





# FIRE RESISTANCE TEST REPORT

DOUBLE-LEAF COMPOSITE TIMBER DOOR with GLAZED ELEMENT AND OVERHEAD PANEL
in accordance with BS EN 1634-1: 2008
Test Sponsor: Garish Crown Fire Engineering & Consultance Consu

**Test Sponsor:** Garish Crown Fire Engineering & Consultancy

Unit 25, Upper G/F., Block B, Wah Lok Industrial Centre (Phase 1),

37-41 Shan Mei Street, Fotan, Shatin, Hong Kong.

Tel: 852-2698 0801

Fax: 852-2688 2508

**Test Laboratory:** Forte Testing and Consultants Company Limited

Contact Information:

Room 11, 2 Floor, Po Hong Centre 2 Wang Tung Street.

Kowloon Bay, Kowloon, Hong Kong

Tel: 852-2152 0638

Fax: 852-3186 2737

Report Number:

Date of Issue:

HKAS has accredited Forte Testing and Consultants Company Limited (Reg. No. 191 – TEST) under HOKLAS for specific laboratory activities as listed in the HQKLAS directory of accredited laboratories. The results shown in this report were determined by this in steport is invalid unless accome laboratory in accordance with terms of accreditation. This report may not be reproduced, except in full, without prior written approval

**HOKLAS Approved Signatory:** 

Ir. Dr Chan Yuk Kit





### 1. Scope of Test

This report is a record of a fire resistance test conducted by Forte Testing and Consultants Company Limited, in conformity with requirements in *BS EN 1634-1: 2008 "Fire resistance and smoke control tests for door, shutter and openable window assemblies and elements of building hardware Part 1: Fire resistance tests for doors shutters and openable windows"* and particular requirements in *BS EN 1363-1: 1999 "Fire resistance tests – Part 1: General requirements"*.

The test subject was double-leaf composite timber door with glazed element and overhead panel the specimen was manufactured and supplied for test by Leung's Wooden Company Limited.

The specimen achieved the following fire resistance:

INTEGRITY	(E)			INSULATION	(I) WOW		
	Sustained Flaming	74	Minutes	Door Frame	Max. Temp. Rise (	I <sub>1</sub> ) 74	Minutes
	Can Cauga	7.1	Minutes	Doorloovee	Average Temp. Ris	se 74	Minutes
	Gap Gauge	74	Minutes	Door Leaves	Max. Temp. Rise (	I <sub>1</sub> ) 74	Minutes
	Cotton Pad	73	Minutes	Glazed Element	Average Temp. Ris	se 74	Minutes
				Glazed Eleriteth	Max. Temp. Rise	74	Minutes
				Oughood Panal	Average Temp. Ris	se 74	Minutes
				Overbiead Panel	Max. Temp. Rise	74	Minutes

### 2. Test Information

2. Test illiorillation		10,000			
Test Laboratory:	FORTE 7	A Y	onsultants Con	npany Limited	
Tool Longlion.	West Si	of Huan Xi	ang Shan, Xin '	Yu Road, Shajir	n, Baoan District,
Test Location:	Shenzhe	en, Guangdor	ig Province, Ch	ina.	
	&Leung's	Wooden Cor	npany Limited		
Test Sponsors:	Garish (	Crown Fire En	gineering & Co	nsultancy	
alile	Shun Hi	ng Fire Rated	ang Shan, Xin ng Province, Ch mpany Limited gineering & Co Building Mater	rials Limited	
Specimen Manutacturer:	Leung's	Leung's Wooden Company Limited			
ID no. of the specimen:	QT14-0	14A			
Date Received:	2014-0	1-16			
1:02	QA14-0	14A and QT1	4-014B		
Test Number:	*A total of three sets of report (Report no. IT14-007, IT14-048 and				
, ·	IT14-07	7) are issued	on this test		-
Date Tested:	2014-0	1-20	Start Time:	15:20	
Approved Test Operator	Mc Cho	eng San Mei,	Sammi		
from FORTE:	IVIS. UII	ony Jan Mei,	Jannin		
Witness of the Test:	Mr. C.K. Leung- Official Delegate of the Sponsor				





### 3. Construction Details of Specimen

#### 3.1 Specimen Description

#### 3.1.1 Door Frame

The composite timber door frame was overall sized 2529 mm (width) x 2950 mm (height). The sectional dimension of the perimeter was 50 mm (w) x 60 mm (thick) with 15 mm single door stop rebate.

The framework was made of a timber block sized 50 mm (w) x 54 mm (thick) with 15 mm single door stop rebate. A layer of 3 mm ceramic fibre and 5mm thick fire rated board was fixed onto the exposed sprface of the timber block and finished with 0.6 mm wood veneer.

The sub-frame was made of film plywood sized 18 mm x 54 mm. The sub-frame was fixed onto the door frame by M5 x 72 mm (long) wood screws. The door frame together with sub-frame was fixed into the concrete supporting frame by M10 x 112 mm (long) anchor bolts. There were 4 numbers of fixings on each jamb and 2 numbers of fixings on head.

Wooden architraves sized 45 mm (w) x 25 were fixed over the door frame and sub-frame on both sides by pressure nails at approximate 250 mm - 300 mm centre to centre.

1 number of 30 mm (w) x 4 mm (t) intumescent seal and 1 number of 12 mm x 12 mm rebate corner smoke seal were fitted into the groove along the door stop at the head and jambs of the door frame. The smoke corner seal was overlapped with the intumescent seal at the corner. The intumescent seal was interrupted at hinge positions.

The space between Door frame, sub-frame and concrete support frame was filled with back rods and fire sealant.

### 3.1.2 Door Leaves

3.1.2 <u>Door Leaves</u>

The specimen comprised of two unequal timber door leaves: an active leaf sized 1300 mm (w) x 2440 mm (h) x 54 mm (t) and an inactive leaf sized 1150mm (w) x 2440 mm (h) x 54mm (t). Both door leaves were with 15 mm rebate on the top and the hinge edge.

The main stiles and rails were made from 2 numbers of 45 mm (w) wooden slab and the mid rails were 45 mm (w) wooden stabs. The stiles at the meeting edge were made of 3 numbers of 45 mm (w) wooden slabs. The space between stiles and rails were filled with 38 mm (t) perlite boards. The exposed sides of the core were covered by 2 layers of 2.5 mm (t) fire rated boards sub-facing and the unexposed sides of the core were covered by 1 layer of 5 mm (t) fire rated boards sub-facing. Both sides finished by a layer of 2.5 mm plywood facing. The sub-facing was fixed onto the door core by glue and screws and the facing was fixed onto the sub-facing by glue.

The meeting edge was unequal rebated type.

1 number of 10 mm (w) x 4 mm (t) intumescent seal was fitted into the groove along the top edge and the meeting edge on active door leaf.1 number of 10 mm (w) x 4 mm (t) intumescent seal was fitted into the groove at the bottom lipping with 13 mm away the door edge from unexposed fire side.

1 number of 30 mm (w) x 4 mm (t) intumescent seal was fitted into the groove along meeting edge with smoke



seal installed along the rebate corner of meeting edge on inactive door leaf.1 number of 10 mm (w) x 4 mm (t) intumescent seal was fitted into the groove along the rebate at the top edge and the bottom of the inactive door & Consultant leaf. The intumescent seal was interrupted at strike plate and flush bolts and the concealed bottom seal positions.

The door lipping was made of 8 mm wooden strip.

### 3.1.3 Overhead Panel

The specimen comprised of an overhead panel sized 2453 mm (w) x 469 mm (h) x 54 mm (b) The core construction of the overhead panel was similar to the door leaf. The overhead panel was flush with both door leaves with 15 mm rebate and fixed onto the Door frame by M5 x 75 mm wood screws. There were 4 numbers of fixing on the horizontal edges and 2 numbers of fixing on the vertical edges.

1 number of 10 mm (w) x 4 mm (t) intumescent seal was fitted into the groove along the rebate of the overhead panel on the top edge and the vertical edges.

1 number of 30 mm (w) x 4 mm (t) intumescent seal and 1 number of smale corner seal was fitted into the groove on the bottom edge of the overhead panel opposite to the top edge of the door leaves.

### 3.1.4 Glazed Element

The specimen comprised of a single glazed element on the inactive goor leaf.

The glazed element overall sized 205 mm (w) x 1055 mm (h) with visual size 165 mm (w) x 1015 mm (h), and installed 140 mm away from the meeting edge and 1180 mm above the bottom edge of the door leaf.

The glazed element consisted of a piece of 25 mm (t) ofterlayered glass pane. It was set and lined with ceramic fibre tape and fire sealant on both sides. The glazing was sandwiched by 1 mm thick steel angle and plate clad with wooden bead. Chamfered wooden glazing beads sized 20 mm (width, parallel to the glass) x 14.5 mm (thick, perpendicular to the glass). The glazing beads were fixed onto the door leaf by wood nails at approximate 150 - 250 mm.

The edges of glass pane were cauthed with fire sealant.

### 3.1.5 Ironmongery

Each door leaf was supported into the Door frame by 3 numbers of butt hinges.

- 1 number of mortise lask with lever handle was installed 1000 mm above the bottom of the active door leaf.
- 1 number of flush bolt was installed at the top and another at the bottom closed to the meeting edge on the inactive leaf on the exposed side.
- 1 number of surface mount door closer was regular arm mounted at the top rim of both door leaves on the exposed side.
- 1 number of concealed bottom seal was installed at the bottom edge of both door leaves.

Push plates were installed on both sides of the door leaves.

Intumescent material was applied to mortised area for ironmongeries.



### 3.2 Material Schedule

Parts specifications were summarized in the following tables.

A star mark "\*" indicates those not being verified by FORTE.

great					
Fra	m	PIA	ın	rk	٠

Manufacturer:	Leung's Wooden Company Limited
Materials:	Hardwood and Fire Rated Board
Overall Sizes:	2529 mm (w) by 2950 mm (h)
Density:	Hardwood - 550 kg/m³ - 700 kg/m³ *  Fire Rated Board - 950 kg/m³ ± 1000 kg/m³*
Section Dimensions:	50 mm by 60 mm
Rebate:	15 mm
Connection Method of Head to Jamb:	Mitred Joint with Tongue and Groove and Fixed by Wood Screws
Fixing Method to Sub-frame:	Wood Screws and Metal Pins
Gap Filling between Door Frame and Sub-frame:	Fire Sealant Excellent

### Door Sub-frame

- 100 March 100	-05
Manufacturer:	Leung's Wooden Company Limited
Material:	Film Plywood
Density:	.350 kg/m³ *
Sizes:	18 mm by 54 mm
Fixing Method to Concre	M10 x 112 mm Anchor Bolts, 4 Numbers of Fixings on Each Jamb and 2
Support Frame:	Numbers of Fixings on Head
	19 Aug. 19 20 20 20 20 20 20 20 20 20 20 20 20 20

### **Architraves**

Manufacturer;	Leung's Wooden Company Limited	
Material;	Hardwood	
Hardwood Density:	550 kg/m <sup>3</sup> - 700 kg/ m <sup>3</sup> *	
Sizes:	45 mm by 25 mm	
Fixing Method	Fixed by Wood Nails	

RESTING AND CONSULTANTS COLTD FORTE TESTING FORTE TEST



### **Door Leaves**

Manufacturer:		Leung's Wooden Company Limited
Over	all Sizes:	(1300 mm + 1150 mm) by 2436 mm
S	Material:	Softwood
and Rails	Width:	45 mm
	Thickness:	38 mm
Stiles	Density:	350 kg/m³ - 450 kg/ m³ *
SI	Moisture Content:	12 - 17% *
	Supplier:	Leung's Wooden Company Limited
Core	Material:	Perlite
ان	Thickness:	38 mm
	Density:	380 kg/ m³ *

## **Door Leaf Lippings**

Manufacturer:	Leung's Wooden Company Lignited	2
Material:	Hardwood	, * 88. <sup>2</sup> -
Thickness:	8 mm . <u></u>	
Density:	550 kg/m³ - 700, <b>®g</b> /m³ *	

### **Door Leaf Facings**

Manufacturer:		Leung's Wooden Company Limited	
Material:		:PVWood	
Thickness:	S	3 mm ± 0.5 mm	
Density:	16.0%	350 kg/m <sup>3</sup> - 450 kg/m <sup>3</sup> *	

# Door Leaf Sub-facings

Leung's Wooden Company Limited	Accidental Ch. Comp.
Gemtree	
Fire Rated Board (Magnesium Oxide) *	
5 mm	The state of the s
950 kg/m³ - 1000 kg/m³ *	
	Fire Rated Board (Magnesium Oxide) * 5 mm



Glazed	F	ement	- Glass	Pano
ulazeu	line !	GHIGHL	- Uld22	Falls

Supplier:	Garish Crown Fire Engineering & Consultancy		
Brand:	Ying Mu		
Nominal Thickness:	25 mm		
Full Sizes:	205 mm x 1055 mm		
Visual Sizes:	165 mm x 1015 mm		
Depth of Cover of Glass Edge:	15 mm - 20 mm		
Fixing Method:	Lined by Ceramic Fiber Tape, Clamped by Stainless Steel Angles and Wooden Glazing Beads on Both Sides		

## Glazed Element - Fixing Angle Plate

Supplier:	Leung's Wooden Company Limited	*************
Material:	Stainless Steel *	
Sizes:	1 mm	

### Glazed Element – Aperture Lining

Supplier:	Leung's Wooden Compagy Limited
Brand:	N/A x\Six
Material:	Fire Resistant Wood (Ceramic Fiber Tape) *
Density:	200 kg/ m³ * * * * * * * * * * * * * * * * * *
Thickness:	3 mm \2000

### Glazed Element - Glazing Beads

Manufacturer:	Leung's Wooden Company Limited	
Material:	Hardwood *	
Density:	550 kg/m <sup>3</sup> - 700 kg/ m <sup>3</sup> *	440 30-
Moisture: Salah	N/A	
Sizes: COTON	20 mm x 19.5 mm	
Fixing Method	Fixed by Wood Nails	

# Butt Hinges

Supplier:	Leung's Wooden Company Limited	
SBrand:	Best	
Model:	3544-2BB *	
Sizes:	102 mm x 102 mm	



### **Door Closers**

Supplier:	Tung Fat Ho Building Material Limited	
Brand:	Ryobi	
Model:	D3550-DA-BC-SU *	(Lear,
Casing Material	Stainless Steel *	CON
Locations of Application:	The Top Rim of the Door Leaf	2
D40077000000		

## Flush Bolts

Supplier:	Leung's Wooden Company Limited	
Brand:	Ying Mu	
Model:	N/A	
Sizes:	25 mm by 150 mm	

### Door Lock

Supplier:	Tung Fat Ho Building Material Limited	
Brand:	MIWA 1555	
Model:	U9 LHS-1B/S 76-D,T,500-58-ST	

### **Push Plate**

Supplier:	Leung's Wooden Company Limited	
Material:	Stainles Steel *	
Thickness:	. 1, 15m	
Sizes:	580 mm by 220 mm	

21200.	200 mm by 220 mm	
Conceal Bottom Smoke Seal		
Supplier:	Leung's Wooden Company Limited	- 11.50 2011 - 11.50
Brand: Spant	REDDIPLEX *	
Model:	IDD *	
Locations of Application:	Bottom Edge of the Door Leaf	

# Rebate Corner Smoke Seal

Sapplier:	Shanghai Gallford Fire Sealing Company Limited	
Brand:	REDDIPLEX *	
Model:	9946 *	
Material:	Poly(vinyl chloride) *	
Locations of Application:	Rebate Corner of the Door Frame	



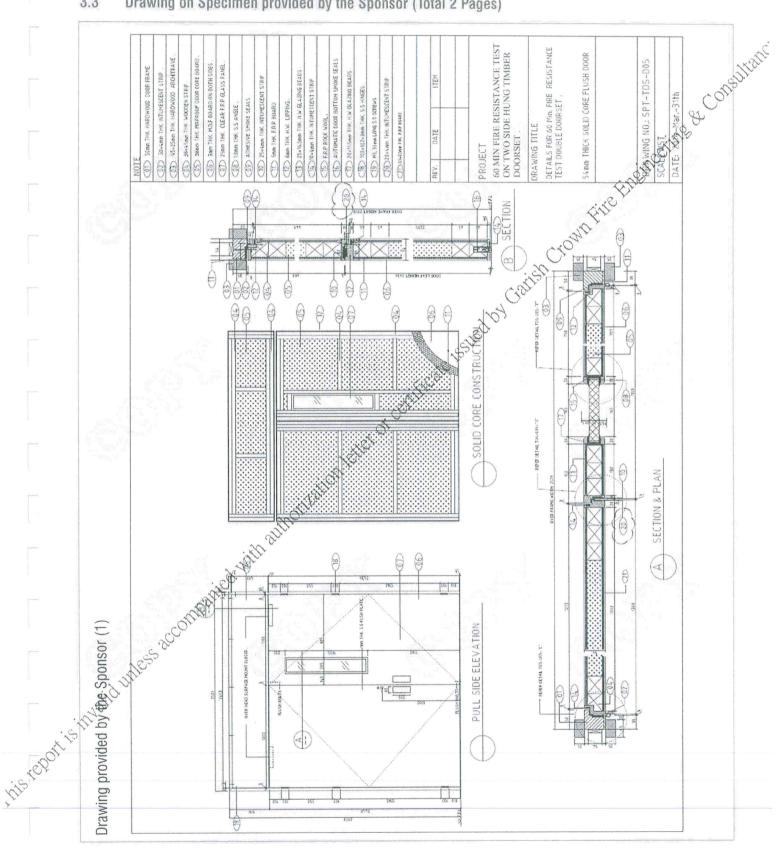
### Intumescent Material - Door Edges

intumescent material – Door Euge	8		
Supplier:	Leung's Wooden Company Limited		
Brand:	Lorient		
Model:	LP3004 *	LP1004 *	
Size:	30 mm by 4 mm	10 mm by 4 mm	
Location:	Meeting Edge of Inactive Door Leaf, Head and Jambs of Door Frame, Bottom Edge of Overhead Panel	Meeting Edge of Active Door Leaf, Hinge Edge and Bottom, Edge of Door Leaves, Top Edge and Side Edge of Overhead Panel	
Fixing – Door Frame		Wil Fig.	
Supplier:	Hilti (Hong Kong) Limited	20	
Brand:	Hilti	California	
Model:	HT *	}	
Sizes:	M10 x 112 mm		
Fire Sealant	Hilti (Hong Kong) Limited  Hilti HT *  M10 x 112 mm		
Supplier:	Hilti (Hong Kong), Cymited		
Brand:	Hilti 👸		
Model:	CP606		
Brand: Model: Locations of Application:  Intumescent Pad Supplier: Model: Thickness: Glue Supplier: Saccontinative of Application:	Gap between the Door Frame and Sub-frame and Edges of the Glass Pane and The Glazing Beads		
Intumescent Pad	Stille Stille		
Supplier:	Leung's Wooden Company Limited	<u> </u>	
Model:	CT56019 *		
Thickness:	3 mm		
Glue Schillige			
Supplier:	Leung's Wooden Company Limited		



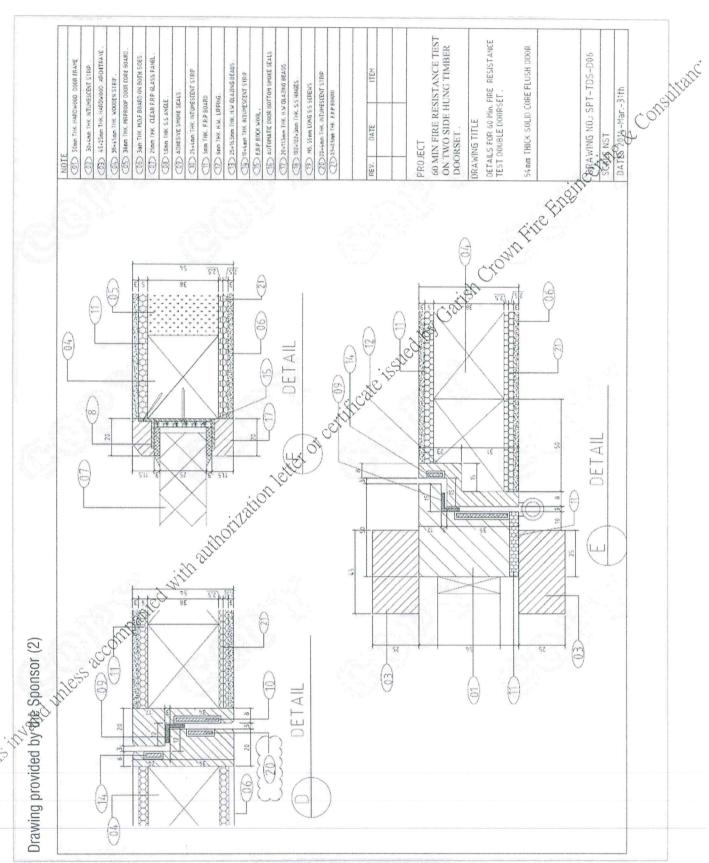


### 3.3 Drawing on Specimen provided by the Sponsor (Total 2 Pages)









RPF-TESTING AND CONSULTANTS CO LTD FORTE TESTING AND CONSULTANTS CO LTD FORTE TESTING



### 4. Specimen Condition

#### 4.1 Selection of the Specimen

The specimen was selected by the Sponsor and submitted to the Test Location. FORTE did not involve in the specimen Etherheeting & Const selection of the specimen.

All the components of the test specimen were supplied by the Sponsor.

#### Verification of the Specimen 4.2

A set of components of the specimen was prepared by the Sponsor.

In section 3.2 of this report, items which had been verified by FORTE was clearly identified and distinguished from those relying on Sponsor's declaration.

#### 4.3 Supporting Construction

The specimen was fixed into a supporting construction made of fully cyrecorrect normal density concrete slabs provided by FORTE. The concrete slabs formed a structural opening 2577 mm (w) x 3030 mm (h).

#### 4.4 Installation of the Specimen

The specimen was assembled and installed by workers delegated by the Sponsor on 2014-01-16

### 4.5 Specimen Conditioning

The specimen was stored in the Test Location from 2014-01-16, the date which specimen was received, to 2014-01-20, the date which fire resistance test performed.

The average environment parameters in the Test Location within this period were:

Ambient	Temperature (°C)	Relative Humidity (%)	
	20 ± 5	alle	75 ± 10

### Direction of Fire Side and Others 4.6

The Sponsor has designated and installed the specimen that door leaves could only be swung inwards the furnace.

With reference to Clause 13; BS EN 1634-1: 2008, hinged timber leaf timber frame doors tested opening into the furnace may cover the opposite direction on both integrity and insulation criteria.

The Yoor lock was NOT locked and NOT latched, and the flush bolt was NOT engaged during the test.



### **Test Method**

#### 5.1 **Pre-test Conditioning**

The pre-test conditionings of the specimen were carried out on 2014-01-19 prior to the fire test with reference to SERV 1634-1: 2008 and clause 5.1. BR EN 1634-1: 2008 BS EN 1634-1: 2008 and clause 5.1, BS EN 14600: 2005.

#### 5.2 **Ambient Temperature**

The ambient temperature was measured by mineral insulated metal sheathed type K thermocouple. The measuring junction was screened by two concentric plastic pipes from radiated heat and draught, at a position approximate 1500 mm away the test construction.

5.3 Heating Condition

The average temperature inside the furnace was monitored and controlled throughout the test according to the standard heating curve stated in BS EN 1363-1:1999 given by the equation:

$$T = 345 \log_{10} (8t+1) + 20$$

T is the average furnace temperature, in degree Celsius t is the time, in minutes emperature inside " The temperature inside the furnace was measured in Conformity with BS EN 1363-1: 1999 by 9 numbers of plate thermometers. These thermometers were evenly distributed over a vertical plane approximately 100 mm from the exposed surface of the test construction.

Just the standard with a through the standard of the standard The positions of furnace thermocouples are shown in Figure 1.

REFERENCE AND CONSULTANTS COLUMN FORTE TESTING FORTE TESTING AND CONSULTANTS COLUMN FORTE TESTING FORTE TESTIN





### 5.4 Unexposed Surface Temperature

The unexposed surface temperatures of the specimen were measured by 44 numbers of type K thermocouples. These thermocouples were positioned and fixed on unexposed surface of the test specimen in conformity with BS EN 1634-1: 2008.

The specimen was evaluated against the maximum temperature rise criterion given by supplementary procedure – Classification I<sub>1</sub> at the request of the Sponsor.

The positions of unexposed surface temperature measurement points are shown in *Figure 3*. The locations of thermocouples are explained in the following table.

Thermocouple	Area	Description
U1 – U5	Door Leaves	For average and maximum unexposed surface temperature rise
U6 – U13	Doorloovee	For maximum unexposed surface temperature rise
U14 – U22	Door Leaves	(Supplementary Procedure
U23 – U24	Door Fromo	For maximum unexposed surface temperature rise
U28 – U30	Door Frame	For maximum unexposed surface temperature rise
U31 – U33	Glazed Element	For average and maximum unexposed surface temperature rise
U34 – U47	Overhead Panel	For average and maximum unexposed surface temperature rise (Supplementary Procedure, I <sub>1</sub> )

### 5.5 Pressure Condition

The pressure inside the furnace was continuously monitored in compliance with BS EN 1363-1: 1999 during the whole test. The pressure at a point 500 mm above the notional floor level was to be maintained  $0 \pm 5$  Pa by five minutes from commencement of the test and  $0 \pm 3$  Pa that from ten minutes onwards with respect to the atmosphere.

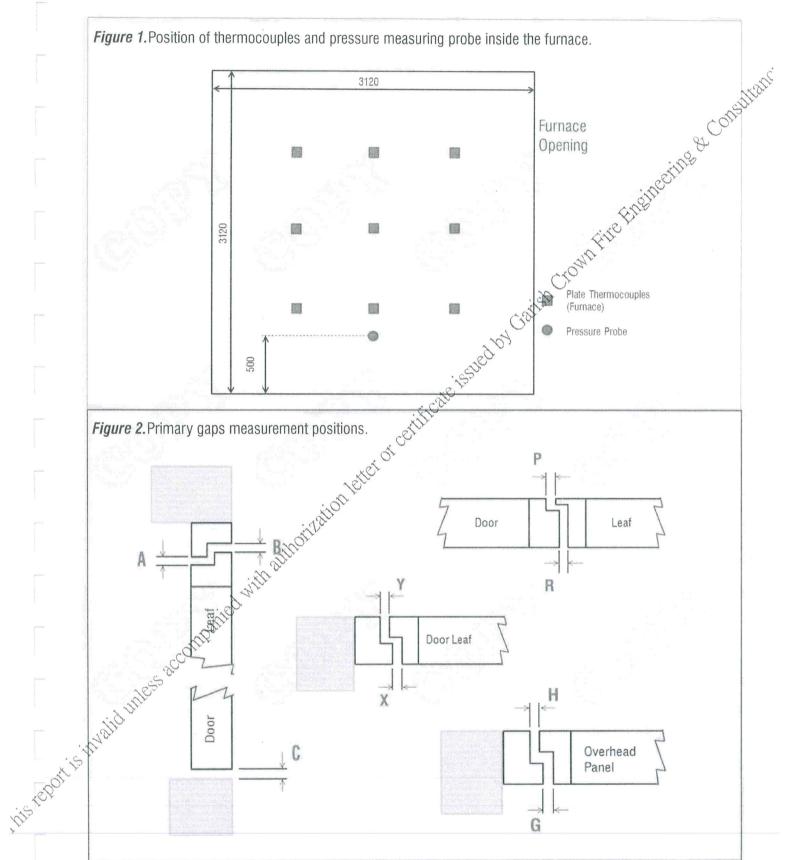
## 5.6 Deflection Measurements

Measurements of the deflection of the test specimen were taken with a steel rule from cross line laser across the top, mid-height and bottom of the specimen.

The positions of deflection measurement points are shown in Figure 4.

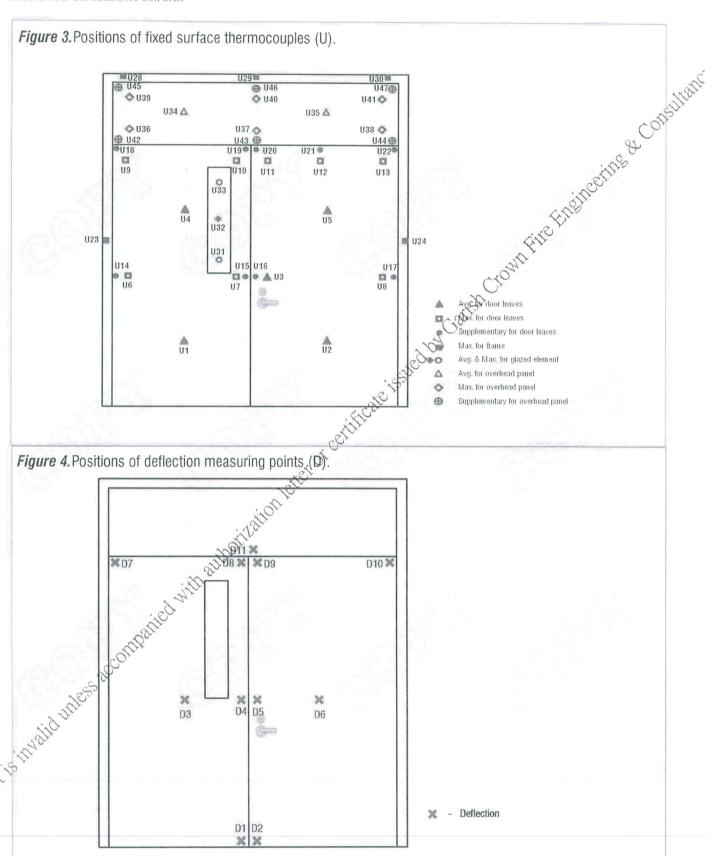
TE-TESTING AND CONSULTANTS COLITD FORTE TESTING AND CONSULTANTS COLITO FORTE TESTING FORTE TESTING AND CONSULTANTS COLITO FORTE TESTING FORTE TESTING FORTE TES















### 6. Test Data

#### 6.1 **Retention Forces**

The retention forces on each door leaf for each direction of opening were determined. The respective highest h

Leaf	Push	Pull
Active	66.0 N	95.2 N
Inactive	63.4 N	70.0 N

Primary gaps of the specimen were measured and subsequently processed in accordance with BS EN 1634-1: 2008 and summarized in the following table.

Measurements were taken in mm.

Gap	Measured						
чар	Minimum	Maximum	Average				
Α	4.3	5.2	4.9				
В	4.3	6.5	5.7				
С	0.5	2.2	1.4				
G	1.8	3.8	2.4				
Н	1.1	2.6	1.9				
P	2.5	4.4	. 336				
R	3.1	4.5	OF 3.9				
X	1.1	4.9 0	2.8				
Υ	2.1	4.11	3.2				
	er an		na an na na ne ne ar ar an na na na na na				
	riless accom	4.4 4.5 4.9 (a) 4 x x x					
in Walid	<i>y</i> .						
official							

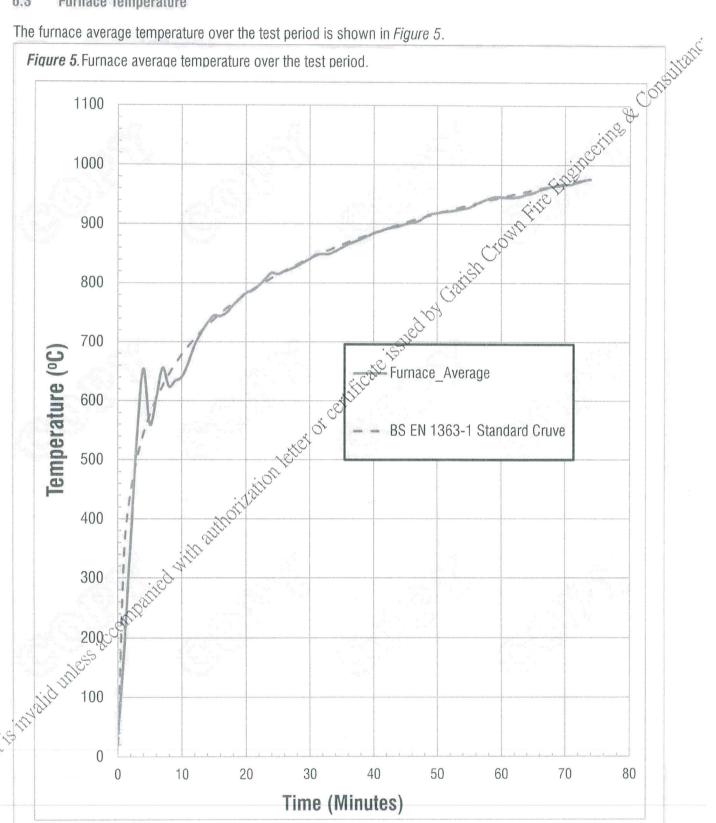
pro catificate is sted by Cratish

RPILESTING AND CONSULTANTS CO LTD FORTE TESTING AND CONSULTANTS CO LTD FORTE TESTING



#### 6.3 **Furnace Temperature**

The furnace average temperature over the test period is shown in Figure 5.

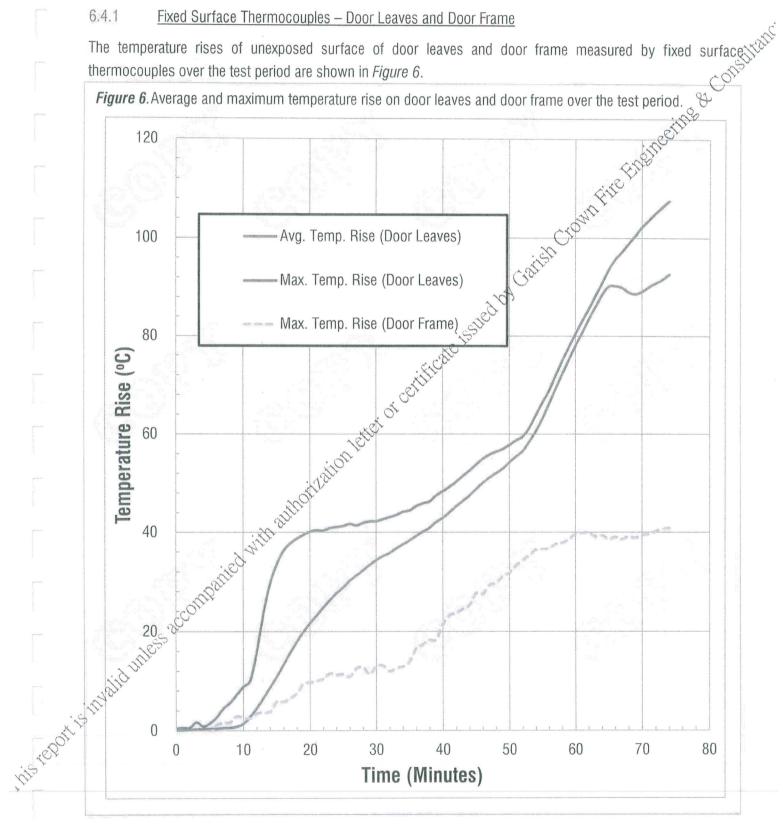






### **Unexposed Surface Temperature Rise** 6.4

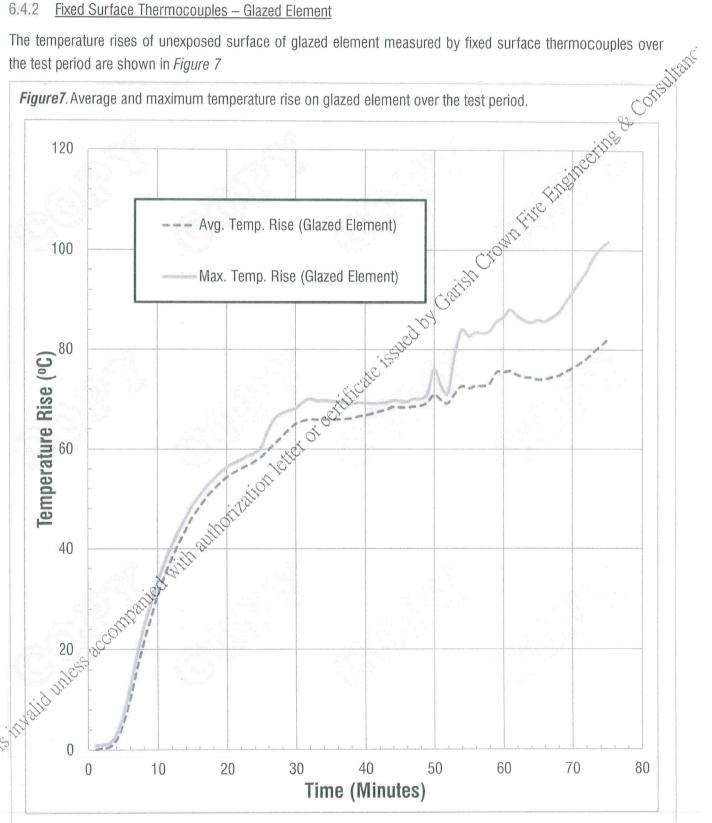
### 6.4.1 Fixed Surface Thermocouples - Door Leaves and Door Frame





#### Fixed Surface Thermocouples - Glazed Element 6.4.2

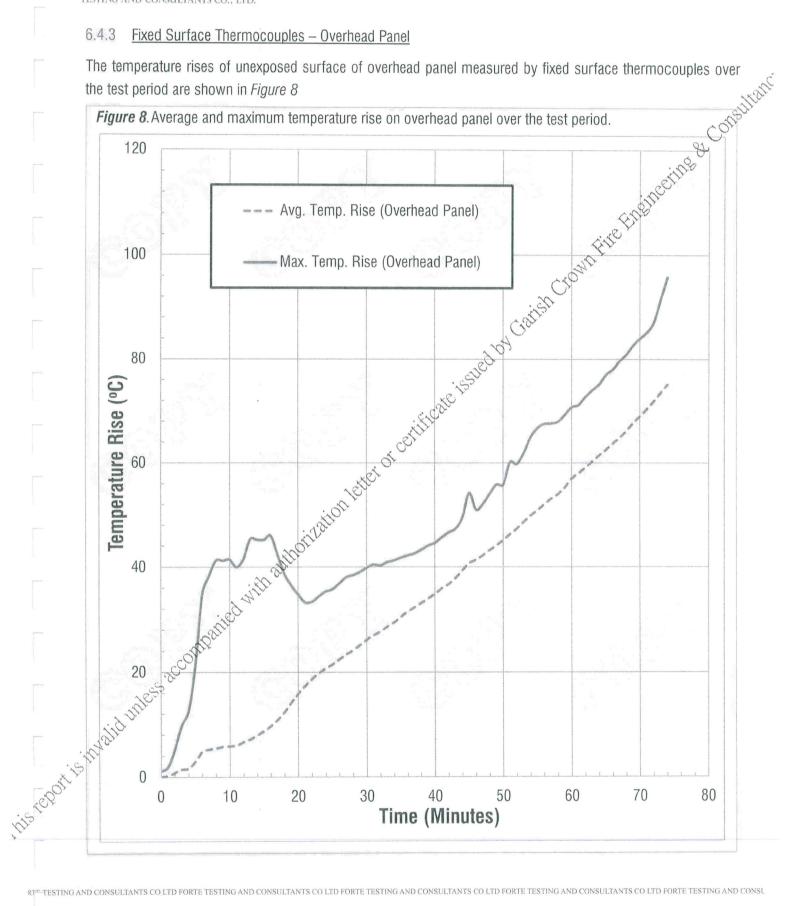
The temperature rises of unexposed surface of glazed element measured by fixed surface thermocouples over the test period are shown in Figure 7







#### Fixed Surface Thermocouples - Overhead Panel 6.4.3





#### 6.4.4 <u>Fixed surface thermocouples</u> – Detailed Temperature Records

The outputs of the unexposed surface thermocouples are summarized in the following tables. Measurements were taken in °C.

### Temperature outputs from unexposed surface temperature U1 to U11U23

nperature o	utputs fro	om unex	oosed su	ırface te	mperatur	e U1 to l	<u> </u>				31.05
ime (min)	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10	0111
0	20.2	19.7	20.0	20.6	20.2	19.5	19.1	18.5	19.7	19.45	19.8
5	20.5	19.9	20.4	20.9	20.6	20.3	19.5	18.9	19.8	19.7	20.2
10	23.6	20.5	21.0	21.5	21.2	20.9	19.8	19.3	20.74	\$ P9.8	20.5
15	53.7	22.3	24.0	32.2	23.5	23.8	20.2	21.3	22.7	20.3	23.6
20	60.3	29.4	37.2	52.6	29.8	53.8	21.4	29.8	45.4	21.4	41.3
25	61.5	39.0	48.2	57.3	38.8	60.4	24.2	37.2	56.4	23.8	50.9
30	62.4	47.3	55.9	59.6	47.1	60.4	28.2	48.0	58.2	26.4	57.1
35	64.6	53.1	59.1	62.9	52.6	61.6	32.7	47.5	61.1	30.5	61.7
40	68.6	58.7	62.6	67.9	57.8	63.7	39.250	52.3	64.3	35.1	65.8
45	72.9	65.9	66.8	74.0	65.3	67.5	√4×32	57.4	67.6	40.0	69.7
50	75.8	73.1	71.4	78.0	73.9	72.3	48.8	62.5	71.2	44.9	73.0
55	83.1	83.9	80.0	86.6	83.0	75.5°	53.4	68.7	74.9	49.4	75.5
60	99.8	99.5	92.9	100.6	98.1	₹8.6	59.0	74.4	82.9	54.7	78.2
65	113.2	113.7	105.2	112.2	107.4	92.6	65.5	83.7	92.2	60.1	81.2
70	122.3	97.8	116.4	120.1	89,6	105.1	72.1	88.0	100.8	66.7	91.8
74	127.7	94.9	124.9	125.3	×91.0	113.0	77.3	92.2	107.4	71.7	102.8

### Temperature outputs from unexposed serface temperature U12 to U16 and U18 to U23

-			Assertation of the second	1000		STANDARD TO STANDARD	SUSTAIN A MUNICIPAL PROPERTY.			AND DESCRIPTION OF THE PERSON		
	Time (min)	U12	U13	1114	U15	U16	U18	U19	U20	U21	U22	U23
	0	19.9	19.8	\$79.0	19.0	18.6	19.5	20.0	19.7	20.0	19.2	17.1
	5	20.2	20.20	21.4	19.5	18.9	20.9	21.6	20.5	20.5	20.7	17.2
	10	20.6	20.8	26.4	20.5	19.6	23.8	29.0	21.6	20.6	22.6	18.6
	15	22.4	22.0	24.1	23.4	22.2	27.1	35.2	23.2	21.1	24.2	17.5
	20	28.4	28.9	26.2	28.5	25.9	30.9	40.1	26.2	22.6	26.9	17.7
	25	37.1	41.1	29.5	35.6	30.4	35.2	44.7	30.9	25.7	30.8	18.3
I	30 🔑	44.6	55.4	34.6	39.6	36.4	39.5	48.9	37.8	30.3	36.2	20.0
	35	51.1	59.5	42.1	49.8	43.3	45.0	53.4	43.9	35.1	43.4	22.8
1	355	56.6	61.8	49.0	58.0	48.9	51.2	56.7	49.9	40.0	50.9	28.9
	45	61.8	63.9	54.1	64.4	58.8	56.8	59.7	56.6	44.9	57.2	34.0
1	50	68.6	67.5	57.9	72.7	66.4	61.6	62.8	61.4	50.2	62.7	39.1
1	55	75.3	72.6	62.3	80.4	73.6	67.9	67.3	65.4	56.0	68.2	43.5
I	60	83.6	77.7	67.1	86.2	77.5	74.3	72.8	70.8	62.6	74.2	47.9
	65	87.7	81.2	72.1	86.7	83.5	82.2	77.2	77.4	68.7	80.4	50.9
	70	86.3	88.2	79.4	90.6	90.2	88.88	90.3	81.3	73.5	86.2	53.6
	74	89.3	96.5	85.1	93.7	97.2	92.1	114.6	83.9	78.1	90.0	54.8
-			The state of the s									

REF-TESTING AND CONSULTANTS CO LTD FORTE TESTING AND CONSULTANTS CO LTD FORTE TESTING





## Temperature outputs from unexposed surface temperature U24 and U28 to U37

Time (min)	U24	U28	U29	U30	U31	U32	U33	U34	U35	U36	U37
0	16.3	17.7	18.0	17.6	22.0	22.2	23.3	20.0	20.2	20.0	20.4
5	18.0	19.7	18.2	19.3	30.0	33.0	34.8	20.3	20.7	20.1	20.6
10	18.2	22.7	18.1	20.0	52.8	59.0	59.8	20.8	21.0	20.9	27.1
15	17.3	26.1	18.8	21.5	66.6	72.7	73.1	22.7	22.7	22.6	25.8
20	17.7	29.8	19.7	22.8	74.3	79.7	79.2	27.6	32.9	35,4	40.3
25	19.1	31.5	20.8	24.5	78.1	82.4	86.3	33.9	42.2	\$46.9	46.7
30	20.1	33.2	22.2	27.8	81.7	91.8	90.7	41.7	47.8	48.6	52.9
35	21.8	34.0	23.0	31.4	82.1	92.0	91.1	48.5	52.4	51.3	55.3
40	23.7	41.6	24.2	35.5	86.4	91.6	90.8	55,30	<sup>33</sup> 57.6	54.1	58.8
45	25.9	47.9	26.2	43.4	89.2	92.0	91.2	63.3	64.1	57.3	63.1
50	28.5	52.0	27.7	47.3	88.5	93.3		3.5	71.6	61.5	67.5
55	31.8	56.7	29.6	50.3	88.88	105.9	90,93	86.0	82.6	66.2	70.8
60	35.2	59.7	31.3	52.1	91.8	110.5	32.3	87.4	90.1	70.8	78.5
65	37.2	58.8	34.3	52.3	90.5	108.20	90.9	85.3	96.0	75.9	88.7
70	39.4	59.5	37.8	55.0	90.5	116.7	92.3	88.7	102.1	84.5	96.9
74	41.1	61.0	41.9	52.4	90.7	P24.2	98.8	93.4	106.7	91.4	103.5

Temperature o	outputs fr	om unex	posed s	urface te	mperatu	ire U38 t	o U47				
Time (min)	U38	U39	U40	UAR	U42	U43	U44	U45	U46	U47	U38
0	18.9	18.4	17.9	19.4	19.6	20.1	19.7	19.2	18.4	17.6	18.9
5	19.2	18.7	18.30	19.9	40.6	20.9	32.1	21.4	18.8	19.9	19.2
10	20.0	19.5	18.6	21.0	60.7	23.3	34.1	28.0	18.8	23.7	20.0
15	21.4	21.3	22.6	21.4	64.5	25.5	44.7	31.4	19.4	25.6	21.4
20	25.2	377	47.0	31.0	54.1	29.0	47.1	34.1	23.0	27.9	25.2
25	29.1	¥6.3	55.1	42.2	52.7	34.4	44.0	37.3	26.6	33.2	29.1
30	34,10	48.4	59.2	49.0	56.0	42.2	43.3	42.0	31.7	39.3	34.1
35	38.5	51.3	61.1	53.2	60.4	47.3	48.5	47.7	35.8	45.2	38.5
40	42.7	54.6	63.9	57.1	59.7	52.0	54.2	55.6	40.7	51.1	42.7
	46.3	58.4	69.2	62.2	73.5	55.7	56.0	67.7	46.2	57.5	46.3
50	50.4	63.3	74.1	68.1	66.9	58.7	57.7	75.1	51.0	63.0	50.4
45 50 55	55.4	68.1	76.5	73.4	72.0	62.8	61.2	81.0	55.4	71.0	55.4
60	61.2	73.7	87.0	77.7	82.2	66.0	67.3	85.4	61.5	79.1	61.2
65	68.1	80.8	96.3	84.6	83.1	68.7	76.1	85.7	68.1	88.2	68.1
70	74.8	90.7	103.2	91.4	83.4	72.2	82.2	91.2	75.2	100.0	74.8
74	78.3	97.3	108.6	96.3	89.5	74.3	87.5	99.5	80.3	115.1	78.3

ORF TESTING AND CONSULTANTS CO LTD FORTE TESTING



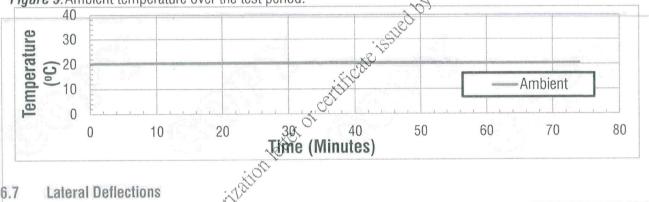
### 6.5 Pressure

The pressure differential in furnace at 500 mm above notional floor level over the test period was summarized in of Consultanci the following table.

Time (min)	Pressure	Time (min)	Pressure
6	1.0	40	-1.2
10	1.8	45	0.0
15	0.3	50	-0.6
20	0.9	55	-0.3
25	0.2	60	0.8
30	-0.3	65	0.4
35	-0.7	70	0.1

The ambient temperature over the test period was recorded and shown in Figure Otoman.

Figure 9. Ambient temperature over the test period.



6.7 Lateral Deflections

Measured lateral deflections over the test period are summarized in the following table. A positive measurement indicates a movement toward into the furnace and vice versa. Measurements were taken in mm.

Maximum deflection measured on specimen was -44mm at D4 at 70 minute of test.

SHOULD SEE THE PROPERTY OF THE PERSON OF THE	ON PARTIE	10	20	30	40	50	55	60	65	70
D1 🔑	+0	+2	+7	+7	+6	+5	+4	+3	+1	-1
D2 255	+0	+2	+5	+6	+5	+5	+4	+3	+2	+0
D2 255	+0	+13	+23	+28	+31	+34	+35	+35	+33	+27
a'a On4	+0	+11	+14	+10	+6	-3	-9	-17	-29	-44
D5	+0	+18	+18	+13	+11	+5	-1	-9	-19	-34
D6	+0	+19	+19	+21	+26	+31	+31	+31	+30	+14
D7	+0	+3	+10	+12	+12	+14	+15	+14	+15	+15
D8	+0	+7	+10	+5	+2	-5	-11	-17	-26	-33
D9	+0	+5	+9	+4	+2	-3	-8	-16	-23	-33
D10	+0	+2	+8	+9	+11	+13	+14	+14	+16	+17
D11	+0	+5	+6	+5	+2	-4	-10	-19	-23	-33

ORF TESTING AND CONSULTANTS CO LTD FORTE TESTING





### 6.8 Observations

The table below summarized the observation on the specimen during the test period.

Photos taken during the test period are also attached.

Time (min.sec)	Observation (from unexposed side)
00.00	Test started Inner glass pane cracked. Light smoke released from the meeting edge. Smoke released from vertical edges of the door leaves.
00.03	Inner glass pane cracked.
01.16	Light smoke released from the meeting edge.
01.40	Smoke released from vertical edges of the door leaves.
02.37	A large amount of smoke released from all the door gaps. Flaming inside the furnace was observed through the glass pane.
03.39	Smoke release increased from the edges of the door leaves. The interlayer of glass pane reacted and turned light brown in color.
04.35	Smoke reduced. Smoke released from hinged edges and the top of door leaves.
06.28	Smoke released from all the gaps of the door leaves
09.23	Light smoke staining mark was observed at hinged edges.
18.26	Smoke released from the top of the overhead panel.
23.36	Smoke released from the top of overhead panel and the top of meeting edge.
28.46	The fire resistance performance of the specimen was stable.
30.00	No integrity failure had occurred.
36.20	Smoke staining mark was observed at the overhead panel which was above the top of meeting edge. Smoke released from the meeting edge at the lock position.
41.12	Both door leaves are bowed slightly towards the furnace.
42.13	Smoke released from the lock position and the meeting edge turned dark. Smoke staining mark appeared at both corners at the top of the overhead panel.
47.56	The right edge of the glass pane turned dark.
55.24	Smoke released from left hinged edge, meeting edge and the gaps of the overhead panel. The left hinge edge turned dark.
57.21	Cotton libre pad test was carried out at the lock position of meeting edge. No flaming or glowing on the cotton pad was observed.
58.28	Sotton fibre pad test was carried out at the top of meeting edge. No flaming or glowing on the cotton pad was observed.
59.24	Cotton fibre pad test was carried out at second hinge position of left hinge edge. No flaming or glowing on the cotton pad was observed.
68:00	No integrity failure had occurred.
Walid 66.18	Cotton fibre pad test was carried out at the lock position of meeting edge. No flaming or glowing on the cotton pad was observed.
67.05	Cotton fibre pad test was carried out at second hinge position of left hinged edge. No flaming or glowing on the cotton pad was observed.
72.25	Intermittent flaming appeared at meeting edge at lock position.
12.20	The author fibre
73.23	Cotton fibre pad test was carried out at meeting edge at lock position. The cotton fibre pad was ignited. Integrity failure was deemed to occur.

RTF-TESTING AND CONSULTANTS CO LTD FORTE TESTING AND CONSULTANTS CO LTD FORTE TESTING





6.9 Photos

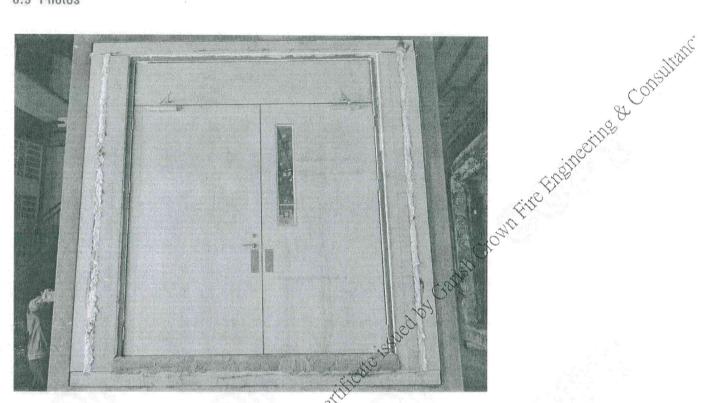


Photo 1. Exposed surface of the specimen before test

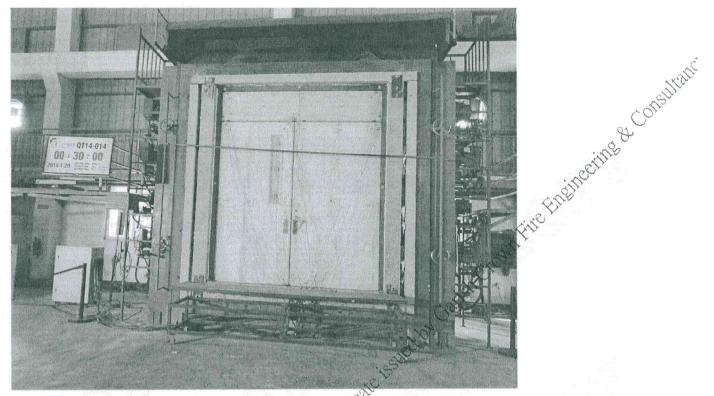


Photo 2. Unexposed surface of the specimen just after the commencement of test.

REF-TESTING AND CONSULTANTS CO LTD FORTE TESTING AND CONSULTANTS CO LTD FORTE TESTING







**Photo 3.** Unexposed surface of the specimen at 30 minute of test.



Photo 4. Unexposed surface of the specimen at 60 minute of test.

TESTING AND CONSULTANTS CO LTD FORTE TESTING AND







Photo 5. Unexposed surface of the specimen at the end of test.

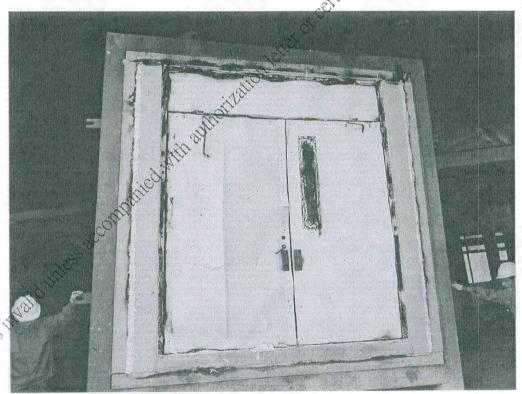


Photo 7. Exposed surface of the specimen after test.

RESTING AND CONSULTANTS COLID FORTE TESTING AND COLID



### 7. Test Results

The test on Door A was terminated after a test period of 74 minutes at request of the Sponsor.

The test data obtained from the fire resistance test was assessed against performance criteria given in BS EN 1634-1: 2008. The test results are summarized in the following table.

	nce Criteria	3	Elapsed Time b Occurrence	efore Failure
Integrity Criteria	(E) of Failure	Description	Elapsed Time o	ුව <sup>ි</sup> efore Failure
Sustained		Continuous flaming for a period of time greater than 10 seconds on unexposed surface	Occurrence 74 mi	nutes
Gap Gauge	Ø6 mm	Penetration of the gauge into the furnace through the specimen and movable along a 150 mm gap  Penetration of the gauge into the furnace through the	74 minutes	(No Failure)
Cotton Pag	Ø25 mm	specimen Ignition of the cotton pad	73 mi	nutes
Performa	nce Criteria		Elapsed Time b	efore Failure
Insulatio	n (I)	oʻi <sup>co</sup> ʻ		
Criteria	of Failure	Description	Elapsed Time bet Occurrence	fore Failure
Integrity Fa	ailure	The performance conterion "insulation" shall automatically be assumed for to be satisfied when the "integrity" criterion coases to be satisfied	73 min	nutes
Average		An increase of the average temperature of unexposed	[Door Leaves]	74 minutes (No Failure)
Temperatu	ire Rise	temperature by more than 140°C	[Glazed Element]	74 minutes (No Failure)
Temperature Rise			[Door Frame]	74 minutes (No Failure)
		An increase of temperature at any other point of the	[Door Leaves]	74 minutes (No Failure)
		specimen above the initial average temperature by more than 180 °C	[Glazed Element]	74 minutes (No Failure)
. 10004411	-, -11		[Overhead Panel]	74 minutes (No Failure)





### 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, and where appropriate BS EN 1363-2. Any significant deviation with respect to size, construction 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.

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

This report may only be reproduced in full by the Sponsor, without comment, abridgement alteration or addition, unless otherwise agreed with written approval by FORTE.

## Field of Direct Application

The field of direct application defines the allowable changes to the test specimen following a successful fire resistance test. These variations can be introduced automatically without the need for the sponsor to seek additional evaluation, calculation or approval.

The series of rules and guidelines are defined in Clause 18" "Field of direct application of test results", BS EN 1634-1: 2008 and relevant clauses and annexes Permitted variations away from the test specimen include 1) materials and construction, 2) size variations, 3) coverage of asymmetrical doorsets and 4) supporting constructions.

The field of direct applications may only be defined following the identification of classification(s). The field of direct and, where applicable, extended application will be included in classification relevant documents. tils teport is invalid unless accompanied with auti

**END OF REPORT**