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HOKLAS 091

TEST REPORT

TEST REPORT NO.: R07L06B
DATE OF ISSUE: 5 March 2008

Test Sponsor:	**Garish Crown Fire Engineering & Consultancy.**
Address of Test Sponsor:	Unit 25, Upper Ground Floor, Block B, Wah Lok Industrial Centre (Phase 1), 37-41 Shan Mei Street, Fotan, Shatin, Hong Kong.
Identification of Test Item:	***Q7K50A – Partially Insulated Double-Leaf Timber Doorset***
Test Method:	Fire resistance test conducted in accordance with BS 476: Part 22: 1987.
Date of Test:	14 December 2007
Ambient temperature at the time of testing:	23 °C

APPROVED SIGNATORY: _____ DATE: 05 MAR 2008

Ir Dr. YUEN Sai-wing, MHKIE (FIRE)

The test results are valid only for the conditions under which the test was conducted.

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Fire resistance test conducted in accordance with BS 476: Part 22: 1987, Section 7 on a partially insulated, double-leaf timber doorset

1. Summary

A specimen of double-leaf, single-acting timber doorset had been subjected to a test in accordance with Section 7 of BS 476: Part 22: 1987 to determine its fire resistance performance.

As requested by the test sponsor, the specimen was mounted within concrete line specimen holder. The specimen was mounted such that the door leaves were swinging towards the heating conditions.

The double-leaf timber doorset had overall dimensions of 2,174 mm wide by 2,339 mm high. It comprised of a timber door frame incorporated with equal door leaves. Both door leaves were of 1,050 mm wide by 2,300 mm high by 50 mm thick and each door leaf was hung to the door frame by 3 nos. of stainless steel butt hinges with sizes of 102 mm by 102 mm. Surface mounted overhead door closers were fixed on the unexposed surface of each door leaf during the test. A mortise knob latchset and 2 nos. of flush bolts were installed on the left and right door leaves respectively. There were 10 mm lipping applied around the door leaves. The left and right door leaves incorporated with a glazed panel with vision sizes of 315 mm wide by 815 mm high and of 186 mm wide by 1,141 mm high respectively. An intumescent seal of 30 mm wide by 4 mm thick was installed at the jambs and head of door frame. An intumescent seal of 15 mm wide by 4 mm thick was installed at the meeting edge rebate of each door leaf. The latchset at the left door leaf was unlatched during the test. The flush bolts at the right door leaf were in unlatched position during the test.

The specimen satisfied the performance requirements specified in BS 476: Part 22: 1987, for the following periods:

Insulation:	**67** Minutes
Integrity:	**67** Minutes (No failure)

The test was discontinued after a period of 67 minutes.

2. Introduction

The specimen was tested in accordance with Section 7, 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 the BS 476: Part 20: 1987, 'Methods for determination of the fire resistance of elements of construction (general principles)'.

The specimen was mounted by the test sponsor. The test was led by Miss Sammi Cheng and was witnessed by Mr. Ho Ho and Mr. Raymond Leung, the representatives of the test sponsor.

3. Test Specimen Construction

The specimen was installed into concrete specimen holders to form the test construction. A comprehensive description of the test construction is presented in the appendix, which is based on a survey of the specimen and information supplied by the test sponsor.

4. Location of Testing Laboratory

96 York, Lot No. 2440, Section M, Ma Tso Lung, Sheung Shui, New Territories, Hong Kong.

5. Equipment

Equipment includes:

Nine (9) thermocouples to monitor the temperature of the furnace, which were kept at 100 mm from the face of the specimen (see Figure 1).

Nine (9) thermocouples to monitor for the temperature of the unexposed face of the specimen (see Figure 2).

A roving thermocouple to measure temperature on hot spots of unexposed surface.

A micro-manometer provided to monitor the furnace pressure.

Cotton pads, 6 mm and 25 mm gap gauges.

Steel ruler to monitor the lateral deflection of the specimen.

6. Test Procedures

The test was conducted in accordance with the procedures specified in Section 7 of BS 476: Part 22: 1987. The ambient temperature of the test area during the test was measured. After the first 10 minutes of the test, the furnace pressure was maintained at 0 ± 2 Pa relative to atmosphere, at 1,000 mm from the notional floor level.

The furnace was monitored by nine (9) thermocouples so that the mean furnace temperature complied with the requirements of Clause 3.1 of BS 476: Part 20: 1987.

The temperature of the unexposed face was monitored by means of nine (9) thermocouples fixed to the unexposed surface (see Figure 2 for the locations and reference numbers of the thermocouples). Six (6) of them (S1-S6) were the key thermocouples for both the mean and maximum temperatures of the unexposed surface and the rest (S7-S9) were fixed to the door frame for maximum temperature of the unexposed surface. The mean and maximum temperatures were recorded.

The cotton pads and gap gauges were used, if considered appropriate, to determine compliance with the integrity criterion of the standard. The occurrence of sustained flaming on the unexposed surface was monitored to determine compliance with this criterion.

The lateral deflections of the specimen were measured by steel rules and recorded.

7. Test Data and Information

The ambient temperature of the test area during the test was 23 °C.

The furnace was controlled so that the mean furnace temperature complied with the requirements of Clause 3.1 of BS 476: Part 20: 1987. The temperatures recorded are shown graphically in Figure 5.

The mean and maximum temperatures of the unexposed surfaces of the specimen are shown graphically in Figures 6.

A summary of the observations made on the general behaviour of the specimen is given in the appendix.

The deflections obtained are summarized in Table 1.

The test was discontinued after a heating period of 67 minutes.

8. Results

When tested in accordance with Section 7 of BS 476: Part 22: 1987, the requirements of the standard were satisfied for the following periods:

Insulation:	67 Minutes
Integrity:	67 Minutes (No failure)

Insulation - It is required that the mean temperature rise of the unexposed surface shall not be greater than 140 °C and that maximum temperature rise shall not be greater than 180 °C. Insulation failure also occurs simultaneously with integrity failure.

The 140 °C rise of the mean temperature of the unexposed surface of the specimen did not reach during the test. The 180 °C rise of the maximum temperature of the unexposed surface of the specimen did not reach during the test. The maximum temperature rise was 85°C at thermocouple S5 after the 67 minutes heating condition.

Integrity - It is required that there is no collapse for the specimen, no sustained flaming on the unexposed surface and no loss of impermeability.

The specimen met the test integrity requirements after a heating period of 67 minutes.

9. Limitations

The results relate only to the behaviour of the specimen of the element of construction under the particular conditions of the test. They are not intended to be the sole criteria for assessing the potential fire performance of the element in use nor do they reflect the actual behaviour in fires (see Clause 12 of BS 476: Part 20: 1987). The test results relate only to the specimen tested and obtained using the door to frame gaps recorded in this report. The fire resistance performance of doors of this design may change if substantially different gaps are used. Application of the results to the specimen of different dimensions or supported other than by a concrete wall or incorporating different components shall be the subject of a design appraisal.

Appendix

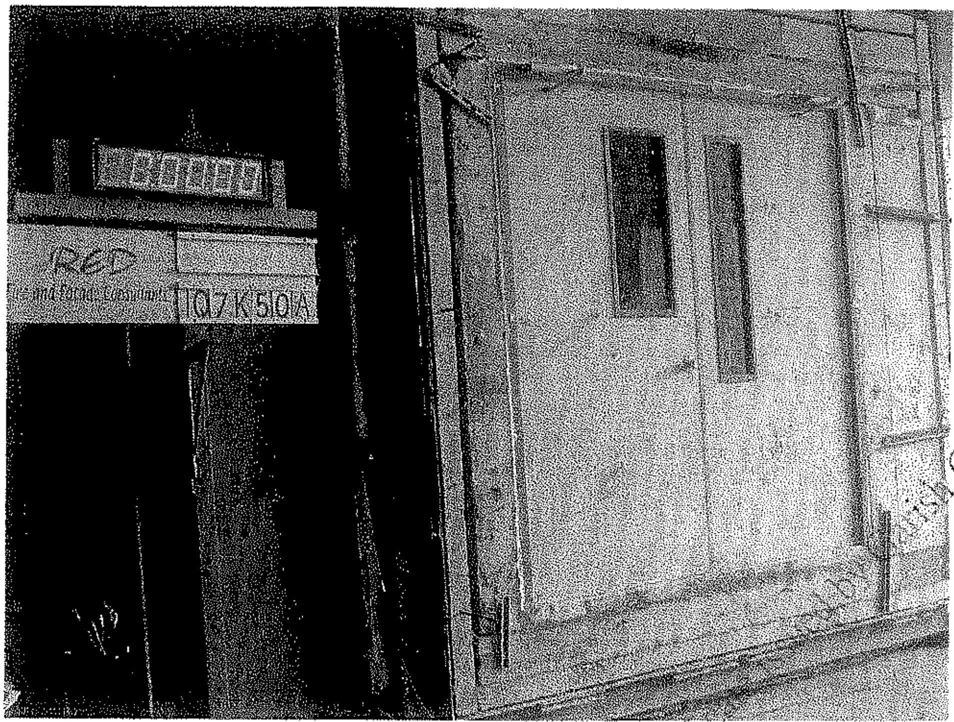


Photo 1: The unexposed face of the specimen before the test.

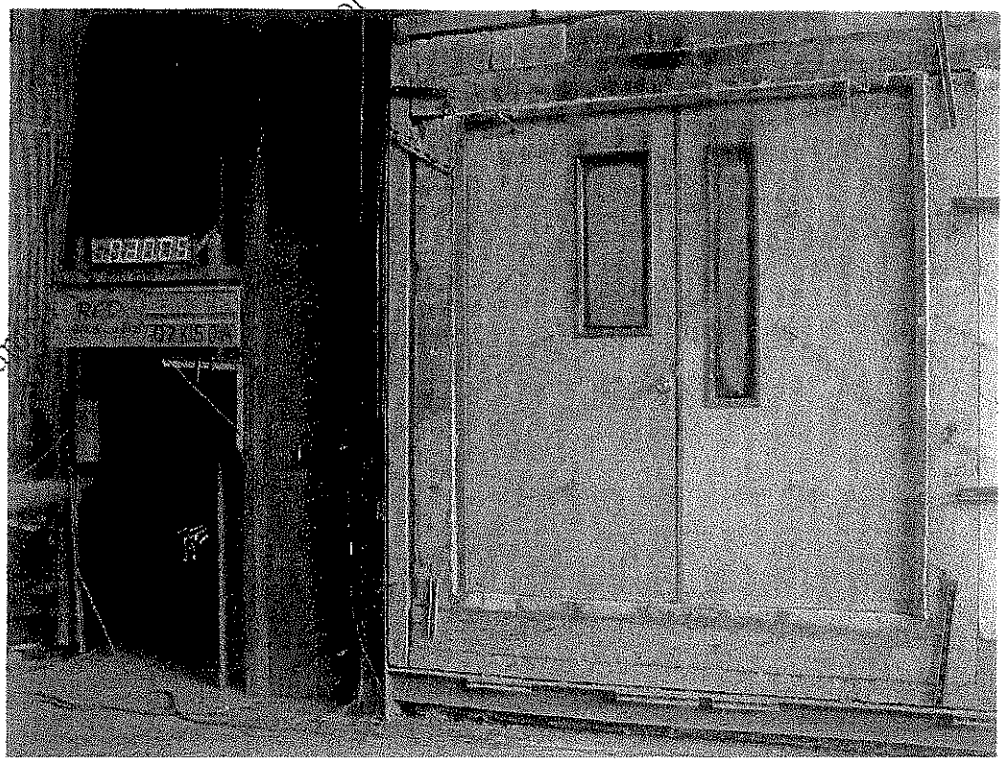


Photo 2: The unexposed face of the specimen after the heating period of 30 minutes.

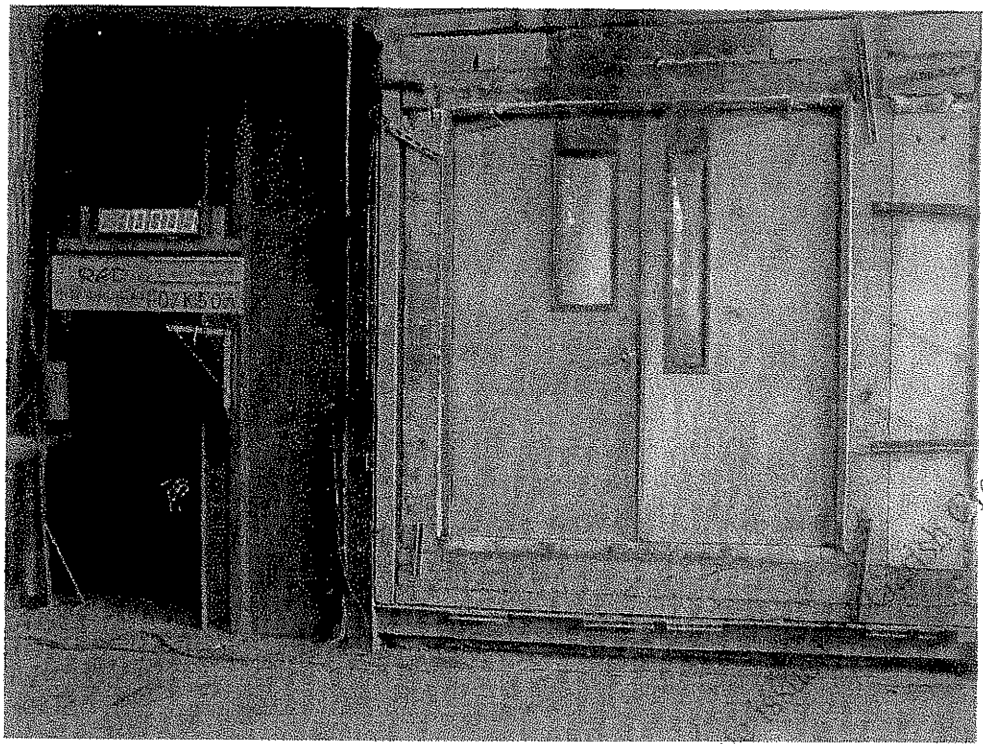


Photo 3: The unexposed face of the specimen after the heating period of 60 minutes.

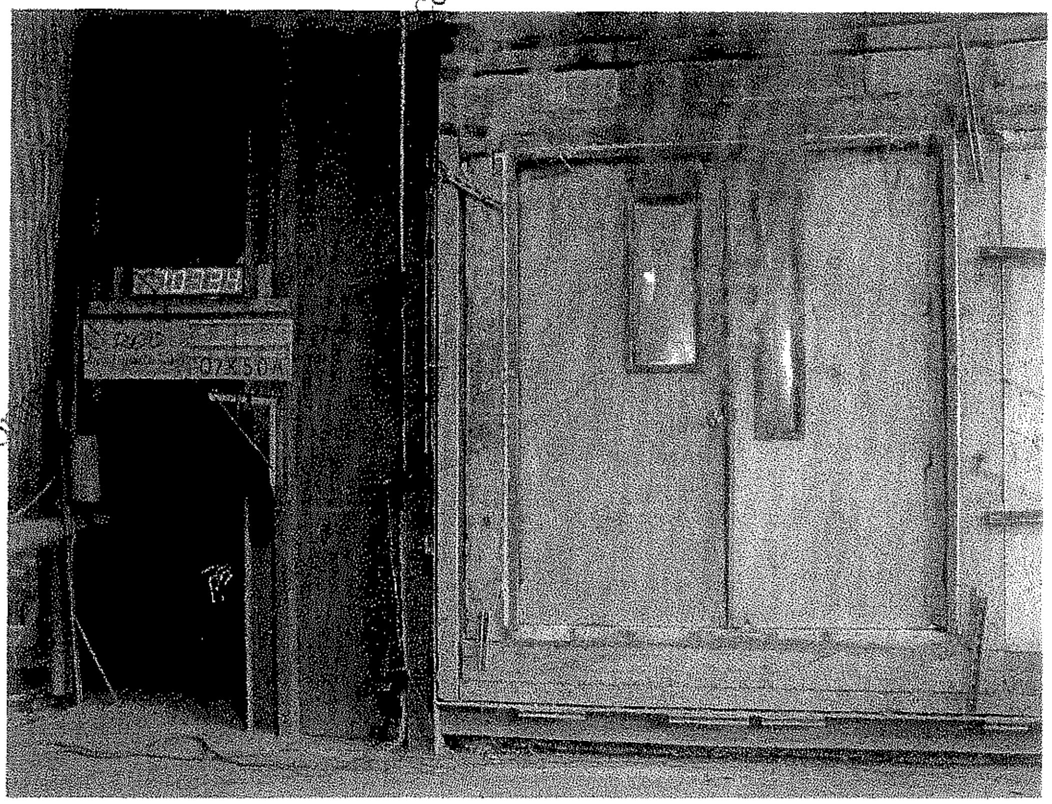


Photo 4: The unexposed face of the specimen after the test.

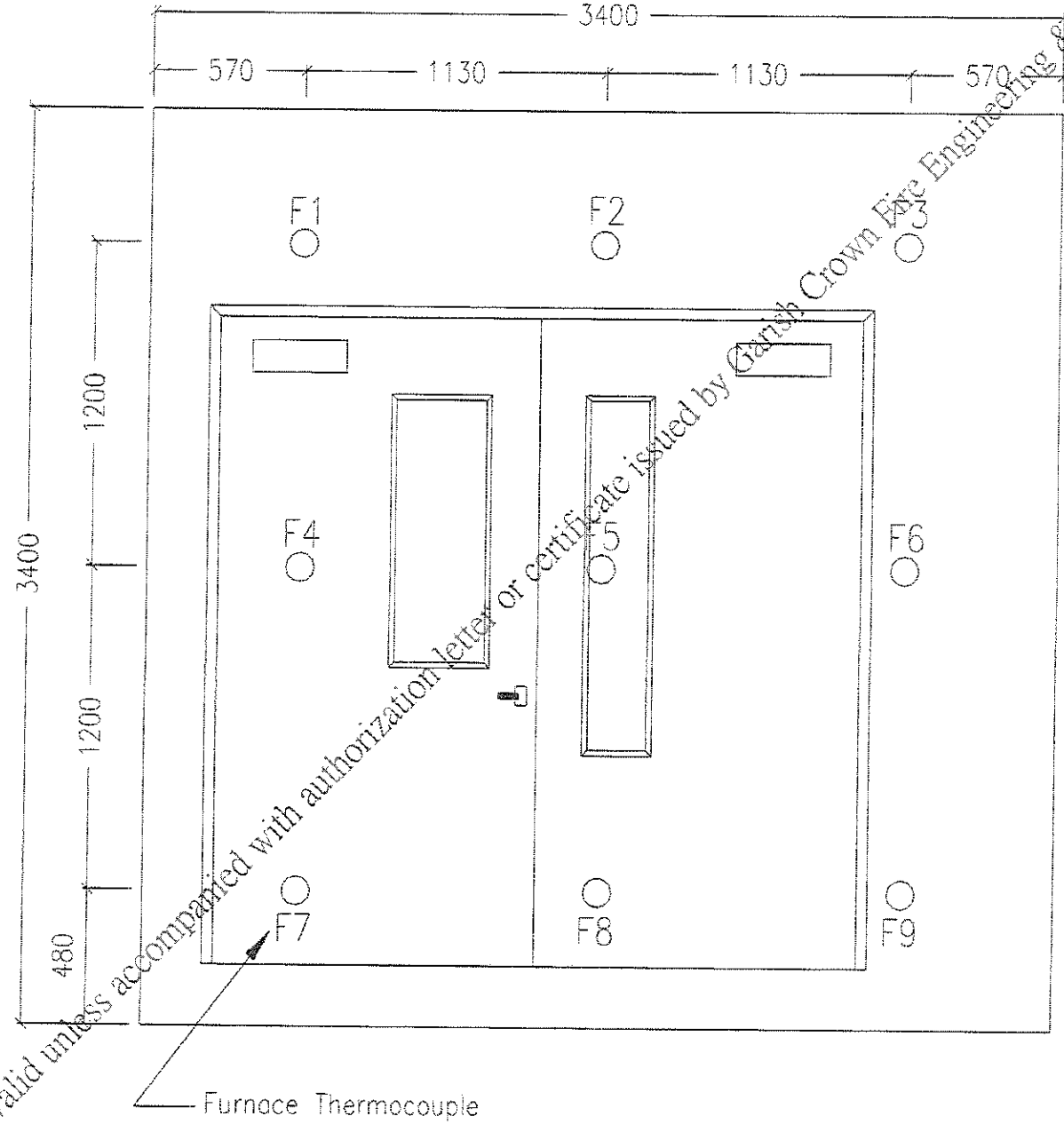


Figure 1 – Locations and reference number of furnace thermocouples.

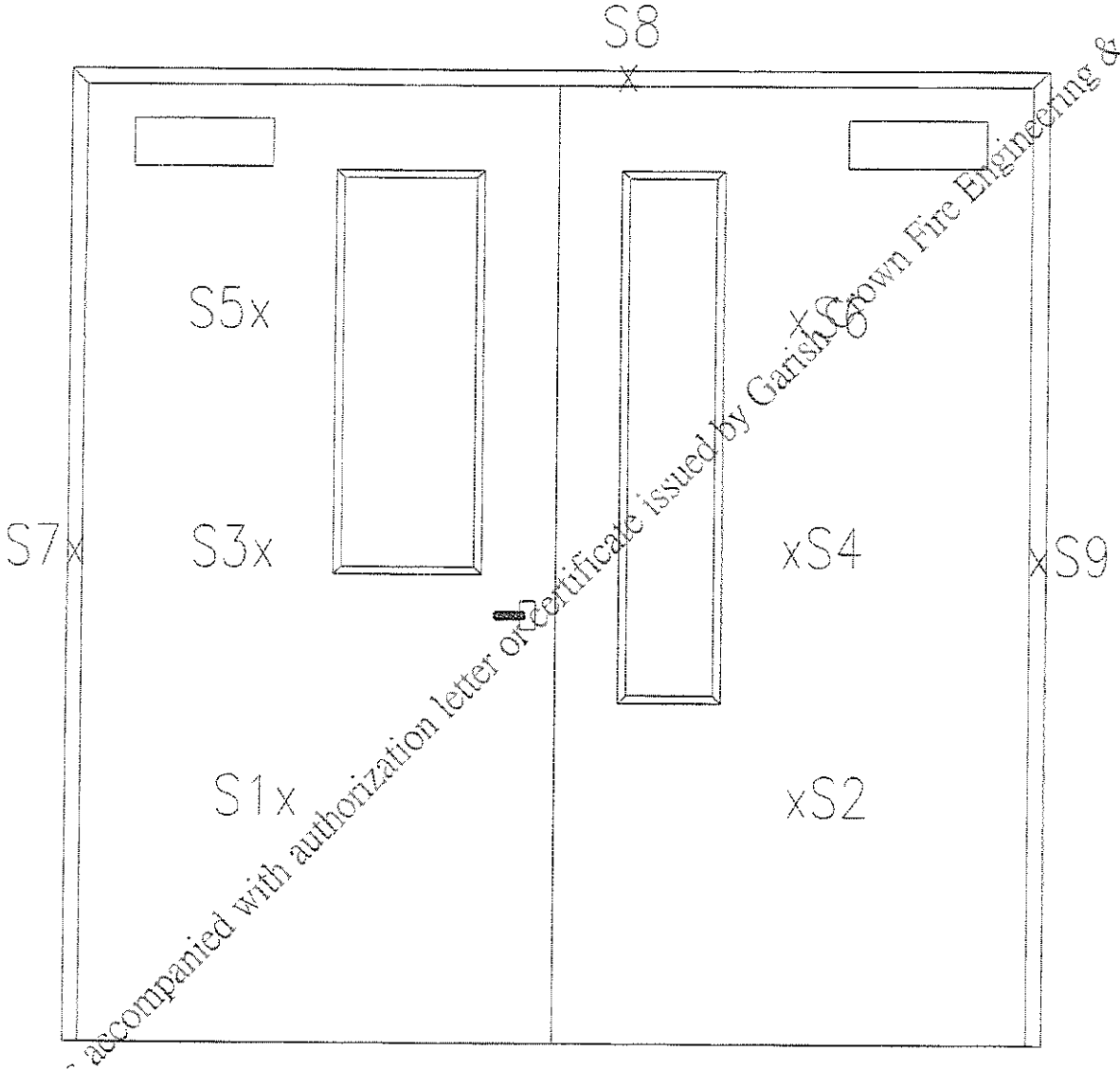


Figure 2 – Locations and reference number of thermocouples to monitor the temperature of unexposed surface of the specimen.

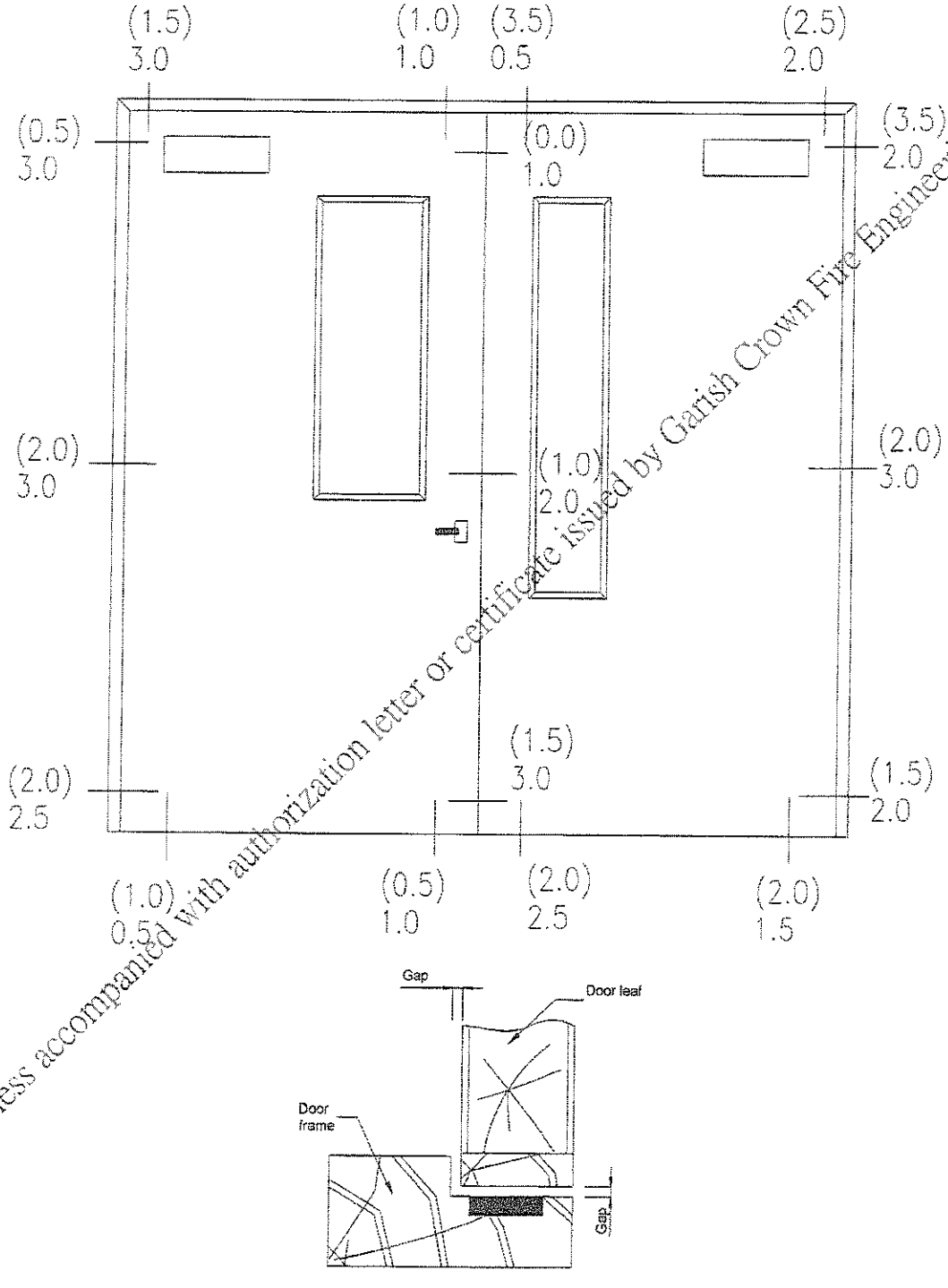


Figure 3 – Door gaps in mm, measured from unexposed face.
(Measurements from exposed face are in brackets)

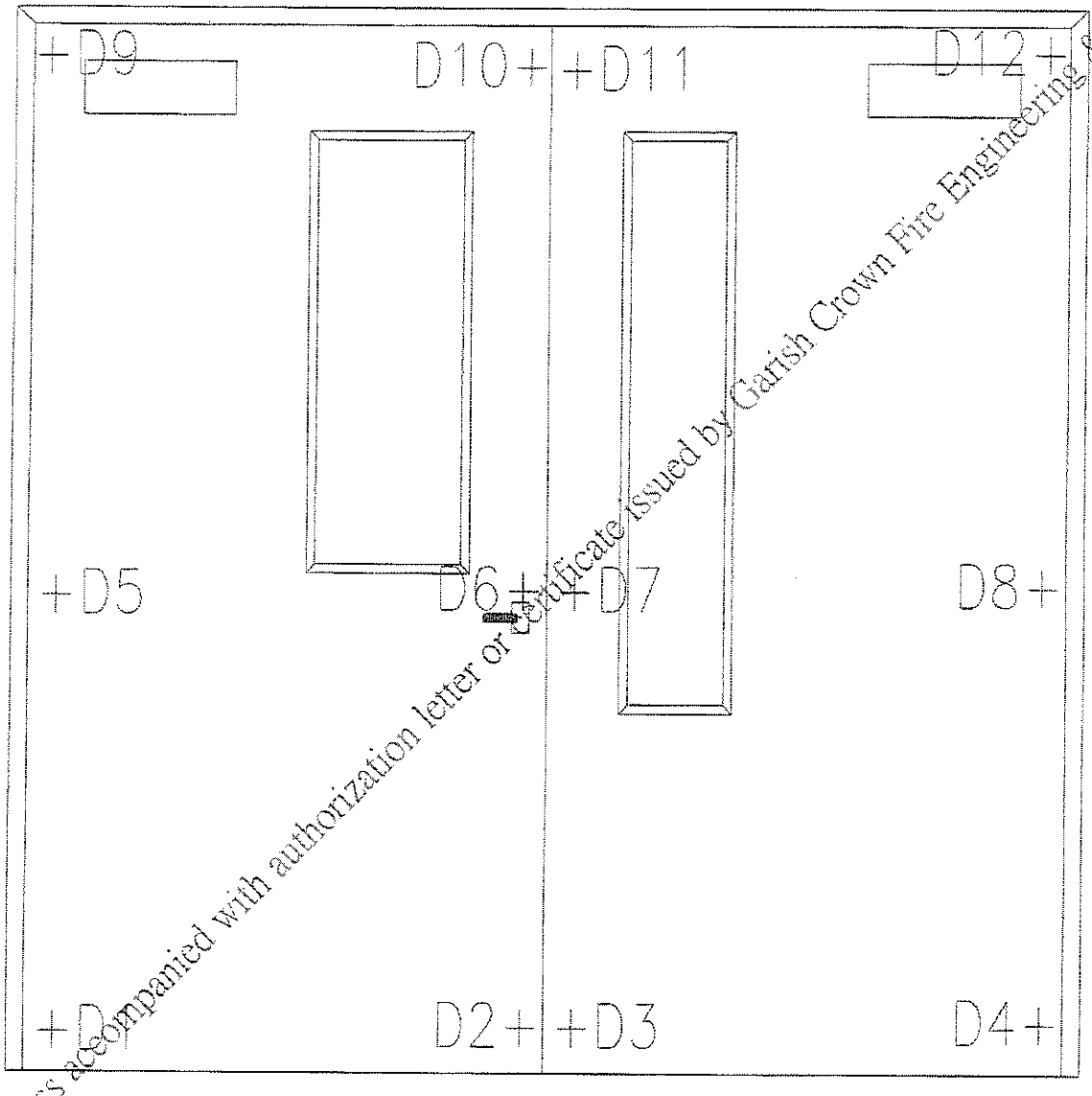


Figure 4 – Locations and reference numbers of displacement measurement.

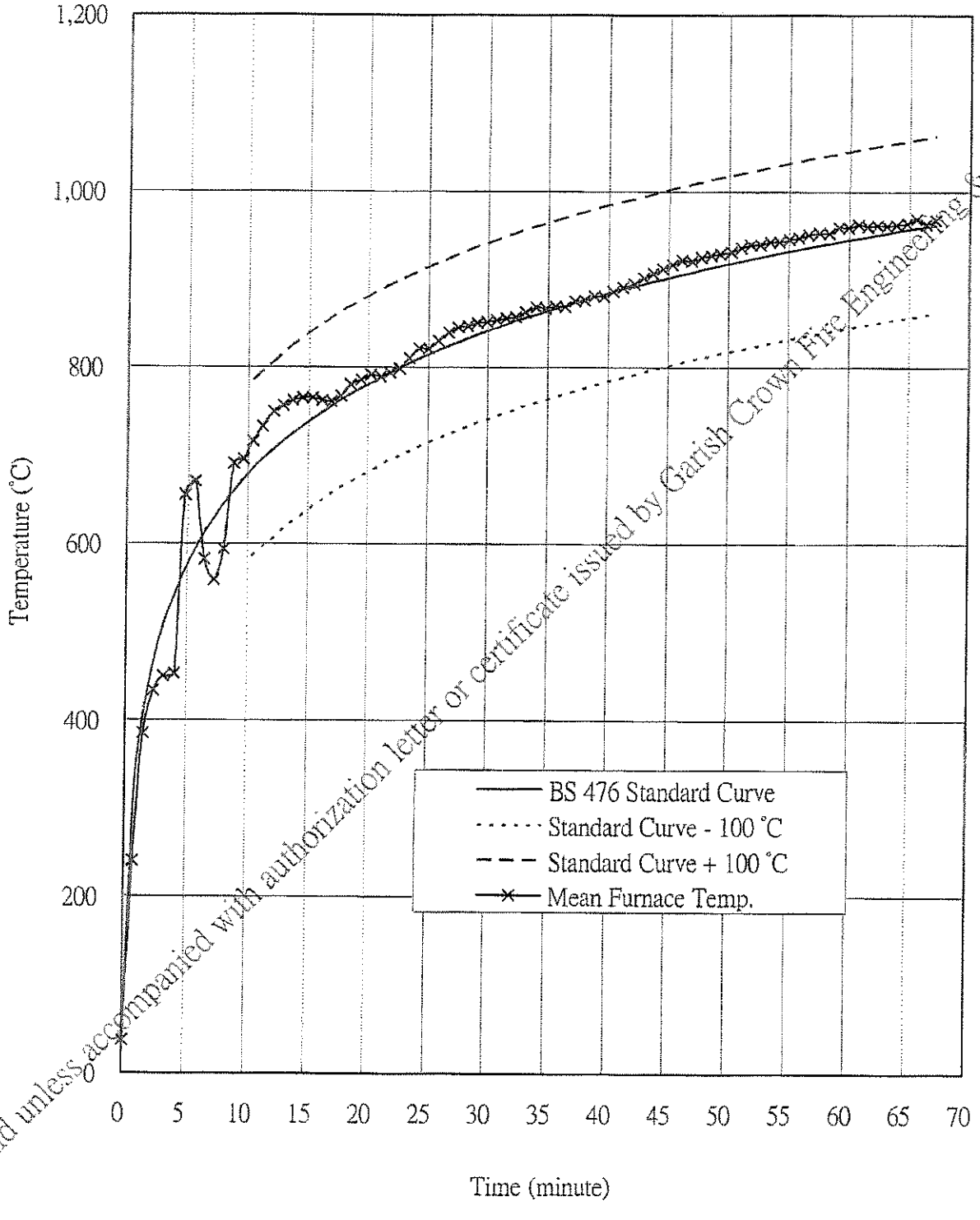


Figure 5 – Mean furnace temperatures.

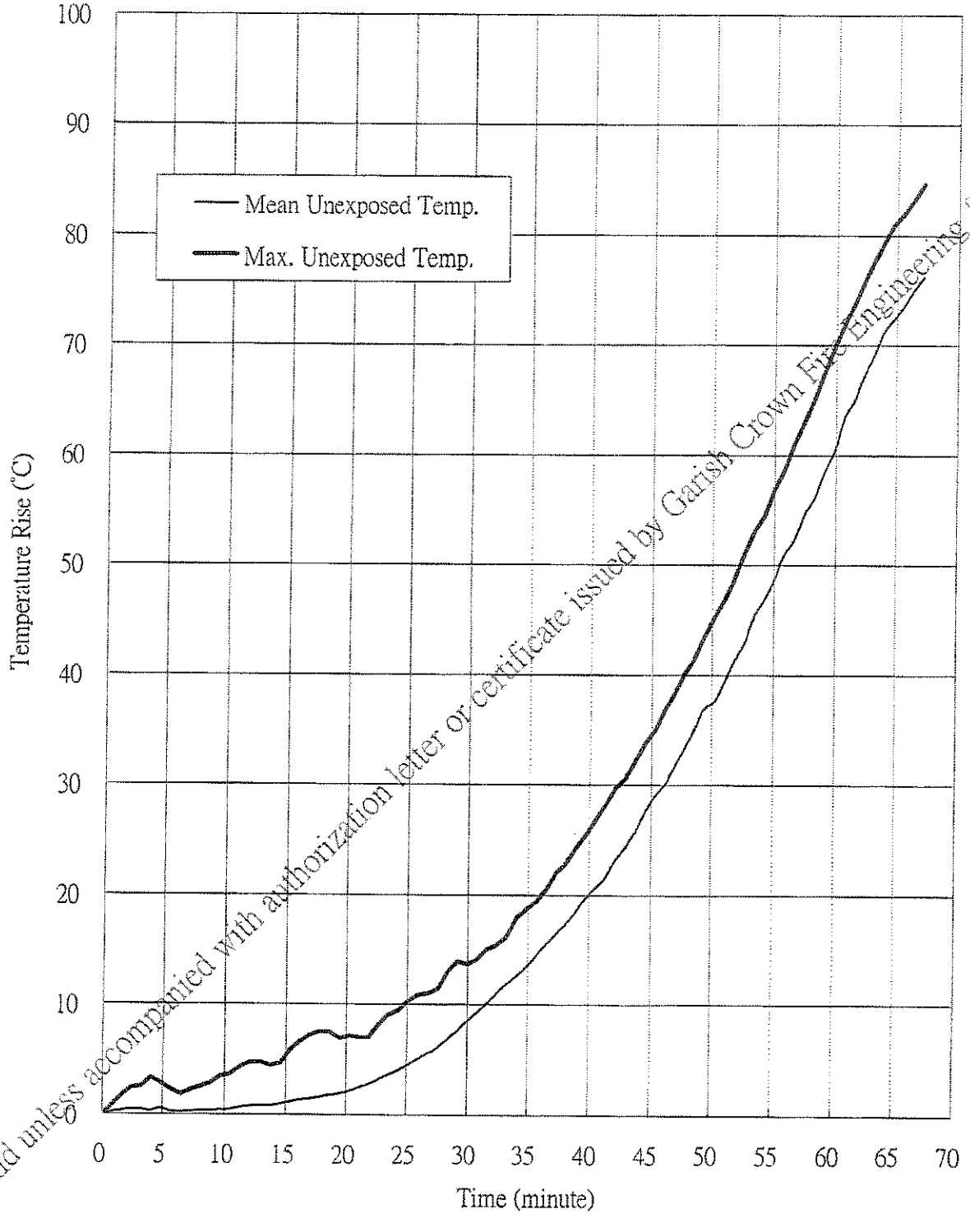


Figure 6 – Temperatures of unexposed surface of doorset.

Observation

Time (min.sec)	Exposed (E) or Unexposed (U)	Observation
00.00	-	Test started.
01.20	U	Cracks developed on both wire glass panels.
01.50	U	Smoke started releasing from the perimeter of door leaves.
02.50	U	More cracks developed on both wire glass panels.
04.20	U	Smoke release increased.
04.30	E	Flaming on the door leaves surface was observed.
06.00	U	Smoke release decreased.
06.20	U	Both wire glass panels turned dark.
11.30	E	Plywood dropped into furnace.
12.30	U	Smoke released from both wire glass panels.
18.50	U	Smoke released from latchset.
19.00	U	Intumescent seal around both wire glass panels started reacting.
22.00	U	Water droplet from the perimeter of the door leaves was observed.
26.30	E	Door leaves surface charred.
30.00	U/E	No significant change was observed. The specimen satisfied the integrity requirements performance.
33.30	U	Intumescent seal around both wire glass panels fully reacted.
35.00	U	Top glazed bead of both wire glass panels turned dark.
41.30	U	Visible deformation of the door leaves was observed.
42.50	U	Intumescent seal at right edge of the right door leaf peeled off.
46.30	U	Intumescent seal at the meeting edge peeled off.
53.30	U	Top left and right corners of the doorset turned dark.
58.30	U	Intumescent seal at right edge of the right door leaf dropped.
60.00	U/E	No significant change was observed. The specimen satisfied the integrity requirements performance.
61.15	U	Intmescent seal at the meeting edge dropped.
63.15	U	Door leaves surface deformed heavily.
65.00	U	Intermittent flaming was observed at the area near latchset and the bottom edge of right door leaf.
67.15	--	Test was terminated as requested by client. The specimen satisfied the integrity requirements performance.

Lateral deflections

Table 1

Lateral deflections (in mm) of the specimen during the test as viewed from the unexposed face.

Time (min) / Location	0	10	20	30	45
D1	0	0	3	7	14
D2	0	-3	-3	-2	-3
D3	0	-3	-5	-6	-3
D4	0	3	6	11	20
D5	0	-2	1	5	11
D6	0	-4	-5	-12	-21
D7	0	-4	-6	-16	-32
D8	0	3	7	10	19
D9	0	2	2	7	/
D10	0	2	4	7	/
D11	0	4	3	6	/
D12	0	0	6	13	/

Positive deflections indicate movement towards the furnace (see also Figure 4 for the locations).

The maximum deflection of doorset occurred at location D7 was 32 mm moving away from the furnace.

Information from client

Item	Description		
1	**Door Frame**		
	Material	:	Hardwood.
	Overall sizes	:	2,174 mm wide by 2,339 mm high.
	Density	:	600 kg/m^3 (Not measured by Laboratory).
	Rebate	:	18 mm by 53 mm.
	Jambs to head jointing method	:	Mortise joint.
	Frame to aperture fixings	:	3 nos. of M8 anchor bolt per jambs.
2	**Door Leaf**		
	Core material	:	Hardwood.
	Density of hardwood	:	550 kg/m^3 (Not measured by Laboratory).
	Left door leaf overall sizes	:	1,050 mm wide by 2,300 mm high by 50 mm thick.
	Right door leaf overall sizes	:	1,050 mm wide by 2,300 mm high by 50 mm thick.
	Fixing method	:	The core strips were impacted within the skeletal frame.
3	**Door Leaf Facings**		
	Material	:	Plywood.
	Thickness	:	5 mm.
	Density	:	Not less than 550 kg/m^3 (Not measured by Laboratory).
	Fixing method	:	'Dynea' aerolite FFD glue.
4	**Door Leaf Lipping**		
	Material	:	Hardwood.
	Density	:	600 kg/m^3 (Not measured by Laboratory).
	Thickness	:	10 mm.
	Fixing method	:	Glued and nailed.
5	**Intumescent Seal for Door Leaf**		
	Manufacturer	:	Gallford Limited.
	Material	:	'Pyroplex' flexible intumescent seal.
	Fixing Locations	:	1 no. of 15 mm wide by 4 mm thick installed at the meeting edge of each door leaf.
		:	1 no. of 30 mm wide by 4 mm thick installed at each jamb and head of door frame.

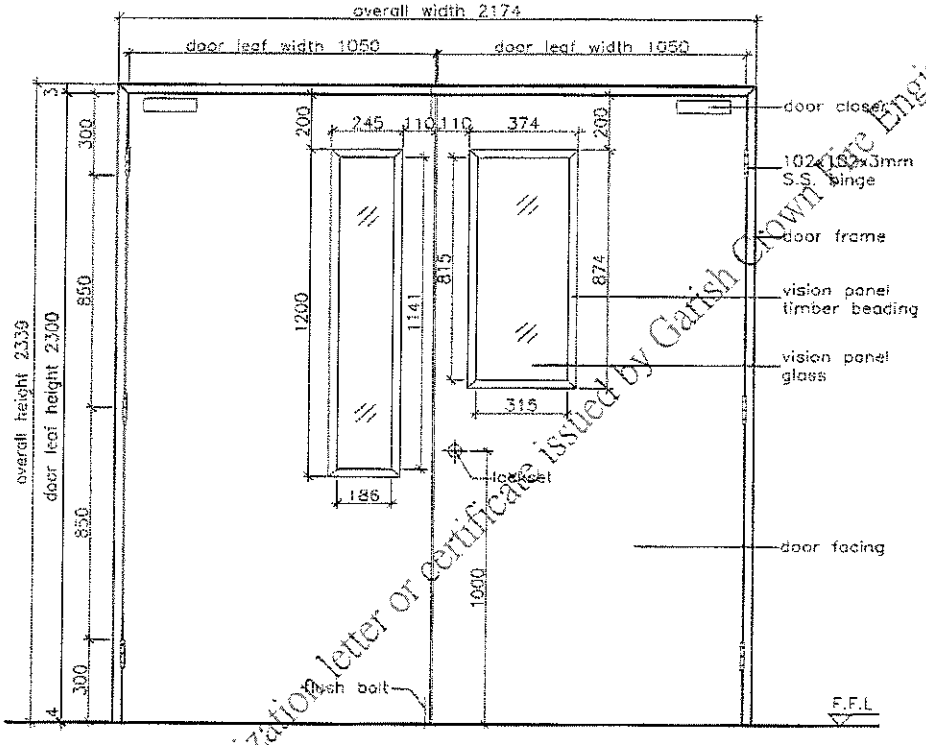
Information from client (Con't)

Item	Description		
6	**Intumescent Seal for Vision Panel**		
	Manufacturer	:	Lorient Pacific Limited.
	Model	:	'Lorient' system 90 plus.
	Applied location	:	Refer to client's drawing.
7	**Glass Panels**		
	Manufacturer	:	Pilkington.
	Nominal thickness (mm)	:	6 mm.
	Aperture sizes		
	i. Left door leaf	:	374 mm wide by 874 mm high.
	ii. Right door leaf	:	245 mm wide by 1,200 mm high.
	Vision sizes		
	i. Left door leaf	:	315 mm wide by 815 mm high.
	ii. Right door leaf	:	186 mm wide by 1,141 mm high.
	Construction	:	Refer to client's drawing.
8	**Flush Bolt**		
	Brand	:	Commy.
	Reference	:	SA – 1013.
	Material	:	Stainless steel.
	Sizes	:	300/200 mm x 22 mm.
9	**Hinges**		
	Brand	:	Commy.
	Reference	:	HS – 1016.
	Material	:	Stainless steel.
	Overall sizes	:	102 mm x 102 mm x 3 mm thick.
	Fixing method	:	Screw provided by manufacturer.
10	**Door Closer (Left Door Leaf)**		
	Brand	:	Commy.
	Reference	:	103 overhead closer.

Information from client (Con't)

Item	Description	
11	**Door Closer (Right Door Leaf)**	
	Brand	: Dorma
	Reference	: TS – 68, regular arm overhead closer.
12	**Latchset**	
	Brand	: Yale.
	Reference	: CA 5907 x US32D, 70 mm B.S. cylindrical entrance lock.
	Material	: Satin stainless steel.

Drawings from client



PULL SIDE ELEVATION

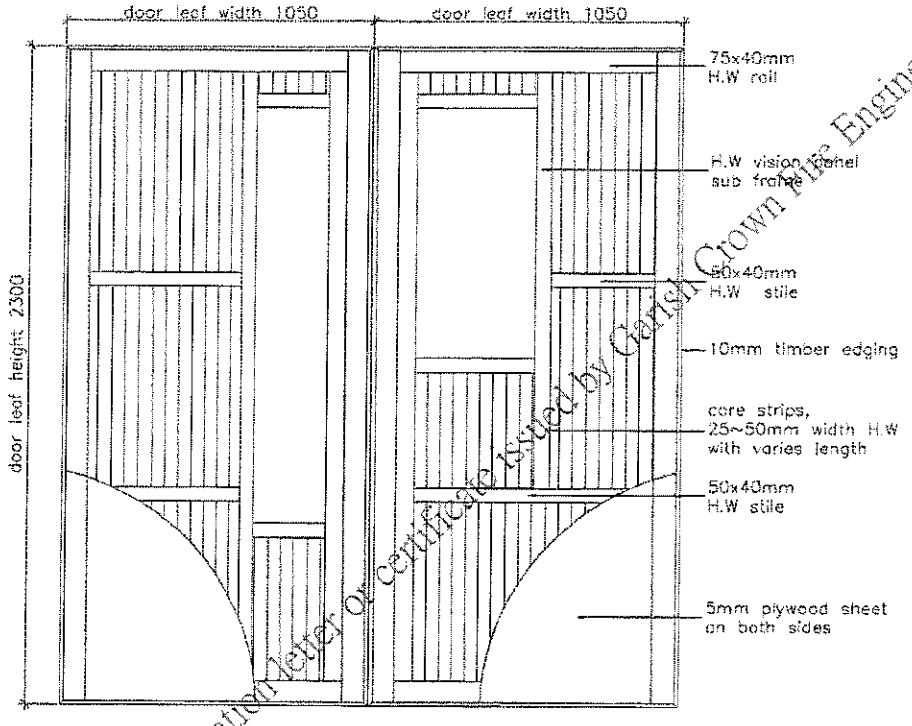
STRUCTURAL OPENING (W x H)	OVERALL SIZE (W x H)	DOOR LEAF SIZE (W x H)
---	2174x2339	1050/1050x2300

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION
REVISIONS			REVISIONS		

PROJECT: FIRE TEST 2007-3

TITLE: 1HR F.R.P TIMBER DOOR DETAIL

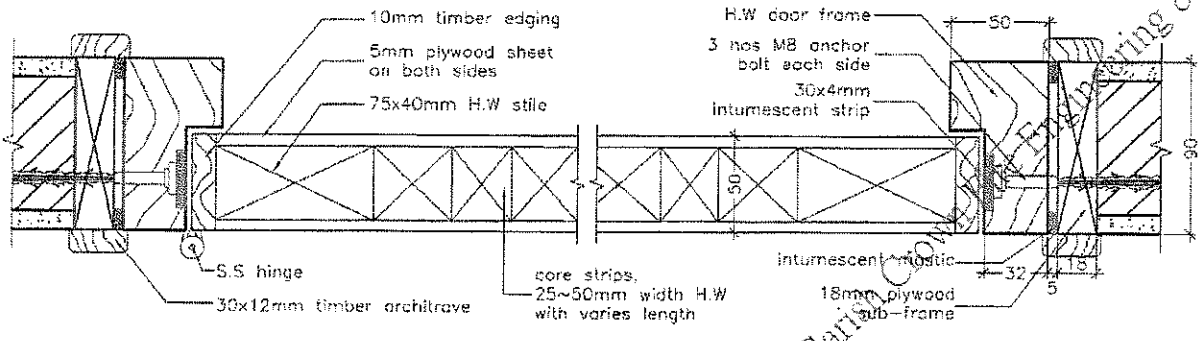
DRAWN BY: LEUNG
CHECKED BY: ---
DATE: 2008/08/13
SCALE: NOT TO SCALE
DRAWING NO.: 60W-T3-D01
REVISION: ---



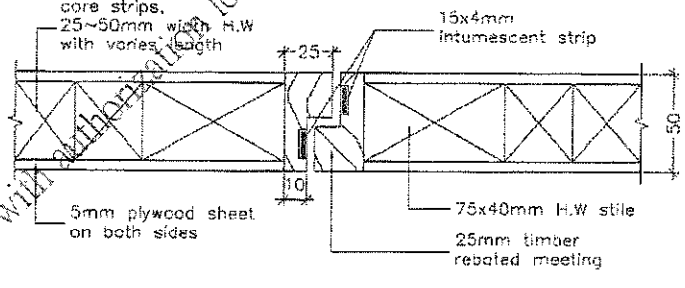
DOOR LEAF CONSTRUCTION

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION
REVISIONS			REVISIONS		

PROJECT	FIRE TEST 2007-3
TITLE	1HR F.R.P TIMBER DOOR DETAIL
DRAWN BY	
CHECKED BY	
DATE	2008/08/13
SCALE	NOT TO SCALE
DRAWING NO. :	SDW-T3-002
REVISION	—



HORIZONTAL SECTION



MEETING STILE

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION
REVISIONS			REVISIONS		

PROJECT	FIRE TEST 2007-3
TITLE	1HR F.R.P TIMBER DOOR DETAIL
DRAWN BY	LUHM
CHECKED BY	—
DATE	2008/08/13
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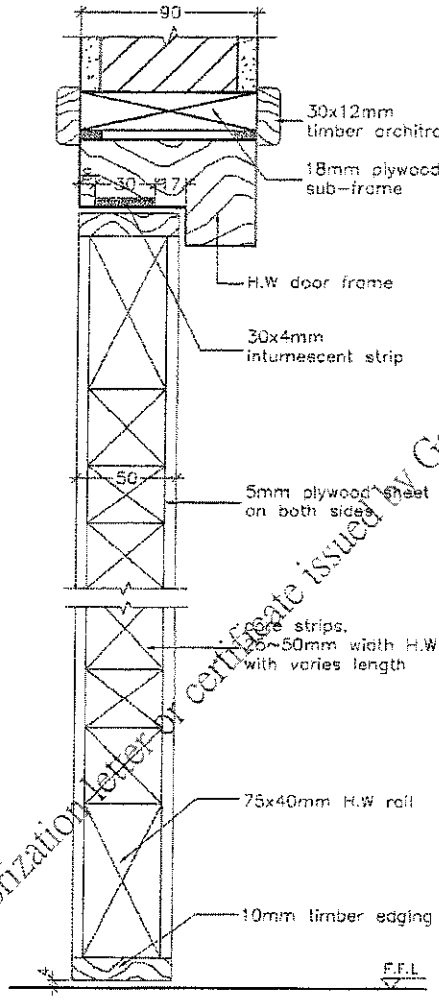
DRAWING NO. :	6IW-T3-D03
REVISION	—



HORIZONTAL SECTION

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION
REVISIONS			REVISIONS		

PROJECT	FIRE TEST 2007-3
TITLE	1HR F.R.P TIMBER DOOR DETAIL
DRAWN BY	Lisa
CHECKED BY	—
DATE	2008/08/13
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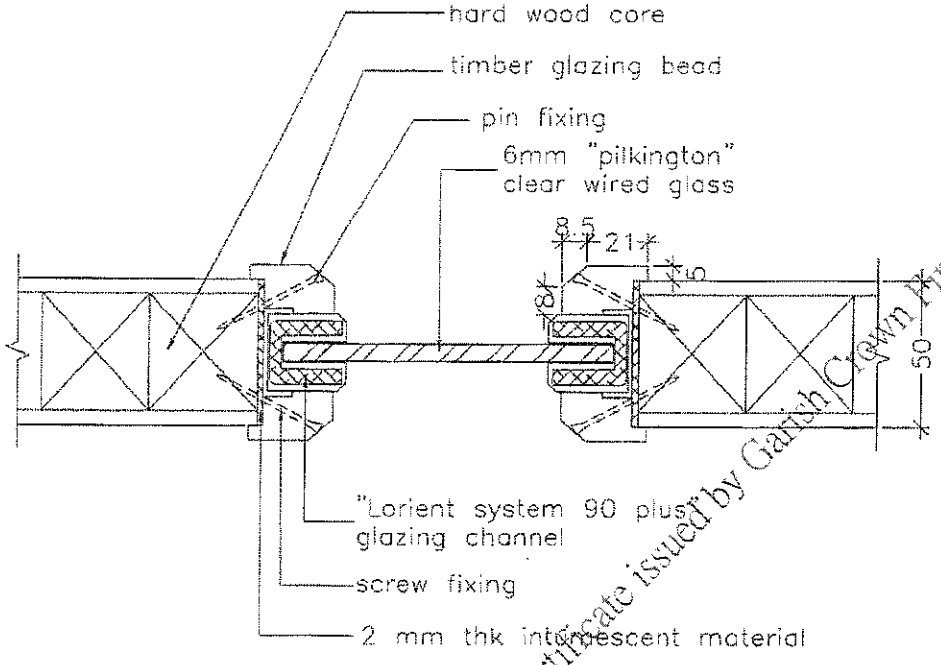
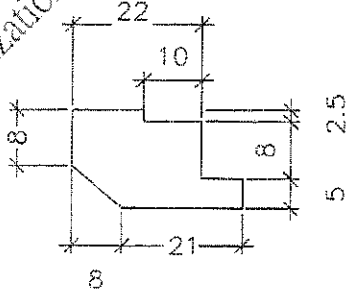
DRAWING NO. :	60W-T3-D04
REVISION	—





DETAIL OF VISION PANEL

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION
REVISIONS			REVISIONS		

PROJECT	FIRE TEST 2007-3
TITLE	1HR F.R.P TIMBER DOOR DETAIL
DRAWN BY	YH Y
CHECKED BY	—
DATE	2008/02/18
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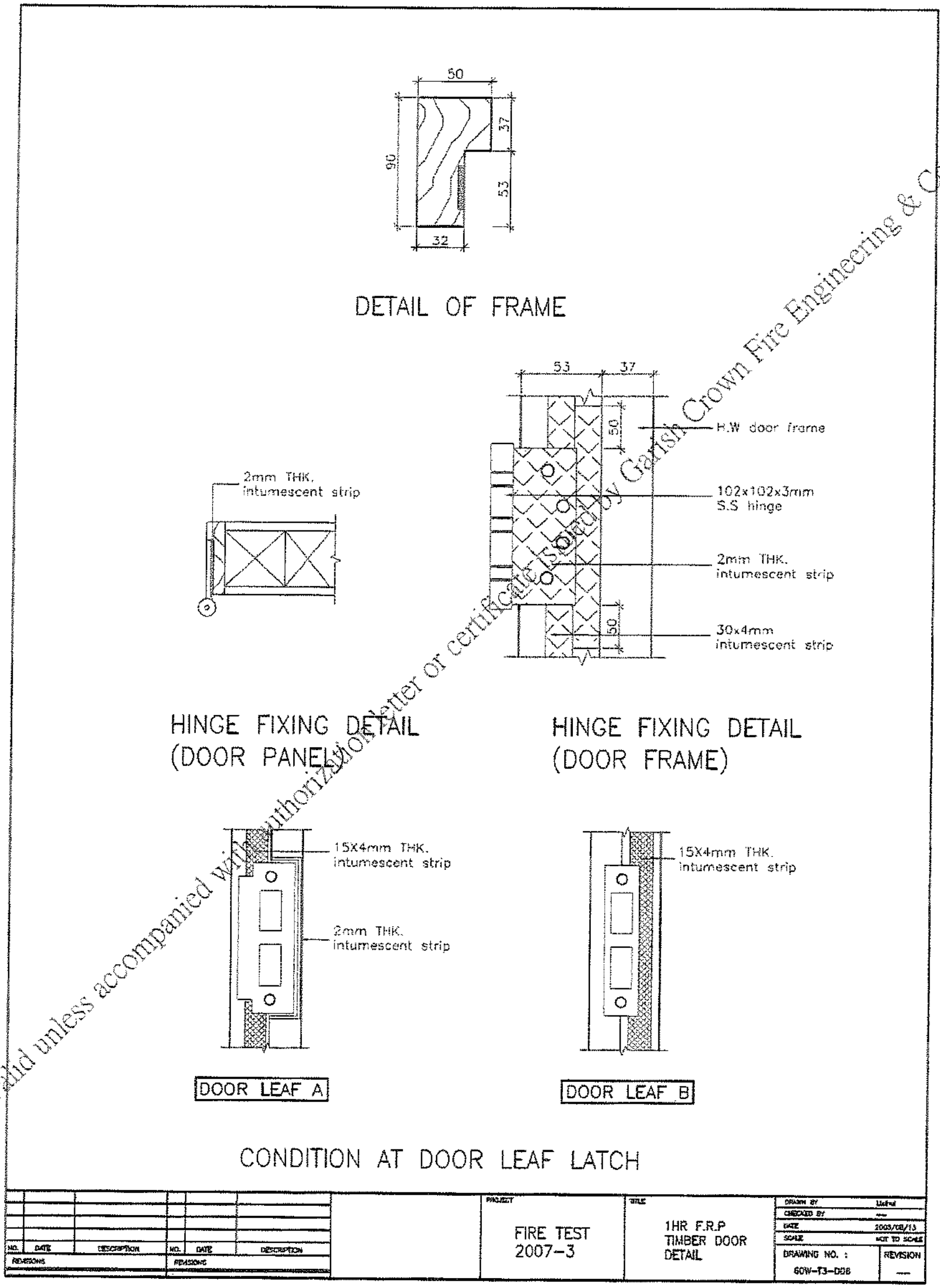
DRAWING NO. :	60W-T3-005
REVISION	—



IRONMONGERY SCHEDULE

Item	Components	Description
1	Door closer	"COMMY" 103S with back check surface mounted type
2	Hinges	"COMMY" stainless steel with ball bearing of size 102mmx102mmx3mm (thick)
3	Lockset	"YALE" CA 5907 x US32D,70mm B.S.cylindrixal entrance lock satin stainless steel
4	Flush bolt	"COMMY" stainless steel lever action type of size 300/200mmx22mm with bolt ø10mmx16mm throw were fitted to the top and bottom of the inactive leaf.

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION
REVISIONS			REVISIONS		

PROJECT	FIRE TEST 2007-3
TITLE	1HR F.R.P TIMBER DOOR DETAIL
DRAWN BY	Lauraf
CHECKED BY	---
DATE	2008/08/13
SCALE	NOT TO SCALE
DRAWING NO. :	6CW-T3-D07
REVISION	---

- End of report -