4.25	3.	3.15	12.	3.75	Maximum:	4.95
		4.	2.35	13.	3.75		
		5.	2.05	14.	4.95		
		6.	3.45	15.	4.30		
		7.	2.90	16.	4.50		
		8.	4.25	17.	3.95		
		*9.	4.00	*18.	4.00		

Dimensions measured between doors and frame as viewed from the exposed face. All dimensions in mm.

\*Dimensions not included in mean or maximum values.

FIGURE 7

ANNEX B

DATA RECORDED DURING THE TEST

**TABLE 1**

RECORDED FURNACE TEMPERATURE RISES AND PERCENTAGE TOLERANCES

:	:	STANDARD:	ACTUAL	:	AREA	:	AREA	:	:	:
:	Time:	FURNACE	FURNACE	:	UNDER	:	UNDER	:	PERCENT	PERCENT
:	:	TEMP.	TEMP.	:	STANDARD:	:	ACTUAL	:	DIFF.	TOLERANCE:
:	Mins:	:	:	:	CURVE	:	CURVE	:	:	:
:	:	Deg C	Deg C	:	Deg C.min:	:	Deg C.min:	:	:	+ or -
:	0:	20	14	:	:	:	:	:	:	:
:	1:	349	180	:	:	:	:	:	:	:
:	2:	445	491	:	:	:	:	:	:	:
:	3:	502	376	:	:	:	:	:	:	:
:	4:	544	554	:	:	:	:	:	:	:
:	5:	576	587	:	:	:	:	:	:	:
:	6:	603	699	:	:	:	:	:	:	:
:	7:	626	683	:	:	:	:	:	:	:
:	8:	645	614	:	:	:	:	:	:	:
:	9:	663	687	:	:	:	:	:	:	:
:	10:	678	685	:	5302	:	5219	:	-2	15
:	12:	705	728	:	:	:	:	:	:	:
:	14:	728	732	:	:	:	:	:	:	:
:	16:	748	737	:	:	:	:	:	:	:
:	18:	766	760	:	:	:	:	:	:	:
:	20:	781	776	:	:	:	:	:	:	:
:	22:	796	788	:	:	:	:	:	:	:
:	24:	809	816	:	:	:	:	:	:	:
:	26:	820	838	:	:	:	:	:	:	:
:	28:	831	850	:	:	:	:	:	:	:
:	30:	842	849	:	15493	:	15570	:	.5	10
:	32:	851	855	:	1694	:	1695	:	0	5

Annex B (Continued)

**TABLE 2**

INDIVIDUAL AND MEAN TEMPERATURE RECORDED ON THE UNEXPOSED  
SURFACE OF THE LEAF OF DOORSET A

: :Time: :Mins:	: T/C 11 : Deg C	: T/C 12 : Deg C	: T/C 13 : Deg C	: T/C 14 : Deg C	: T/C 15 : Deg C	: MEAN : TEMP. : Deg C
:	:	:	:	:	:	:
: 0:	14 :	14 :	14 :	14 :	14 :	14 :
: 1:	14 :	14 :	14 :	14 :	14 :	14 :
: 2:	14 :	14 :	14 :	14 :	14 :	14 :
: 3:	14 :	14 :	14 :	14 :	14 :	14 :
: 4:	14 :	14 :	14 :	14 :	14 :	14 :
: 5:	14 :	14 :	14 :	14 :	14 :	14 :
: 6:	16 :	14 :	14 :	14 :	14 :	14 :
: 7:	23 :	14 :	14 :	15 :	14 :	16 :
: 8:	32 :	14 :	14 :	21 :	19 :	20 :
: 9:	41 :	14 :	14 :	31 :	26 :	25 :
: 10:	49 :	14 :	14 :	40 :	34 :	30 :
: 11:	56 :	14 :	16 :	50 :	42 :	36 :
: 12:	61 :	14 :	19 :	57 :	51 :	40 :
: 13:	65 :	14 :	23 :	62 :	57 :	44 :
: 14:	68 :	14 :	27 :	67 :	63 :	48 :
: 15:	71 :	14 :	31 :	70 :	67 :	51 :
: 16:	74 :	14 :	36 :	73 :	71 :	54 :
: 17:	76 :	14 :	41 :	75 :	74 :	56 :
: 18:	79 :	*	46 :	78 :	76 :	59 :
: 19:	81 :	:	51 :	80 :	78 :	61 :
: 20:	84 :	:	56 :	82 :	81 :	64 :
: 21:	90 :	:	60 :	84 :	84 :	67 :
: 22:	96 :	:	64 :	87 :	89 :	71 :
: 23:	99 :	:	68 :	94 :	95 :	75 :
: 24:	101 :	:	71 :	99 :	97 :	77 :
: 25:	108 :	:	74 :	100 :	100 :	80 :
: 26:	118 :	:	77 :	102 :	106 :	84 :
: 27:	132 :	:	79 :	107 :	116 :	91 :
: 28:	146 :	:	81 :	118 :	130 :	99 :
: 29:	161 :	:	83 :	133 :	147 :	109 :
: 30:	176 :	:	84 :	150 :	163 :	120 :
: 31:	191 :	:	86 :	169 :	184 :	131 :
: 32:	239 :	:	88 :	197 :	230 :	245 :

\* Thermocouple malfunction



Annex B (Continued)

**TABLE 3**

INDIVIDUAL AND MEAN TEMPERATURE RECORDED ON THE UNEXPOSED  
SURFACE OF THE LEAF OF DOORSET B

: :Time: :Mins:	: T/C 16 Deg C	: T/C 17 Deg C	: T/C 18 Deg C	: T/C 19 Deg C	: T/C 20 Deg C	: MEAN TEMP. Deg C	: :
: 0:	14	14	14	14	14	14	:
: 1:	14	14	14	14	14	14	:
: 2:	14	14	14	14	14	14	:
: 3:	14	14	14	14	14	14	:
: 4:	14	14	14	14	14	14	:
: 5:	14	14	14	14	14	14	:
: 6:	14	14	14	14	14	14	:
: 7:	14	14	14	14	14	14	:
: 8:	14	14	14	14	14	14	:
: 9:	14	14	14	14	14	14	:
: 10:	14	14	14	14	14	14	:
: 11:	14	14	14	14	14	14	:
: 12:	14	14	14	14	14	14	:
: 13:	14	14	14	14	14	14	:
: 14:	14	14	14	14	14	14	:
: 15:	15	16	14	14	14	15	:
: 16:	18	19	14	15	17	17	:
: 17:	20	22	16	17	20	19	:
: 18:	24	26	19	20	23	22	:
: 19:	27	30	21	23	27	26	:
: 20:	30	33	24	26	31	29	:
: 21:	33	38	27	29	35	32	:
: 22:	36	41	30	32	38	36	:
: 23:	40	44	33	36	42	39	:
: 24:	43	48	36	40	45	42	:
: 25:	47	51	39	44	48	46	:
: 26:	50	54	42	47	51	49	:
: 27:	54	57	46	51	54	52	:
: 28:	56	59	49	53	57	55	:
: 29:	59	62	52	57	59	58	:
: 30:	62	65	56	60	62	61	:
: 31:	65	67	58	62	64	63	:
: 32:	68	70	62	65	66	66	:

Annex B (Continued)

TABLE 4

INDIVIDUAL TEMPERATURES RECORDED ON THE UNEXPOSED  
SURFACE OF THE FRAME OF DOORSET A

: Time:	T/C 21	T/C 22	T/C 24
: Mins:	Deg C	Deg C	Deg C
: 0:	14	14	14
: 1:	14	14	14
: 2:	14	14	14
: 3:	14	14	14
: 4:	16	14	14
: 5:	15	14	14
: 6:	15	14	14
: 7:	18	14	14
: 8:	23	14	14
: 9:	30	14	14
: 10:	38	14	14
: 11:	46	14	14
: 12:	53	14	14
: 13:	58	14	14
: 14:	63	14	14
: 15:	67	14	14
: 16:	71	14	14
: 17:	73	14	14
: 18:	76	14	14
: 19:	79	14	14
: 20:	82	14	14
: 21:	87	14	14
: 22:	92	14	14
: 23:	95	14	14
: 24:	97	14	14
: 25:	102	14	14
: 26:	111	14	14
: 27:	125	14	14
: 28:	140	14	14
: 29:	155	14	14
: 30:	172	14	14
: 31:	194	14	14
: 32:	368	16	14

Annex B (Continued)

TABLE 5

INDIVIDUAL TEMPERATURES RECORDED ON THE UNEXPOSED  
SURFACE OF THE FRAME OF DOORSET B

:	:	:	:	:
:Time:	T/C 25	:	T/C 26	:
:	:	:	:	:
:Mins:	Deg C	:	Deg C	:
:	:	:	:	:
:	0:	14	:	14
:	1:	14	:	14
:	2:	14	:	14
:	3:	14	:	14
:	4:	14	:	14
:	5:	22	:	14
:	6:	24	:	14
:	7:	23	:	14
:	8:	23	:	14
:	9:	24	:	14
:	10:	21	:	14
:	11:	19	:	14
:	12:	20	:	14
:	13:	20	:	14
:	14:	18	:	14
:	15:	17	:	14
:	16:	17	:	14
:	17:	16	:	14
:	18:	15	:	14
:	19:	14	:	14
:	20:	14	:	14
:	21:	14	:	14
:	22:	14	:	14
:	23:	14	:	14
:	24:	14	:	14
:	25:	14	:	14
:	26:	14	:	14
:	27:	14	:	14
:	28:	15	:	14
:	29:	15	:	14
:	30:	23	:	14
:	31:	24	:	14
:	32:	23	:	14

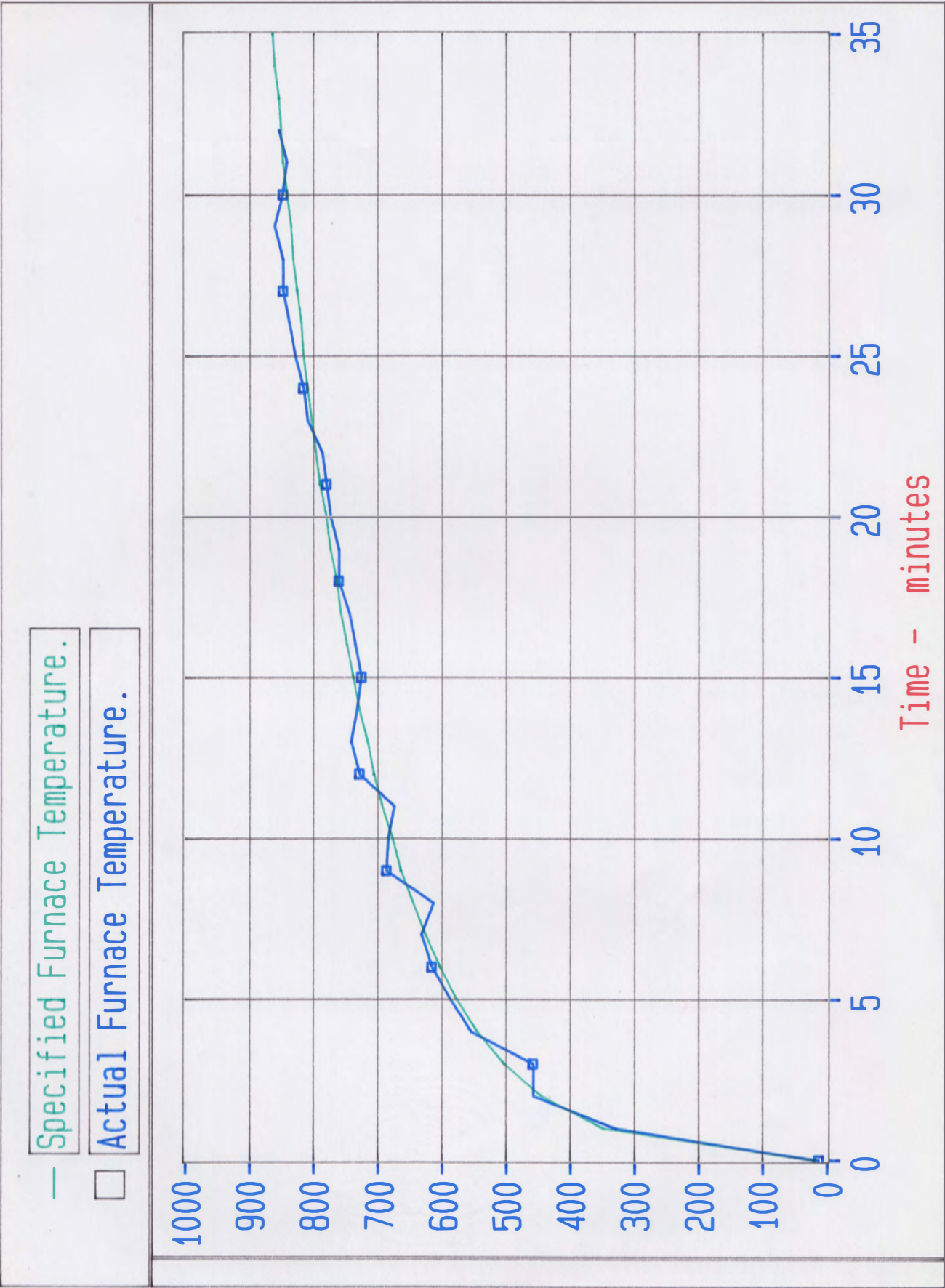


FIGURE 8

— Mean Unexposed Surface Temp. Door A.

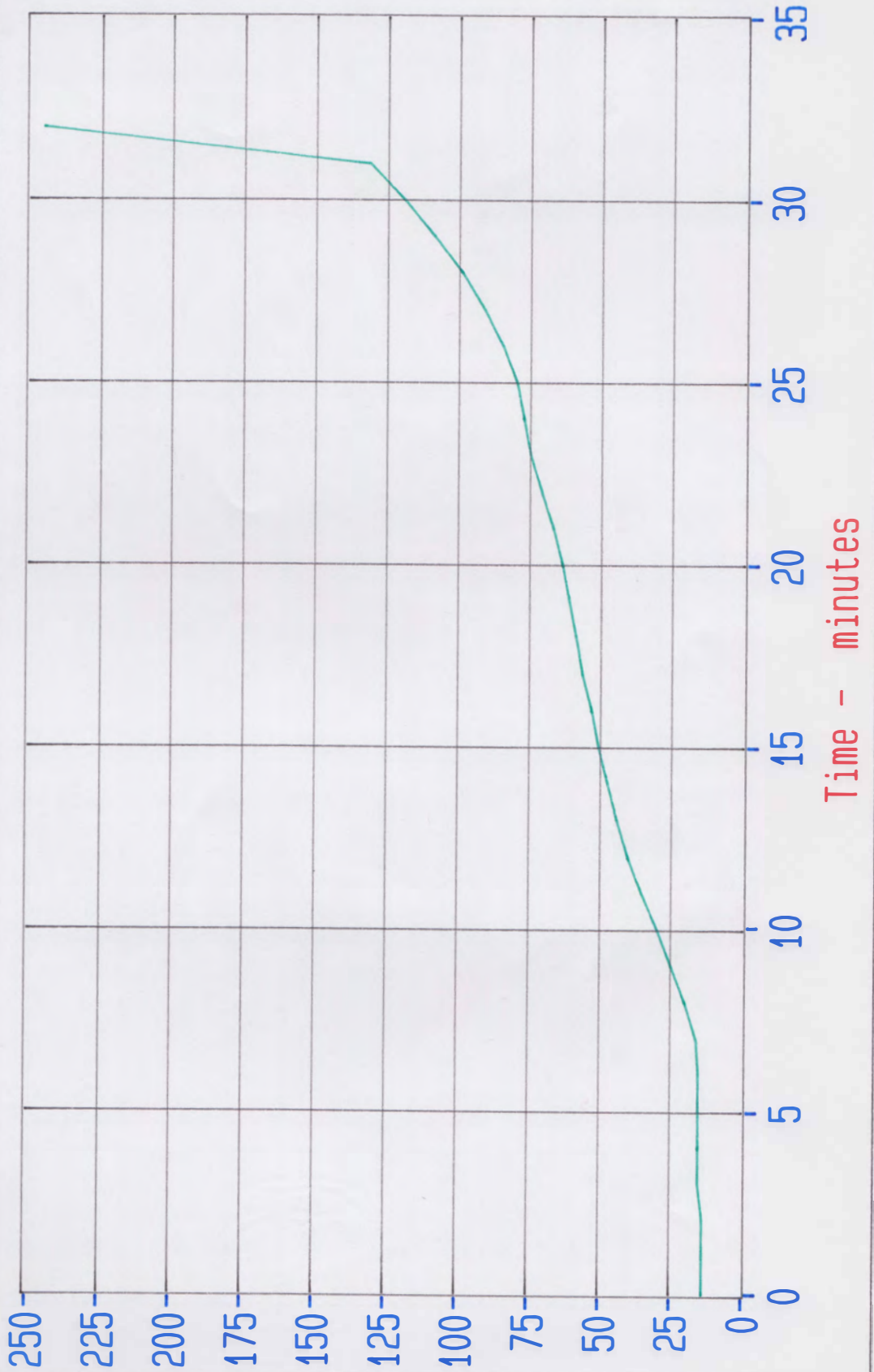


FIGURE 9



— Mean Unexposed Surface Temp. Door B.

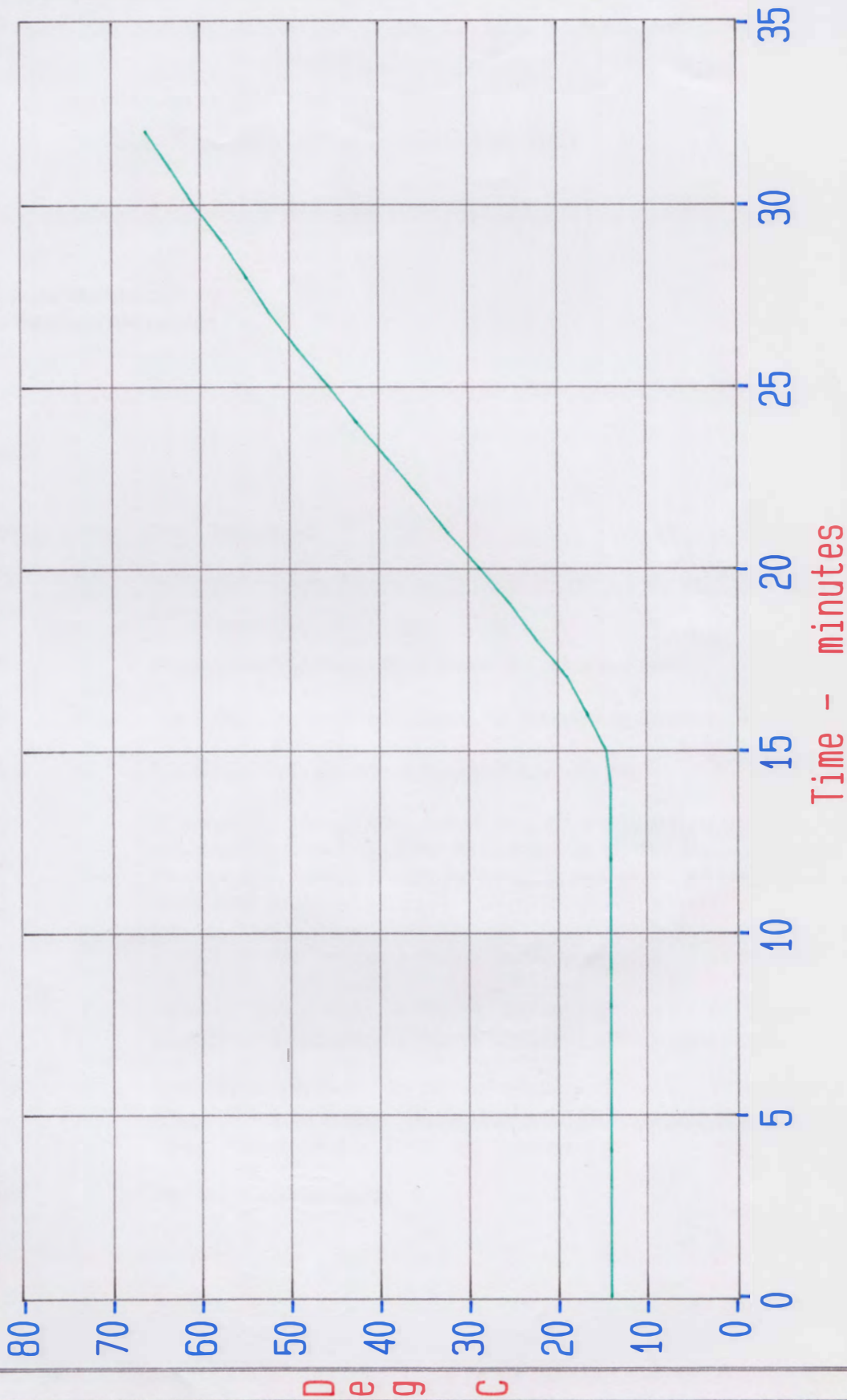


FIGURE 10

## ANNEX C

### OBSERVATIONS MADE DURING THE TEST

The following observations were made during the test by Warrington Fire Research Centre

E - Observations from exposed side

U - Observations from unexposed side

Time			
mins	secs		
00	00		Test commences.
02	10	U	Slight smoke/steam release begins from around the top edge of both door leaves.
04	00	U	Smoke release increases from around the upper leaf edges.
10	00	E	The Perkomatic closer is visible as the surrounding flaxboard falls.
20	00	E	The tubes within the core of door leaf A are visible.
22	00	U	A darker area below thermocouple no. 11 is forming on the door leaf coincident with the end of the Perkomatic closer. The unexposed surface temperature is measured using the roving thermocouple, the temperature is found to be 66°C.
28	30	U	A slight glow is forming in the top leading edge corner of the doorset.
28	58	U	Sustained flames occur in the top leading edge corner of Doorset A. <b><u>Integrity and insulation failure of Doorset A is deemed to occur.</u></b>
29	39	U	Sustained flames occur in the top leading edge corner of Doorset B. <b><u>Integrity and insulation failure of Doorset B is deemed to occur.</u></b> No further areas of integrity failure are observed.
32	00		The test is discontinued.

ANNEX D

PHOTOGRAPHS

- |         |   |   |
|---------|---|---|
| Plate 1 | - | The exposed face prior to testing.                                  |
| Plate 2 | - | Edge detail of door leaf A showing door closers prior to testing.   |
| Plate 3 | - | The unexposed face of Doorset A prior to testing.                   |
| Plate 4 | - | The unexposed face of Doorset B prior to testing.                   |
| Plate 5 | - | The unexposed face of Doorsets A and B after 5 minutes of testing.  |
| Plate 6 | - | The unexposed face of Doorsets A and B after 28 minutes of testing. |





Plate 1



Plate 2





Plate 3



Plate 4





Plate 5

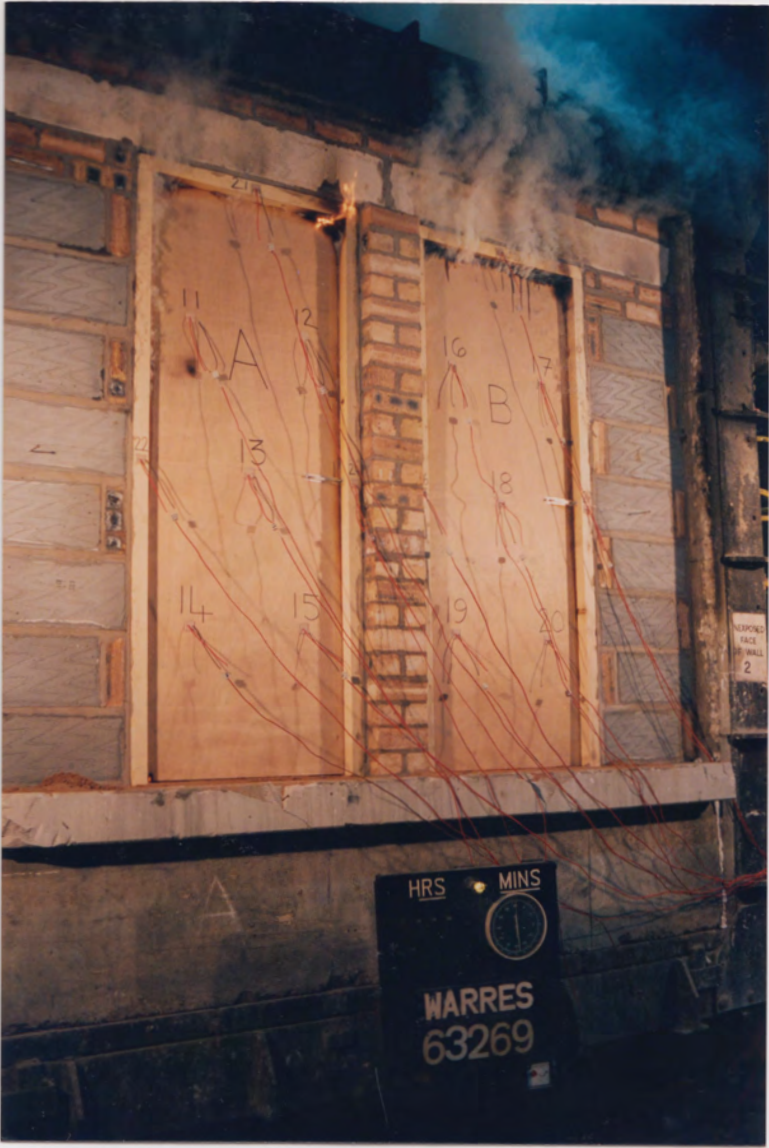


Plate 6