

FIRE RESISTANCE TEST REPORT

**SINGLE-LEAF COMPOSITE TIMBER DOOR with an OVERHEAD PANEL; and
SINGLE-LEAF COMPOSITE TIMBER DOOR with SINGLE GLAZED ELEMENT**

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

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Report Number: **IT14-047**

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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 Company Limited, in conformity with requirements in BS EN1634-1: 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 two sets of composite timber doors: a single-leaf door with an overhead panel, namely Door A; and a single-leaf door with single glazed element, namely Door B.

The specimens were manufactured and supplied for test by Leung's Wooden Company Limited.

The specimens achieved the following fire resistance:

<u>DOOR A</u>				<u>DOOR B</u>			
INTEGRITY (E)				INTEGRITY (E)			
	Sustained Flaming	66	Minutes		Sustained Flaming	71	Minutes
	Gap Gauge	71	Minutes		Gap Gauge	71	Minutes
	Cotton Pad	66	Minutes		Cotton Pad	71	Minutes
INSULATION (I)				INSULATION (I)			
Door Frame	Max. Temp. Rise(I ₂)	71	Minutes	Door Frame	Max. Temp. Rise(I ₁)	71	Minutes
Door Leaf	Average Temp. Rise	71	Minutes	Door Leaf	Average Temp. Rise	71	Minutes
	Max. Temp. Rise(I ₂)	71	Minutes			Max. Temp. Rise(I ₁)	71
Overhead Panel	Average Temp. Rise	71	Minutes	Glazed Element	Average Temp. Rise	71	Minutes
	Max. Temp. Rise(I ₂)	71	Minutes			Max. Temp. Rise	71

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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 Sponsors:	Leung's Wooden Company Limited Garish Crown Fire Engineering & Consultancy Shun Hing Fire Rated Building Materials Limited	
Specimens Manufacturer:	Leung's Wooden Company Limited	
ID no. of the Specimens:	Door A: QT 14-015A; Door B: QT 14-015B	
Date Received:	2014-01-16	
Test Number:	QT14-015A	*A Total of three sets of report (Report no. IT14-006, IT14-008 and IT14-047) are issued on this test
Date Tested:	2014-01-20	Start Time: 10:50
Approved Test Operator from FORTE:	Ms. Cheng San Mei, Sammi	
Witness of the Test:	Mr. C.K. Leung – Official Delegate of the Sponsor	

3. Construction Details of Specimens

3.1 Specimens Description

3.1.1 Door A

3.1.1.1 Door Frame

The four sided timber door frame was overall sized 1276 (width) x 2950 mm (height) with a sectional dimension 50 mm (w) x 60 mm (thick). The door frame was with a 15 mm single door stop rebate.

The framework was made of a timber block sized 50 mm (w) x 54 mm (t) with 15 mm single door stop rebate. A layer of nominal 3 mm ceramic fibre and 5 mm (t) fire rated board was fixed onto the exposed surface 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 (l) anchor bolts. There were 4 numbers of fixings on each jamb and 2 numbers of fixings on head.

Wooden architraves sized 70 mm (w) x 25 mm (t) were fixed over the door frame on unexposed side, while architraves sized 45 mm (w) x 25 mm (t) were over the door frame on the exposed side. The architraves were fixed by pressure nails at 200 mm - 250 mm centre to centre.

1 number of 30 mm (w) x 4 mm (t) intumescent seal and 1 number of rebate corner smoke seal were fitted into the groove along the door stop at the head, the jambs and the bottom of the door frame. The rebate corner smoke seal was overlapped the intumescent seal at the door corner without interrupted. The intumescent seal was interrupted at hinge, strike plate and concealed door closer positions.

The space between the framework, sub-frame and concrete support frame filled with backer rod and fire sealant.

3.1.1.2 Door Leaf

The specimen comprised of a composite timber door leaf sized 1200 mm (w) x 2440 mm (h) x 54 mm (t). 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 slabs. The space between stiles and rails were filled with 38 mm (t) perlite boards. The exposed side of the core were covered by 2 layers of 2.5 mm (t) fire rated boards sub-facing and the unexposed side of the core were covered by 1 layer of 5 mm (t) fire rated board sub-facing. Both sides finished by a layer of 3 mm medium density fibreboard (MDF) 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 door lipping was made of 8 mm wooden strips. The door leaf was with 15 mm single rebate so that the unexposed side was flush with the door frame.

1 number of 10 mm (w) x 4 mm (t) intumescent seal was fitted into the groove along the perimeter of the door leaf.

3.1.1.3 Overhead Panel

The specimen comprised of an overhead panel sized 1200 mm (w) x 431 mm (h) x 54 mm (t). The core construction of the overhead panel was same to door leaf. The overhead panel was flush with the door leaf with 15 mm rebate and fixed onto the framework by M5 x 75 mm wood screws. There were 2 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 smoke corner seal was fitted into the groove on the bottom edge of the overhead panel opposite to the head of the door leaf.

3.1.1.4 Ironmongery

The door leaf was supported onto the door frame by 3 numbers of concealed hinges.

1 number of mortised door lock with lever handle was installed 1000 mm above the bottom edge of the door leaf.

1 number of door closer was regular arm surface mounted at the top rim of the door leaf on the exposed side.

1 number of door viewer was installed 1460 mm above the bottom edge of the door leaf.

1 number of push plate was fixed onto the door leaf below the door lock on both sides. The push plates were fixed by screws.

1 number of conceal bottom smoke seal was installed at the bottom edge of the door leaf.

Intumescent material was applied to mortised area for ironmongeries.

3.1.2 Door B

3.1.2.1 Door Frame

The timber door frame was overall sized 1266 (w) x 2720 mm (h). The overall sectional dimension of the perimeter door frame was 50 mm (w) x 100 mm (t).

The framework was made of a timber block sized 50 mm (w) x 94 mm (t) with 15 mm single door stop rebate. A layer of nominal 3 mm ceramic fibre and 5 mm thick fire rated board was fixed onto the exposed surface of the timber block and finished with 0.6 mm wood veneer.

The sub-frame sized 18 mm x 100 mm was fixed onto the door frame by M5 x 72 mm (l) wood screws. The door frame together with sub-frame was fixed into the concrete supporting frame by M10 x 112 mm (l) 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 15 mm (t) was fixed over the door frame and supporting frame on both sides. The architraves were fixed by pressure nails at 200 mm - 250 mm centre to centre.

1 number of 30 mm (w) x 4 mm (t) intumescent seal and 1 number of smoke corner seal were fitted into the groove along the door stop at the head and the jambs of the door frame.

The space between the framework, sub-frame and concrete support frame filled with backer rod and fire sealant.

3.1.2.2 Door Leaf

The specimen comprised of a composite timber door leaf sized 1200 mm (w) x 2658 mm (h) x 54 mm (t).

The main stiles and rails of the door leaves were made of 2 numbers of 45 mm (w) x 38 mm (t) wooden slabs. The intermediate rails were made of single 45 mm (t) x 38 mm (t) wooden slab. The stiles and rails were fixed together by screws and glue. The space between stiles and rails were filled with 38 mm (t) perlite boards.

The exposed side of the core were covered by 2 layers of 2.5 mm (t) fire rated boards sub-facing and the unexposed side of the core were covered by 1 layer of 5 mm (t) fire rated board sub-facing. Both sides finished by a layer of 3 mm medium density fibreboard (MDF) 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 door lipping was made of 8 mm wooden strips.

3.1.2.3 Glazed Element

The specimen comprised of a glazed element visually sized 505 mm (w) x 1775 mm (h) installed 135 mm away the meeting edge and 200 mm below the top edge of the active leaf.

The glazed element comprised of a piece of nominal 25 mm (t) interlayered glass pane. It was set and lined with ceramic fibre tape and fire sealant on both sides. The glass pane was then fixed by a pair of 1.0 mm (t) steel angle sections. The steel angle sections were fixed onto the door core by screws. Chamfered wooden glazing beads sized 25 mm (width, parallel to the glass) x 8 mm (thick, perpendicular to the glass). The glazing beads were fixed onto the door leaf by wood nails at approximate 200 mm centre to centre.

The edges of the glass pane and the glazing beads were caulked by fire sealant.

3.1.2.4 Ironmongery

The door leaf was supported onto the door frame by 4 numbers of butt hinges.

1 number of knob lock was installed 1000 mm above the bottom edge of the door leaf.

1 number of concealed door closer was installed at the top edge of the door leaf.

1 number of concealed bottom smoke seal was fixed in the bottom edge of the door leaf.

1 number of push plate was fixed onto the door leaf below the door lock on both sides. The push plate was fixed by screws.

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 verified by FORTE.

Door A

Door Frame

Manufacturer:	Leung’s Wooden Company Limited
Material:	Hardwood and Fire Rated Board *
Overall Sizes:	1276 mm (w) by 2950 mm (h)
Density:	Hardwood - 550 kg/m ³ - 700 kg/m ³ * Fire Rated Board - 950 kg/m ³ ± 1000 kg/m ³ *
Dimensions:	50 mm by 60 mm
Door Stop 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

Door Sub-frame

Manufacturer:	Leung’s Wooden Company Limited
Material:	Film Plywood *
Density:	350 kg/m ³ *
Sizes:	18 mm by 54 mm
Fixing Method to Concrete Support Frame:	M10 x 112 mm Anchor Bolts, 4 Numbers of Fixings on Each Jamb and 2 Numbers of Fixings on Head

Architraves

Manufacturer:	Leung’s Wooden Company Limited	
Material:	Hardwood *	
Density:	550 kg/m ³ - 700 kg/m ³ *	
Size:	Unexposed Side	70 mm by 25 mm
	Exposed Side	45 mm by 25 mm
Fixing method:	Fixed by Wood Nails	

Door Leaf and Overhead Panel Lippings

Manufacturer:	Leung’s Wooden Company Limited
Material:	Hardwood *
Thickness:	8 mm
Density:	550 kg/m ³ - 700 kg/m ³ *

Door Leaf and Overhead Panel

Manufacturer:		Leung's Wooden Company Limited
Overall Sizes:	Door Leaf	1200 mm (w) by 2440 mm (h)
	Overhead Panel	1200 mm (w) by 431 mm (h)
Stiles and Rails	Material:	Softwood *
	Width:	45 mm
	Thickness:	38 mm
	Density:	350 kg/m ³ - 450 kg/m ³ *
	Moisture Content:	12 - 17% *
Core	Supplier:	Leung's Wooden Company Limited
	Material:	Perlite *
	Thickness:	38 mm
	Density:	380 kg/m ³ *

Door Leaf and Overhead Panel Facing

Manufacturer:	Leung's Wooden Company Limited
Material:	Medium Density Fibreboard (MDF) *
Thickness:	3 mm ± 0.5 mm
Density:	350 kg/m ³ - 450 kg/m ³ *

Door Leaf and Overhead Panel Sub-facing

Supplier:	Leung's Wooden Company Limited
Brand:	Gemtree *
Material:	Fire Rated Board (Magnesium Oxide) *
Thickness:	5 mm
Density:	950 kg/m ³ ± 1000 kg/m ³ *

Butt Hinge

Supplier:	Leung's Wooden Company Limited
Brand:	SDH
Model:	CH140-97-ST-Anls *
Material:	Stainless Steel *
Sizes:	140 mm by 35 mm by 49 mm

Door Closer

Supplier:	Leung's Wooden Company Limited
Brand:	ECO
Model:	7S-50-EN *

Door Lock

Supplier:	Tung Fat Ho Building Material Limited
Lock Case	Brand: MIWA
	Model: LA *
	Material: Stainless Steel *
Lever Handle	Brand: MIWA
	Model: 6401 *
	Material: Stainless Steel *

Door Viewer

Supplier:	Shanghai Gallford Fire Sealing Company Limited
Brand:	Gallford *
Model:	FDV9025 *
Body Material:	Steel *
Body Diameter:	25 mm

Push Plate

Supplier:	Leung's Wooden Company Limited
Material:	Stainless Steel *
Thickness:	1 mm
Height:	220 mm

Concealed Bottom Smoke Seal

Supplier:	Shanghai Gallford Fire Sealing Company Limited
Brand:	Gallford *
Model:	GF-B09 *

Intumescent Material - Door Frame and Door Leaf

Supplier:	Leung's Wooden Company Limited	
Brand:	Lorient	
Door Frame	Model:	LP3004
	Size:	30 mm by 4 mm
Door Leaf	Model:	LP1004
	Size:	10 mm by 4 mm

Rebate Corner Smoke Seal

Supplier:	Shanghai Gallford Fire Sealing Company Limited
Brand:	Gallford *
Model:	AD003T
Material	PVC *

Fixing – Anchor Bolts

Supplier:	Leung's Wooden Company Limited
Brand:	Hilti
Model:	HT *
Sizes:	M10 by 112 mm

Fire Sealant

Supplier:	Hilti (Hong Kong) Limited
Brand:	CP606
Locations of Application:	Gap between the Door Frame and Sub-frame and Edges of the Glass Pane and the Glazing Beads

Intumescent Pad

Supplier:	Leung's Wooden Company Limited
Model:	CT56019 *
Thickness:	3 mm

Glue

Manufacturer:	Leung's Wooden Company Limited
Type:	木膠粉 *

5.5 Pressure Condition

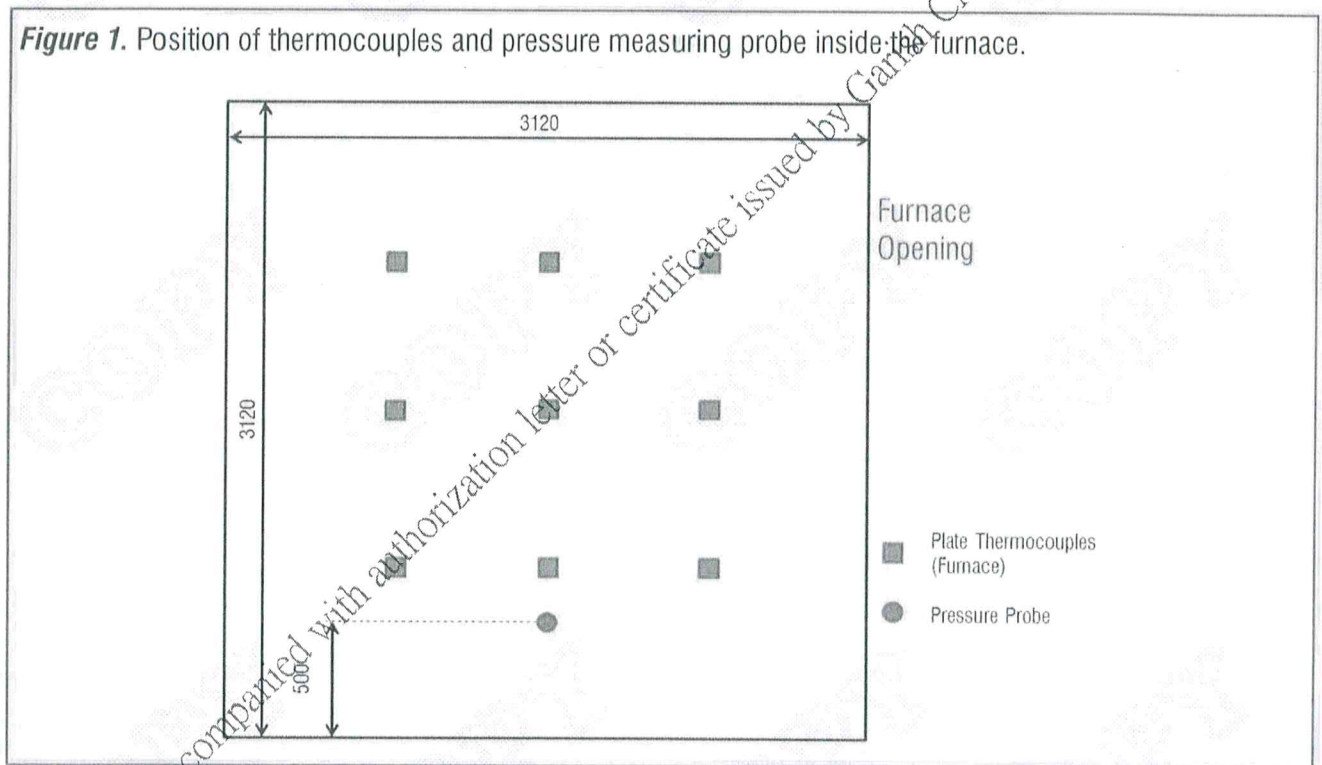
The pressure inside the furnace was continuously monitored in compliance with *BS EN 1363-1: 1999* during the whole test. The pressure at a point 500 mm above the notional floor level was to be maintained 0 ± 5 Pa by five minutes from commencement of the test and 0 ± 3 Pa that from ten minutes onwards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

5.6 Deflection Measurements

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

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

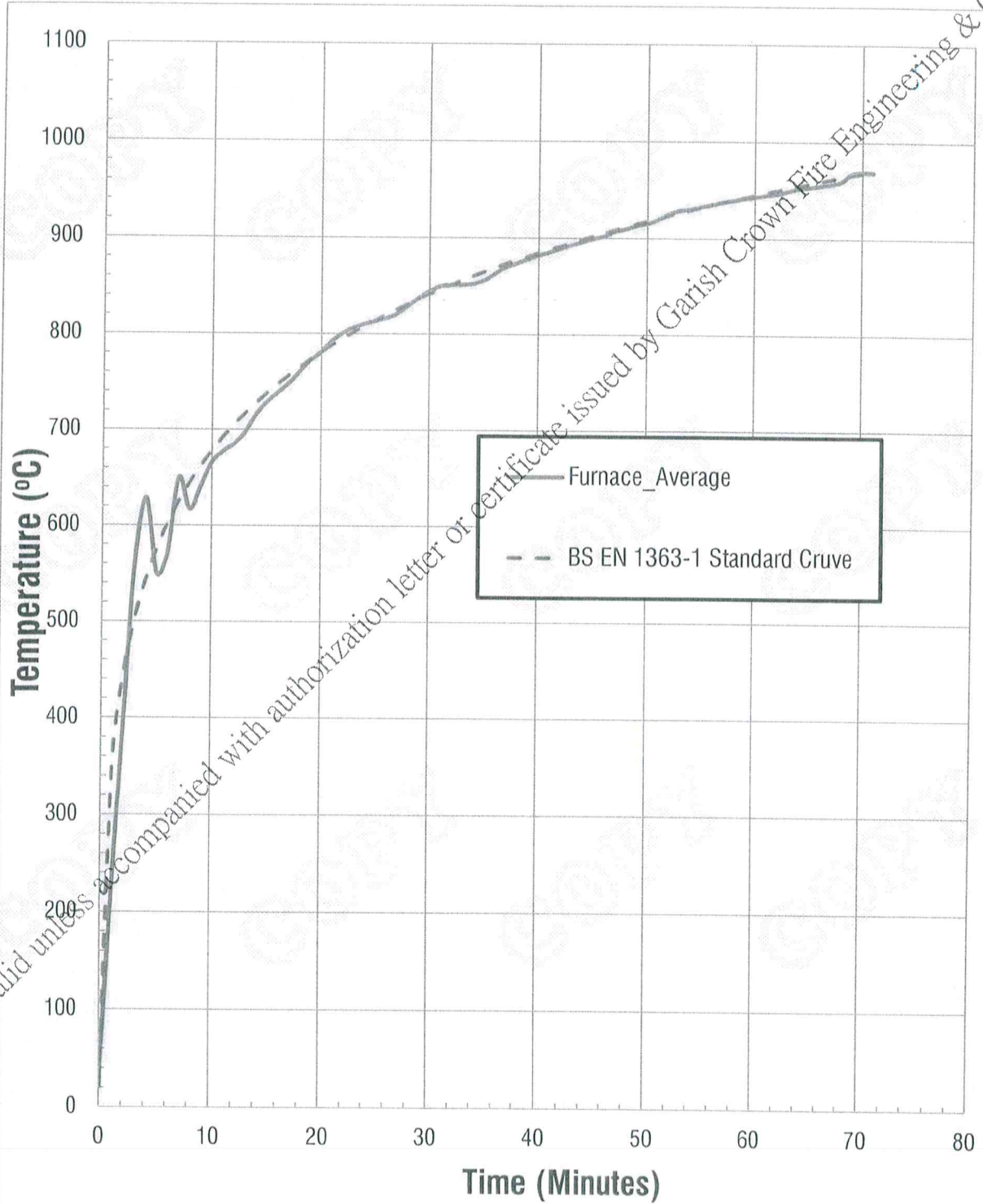
Figure 1. Position of thermocouples and pressure measuring probe inside the furnace.



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.



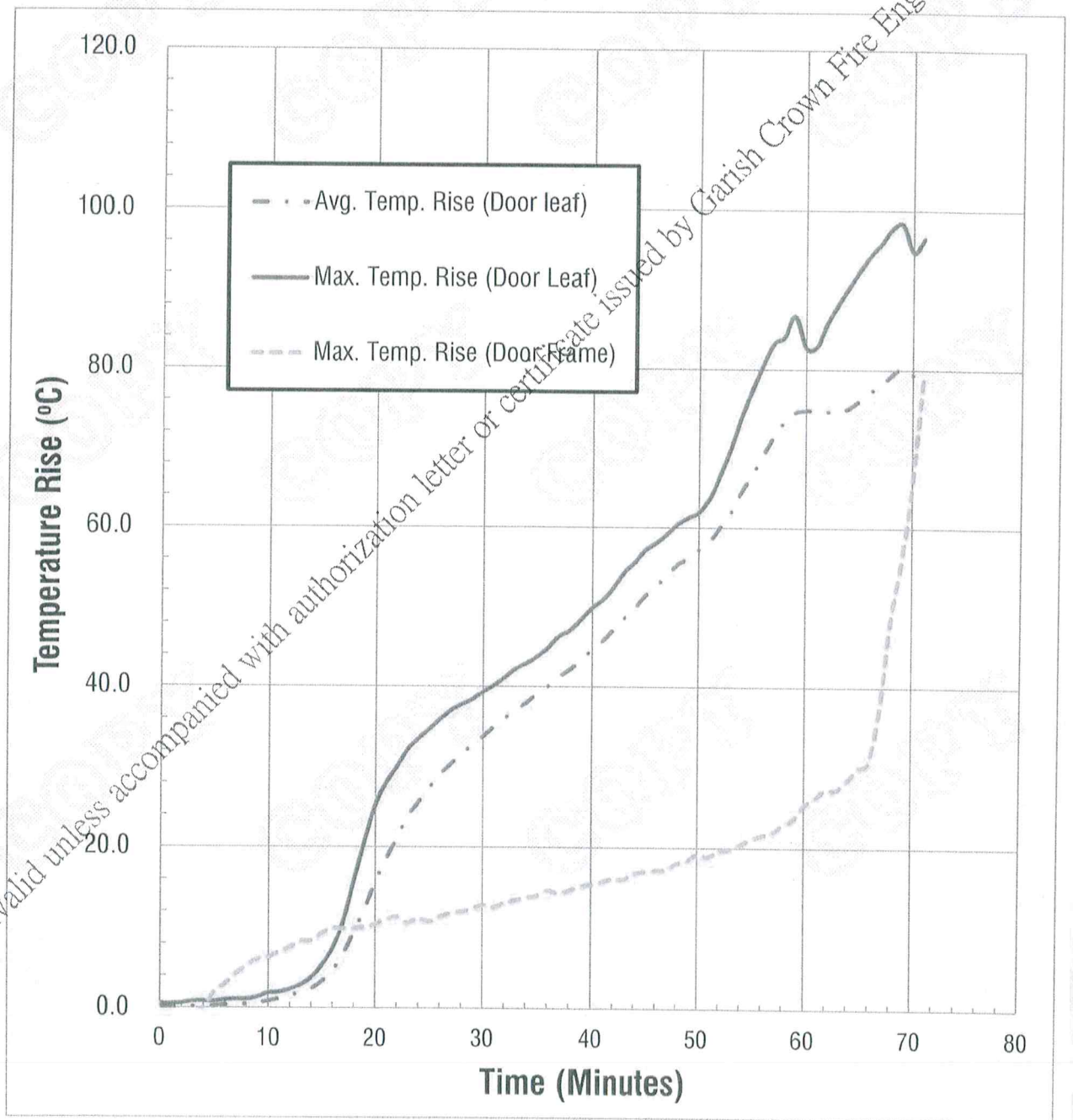
6.4 Unexposed Surface Temperature Rise

6.4.1 Door A

6.4.1.1 Fixed Surface Thermocouples – Door Leaf and Door Frame

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

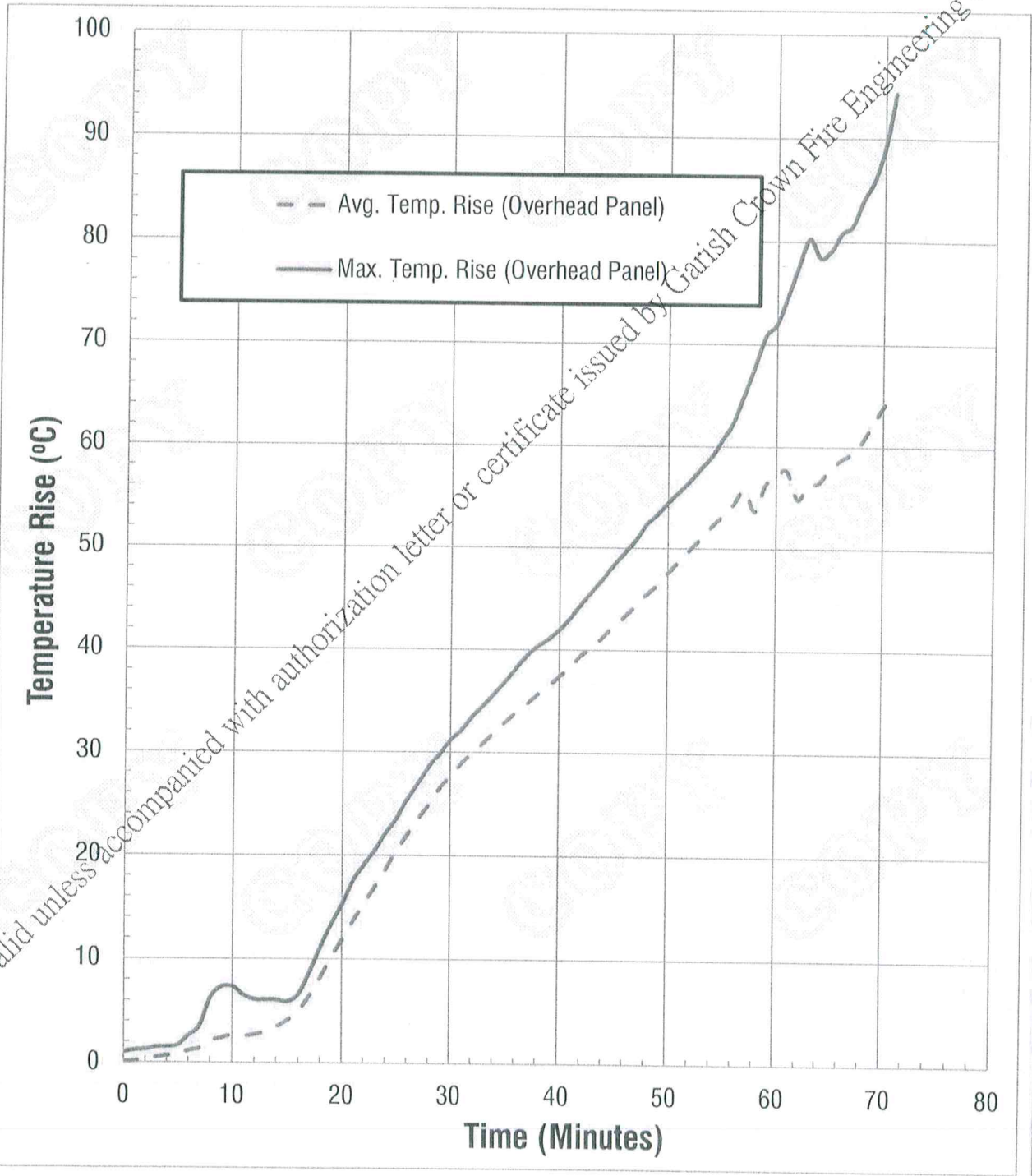
Figure 6. Average and maximum temperature rise on door leaf and door frame of Door A over the test period.



6.4.1.2 Fixed Surface Thermocouples – Overhead Panel

The temperature rises of unexposed surface on overhead panel of Door A measured by fixed surface thermocouples over the test period are shown in Figure 7.

Figure 7. Average and maximum temperature rise on overhead panel of Door A over the test period.



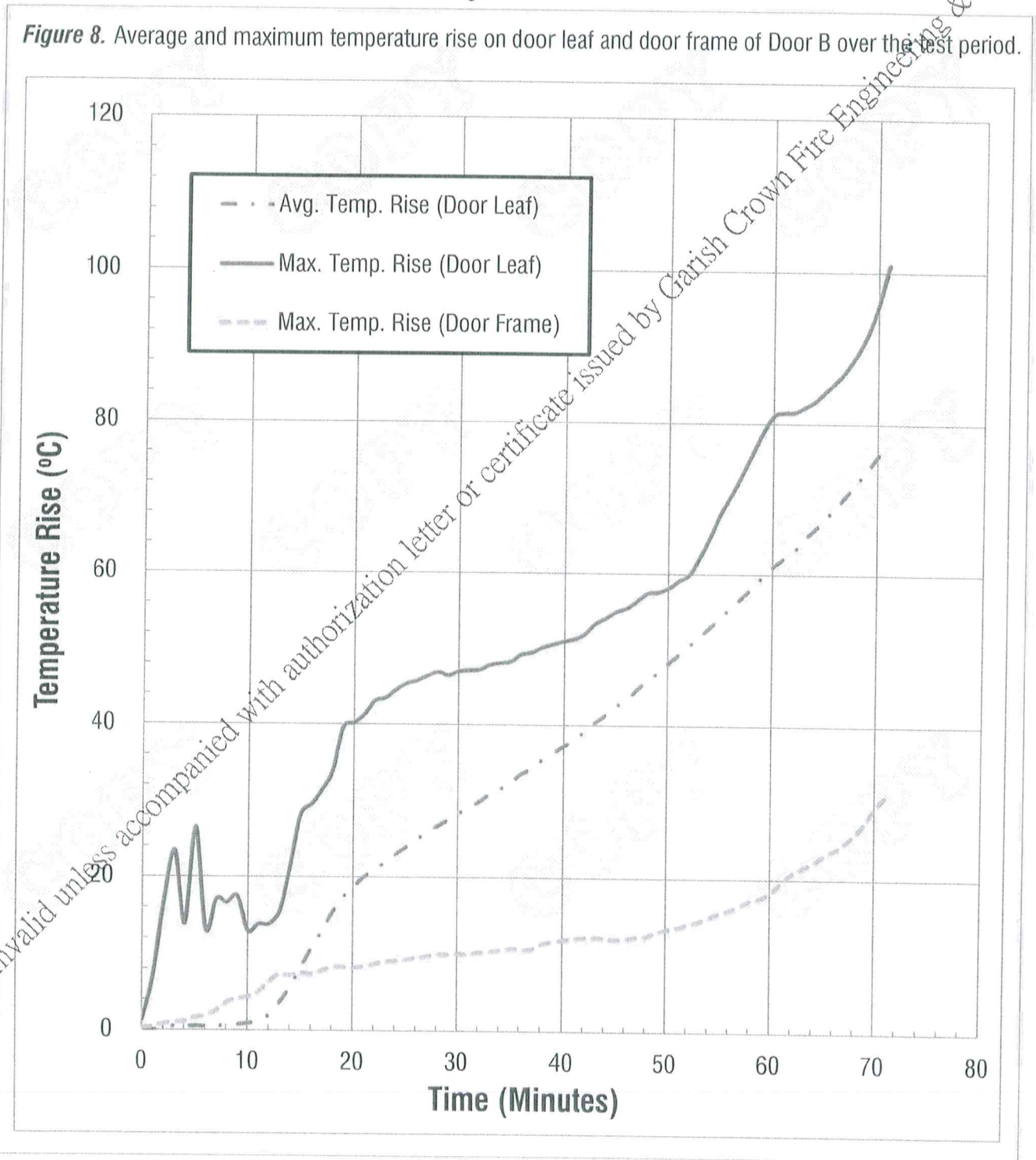
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6.4.2 Door B

6.4.2.1 Fixed Surface Thermocouples – Door Leaf and Door Frame

The temperature rises of unexposed surface on door leaf and door frame of Door B measured by fixed surface thermocouples over the test period are shown in *Figure 8*.

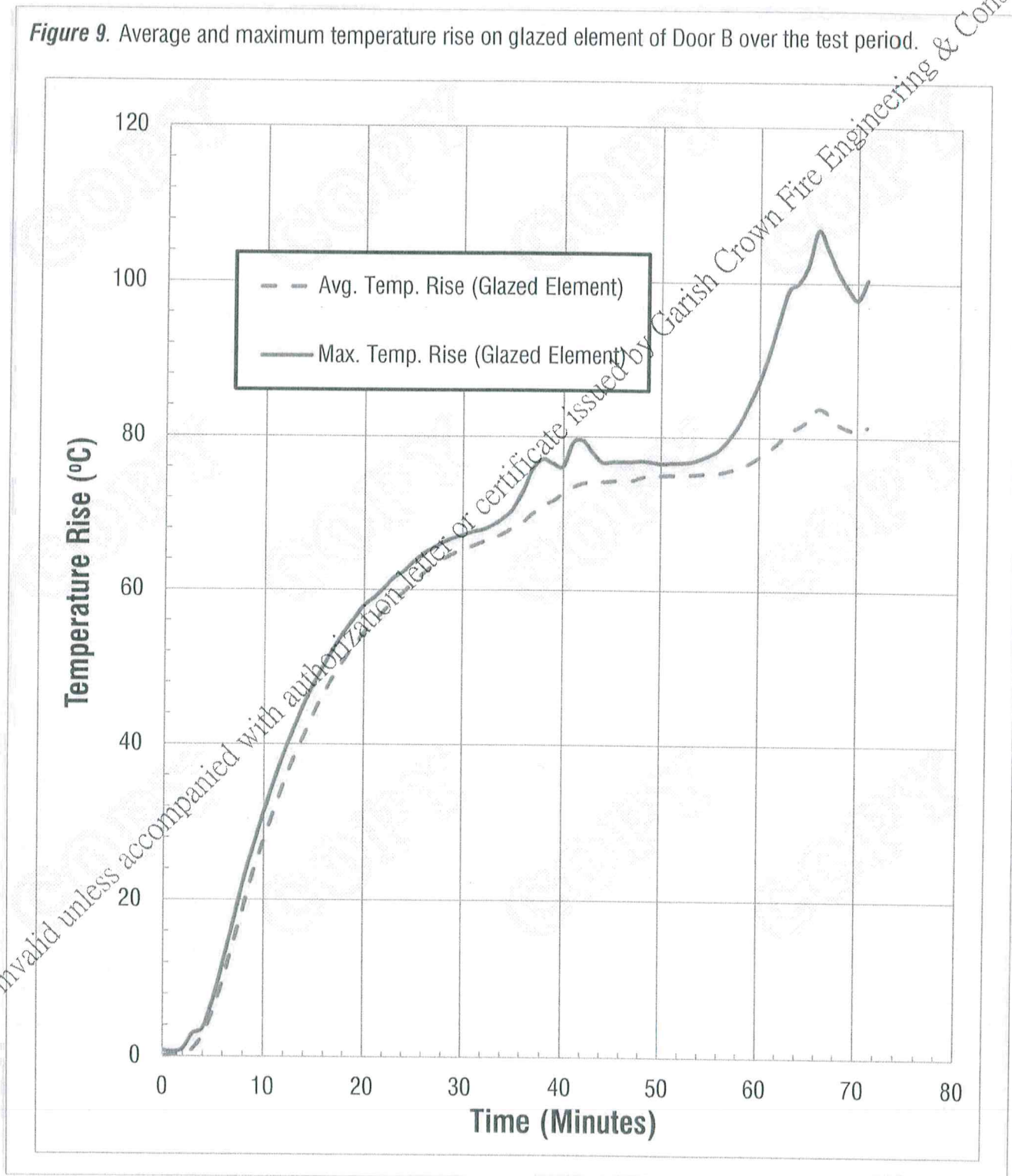
Figure 8. Average and maximum temperature rise on door leaf and door frame of Door B over the test period.



6.4.2.2 Fixed Surface Thermocouples – Glazed Element

The temperature rises of unexposed surface on glazed element of Door B measured by fixed surface thermocouples over the test period are shown in Figure 9.

Figure 9. Average and maximum temperature rise on glazed element of Door B over the test period.



Temperature outputs from unexposed surface temperature U14 to U15 and U18 to U25

Time (min)	U14	U15	U18	U19	U20	U21	U22	U23	U24	U25
0	14.0	13.3	13.5	13.6	16.0	16.2	15.0	14.6	14.0	15.5
5	14.1	13.5	17.6	15.1	16.4	16.9	16.3	15.5	14.7	16.1
10	15.9	13.8	21.9	17.5	17.1	17.4	22.6	16.1	17.4	16.7
15	15.3	14.1	24.9	20.9	19.2	19.6	21.1	17.9	18.1	20.1
20	16.1	15.2	26.0	25.0	27.2	27.7	26.1	25.0	26.1	30.5
25	17.0	16.5	26.4	25.4	37.8	38.8	29.8	33.1	35.8	38.8
30	17.8	17.9	28.5	26.1	45.9	46.5	37.6	39.8	44.5	43.1
35	18.6	19.4	29.6	27.4	51.4	52.1	44.6	44.9	49.5	46.6
40	19.9	21.1	31.0	29.4	56.2	57.2	49.6	50.1	52.6	50.2
45	20.9	22.5	32.6	29.8	62.4	63.5	55.0	54.4	56.2	53.6
50	22.8	24.0	34.8	30.8	68.2	69.7	60.7	59.3	61.3	57.8
55	24.3	26.2	36.7	31.8	74.0	76.0	66.9	64.8	66.9	62.0
56	25.0	26.6	37.2	32.7	74.9	77.8	68.2	65.9	68.0	62.8
57	25.2	27.4	37.5	32.5	76.4	80.5	69.1	67.0	68.8	63.9
58	25.7	28.0	38.5	33.2	78.7	83.2	70.2	68.1	Detached	64.8
59	26.4	28.8	39.2	35.2	80.7	86.1	72.6	69.0	Detached	65.5
60	26.8	29.5	41.0	34.7	83.2	87.2	73.2	69.7	Detached	66.6
61	27.0	30.2	41.8	34.2	86.2	89.9	74.8	70.1	Detached	67.5
62	27.5	31.1	42.9	34.9	89.0	92.8	75.3	71.2	Detached	68.5
63	28.1	31.9	42.9	35.4	91.2	95.5	76.5	71.9	Detached	69.6
64	28.5	32.7	44.1	35.8	93.7	90.7	78.5	73.2	Detached	70.3
65	29.3	33.7	45.5	36.5	94.4	87.2	83.3	74.2	Detached	71.3
66	29.7	34.7	46.4	38.1	96.1	86.1	84.0	76.3	Detached	73.0
67	30.2	35.6	52.7	38.5	96.8	86.1	88.5	77.5	Detached	74.3
68	30.6	36.4	63.8	39.1	99.2	86.4	95.8	78.8	Detached	76.4
69	31.3	37.2	71.3	40.1	100.7	87.1	101.1	80.6	Detached	77.9
70	31.7	38.2	81.1	40.7	103.1	88.2	104.3	82.1	Detached	80.1
71	32.1	38.8	95.2	42.4	103.1	89.0	109.6	83.8	Detached	82.1

Temperature outputs from unexposed surface temperature U30 to U39

Time (min)	U30	U31	U32	U33	U34	U35	U36	U37	U38	U39
0	14.1	14.7	14.3	14.5	16.1	14.7	15.6	15.2	14.9	13.6
5	14.4	14.9	14.6	16.0	16.1	23.8	15.9	16.0	25.9	41.2
10	14.6	15.5	15.4	15.5	16.9	16.7	16.5	16.2	27.7	20.2
15	15.4	26.6	35.4	16.8	19.7	18.3	19.1	17.4	29.7	21.4
20	17.5	53.4	50.5	19.3	26.1	22.7	31.1	19.7	31.0	24.4
25	20.6	60.1	54.3	23.0	35.2	28.1	48.4	23.7	37.5	25.4
30	25.2	61.8	57.5	28.0	42.7	34.3	54.0	28.0	42.5	29.1
35	30.4	63.1	60.2	33.3	48.9	39.7	57.2	33.5	46.6	33.1
40	36.6	65.8	63.1	39.5	54.9	46.3	60.4	39.3	50.5	38.1
45	42.1	69.8	66.9	44.8	62.5	52.8	65.1	45.4	55.7	43.9
50	48.7	72.9	70.6	51.4	71.0	60.3	69.3	50.7	61.3	50.7
55	54.5	76.2	74.5	57.6	82.9	66.7	74.0	55.6	68.4	58.8
56	56.3	76.2	74.6	59.1	85.3	68.5	74.2	56.6	69.5	59.8
57	57.5	76.8	75.2	60.7	88.0	69.8	74.9	57.8	70.8	61.5
58	58.9	77.8	75.5	61.7	90.7	71.1	75.5	58.5	71.8	62.9
59	60.2	79.0	75.9	63.3	93.6	72.8	76.0	59.7	73.2	64.1
60	61.8	80.6	76.1	64.6	95.8	74.1	76.6	61.2	74.4	65.7
61	62.6	83.2	76.7	65.6	96.2	74.9	77.3	62.1	75.6	67.5
62	64.0	85.6	76.9	66.7	96.3	76.2	77.9	63.3	77.3	69.0
63	66.0	89.0	77.2	68.2	97.0	77.9	78.3	64.8	79.3	70.4
64	67.4	91.7	77.7	69.4	97.8	79.1	78.7	66.0	81.0	71.6
65	68.8	94.2	78.7	70.6	99.2	80.1	79.3	67.4	83.0	73.5
66	70.0	96.6	79.8	71.8	100.4	81.2	80.1	68.7	84.9	74.7
67	71.4	98.7	81.5	72.8	101.9	82.2	82.0	70.1	86.7	76.6
68	72.6	101.7	83.8	73.6	103.0	83.0	84.7	71.8	88.7	78.6
69	74.5	103.5	86.3	74.6	104.2	84.1	86.9	72.8	90.4	80.0
70	75.6	105.4	89.9	75.6	105.8	85.1	89.6	73.9	91.9	81.7
71	76.7	107.5	93.1	76.1	107.4	85.3	93.2	75.8	94.0	83.6

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.

Positions refer to *Figure 4a & 4b*.

Maximum deflection on Door A measured was +57 mm at D3 at 60 minute of test; whereas the maximum deflection on Door B measured was +45 mm at D11 at 60 minute of test.

Position \ Time (min)		0	10	20	30	40	50	55	60
Door A	D1	+0	+0	+1	+2	+2	+4	+4	+4
	D2	+0	-2	-3	-1	+1	+2	+3	+6
	D3	+0	+12	+14	+27	+38	+49	+52	+57
	D4	+0	+0	+5	+7	+12	+12	+15	+15
	D5	+0	+3	+8	+14	+17	+17	+19	+19
	D6	+0	+2	+12	+18	+21	+24	+24	+27
	D7	+0	-1	+2	+5	+6	+6	+7	+8
Door B	D8	+0	+4	+7	+11	+11	+11	+10	+10
	D9	+0	+1	+1	+3	+3	+4	+5	+4
	D10	+0	+1	+1	+2	+3	+3	+3	+4
	D11	+0	+6	+13	+26	+31	+35	+38	+45
	D12	+0	+4	+9	+14	+18	+20	+22	+28
	D13	+0	+2	+9	+19	+24	+31	+35	+43
	D14	+0	+2	+5	+9	+10	+13	+13	+15

Tme (min.sec)	Observation (from unexposed side)
51.12	Door B: Oil leakage was observed at door closer position. Glass pane turned white again. Smoke released from the lock and the head of the door leaf.
54.19	Door A: Smoke released from gaps around the overhead panel and leading edge at lock position.
58.01	Door A: Cotton fibre pad test was carried out at the top of the door leaf which was between overhead panel and the door leaf. No flaming or glowing on the cotton pad was observed.
60.00	Door A & B: No integrity failure had occurred.
60.19	Door A: Cotton fibre pad test was carried out at the top left corner of the door leaf. No flaming or glowing on the cotton fibre pad was observed.
62.39	Door A: Glowing could be observed at lower corner of overhead panel.
64.05	Door A: Cotton fibre pad test was carried out at the top left corner of the door leaf. No flaming or glowing on the cotton pad was observed.
64.46	Door B: Cotton fibre pad test was carried out at the top left corner of the door leaf. No flaming or glowing on the cotton pad was observed.
65.49	Door A: Cotton fibre pad test was carried out at the top left corner of the door leaf. No flaming or glowing on the cotton fibre pad was observed.
66.36	Door A: Sustainable flaming was observed at the left top corner of the door leaf. Integrity failure was deemed to occur.
67.54	Door A: Cotton fibre pad test was carried out at the flaming corner of the door leaf. The cotton fibre pad was ignited. Integrity failure was deemed to occur.
71.07	Test was terminated at request of the Sponsor.

6.9 Photos

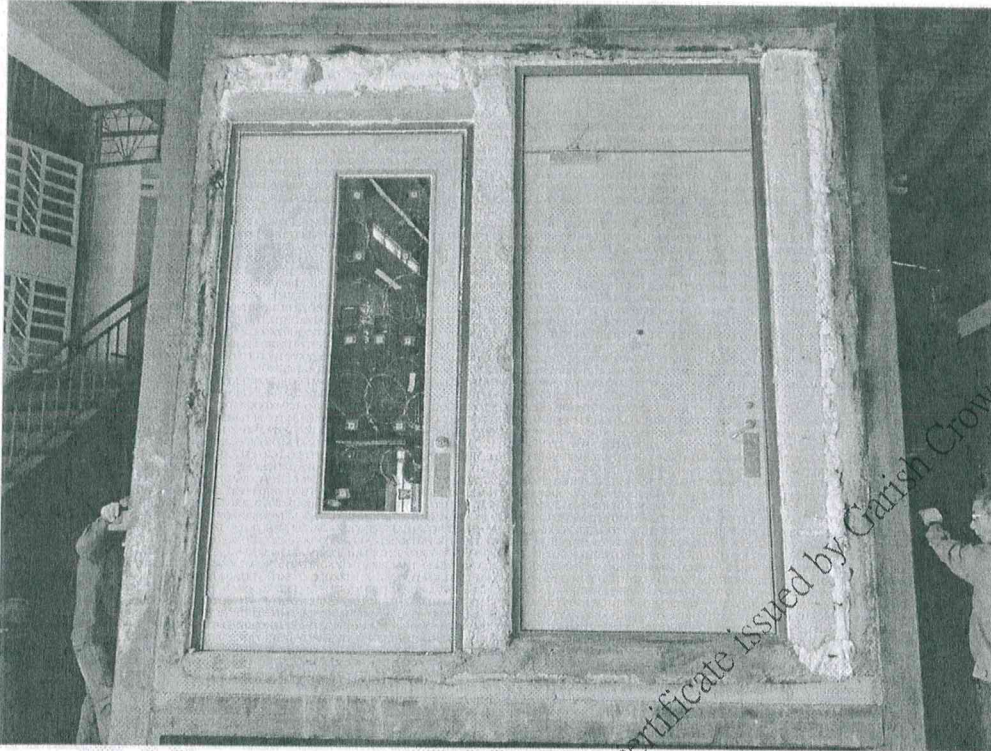


Photo 1. Exposed surface of the specimens before test. (Left: Door B; Right: Door A)

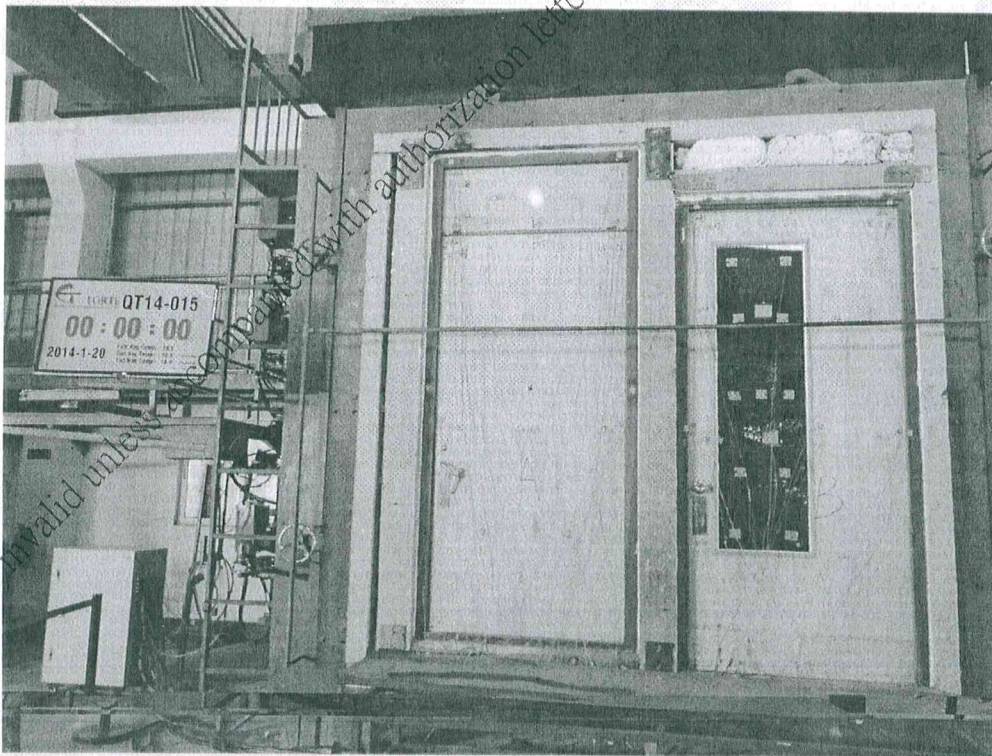


Photo 2. Unexposed surface of the specimens just after the commencement of test. (Left: Door A; Right: Door B)

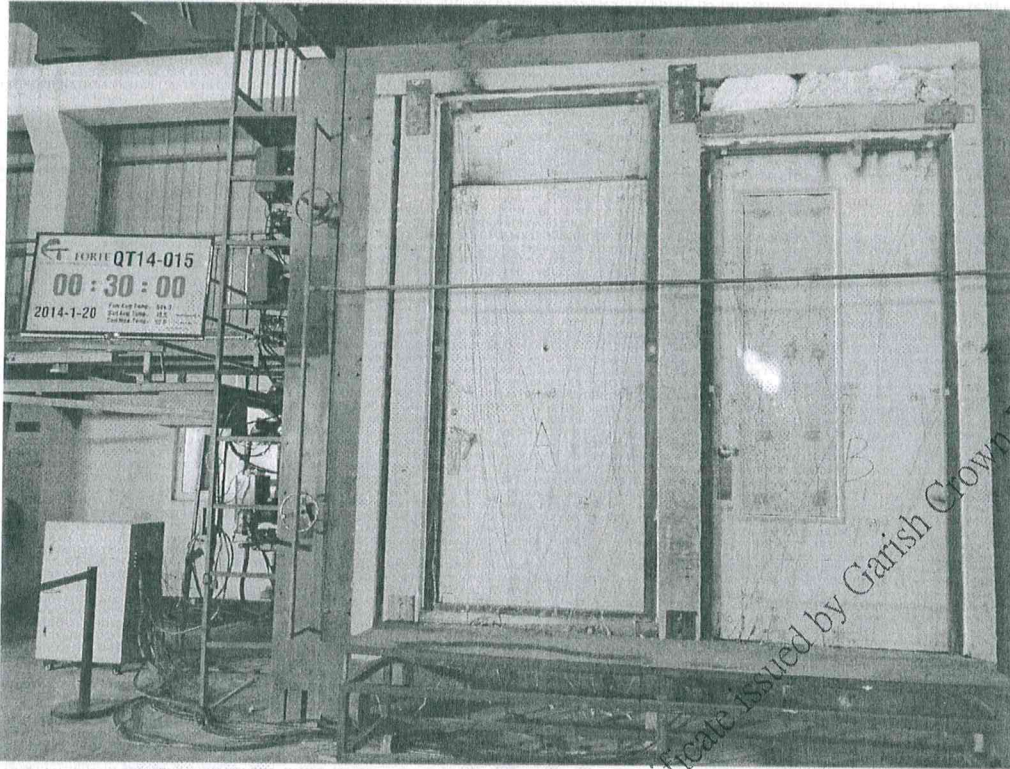


Photo 3. Unexposed surface of the specimens at 30 minute of test.

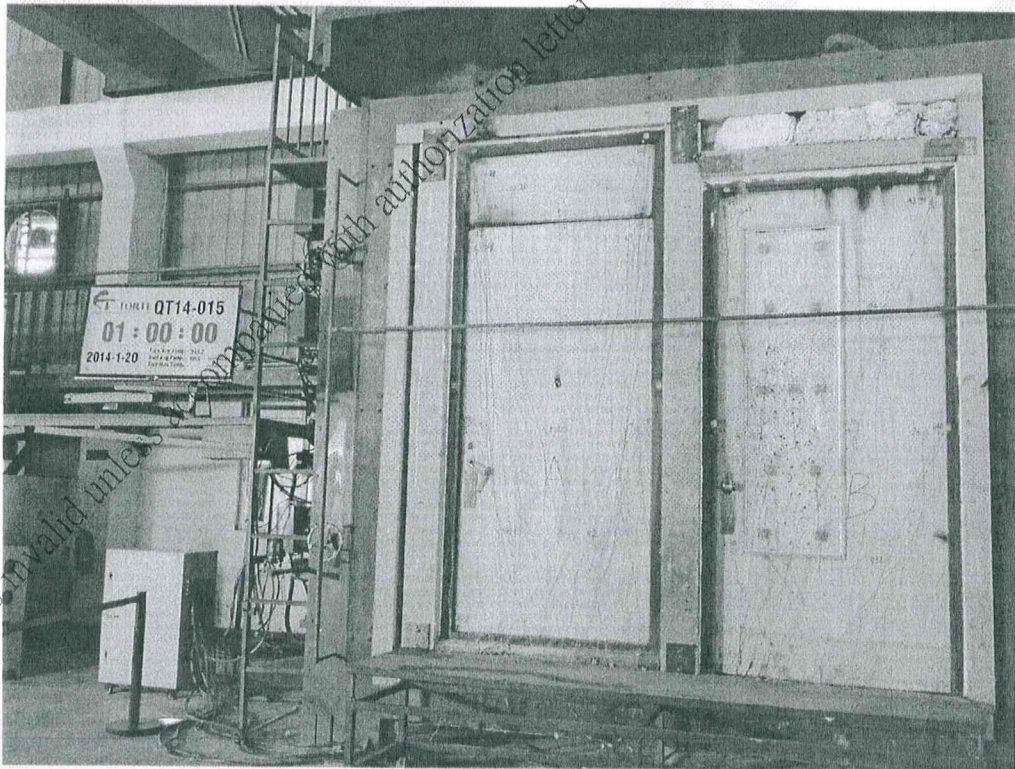


Photo 4. Unexposed surface of the specimens at 60 minute of test.

7.2 Door B

The test on Door A was terminated after a test period of 71 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	71 minutes (No Failure)	
Gap Gauge	Ø6 mm	Penetration of the gauge into the furnace through the specimen and movable along a 150 mm gap	71 minutes (No Failure)	
	Ø25 mm	Penetration of the gauge into the furnace through the specimen		
Cotton Pad		Ignition of the cotton pad	71 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	71 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]	71minutes (No Failure)
			[Glazed element]	71minutes (No Failure)
Maximum Temperature Rise [Supplementary Procedure, I ₁]	An increase of temperature at any other point of the specimens above the initial average temperature by more than 180 °C		[Door Frame]	71minutes (No Failure)
			[Door Leaves]	71minutes (No Failure)
			[Glazed element]	71minutes (No Failure)

Appendix A - Temperature outputs from Unexposed Surface. (Additional information only)

Supplementary Temperature outputs from unexposed surface temperature U10 to U13 and U26 to U29

Time (min)	U10	U11	U12	U13	U26	U27	U28	U29
0	14.1	13.7	14.6	14.5	15.2	14.8	14.2	14.6
5	14.2	13.9	17.2	15.9	56.7	17.3	20.5	16.5
10	24.4	15.1	26.5	19.0	76.3	22.2	26.7	19.7
15	21.2	16.3	30.2	23.2	58.7	33.9	30.8	24.8
20	22.7	19.1	39.1	31.9	73.1	43.9	34.9	30.2
25	25.2	22.8	48.4	40.2	83.0	47.2	41.2	33.2
30	30.3	28.0	58.6	47.1	91.8	45.5	44.7	37.0
35	34.8	33.8	66.0	53.4	93.2	49.0	48.0	41.4
40	37.5	41.0	71.6	59.7	95.6	54.5	52.4	47.5
45	41.5	47.8	76.3	65.5	106.1	58.6	56.2	52.6
50	47.1	54.5	82.3	70.7	129.8	62.0	61.6	57.7
55	53.0	61.0	89.0	77.0	156.1	67.5	66.1	62.0
56	54.7	62.5	91.5	77.8	162.4	69.0	67.8	63.4
57	55.7	64.0	93.4	78.3	166.2	73.3	68.2	64.4
58	56.8	65.4	95.6	78.6	175.2	78.1	70.4	65.8
59	58.2	67.1	99.3	79.2	188.8	78.4	71.1	66.5
60	59.3	68.8	101.1	80.0	209.7	80.8	72.7	67.9
61	60.6	70.8	105.6	80.9	271.5	81.4	73.8	68.2
62	62.6	72.2	108.4	81.1	327.7	82.9	75.4	69.6
63	63.7	74.1	111.8	82.2	384.4	82.1	75.6	71.2
64	66.2	75.7	116.4	82.7	436.6	81.2	77.8	72.7
65	68.4	77.7	124.2	83.5	499.8	81.6	79.2	73.7
66	69.4	79.4	129.0	84.5	536.2	82.0	80.0	74.6
67	71.3	81.0	138.1	85.4	602.2	83.2	85.6	75.4
68	72.9	82.4	146.5	86.6	634.6	85.1	100.5	76.6
69	74.5	83.8	155.7	87.3	626.6	88.0	109.7	78.1
70	76.7	85.8	166.1	88.7	626.2	96.1	121.2	79.6
71	79.8	86.9	180.8	90.1	634.4	101.3	136.3	81.8

END OF REPORT