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HOKLAS 091

TEST REPORT

TEST REPORT NO.: R08K13
DATE OF ISSUE: 25 August 2009

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:	***Q8J15 – Double-leaf single-acting timber doorset***
Test Method:	Fire resistance test conducted in accordance with BS 476: Part 22: 1987.
Date of Test:	24 November 2008
Ambient temperature at the time of testing:	26 ℃

APPROVED SIGNATORY: _____ DATE: 25 AUG 2009

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

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

Hong Kong Accreditation Service (HKAS) has accredited this laboratory under Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accreditation laboratories. The results shown in this test report were determined by this laboratory in accordance with its terms of accreditation. This report may not be reproduced except in full.

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

1. Summary

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

As requested by the test sponsor, the specimens were mounted within concrete line specimen holders as shown in the client's drawings (see the appendix). They were mounted such that the door leaves of doorset swinging towards the heating conditions.

The doorset had overall dimensions of 2,158 mm wide by 2,333 mm high. It was comprised of a timber door frame incorporated with equal door leaves. Each door leaf was of 1,050 mm wide by 2,300 mm high by 48 mm thick. Each leaf was incorporated with 38 mm thick wood core sandwiched by 5 mm thick plywood on both sides. The leaf was hung by 3 nos. of stainless steel butt hinges. An overhead surface mounted door closer was installed on the exposed side of each door leaf. A Flush bolt was fixed on the top of the left door leaf and a lever lockset was installed on the right door leaf. Each door leaf incorporated with 6 mm 'Pilkington' clear wire glass panel with vision sizes of 100 mm wide by 950 mm high. An intumescent seal with sizes of 10 mm wide by 4 mm thick was installed at each jamb and head of door frame and rebate meeting edge of each door leaf. The door bolt and lockset were latched and locked during the test.

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

Insulation:	32 Minutes
Integrity:	32 Minutes

The test was discontinued after a period of 32 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 Mr. Rocky Fung and was witnessed by Mr.Tam, the representative 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 relative to taut wires 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 of the doorset and the rest (S7-S9) were fixed to the door frame for maximum temperature of the unexposed surface of the doorset. 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 specimens were measured by steel rules and recorded.

7. Test Data and Information

The ambient temperature of the test area during the test was 26°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 specimens are shown graphically in Figure 6.

A summary of the observations made on the general behaviour of the specimens are given in the appendix.

The deflections obtained are summarized in Table 1.

The test was discontinued after a heating period of 32 minutes.

8. Results

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

Insulation:	32 Minutes
Integrity:	32 Minutes

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 doorset did not reach during the test. The 180 °C rise of the maximum temperature of the unexposed surface of doorset did not reach during the test. The maximum temperature rise of the doorset was 27 °C at thermocouple S5 after 32 minutes of the 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 did meet test integrity requirements after a heating period of 32 minutes.

9. Limitations

The results relate only to the behaviour of the specimens 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 specimens of different dimensions or supported other than by a concrete wall or incorporating different components shall be the subject of a design appraisal.

Appendix

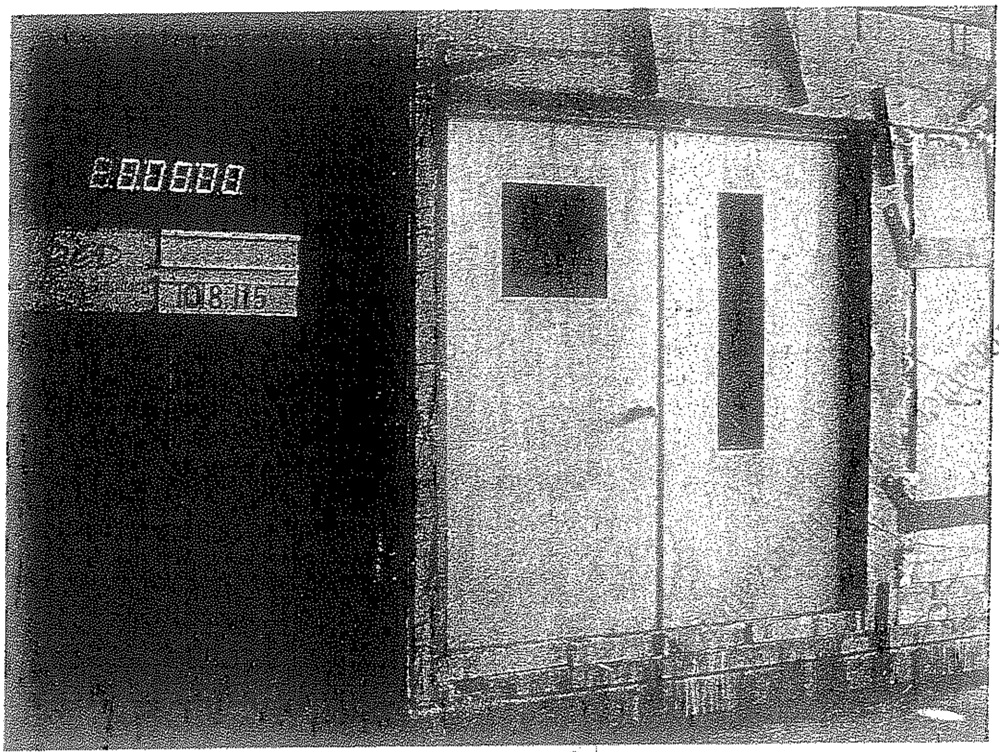


Photo 1: The unexposed face of the specimens before the test.

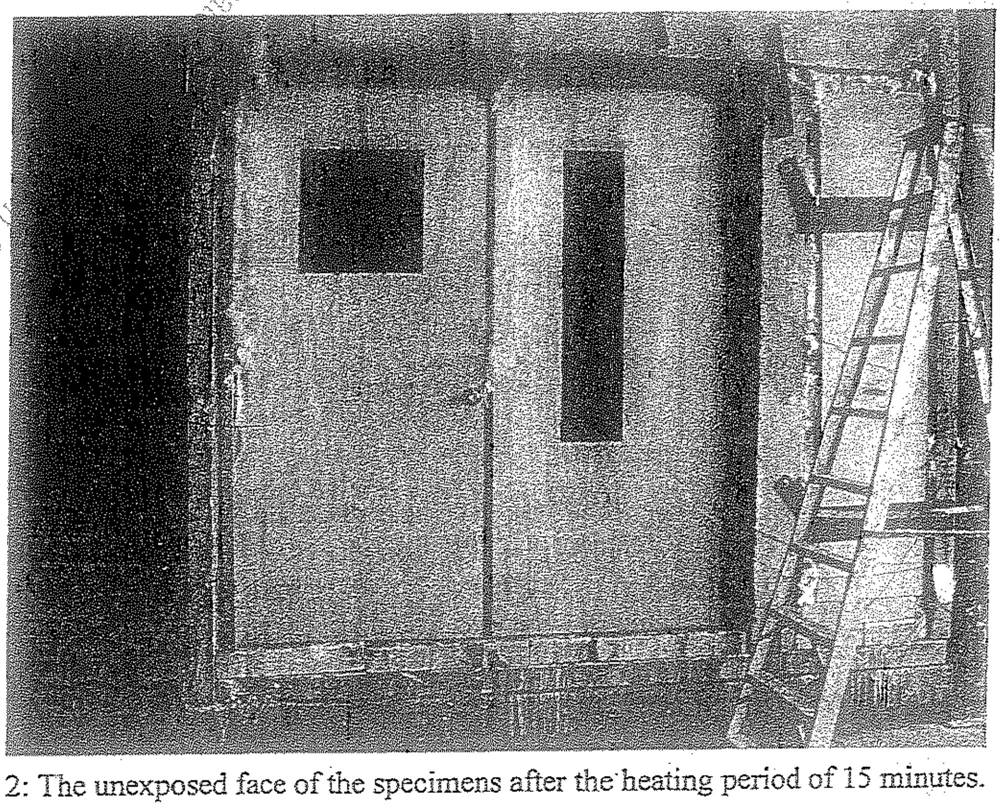


Photo 2: The unexposed face of the specimens after the heating period of 15 minutes.

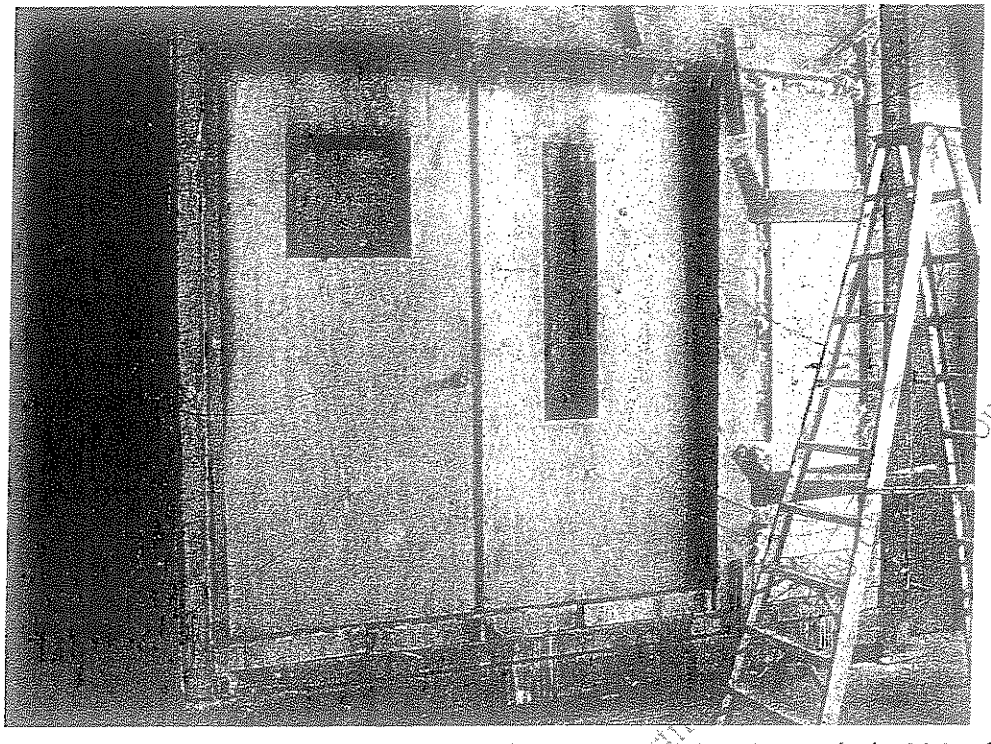


Photo 3: The unexposed face of the specimens after the heating period of 28 minutes.

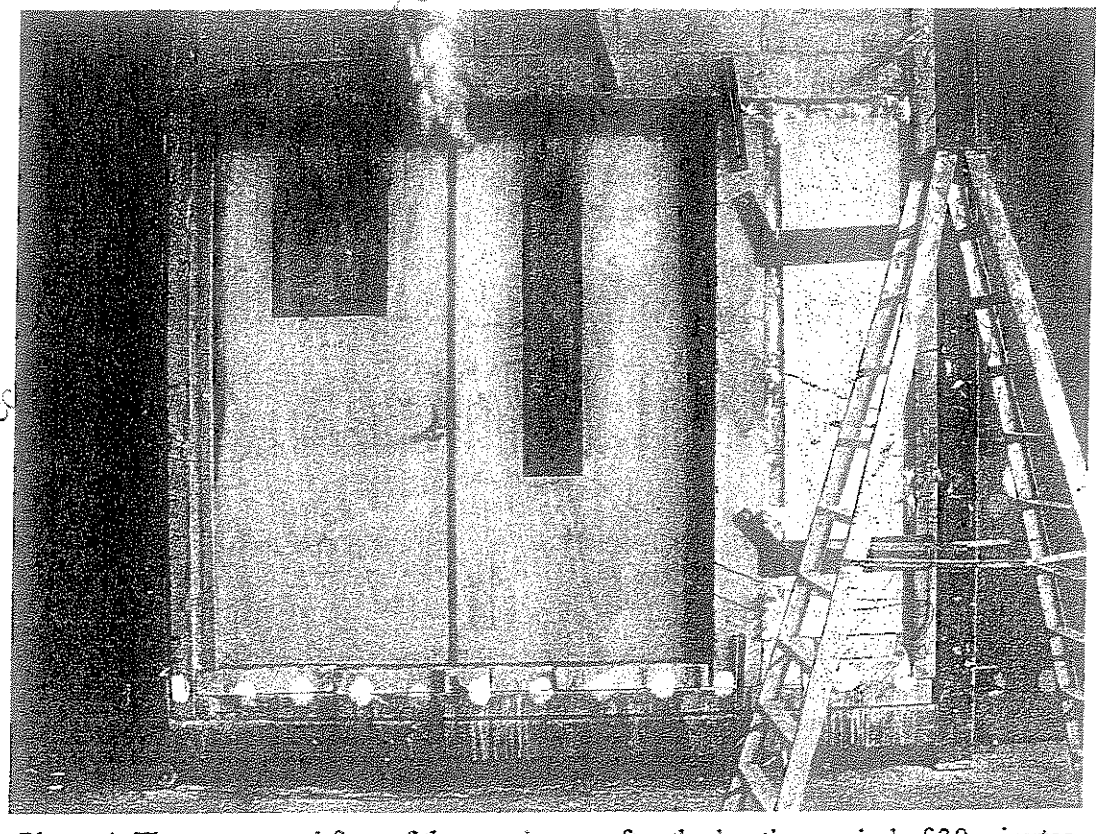


Photo 4: The unexposed face of the specimens after the heating period of 30 minutes.

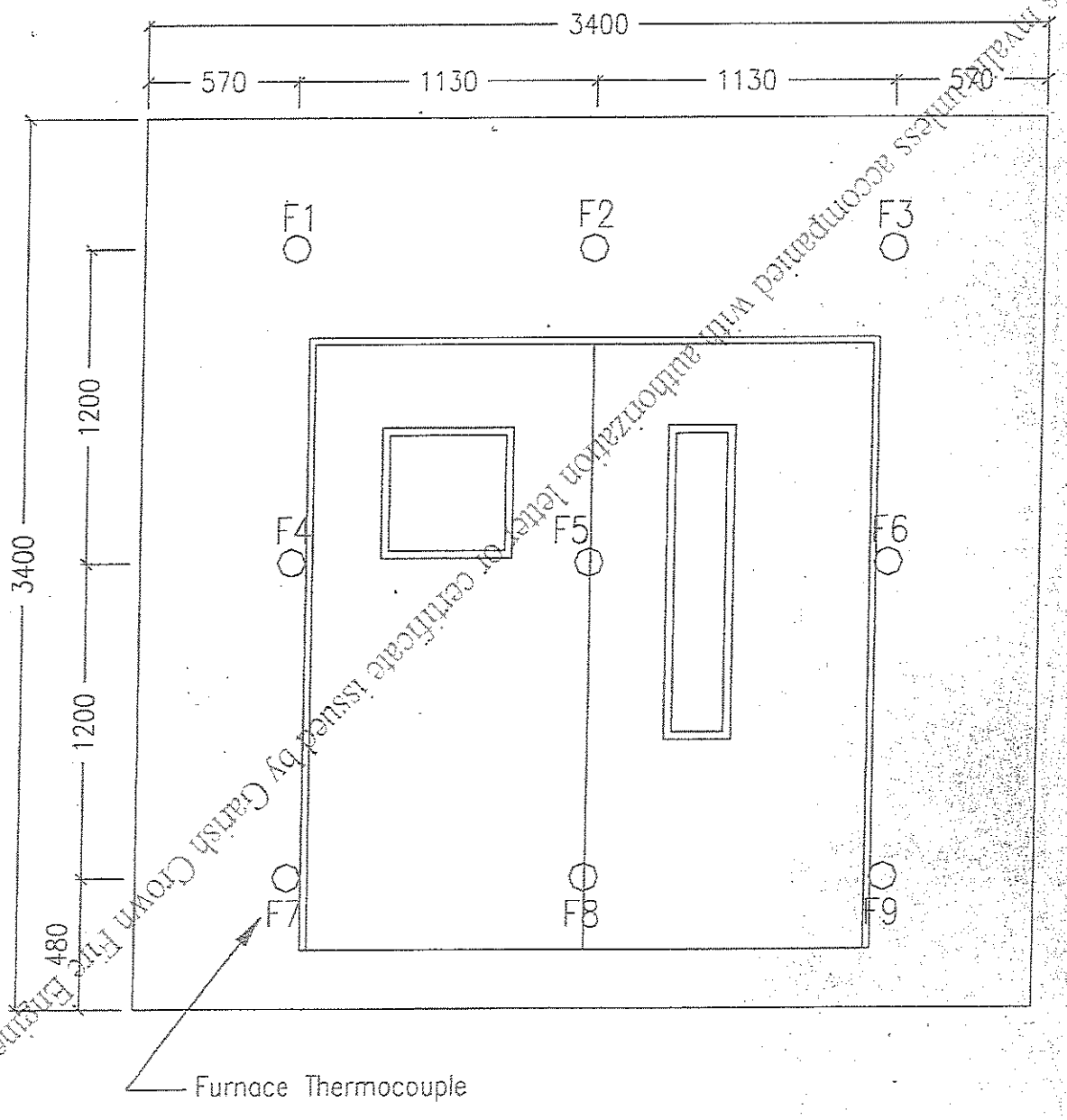


Figure 1 – Locations and reference number of furnace thermocouples.

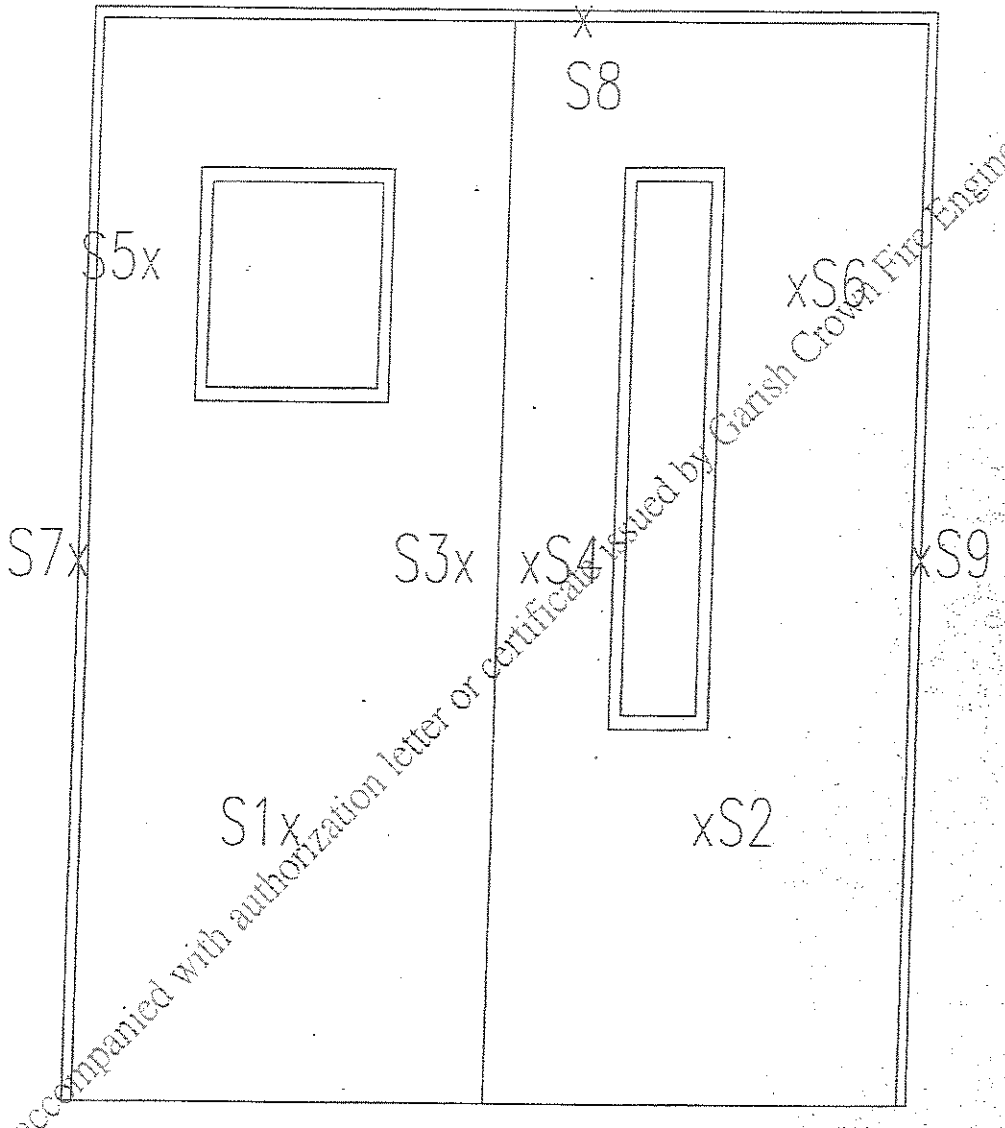
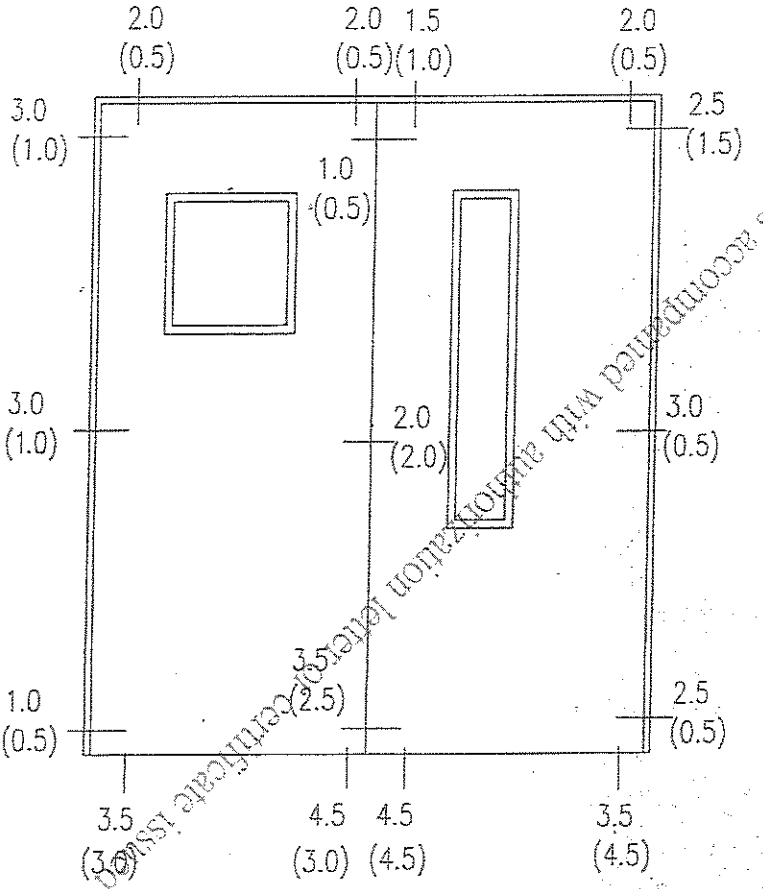


Figure 2 – Locations and reference number of thermocouples to monitor the temperature of unexposed surface of the specimens.



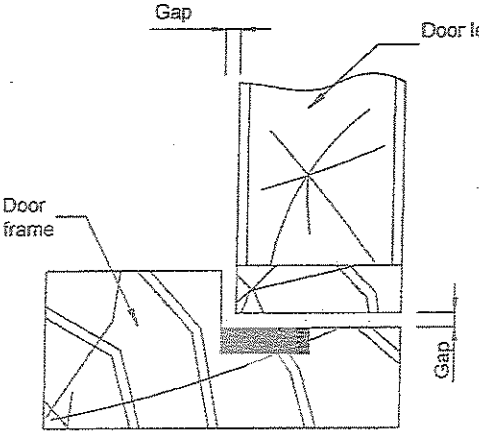


Figure 3 – Door gaps in mm, measured from unexposed face.
(Measurements from exposed face are in brackets).

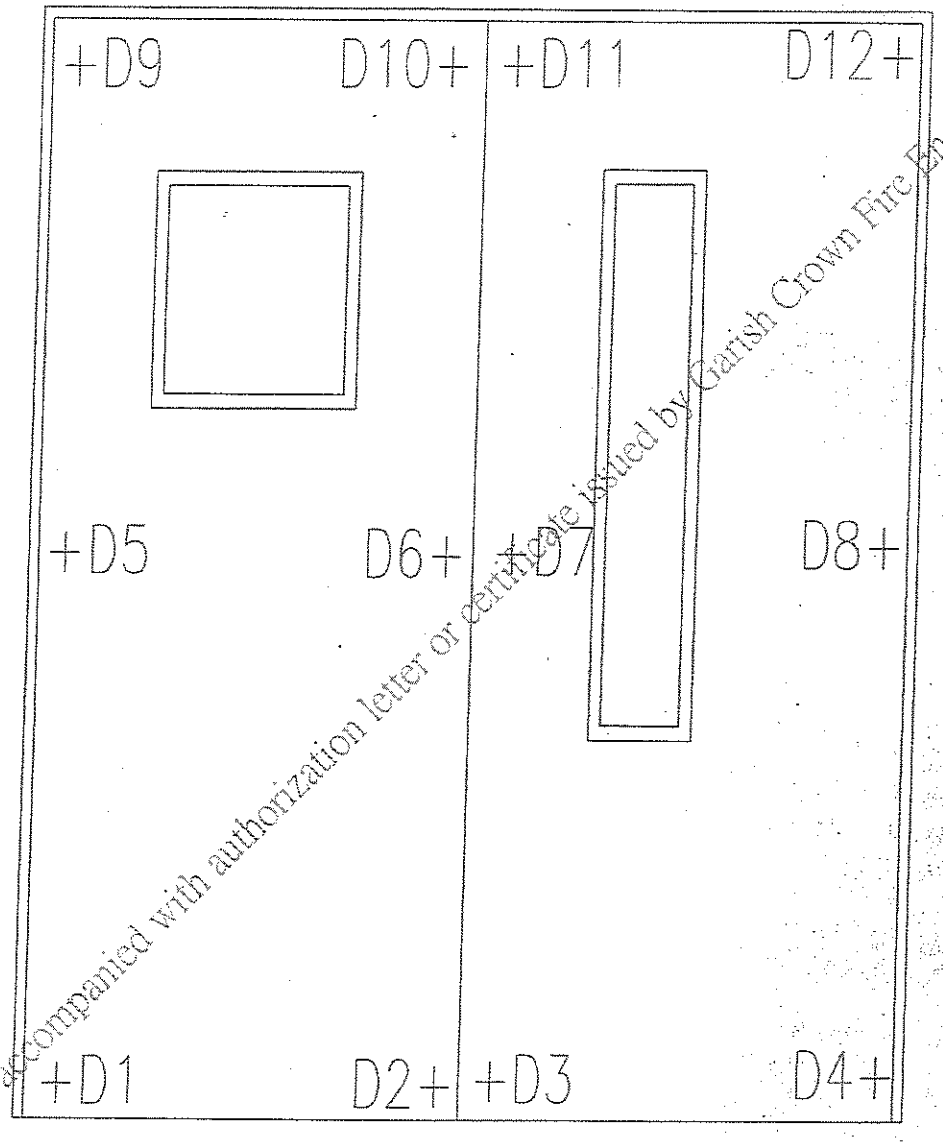


Figure 4 – Locations and reference numbers of displacement measurement.

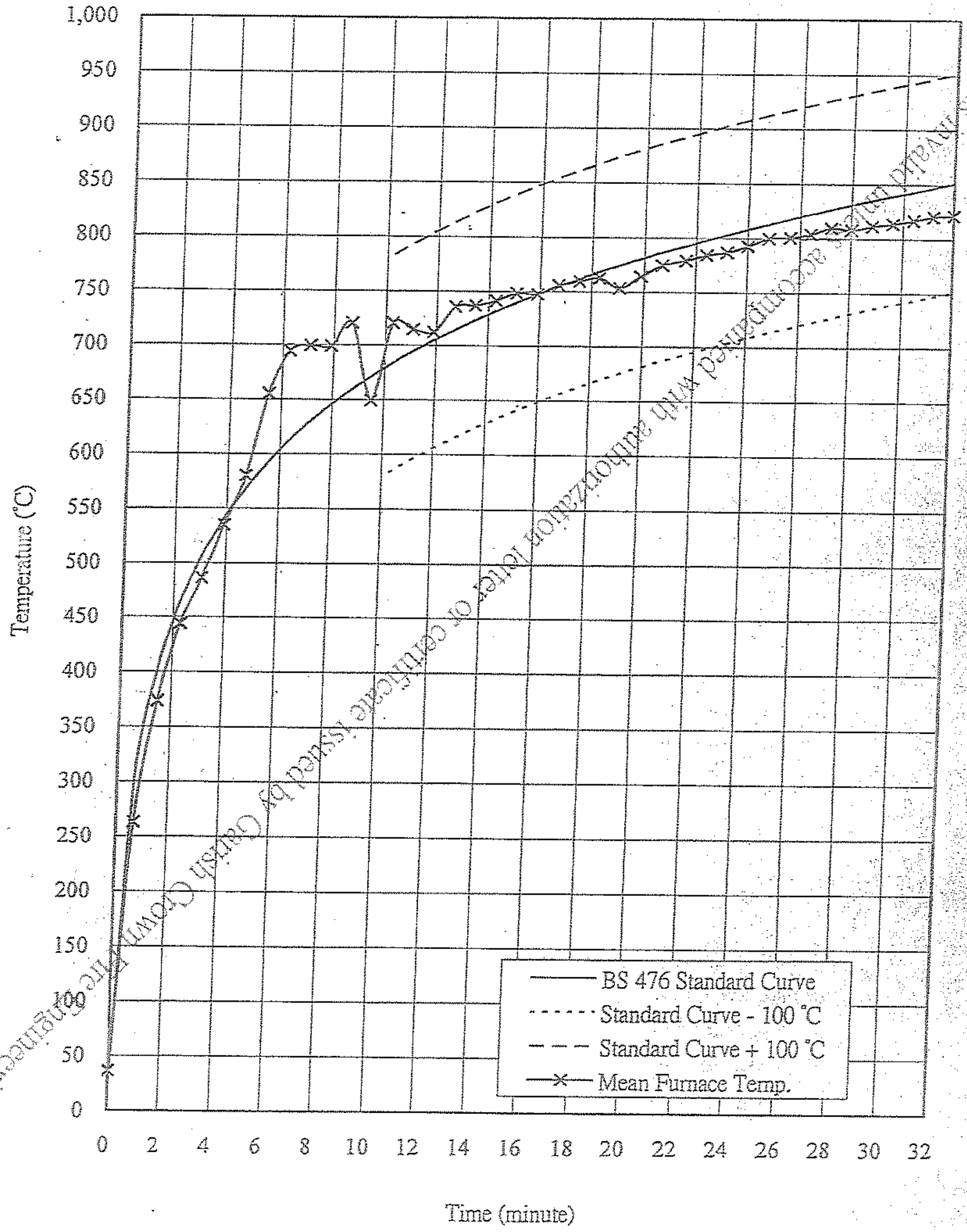


Figure 5 – Mean furnace temperatures.

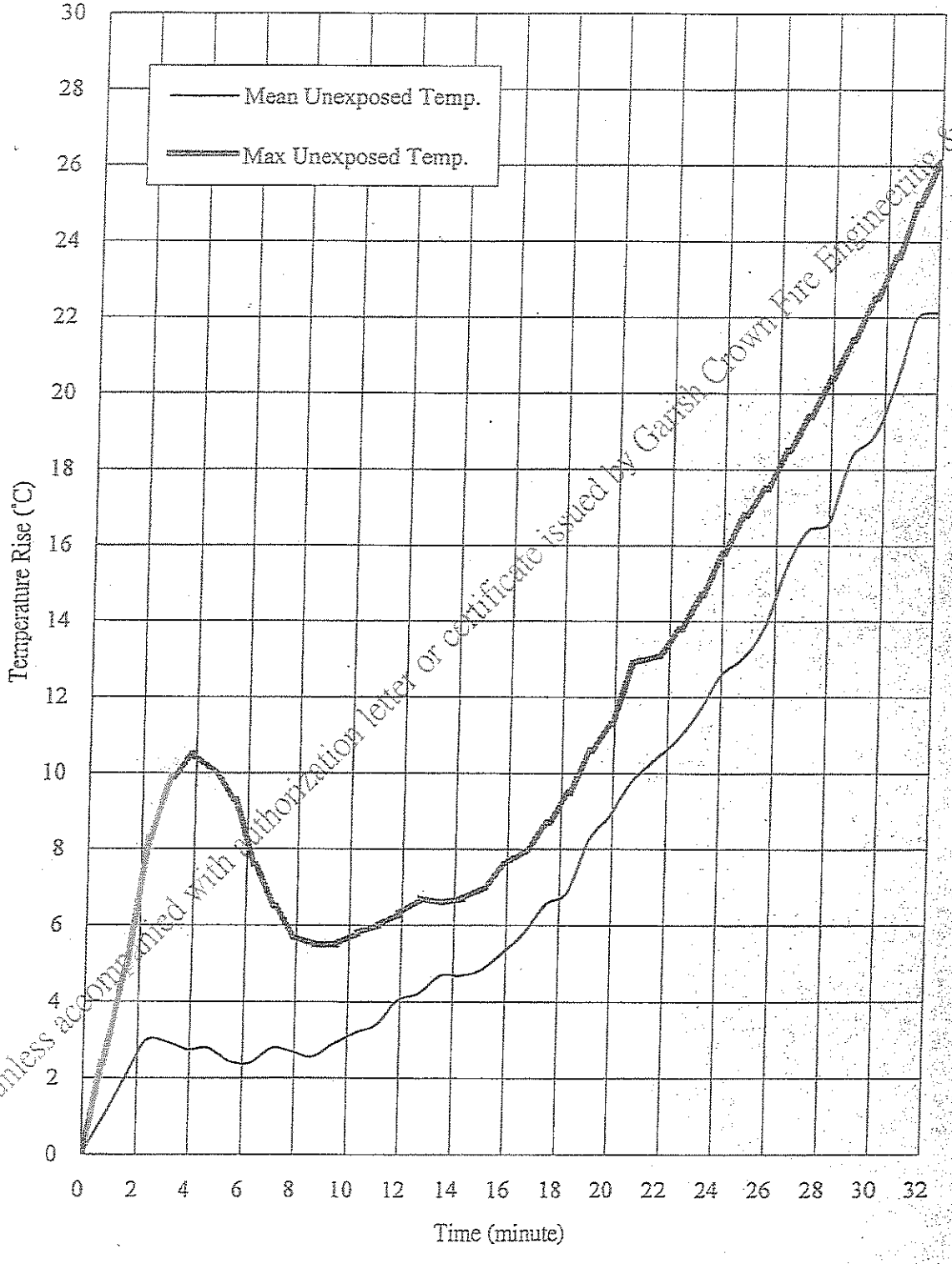


Figure 6 – Temperatures of unexposed surface.

Observation

Time (min.sec)	Exposed (E) or Unexposed (U)	Observation
00.00	-	Test started.
01.00	U	Cracks developed at vision panel at the left door leaf.
01.10	U	Smoke started releasing from the perimeter of the door leaves.
02.00	U	Cracks developed at vision panel at the right door leaf.
02.30	U	Smoke release increased from the perimeter of the door leaves.
04.30	U	Smoke release further increased from the perimeter of the door leaves.
05.00	E	Flaming was observed at the surface of the door leaves.
06.30	U	Vision panel at left door leaf turned dark.
07.00	U	Vision panel at right door leaf turned dark.
08.00	E	The door leaves charred.
10.00	U	The intumescent seals around the vision paned reacted.
13.00	U	Smoke release further increased from the meeting edges and perimeter of the door leaves.
16.00	U	Deformation of the vision panels was observed.
20.00	U	Deformation of the door leaves was observed.
22.00	U	Door closers fell down into the furnace.
30.00	U	No significant change was observed. The specimen satisfied the integrity requirements performance.
32.00	--	Test was terminated as requested by client.

Lateral deflections

Table 1

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

Location \ Time (mins)	0	10	20	30
D1	0	0	0	1
D2	0	-1	1	2
D3	0	-4	-4	-3
D4	0	2	8	5
D5	0	3	2	-1
D6	0	4	2	-2
D7	0	6	6	0
D8	0	5	10	14
D9	0	-2	-	-
D10	0	4	-	-
D11	0	2	-	-
D12	0	3	-	-

Negative deflections indicate movement away from the furnace (see also Figure 4 for the locations). The maximum deflection of doorset occurred at location D8 was 14 mm moving towards to the furnace.

Information from client

Item	Description		
1	**Door Frame**		
	Material	:	Timber.
	Overall sizes	:	2,158 mm wide by 2,333 mm high by 90 mm thick.
	Density	:	550 kg/m^3 (not measured by laboratory).
	Rebate	:	20 mm.
	Jambs to head jointing method	:	Mortise joint.
	Frame to aperture fixings	:	3 nos. of M8 anchor bolt per jamb.
2	**Door Leaf Core**		
	Material	:	Timber.
	Density	:	450 kg/m^3 (not measured by laboratory).
	Overall sizes		
	i. Stiles and rails	:	90 mm.
	ii. Core strips	:	20-40 mm.
	Fixing method	:	Impacted within skeletal frame.
3	**Door Leaf Facings**		
	Material	:	Plywood.
	Density	:	550 kg/m^3 (not measured by laboratory).
	Thickness	:	5 mm.
	Fixing method	:	Glued.
4	**Door Leaf Lippings**		
	Material	:	Timber.
	Density	:	450 kg/m^3 (not measured by laboratory).
	Thickness	:	10 mm.
	Fixing method	:	Guled and nailed.
5	**Intumescent Seal**		
	Manufacturer	:	Galford.
	Material	:	'Pyroplex' intumescent seal.
	Fixing locations	:	1 nos. at door frame.
	Overall sizes	:	10 mm by 4 mm.
	Fixing method	:	Glued.

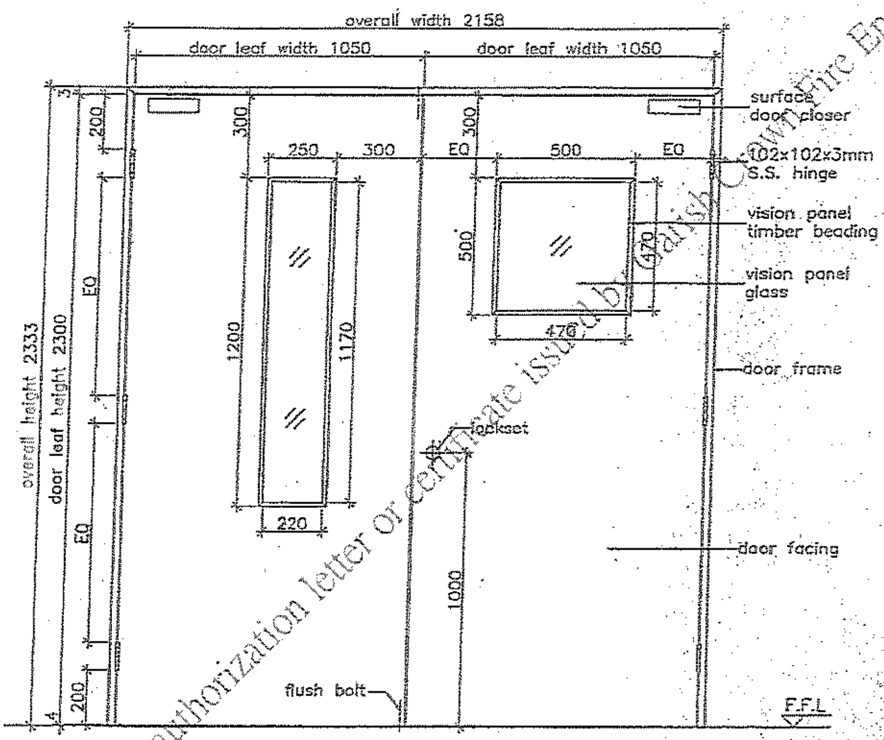
Information from client (Con't)

Item	Description		
6	**Hinges**		
	Brand	:	COMMY.
	Material	:	Stainless steel.
	Overall sizes	:	102 mm wide by 102 mm high by 3 mm thick.
	Fixing method	:	Screw.
7	**Overhead Door Closer**		
	Brand	:	COMMY.
	Reference	:	613 with back check.
	Fixing method	:	Screw.
8	**Lockset**		
	Brand	:	COMMY.
	Description	:	5871 ET, 70 mm B.S. cylindrical entrance lock.
	Material	:	Stainless steel.
9	**Flush Bolt**		
	Brand	:	COMMY.
	Material	:	Stainless steel.
10	**Intumescent Liner for Glass Panel**		
	Brand	:	ARBO.
	Material	:	Intumescent sealant.

Information from client (Con't)

Item	Description		
11	**Glass Panel**		
	Brand	:	Pilkington.
	Model	:	Pyroshield.
	Nominal thickness	:	6 mm.
	Aperture sizes	:	Left door leaf - 220 mm by 1,170 mm. Right door leaf - 470 mm by 470 mm.
	Vision sizes	:	Left door leaf – 250 mm by 1,200 mm. Right door leaf – 500 mm by 500 mm.
12	**Glazed Bead**		
	Material	:	Timber.
	Density	:	550 kg/m^3 (not measured by laboratory).
	Size	:	15 mm by 19 mm.
13	**Glue**		
	Brand	:	Urea formaldehyde.

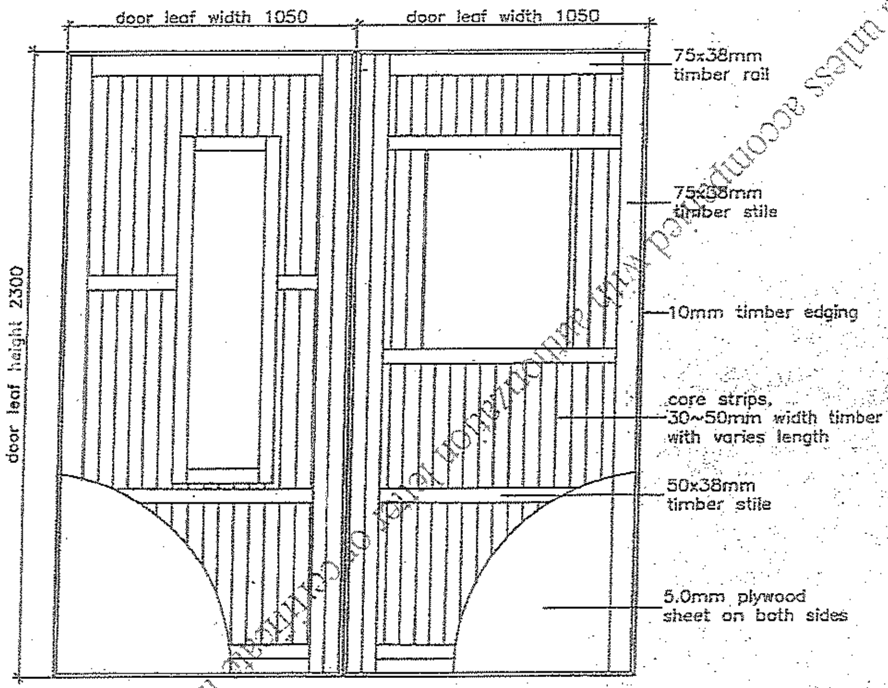
Drawings from client



PULL SIDE ELEVATION

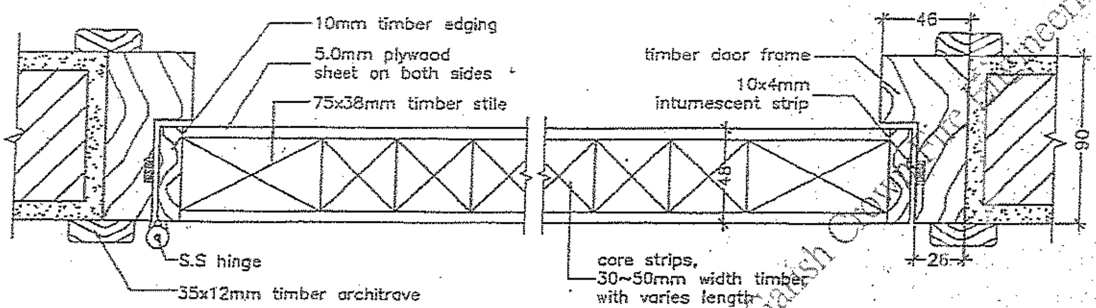
STRUCTURAL OPENING (W x H)	OVERALL SIZE (W x H)	DOOR LEAF SIZE (W x H)
—	2158x2333	1050/1050x2300

PROJECT	TITLE	DRAWING NO.	REVISION
FIRE TEST 2008–1	1/2HR F.R.P TIMBER DOOR DETAIL	3092-001	—

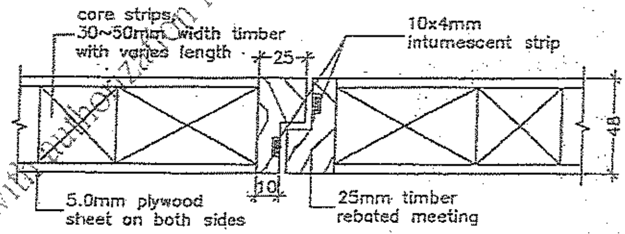


DOOR LEAF CONSTRUCTION

PROJECT	TITLE	DRAWING NO.	REVISION
FIRE TEST 2008-1	1/2HR F.R.P TIMBER DOOR DETAIL	30M-D02	---

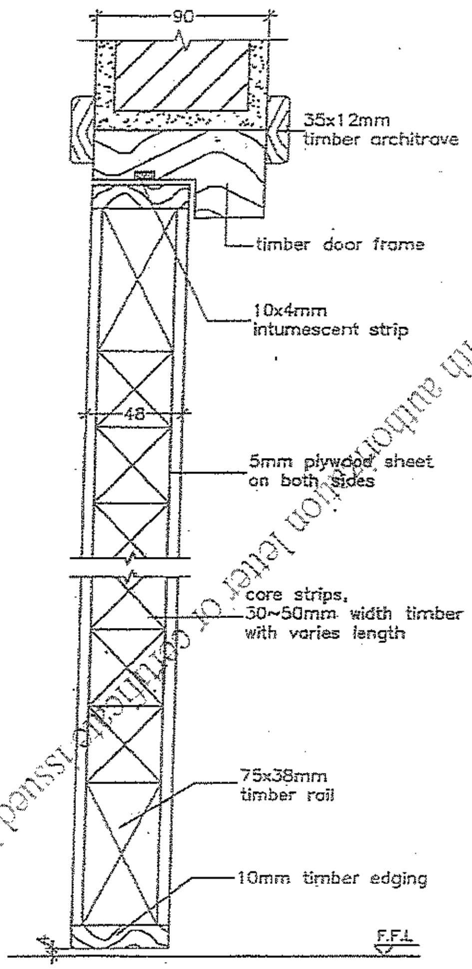


HORIZONTAL SECTION



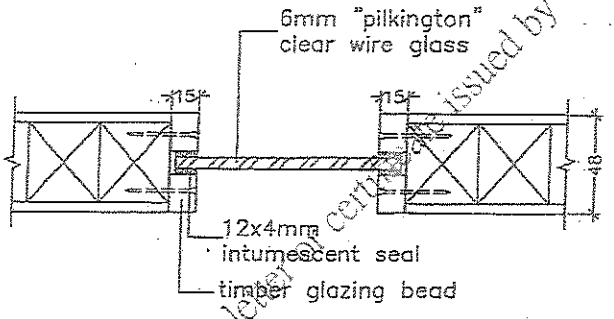
MEETING STILE

PROJECT	TITLE	DRAWING NO. :	REVISION
FIRE TEST 2008-1	1/2HR F.R.P TIMBER DOOR DETAIL	30W2-003	—



HORIZONTAL SECTION

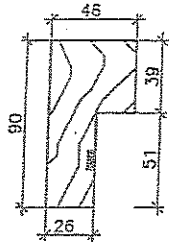
PROJECT: FIRE TEST 2008-1	TITLE: 1/2HR F.R.P TIMBER DOOR DETAIL	DRAWING NO.: 30Y2-004



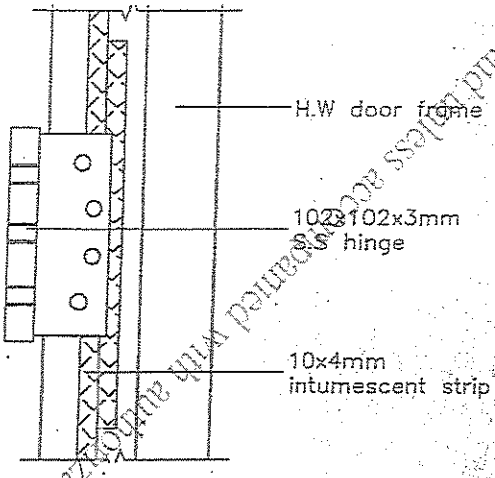
DETAIL OF VISION PANEL

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION
REVISIONS			REVISIONS		

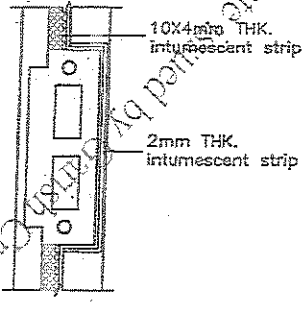
PROJECT	FIRE TEST 2008-1
TITLE	1/2HR F.R.P TIMBER DOOR DETAIL
DRAWN BY	Louise
CHECKED BY	—
DATE	2008/05/15
SCALE	NOT TO SCALE
DRAWING NO. :	3DW2-005
REVISION	—



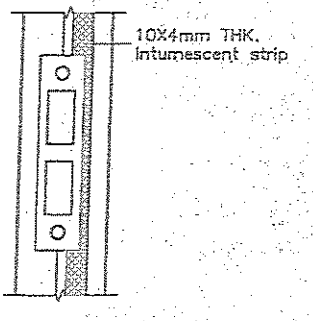
DETAIL OF FRAME



HINGE FIXING DETAIL
(DOOR FRAME)



DOOR LEAF A



DOOR LEAF B

CONDITION AT DOOR LEAF LATCH

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION
REVISIONS			REVISIONS		

PROJECT: FIRE TEST 2008-1

TITLE: 1/2HR F.R.P TIMBER DOOR DETAIL

DRAWN BY: [illegible]
CHECKED BY: ----
DATE: 2008/08/25
SCALE: NOT TO SCALE
DRAWING NO.: 30WZ-D06
REVISION: ---

IRONMONGERY SCHEDULE

Item	Components	Description
1	Door closer	"COMMY" 613 with back check surface mounted type
2	Hinges	"COMMY" stainless steel with ball bearing of size 102mm×102mm×3mm (thick)
3	Lockset	"COMMY" 5871 ET, 70mm B.S. cylindrical entrance lock. satin stainless steel
4	Flush bolt	"COMMY" stainless steel lever action type of size 200mm×22mm with bolt ø10mm×16mm 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: 1/2HR F.R.P TIMBER DOOR DETAIL

DRAWN BY	LEUNG
CHECKED BY	—
DATE	2008/FEB/13
SCALE	NOT TO SCALE
DRAWING NO. :	REVISION
3CW2-D07	—

- End of report -