

FIRE RESISTANCE TEST REPORT

DOUBLE-LEAF COMPOSITE TIMBER DOOR with TWO GLAZED ELEMENTS

in accordance with **BS EN 1634-1: 2008**

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, Fo Tan, N.T. Hong Kong.
Tel: 852-2698 0801 Fax: 852-2688 2508

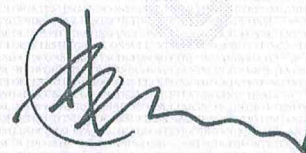
Test Laboratory: **Forte Testing and Consultants Company Limited**
Contact Information:
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Report Number: **IT 15-005**

Date of Issue: **2015-03-10**

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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 Co., Ltd, 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 subjects were a double acting double-leaf composite timber door with two glazed elements, namely Door A, and a flush type single acting single-leaf composite timber door with a glazed element, namely Door B. The specimens were supplied for test by Garish Crown Fire Engineering & Consultancy and Shun Hing Fire Rated Building Materials Limited, the Sponsors.

This report contained test results and details for Door A and test results and details for Door B was recorded in other reports, numbered IT15-045 / IT15-047.

Door A achieved the following fire resistance:

INTEGRITY (E)		INSULATION (I)	
Sustained Flaming	139 Minutes	Door Frame	Max. Temp. Rise(I ₂) 139 Minutes
Gap Gauge	139 Minutes	Door Leaves	Average Temp. Rise 139 Minutes
Cotton Pad	139 Minutes		Max. Temp. Rise (I ₂) 139 Minutes
		Glazed Elements	Average Temp. Rise 139 Minutes
			Max. Temp. Rise 139 Minutes

2. Test Information

Test Laboratory:	FORTE Testing and Consultants Company Limited
Test Location:	West Side of Huan Xiang Shan, Xin Yu Road, Shajin, Baoan District, Shenzhen, Guangdong Province, China.
Test Sponsor:	Garish Crown Fire Engineering & Consultancy Shun Hing Wood Working Company Limited
Specimen Manufacturer:	Shun Hing Wood Working Company Limited
ID no. of the Specimen:	Door A: QT 15-011A; Door B: QT 15-011B
Date Received:	2015-01-09 QT 15-011
Test Number:	*With this test, separate report for each specimen was required by the Sponsors. A total of two sets of report (Report no. IT15-005 and IT15-046) had issued on specimen named Door A
Date Tested:	2015-01-16
Start Time:	10:50
Approved Test Operator from FORTE:	Ms. Cheng San Mei, Sammi / Ms. Dong Xingmei
Witness of the Test:	Mr. K. W. Yip – Official Delegate of the Sponsor
Report Issue Record:	Version1 - 2015-03-10

3. Construction Details of Specimen

3.1 Specimen Description

3.1.1 Door Frame

The composite door frame overall sized 1653 mm (width) x 2858 mm (height). The sectional dimension of the rectangular door frame was 45 mm (w) x 100 mm (thick).

The sub-frame was made with film plywood sized 87 mm (w) x 18 mm (t). The sub-frame was fixed into the concrete supporting frame by M10 x 135 mm (l) wood screws with plastic sleeves at approximate 620 mm to 670 mm centre to centre. There were 4 numbers of fixing at each jamb and 3 numbers at the head of door frame.

The door frame was made of wooden post that protected by 2 mm (t) intumescent pad and 5 mm (t) fire board, then finished with 3 mm (t) timber facing. The door frame fixed onto the sub-frame by M4 x 40 mm (long) screws at approximate 200 mm to 250 mm centre to centre. There were 14 numbers of fixings on each vertical jamb and 24 numbers on the head of the door frame.

Wooden architraves sized 50 mm (w) x 15 mm (t) were fixed over the door frame on exposed side. The architraves were fixed by screws at approximate of 300 – 400 mm centre to centre.

2 number of 20 mm (w) x 4 mm (t) intumescent seal with plastic fins were fitted into the grooves at the head and each jamb with 5 mm separation between two seals.

The intumescent seals with plastic fins were interrupted at top pivot.

2 mm (t) intumescent pad was fitted underneath the intumescent seals.

The space between door frame and sub-frame was filled with ceramic fibre and lined up with fire sealant.

3.1.2 Door Leaves

The specimen comprised of two unequal width door leaf: an active leaf sized 1050 mm (w) x 2800 mm (h) x 62 mm (t) and an inactive leaf sized 500 mm (w) x 2800 (h) x 62 mm (t). The stiles and rails were made of 3 numbers of 25 mm (w) x 32 mm (t) wooden slabs. The space between stiles and rails were filled with 32 mm (t) perlite core. Both sides of the door core were covered by triple layer of 5 mm + 3 mm + 3 mm (t) fire board and finished by a layer of 4 mm (t) medium density fibre (MDF) board facing on fire exposed side and a layer of 4 mm (t) plywood facing on the non-fire exposed side. The fire board was fixed onto the door core by glue and screws and the facing was fixed onto the sub-facing by glue.

The specimen was an non-rebated round meeting edge.

2 number of 20 mm (w) x 4 mm (t) intumescent seal with plastic fins was fitted into the groove along the meeting edge on the active door leaf with 5 mm separation between two seals.

1 number of 38 mm (w) x 4 mm (t) intumescent seal was fitted into the groove along the meeting edge on the inactive door leaf.

1 number of 38 mm (w) x 4 mm (t) intumescent seal was fitted into the groove along the top edges and pivoted edge on each door leaf.

1 number of 20 mm (w) x 4 mm (t) intumescent seal with plastic fins and 2 numbers of 10 mm (w) x 4 mm (t) intumescent seal with plastic fins was fitted together into the groove along the bottom edge of each door leaf.

2 mm (t) intumescent pad was fitted underneath the intumescent seals.

The width of intumescent seal was partially reduced at flush bolt positions.

The door sub-lipping was made of 3 mm (t) fire board and the door liping was made of wooden strip.

3.1.3 Glazed Elements

The specimen comprised of two glazed elements on the active door leaf.

The upper glazed element was visually sized of 210 mm (w) x 1560 mm (h). The upper glazed element was installed 350 mm away from the top edge and 300 mm away from the meeting edge of the door leaf. The lower glazed element was visually sized of 260 mm (w) x 260 mm (h). The lower glazed element was installed 194 mm below the top edge and 200 mm away from the meeting edge.

Each glazed element consisted of a piece of 42 mm (t) glass pane. The glass panes were set and lined with ceramic fibre then clamped with 1.5 mm (t) metal plate & angle and timber glazing beads. The glazing beads on both side was chamfered with size 45 mm (width, parallel to the glass) x 12 mm (thick, perpendicular to the glass). The glazing beads were fixed onto the door leaf by screws at approximate 150 mm - 300 mm centre to centre.

The gaps between glazing beads and glass pane were caulked with fire sealant.

3.1.4 Ironmongery

Each door leaf was supported into the door frame by top pivot and floor hinge.

A rim lock with cylinder was installed 1000 mm above the bottom edge of the active leaf.

A lever handle was installed 1100 mm above the bottom edge of the active leaf on the non-fire exposed side.

A flush bolt was installed at the top and another at the bottom of the meeting edge on the inactive leaf.

Intumescent materials and fire sealant were applied to mortised area for ironmongeries.



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

Door Frame

Manufacturer:	Shun Hing Wood Working Company Limited
Material:	Hardwood
Density:	550 - 700 kg/m ³ *
Moisture Content:	12 - 17 % *
Sizes:	50 mm x 15 mm
Fixing Method:	By Screws at Approximate of 300 - 400 mm Centre to Centre.



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Door Leaves

Manufacturer: Shun Hing Wood Working Company Limited
Overall Sizes: (1050+500) mm x 2800 mm x 62 mm

Skeleton	Material:	Softwood *
	Width:	Main Stiles and Rails - 3 x 25 mm Mid Rails and Aparture of Glazed Element - 25 mm
	Thickness:	32 mm
	Density:	350 - 450 kg/m ³ *
Core	Moisture Content:	12 - 17 % *
	Material:	Perlite
	Thickness:	32 mm
	Density:	380 kg/m ³ *

Fire Board

Supplier: Shun Hing Wood Working Company Limited
Brand: Gemtree *
Material: Magnesium Oxide *
Density: 950 kg/m³ *
Thickness: 3 mm - Sub-facing of the Door Leaf and Sub-lipping of the Door Leaf
5 mm - Door Frame and Sub-facing of the Door Leaf

Door Leaves Facing

Supplier: Shun Hing Wood Working Company Limited
Material: Fire Exposed Side - Medium Density Fibre Board
Non-fire Exposed Side - Plywood
Thickness: 4 mm

Lipping

Manufacturer: Shun Hing Wood Working Company Limited
Material: Hardwood
Density: 550 - 700 kg/m³ *
Moisture Content: 12 - 17 % *
Thickness: 10 mm

Glass Pane - Upper

Supplier: Shenzhen Zhong Xin Chang Technology Company Limited
Brand: Ying Mu *
Thickness: 42 mm
Overall Sizes: 260 mm x 1610 mm
Visual Sizes: 210 mm x 1560 mm
Depth of Cover of Glass Edge: 25 mm
Fixing Method: Set and Lined with Ceramic Fibre then Clamped with 1.5 mm Metal Plate & Angle and Timber Glazing Beads

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Glass Pane - Lower

Supplier:	Shenzhen Longdian Sci-tech Industrila Company Limited
Brand:	Ying Mu *
Thickness:	42 mm
Overall Sizes:	310 mm x 310 mm
Visual Sizes:	260 mm x 260 mm
Depth of Cover of Glass Edge:	25 mm
Fixing Method:	Set and Lined with Ceramic Fibre then Clamped with 15 mm Metal Plate and Timber Glazing Beads

Glazed Aperture Lining

Supplier:	Garish Crown Fire Engineering & Consultancy
Brand:	Ying Mu *
Material:	Ceramic Fibre Tape
Thickness:	5 mm - Clamped between the Glass Pane and the Metal Angle 2 mm - Set below the Glass Pane

Glazing Bead

Manufacturer:	Shun Hing Wood Working Company Limited
Material:	Hardwood
Sizes:	45 mm x 12 mm
Density of Timber Glazing Bead:	550 - 700 kg/m ³ *
Fixing Method:	By Screws at Approximate 150 mm - 300 mm Centre to Centre.

Top Pivot and Floor Spring Hinge

Supplier:	Tung Fat Ho Building Material Limited	Commy Hardware Company Limited
Brand:	Exidor *	Commy
Model:	2950-EN1-4-NHO-SPO-DA-SS *	NH-2000-450 *
Material:	Stainless Steel *	Stainless Steel *

Rim Lock and Cylinder

Supplier:	Commy Hardware Company Limited
Brand:	Commy
Model:	LK 558S *
Material:	Stainless Steel *

Lever Handle

Supplier:	Garish Crown Fire Engineering & Consultancy
Material:	Stainless Steel *
Location Applied:	At 1100 mm above the Bottom Edge of the Active Leaf on the Non-fire Exposed Side

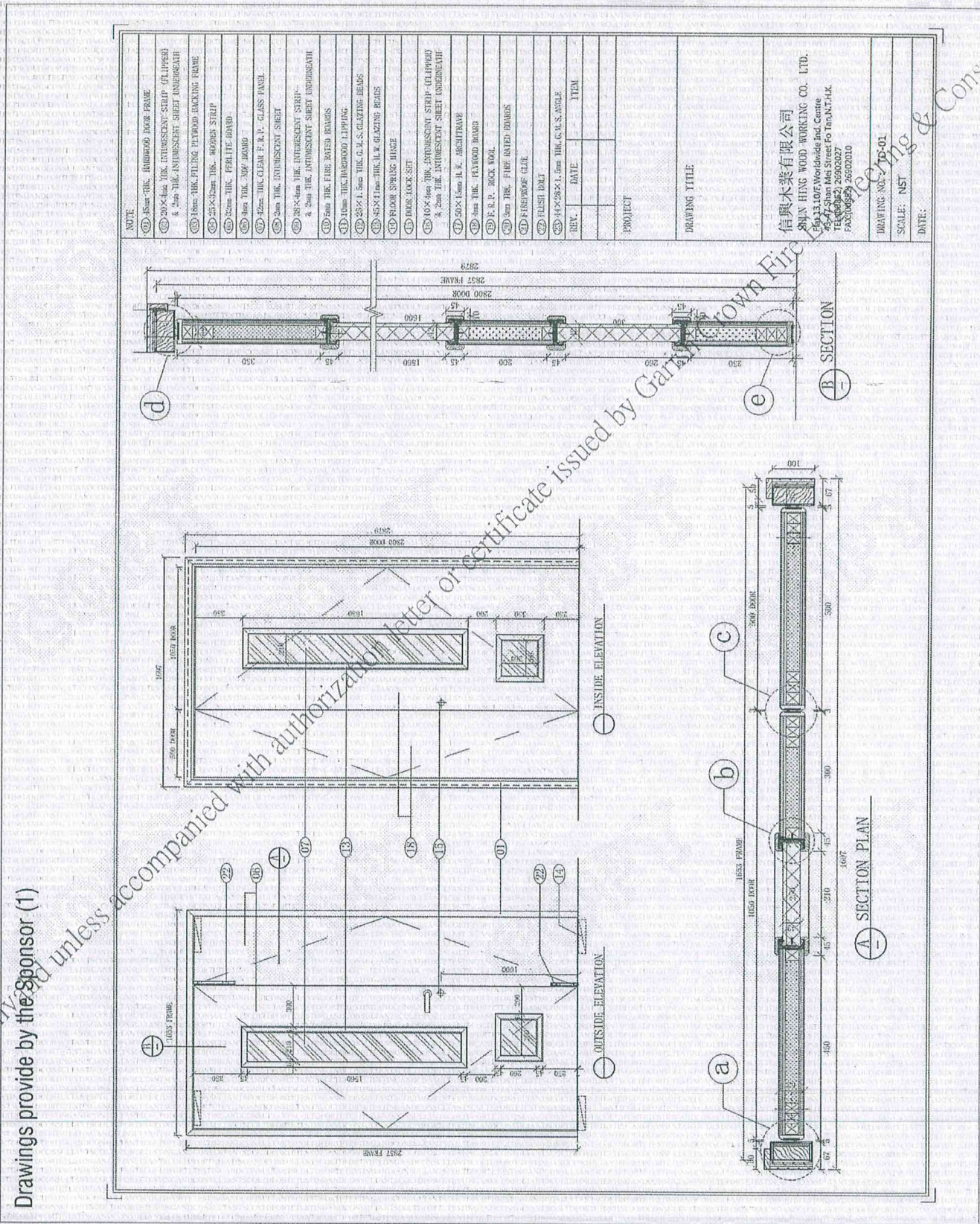


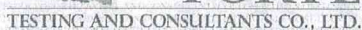
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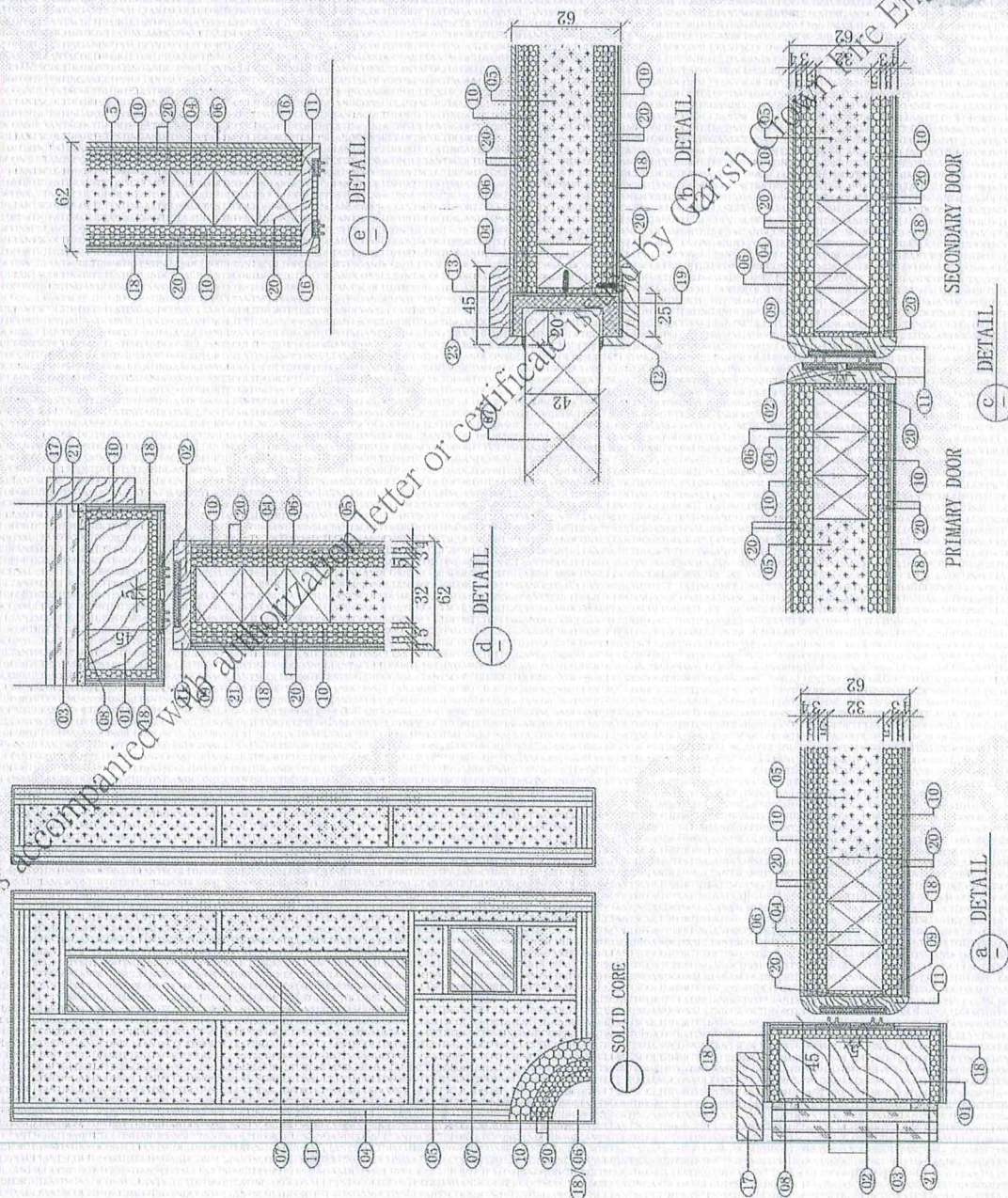
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3.2 Drawings on the Specimen provided by the Sponsor (Total 2 pages)





Drawings provide by the Sponsor (2)



信興木業有限公司
SHUN HING WOOD WORKING CO. LTD.
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43-47 Shan Mei Street Fo Tan, N.T.H.K.
TEL: (00852) 26902027
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DRAWING NO.: TD-02
SCALE: N57
DATE: 2

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 selection of the specimen.

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

4.2 Verification of the Specimen

One specimen was transferred to the Test Location on 2015-01-09 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 cured reinforced normal density concrete slabs provided by FORTE. Door A was installed into one sized 1690 mm (w) x 2875 mm (h).

4.4 Installation of the Specimen

The specimen was assembled and installed by workers delegated by the Sponsor from 2015-01-10 to 2015-01-13.

4.5 Specimen Conditioning

The specimen was stored in the Test Location from 2015-01-09, the date which specimen was received, to 2015-01-16, the date which fire resistance test performed.

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

Ambient Temperature (°C)	Relative Humidity (%)
16 ± 5	66 ± 5

4.6 Direction of Fire Side and Others

The Sponsor designated and installed that door leaves on specimen could be swung inward or outward the furnace.

The door was UNLATCHED and UNLOCKED; the flush bolts were UNBOLTED during the test.

5. Test Method

5.1 Pre-test Conditioning

The pre-test conditioning of the specimen was carried out on 2015-01-15 prior to the fire test with reference to **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 from 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:

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

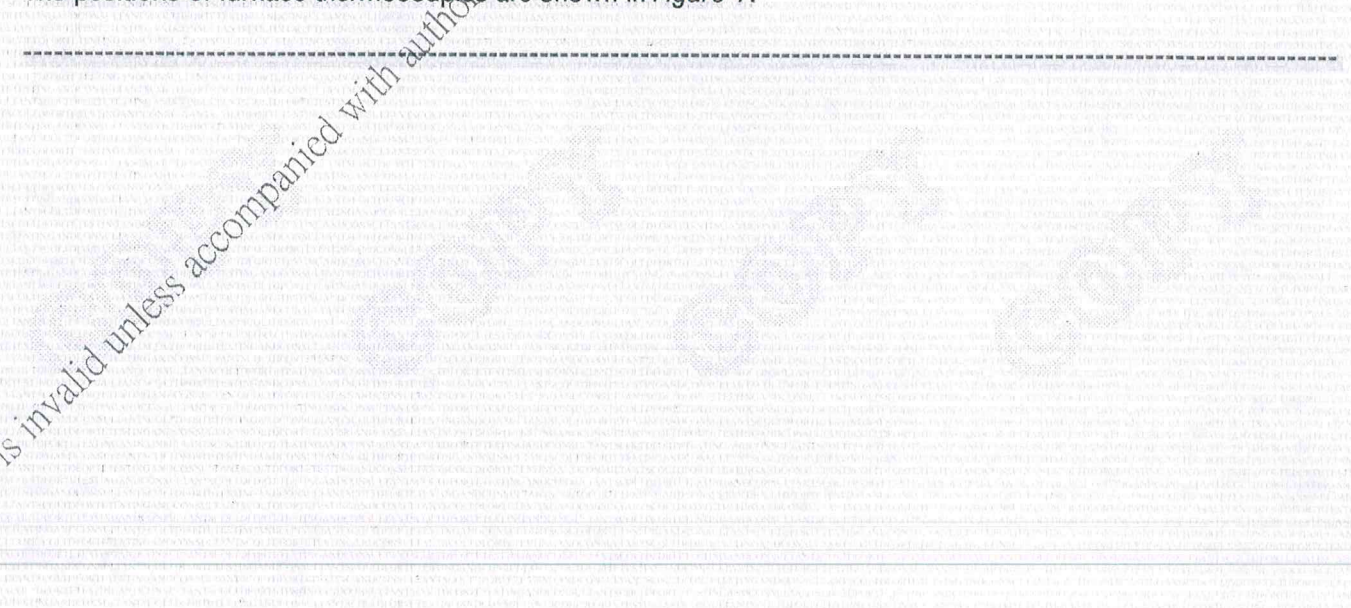
Where,

T is the average furnace temperature, in degree Celsius

t is the time, in minutes

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.

The positions of furnace thermocouples are shown in **Figure 1**.



5.4 Unexposed Surface Temperature

The unexposed surface temperatures of the specimen were measured by 30 numbers of type K thermocouples.

The temperature rise was calculated by subtracting the initial average temperature from the unexposed temperature measured.

The Specimen was evaluated against the maximum temperature rise criterion given by normal procedure – Classification I_2 at the request of the Sponsor.

These thermocouples were positioned and fixed on unexposed surface of the test specimen in conformity with BS EN 1634-1: 2008.

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	Door Leaves	For maximum unexposed surface temperature rise (Normal Procedure, I_2)
U14 – U18	Door Frame	For maximum unexposed surface temperature rise
U19 – U20	Glazed Elements	For average and maximum unexposed surface temperature rise
U21– U22	Glazed Elements	For maximum unexposed surface temperature rise
U23 – U30	Door Leaves	For additional temperature rise information. Data show in Appendix A

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 ± 5 Pa by five minutes from commencement of the test and 0 ± 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.

Figure 3. Positions of fixed surface thermocouples (U) on the Specimen.

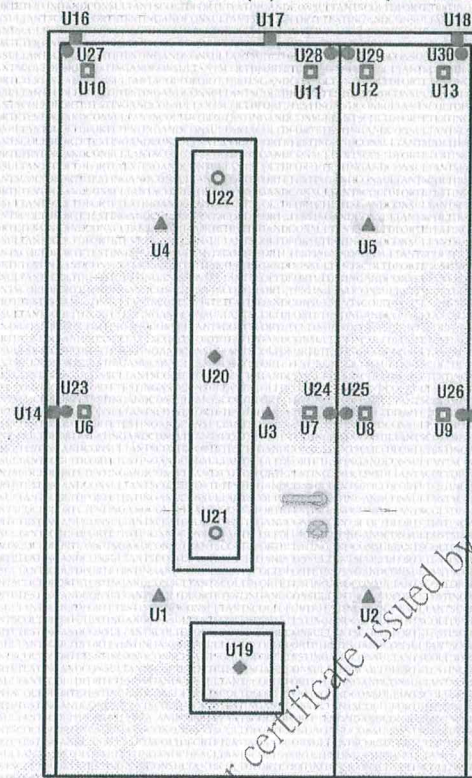
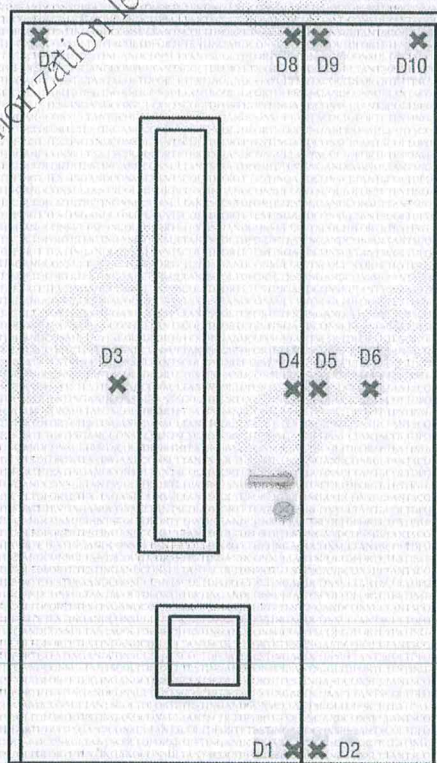


Figure 4. Positions of deflection measurement points (D) on the Specimen.



6. Test Data

6.1 Retention Forces

The retention forces on each door leaf of the specimen for each direction of opening were determined. The respective highest gauge measurements are summarized in the following table.

Leaf	Push	Pull
Active	115.8N	147.6N
Inactive	130.2N	127.7N

6.2 Gaps Measurement

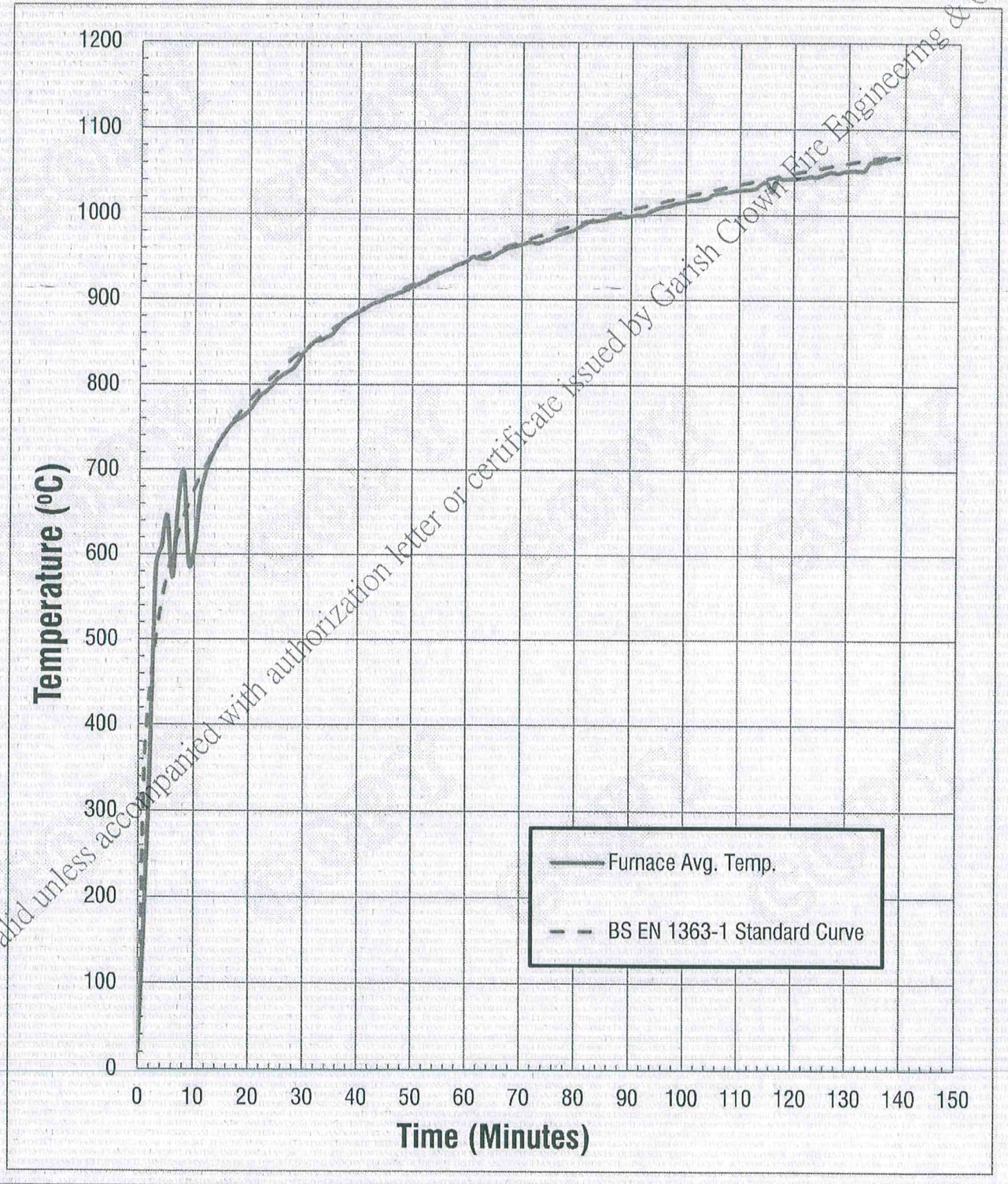
Primary gaps of the specimen were measured and summarized in the following table. Measurements were taken in mm.

Gap	Measured		
	Minimum	Maximum	Average
A	0.5	3.1	1.6
B	5.5	7.3	6.1
P	2.9	4.8	3.8
X	0.5	4.8	2.5

6.3 Furnace Temperature

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

Figure 5. Furnace average temperature over the test period.

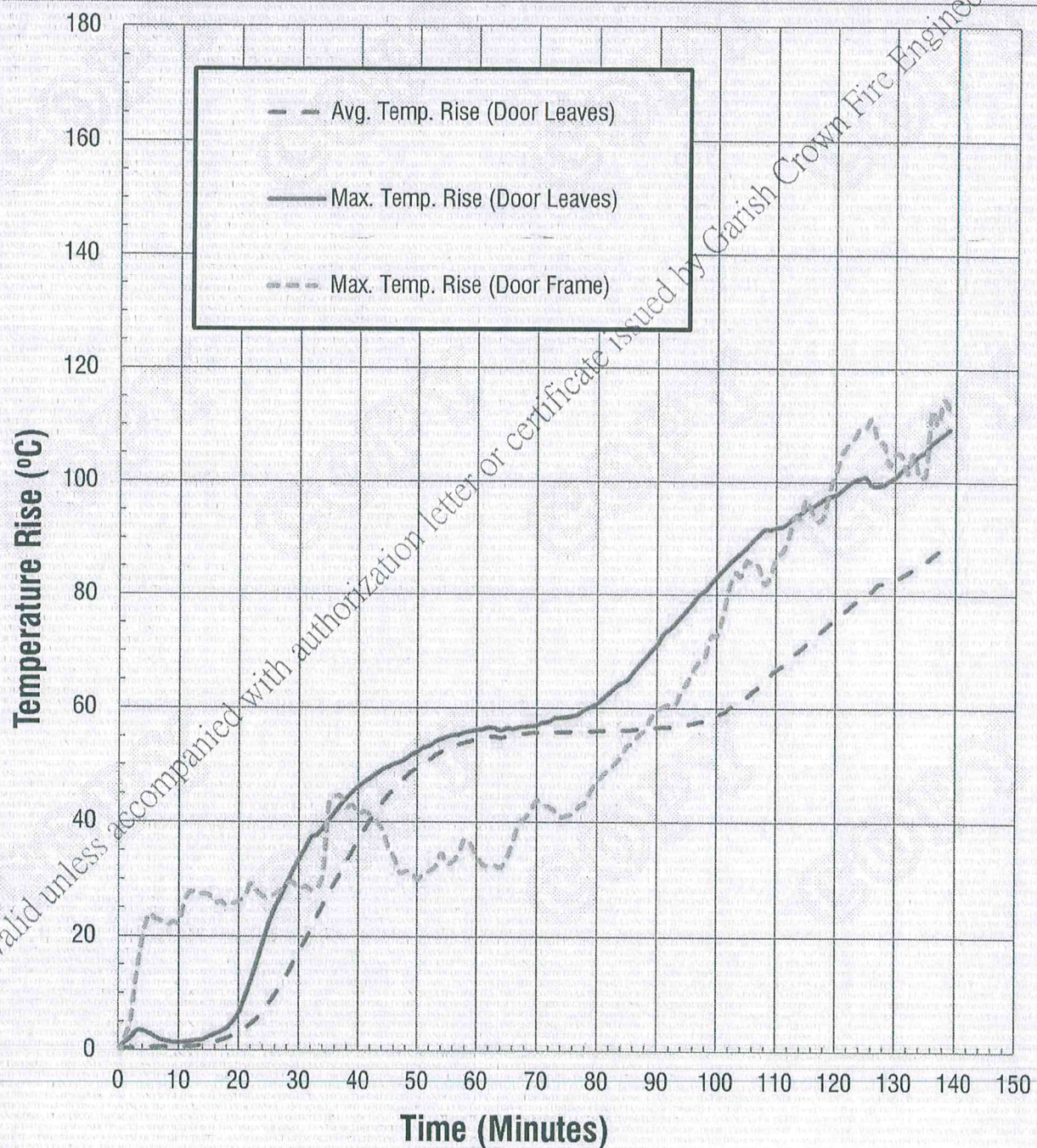


6.4 Unexposed Surface Temperature Rise

6.4.1 Fixed Surface Thermocouples – Door Leaves and Door Frame

The temperature rises of unexposed surface on door leaves and door frame measured by fixed surface thermocouples over the test period are shown in *Figure 6*.

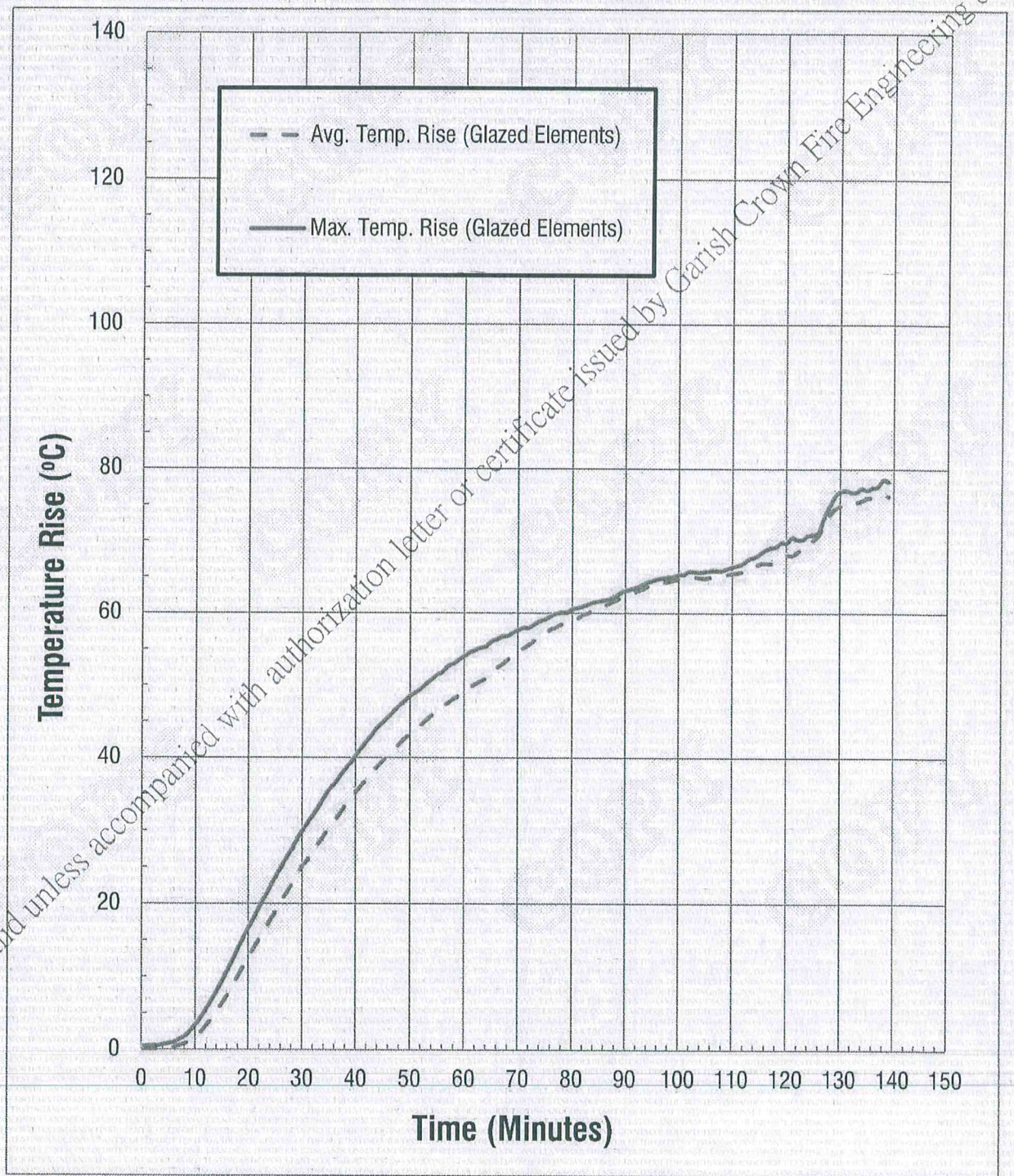
Figure 6. Average and maximum temperature rise on door leaves and door frame over the test period.



6.4.2 Fixed Surface Thermocouples – Glazed Elements

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

Figure 7. Average and maximum temperature rise on the glazed elements over the test period.



6.4.3 Fixed Surface Thermocouples – Detailed Temperature Records

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

Discard - Thermocouple U7 was dysfunction at 16 minute to 31 minute of the test, therefore the data obtained from U7 within this period was discarded.

Temperature outputs from unexposed surface temperature U1 to U11

Time (min)	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10	U11
0	14.3	14.5	14.3	14.3	14.6	13.4	12.8	12.7	13.9	13.3	13.5
10	14.7	15.1	14.8	14.8	15.3	14.5	12.2	13.2	15.1	14.0	14.1
20	17.5	17.4	18.3	18.0	17.5	16.5	Discard	15.8	16.9	17.0	16.7
30	33.3	35.4	30.9	27.5	32.2	27.0	Discard	30.4	31.5	31.0	30.7
40	55.9	52.5	53.5	45.4	49.5	46.8	55.4	48.7	49.9	52.1	49.4
50	66.5	62.7	66.8	62.0	61.8	59.5	63.9	61.7	61.2	64.1	58.7
60	69.7	67.1	70.6	69.6	67.8	64.4	67.4	66.3	65.6	68.6	63.9
70	70.2	68.1	71.1	71.3	69.9	66.6	68.0	67.3	66.3	70.2	66.3
80	69.6	69.2	71.0	71.4	70.9	67.5	67.8	68.1	67.9	70.6	67.8
90	69.7	70.5	71.8	71.4	72.1	68.3	68.8	69.4	69.1	70.9	68.7
91	69.5	70.7	71.3	71.3	72.8	68.1	68.7	70.1	69.7	70.8	68.7
92	69.7	70.9	71.5	71.3	72.6	68.1	68.8	70.2	70.2	70.8	68.8
93	69.8	71.0	71.5	71.3	72.5	68.3	69.0	70.3	70.4	70.9	69.1
94	70.0	71.2	71.5	71.5	72.5	68.5	69.0	70.3	70.6	71.0	69.3
95	70.1	71.5	71.9	71.6	72.8	68.8	69.1	71.2	71.2	71.2	69.5
100	70.4	75.2	72.8	71.9	76.4	68.7	69.9	78.3	78.2	72.3	70.2
110	75.3	88.2	80.3	73.6	89.0	74.4	79.1	91.2	90.2	79.2	75.1
120	84.7	96.1	88.8	81.6	99.9	89.7	89.8	99.2	98.4	90.4	84.9
130	94.0	104.1	95.6	91.9	100.1	93.4	98.0	88.4	105.6	96.5	94.1
135	97.4	108.0	98.8	96.2	101.3	95.9	100.8	87.3	108.4	99.3	98.1
136	98.1	109.1	99.5	96.8	102.5	96.1	101.3	88.1	109.4	100.4	98.8
137	99.0	110.5	100.2	97.8	102.9	97.3	101.9	88.5	110.0	100.8	99.7
138	99.4	111.7	100.8	98.6	103.4	98.0	102.5	88.6	110.1	101.3	100.6
139	99.6	112.9	100.9	98.9	103.9	98.3	102.8	89.5	109.2	101.6	101.1



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Temperature outputs from unexposed surface temperature U12 to U22

Time (min)	U12	U13	U14	U15	U16	U17	U18	U19	U20	U21	U22
0	13.8	14.1	12.8	12.9	11.9	13.4	13.5	12.9	13.1	13.5	12.5
10	14.6	15.8	14.0	18.0	35.8	25.7	36.8	14.4	15.2	16.5	14.5
20	17.3	21.1	13.8	18.5	40.6	25.9	34.6	24.1	27.4	29.8	26.3
30	45.5	48.0	14.8	19.8	42.6	24.9	27.0	36.1	40.2	43.0	38.7
40	58.9	60.6	16.6	21.8	55.8	26.8	34.0	46.2	50.4	53.4	48.8
50	65.2	65.8	19.4	25.3	44.4	30.3	37.3	54.2	58.5	61.6	56.8
60	68.9	67.6	24.1	30.0	48.5	35.0	42.5	59.9	64.5	67.1	62.8
70	71.4	69.0	31.1	34.9	58.1	40.2	47.3	66.7	68.7	70.8	66.8
80	75.3	70.9	38.6	39.9	61.5	46.0	51.7	72.2	72.0	73.7	70.0
90	85.7	75.3	44.0	46.0	74.0	51.5	56.1	76.2	74.9	75.6	72.8
91	87.5	76.6	44.7	46.5	74.7	51.9	55.9	76.4	75.1	75.6	72.8
92	88.4	77.7	45.2	47.0	75.0	52.4	56.7	76.7	75.5	75.6	73.0
93	89.4	79.2	45.8	47.8	75.0	53.1	57.7	77.0	75.7	75.8	73.0
94	90.6	80.4	46.5	48.6	77.4	53.6	58.5	77.3	76.1	76.0	73.4
95	91.8	81.8	47.1	49.5	78.9	54.2	59.0	77.6	76.3	76.3	73.3
100	97.7	89.1	49.5	52.8	87.2	57.2	60.8	78.4	77.2	77.2	74.3
110	106.4	100.4	55.1	60.1	101.0	62.5	68.4	79.0	78.2	79.5	76.0
120	112.3	108.1	60.5	66.7	116.1	67.9	74.9	79.8	82.5	82.9	77.4
130	115.4	108.8	64.0	70.6	119.3	73.0	80.6	90.0	86.0	83.0	79.5
135	119.9	112.1	65.3	72.8	115.8	75.8	83.6	90.2	88.0	84.8	80.6
136	121.3	113.2	65.4	73.3	127.0	76.0	83.7	90.5	87.8	85.9	80.2
137	122.1	114.0	65.7	73.3	124.6	76.9	84.7	90.7	88.0	86.8	80.9
138	122.9	114.5	66.1	74.6	128.9	77.2	85.3	91.6	87.5	87.4	82.2
139	123.8	115.0	66.5	74.5	127.2	77.0	86.0	91.4	87.3	87.9	81.2

6.5 Pressure

The furnace pressure differential with respect to the atmosphere at 500 mm above notional floor level over the test period is summarized in the following table.

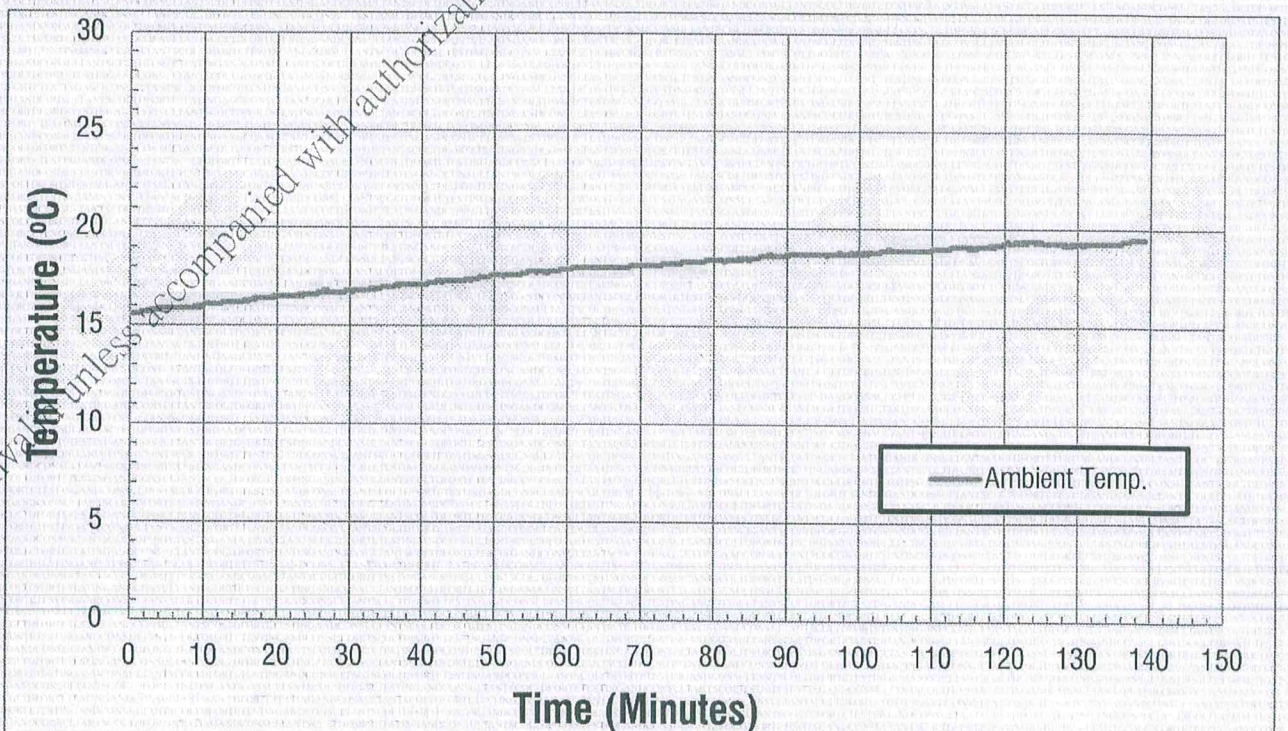
Time (min)	Pressure	Time (min)	Pressure	Time (min)	Pressure
6	0.7	55	2.0	105	-1.0
10	-0.2	60	-0.4	110	0.6
15	0.5	65	-1.4	115	-0.9
20	0.2	70	-0.9	120	-0.2
25	0.3	75	-1.3	125	-0.5
30	-1.0	80	1.0	130	-0.3
35	-0.7	85	0.2	135	1.7
40	1.2	90	0.3	139	-0.7
45	0.5	95	-0.1		
50	0.8	100	-0.9		

6.6 Ambient Temperature

The ambient temperature over the test period was recorded and shown in Figure 8.

The ambient temperature at the commencement of test was 15.6°C.

Figure 8. 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 towards into the furnace and vice versa.

Measurements were taken in mm.

Maximum deflection value of the specimen was bolded at the following table.

Position \ Time (min)	0	20	40	60	80	100	110	120
D1	+0	+0	+5	+7	+7	+10	+10	+11
D2	+0	+7	+14	+15	+12	+15	+15	+15
D3	+0	+15	+26	+38	+44	+48	+53	+56
D4	+0	+13	+27	+37	+47	+52	+72	+82
D5	+0	+19	+31	+40	+47	+63	+70	+77
D6	+0	+13	+24	+33	+39	+50	+55	+57
D7	+0	+4	+1	+0	-1	-5	-6	-1
D8	+0	+3	+5	+7	+8	+10	+13	+11
D9	+0	+9	+10	+15	+16	+16	+23	+25
D10	+0	+2	+2	+4	+2	+2	+4	+0

6.8 Observations

Significant behaviours of the specimen during the test period are summarized in the following table.

Photos taken during the test period are also attached.

Time (min.sec)	Observation (from unexposed side)
00.00	Test Started.
00.45	Smoke released from the right hinged edge and the head of door leaf.
02.36	Large amount of the smoke released from the door gaps.
04.12	Interlayer of the upper glass pane reacted. "Pop" sound was heard from the specimen.
05.56	Staining mark appeared around the door frame.
13.54	Interlayer of the glass panes reacted.
20.17	The interlayer of upper glass pane turned yellowish brown. The interlayer of lower glass pane turned milky.
30.00	No integrity failure had occurred.
31.26	The smoke released from the head of door frame. Smoke release reduced.
33.29	The middle of door leaves bended towards into the furnace.

Time (min.sec)	Observation Cont'd (from unexposed side)
42.49	The smoke released from the left corner of active door leaf and the top of meeting edge.
45.13	The smoke released from the bottom of the right jamb.
54.13	The smoke released from top left corner increased.
60.00	No integrity failure had occurred.
60.25	Cotton fibre pad test was carried out at top left corner of the active door leaf. No flaming or glowing was observed on the cotton pad.
61.30	Cotton fibre pad test was carried out at bottom of the right jamb. No flaming or glowing was observed on the cotton pad.
68.43	Smoke started to release from the left bottom of left jamb.
72.16	Smoke started released from the top right corner of specimen.
78.47	Smoke started to release from the door lock. Staining mark appeared around the door lock.
88.02	Reacted intumescent seal was observed at the upper part of the meeting edge.
90.00	No integrity failure had occurred.
98.32	A red spot was observed at lower portion of upper glass pane.
100.18	The red spot turned to solid white color again.
100.50	Red spots appeared at the upper glass pane and turned into yellowish brown color again. The glass pane turned dark and red in the middle portion.
102.54	The smoke release from lockset reduced. No crack on the glass pane.
113.54	Cotton fibre pad test was carried out at top meeting edge. No flaming or glowing was observed on the cotton pad. The middle of door leaves bended further towards into the furnace.
120.00	No integrity failure had occurred.
126.19	Cotton fibre pad test was carried out at top meeting edge. No flaming or glowing was observed on the cotton pad. White reacted intumescent material was observed along the upper portion of the meeting edge.
135.27	Cotton fibre pad test was carried out at top left corner of the active door leaf. No flaming or glowing was observed on the cotton pad.
136.23	Cotton fibre pad test was carried out at top meeting edge. No flaming or glowing was observed on the cotton pad.
139.13	Test was terminated at request of the Sponsor.

6.9 Photos

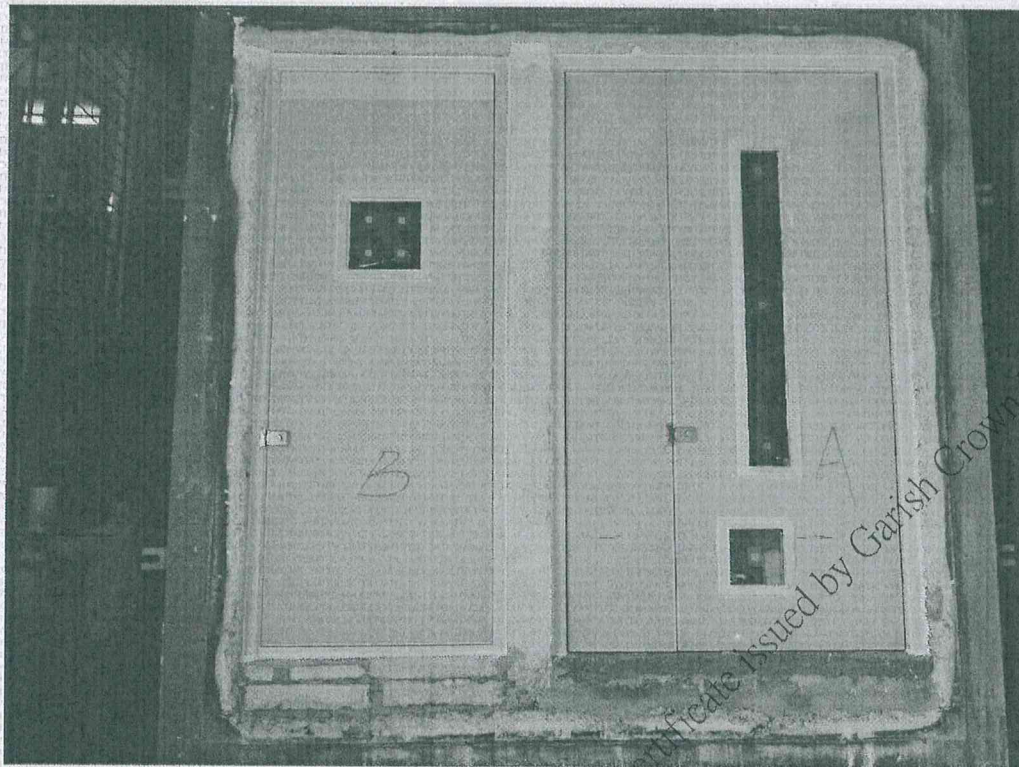


Photo 1. Exposed surface of the specimen before test. (Left: Door B; Right: Door A)

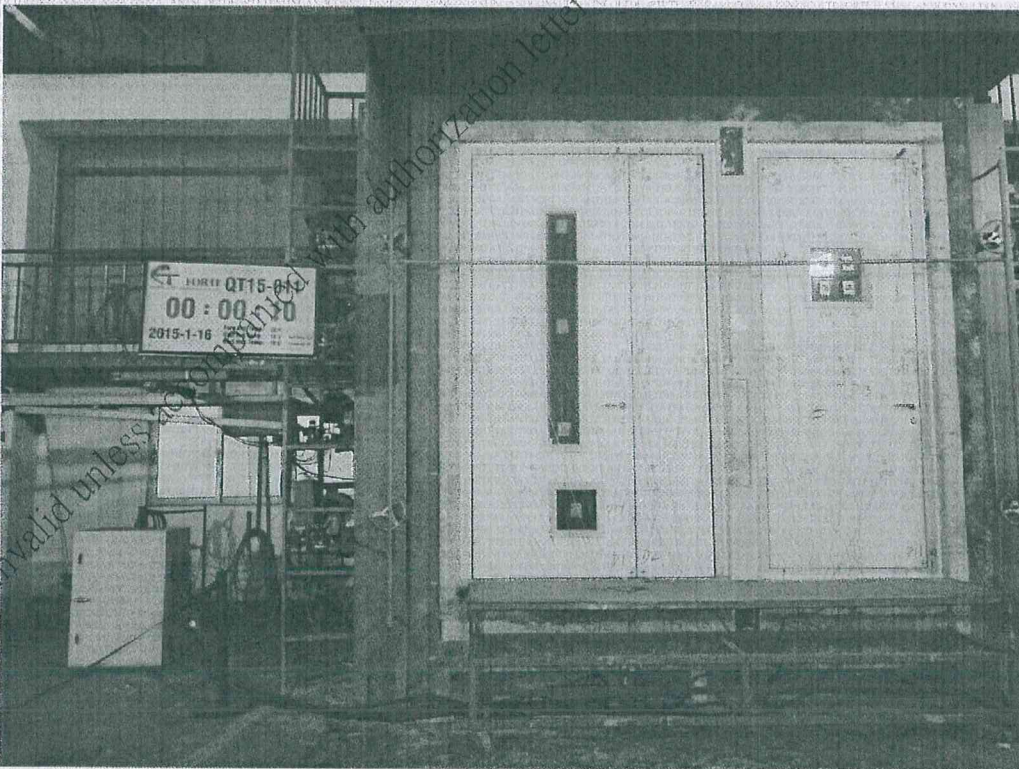


Photo 2. Unexposed surface of the specimen just after the commencement of test. (Left: Door A; Right: Door B)

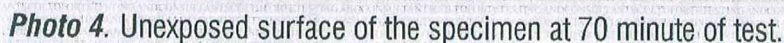
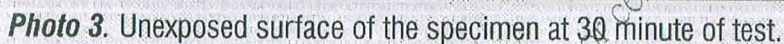




Photo 5. Unexposed surface of the specimen at 90 minute of test.



Photo 6. Unexposed surface of the specimen at 120 minute of test.



Photo 7. Unexposed surface of the specimen at the end of test.

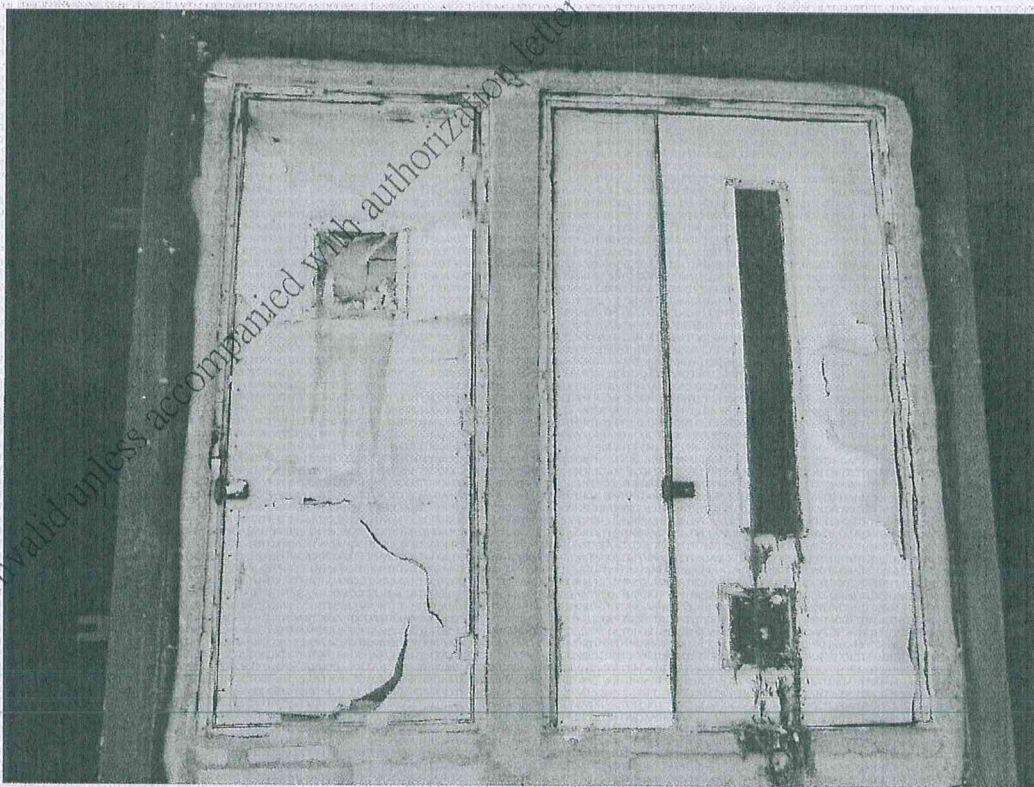


Photo 8. Exposed surface of the specimen after the test. (Left: Door B; Right: Door A)

7. Test Results

The test on Specimen, Door A was terminated after a test period of 139 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.

Performance Criteria			
Integrity (E)			
Criteria of Failure		Description	Elapsed Time before Failure Occurrence
Sustained Flaming		Continuous flaming for a period of time greater than 10 seconds on unexposed surface	139 minutes (No Failure)
Gap Gauge	Ø6 mm	Penetration of the gauge into the furnace through the specimen and movable along a 150 mm gap	139 minutes (No Failure)
	Ø25 mm	Penetration of the gauge into the furnace through the specimen	
Cotton Pad		Ignition of the cotton pad	139 minutes (No Failure)
Performance Criteria			
Insulation (I)			
Criteria of Failure		Description	Elapsed Time before Failure Occurrence
Integrity Failure		The performance criterion "insulation" shall automatically be assumed not to be satisfied when the "integrity" criterion ceases to be satisfied	139 minutes (No Failure)
Average Temperature Rise	An increase of the average temperature of unexposed surface of the specimen above the initial average temperature by more than 140 °C		[Door Leaves] 139 minutes (No Failure)
			[Glazed Elements] 139 minutes (No Failure)
Maximum Temperature Rise [Normal Procedure, I ₂]	An increase of temperature at perimeter frame of the doorset or openable window above the initial average temperature by more than 360 °C; and any other point of the specimen above the initial average temperature by more than 180 °C		[Door Leaves] 139 minutes (No Failure)
			[Door Frame] 139 minutes (No Failure)
			[Glazed Elements] 139 minutes (No Failure)

8. 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 uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

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9. 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 13 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.

Appendix A

Fixed Additional Surface Thermocouples – Detailed Temperature Records

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

Temperature outputs from unexposed surface temperature U23 to U30

Time (min)	U23	U24	U25	U26	U27	U28	U29	U30
0	12.7	12.4	14.3	14.6	14.4	14.5	14.9	14.2
10	14.9	13.0	15.0	25.0	26.7	21.7	30.6	38.6
20	18.4	15.1	17.9	28.2	37.1	32.6	42.7	48.2
30	24.4	23.0	27.0	33.8	49.8	44.6	57.7	54.5
40	33.0	34.0	42.4	43.1	61.9	57.4	69.4	33.3
50	42.1	47.6	54.8	52.8	71.0	65.5	79.0	34.7
60	50.7	63.3	63.2	60.4	79.9	71.5	91.2	71.8
70	58.6	68.7	71.4	66.4	85.9	77.0	105.0	76.3
80	64.4	73.2	82.6	72.3	91.8	83.2	122.3	81.9
90	70.1	80.0	96.5	81.5	100.5	91.4	143.9	91.5
91	70.6	80.1	97.9	83.2	101.5	92.8	146.1	93.0
92	71.3	81.3	98.8	85.0	102.5	93.8	148.7	93.6
93	72.2	82.5	100.2	86.4	104.0	95.0	151.4	95.1
94	73.2	83.4	101.8	87.7	105.1	96.2	154.6	96.5
95	74.3	84.2	103.3	89.2	106.4	97.2	156.9	97.4
100	78.8	87.8	110.3	94.6	113.4	103.0	169.6	103.0
110	91.5	102.7	124.6	103.1	130.5	116.7	202.1	114.0
120	100.7	120.1	142.7	113.7	155.4	131.6	245.5	123.1
130	111.2	142.0	144.4	126.5	178.2	151.2	269.7	141.4
135	117.5	153.2	152.1	133.4	189.7	162.8	279.6	152.1
136	119.0	155.3	154.8	135.9	194.6	166.6	280.6	154.8
137	120.6	157.9	156.9	137.0	196.8	170.6	282.4	156.9
138	121.6	161.2	159.2	137.7	199.2	172.2	285.0	159.1
139	124.1	163.5	161.3	139.1	201.4	174.7	286.8	161.5

END OF REPORT

