FORTE
TESTING AND CONSULTANTS CO., LTD.

HOKLAS 191
TEST

FIRE RESISTANCE TEST REPORT

SINGLE-LEAF COMPOSITE FLUSH TYPE TIMBER DOOR with A GLAZED ELEMENT

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

Test Sponsor: **Garish Crown Fire Engineering & Consultancy**
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Test Laboratory: **Forte Testing and Consultants Company Limited**
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Report Number: **IT 15-045**

Date of Issue: **2015-03-24**

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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 B and test results and details for Door A was recorded in other reports, numbered IT15-005 / IT15-046.

Door B achieved the following fire resistance:

INTEGRITY	**(E)**	**INSULATION**	**(I)**	
Sustained Flaming	120 Minutes	Door Frame	Max. Temp. Rise(I_1)	120 Minutes
Gap Gauge	120 Minutes	Door Leaf	Average Temp. Rise	120 Minutes
Cotton Pad *	119 Minutes		Max. Temp. Rise (I_1)	120 Minutes
		Glazed Element	Average Temp. Rise	95 Minutes
			Max. Temp. Rise (I_1)	95 Minutes

* Cotton pad failure occurred at the glazed element.

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
Test Number:	QT 15-011 *With this test, separate report for each specimen was required by the Sponsors. A total of two sets of report (Report no. IT15-045 and IT14-047) had issued on specimen named Door B.
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:	Version 1 - 2015-03-24

3. Construction Details of Specimen

3.1 Specimen Description

3.1.1.1 Door Frame

The four sided composite door frame was overall sized 1144 mm (width) x 2853 mm (height). The sectional dimension of the door frame was 65 mm (w) x 62 mm (thick) and it was singe-rebated type with 15 mm rebate. The sub-frame was made with film plywood sized 55 mm (w) x 18 mm (t). The sub-frame was fixed into the concrete supporting frame by M10 x 135 mm (l) door frame anchor at approximate 620 mm to 670 mm centre to centre. There were 4 numbers of fixing at each jamb and 2 numbers at the head of door frame.

The door frame was made of wooden post that protected by 5 mm (t) fire board and 2 mm (t) intumescent pad, then finished with 3 mm (t) plywood 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 12 numbers of fixings on each vertical jamb and 18 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 and unexposed side. The architraves were fixed by screws at approximate of 300 mm - 400 mm centre to centre.

1 number of 30 mm (w) x 4 mm (t) intumescent seal with plastic fins were fitted flush with the indent part of the four side door frame.

1 number of 10 mm (w) x 4 mm (t) intumescent seal with plastic fins were fitted flush with the raised part of the four sided door frame.

The 30 mm (t) intumescent seals with plastic fins were interrupted at concealed door closer channel and concealed hinge position.
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 fire sealant.

3.1.1.2 Door Leaf

The specimen was a door leaf sized 1050 mm (w) x 2756 mm (h) x 62 mm (t) with single rebated edges that flush with the door frame.
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 5 mm + 3 mm + 3 mm (t) fire boards 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.
1 number of 30 mm (w) x 4 mm (t) intumescent seal and 1 number of 10 mm (w) x 4 mm (t) intumescent seal were fitted into the perimeter of the door leaf.
The 30 mm (t) intumescent seals were interrupted at concealed door closer and concealed hinge positions.
2 mm (t) intumescent pad was fitted underneath the intumescent seals.
The door sub-lipping was made of 3 mm (t) fire board and the door lipping was made of wooden strip.

3.1.1.3 Glazed Element

The specimen comprised of a glazed element.
The glazed element was visually sized of 357 mm (w) x 357 mm (h). The glazed element was installed 600 mm away from the top edge and 300 mm away from the leading edge of the door leaf.
The glazed element consisted of a piece of 42 mm (t) glass pane. The glass pane was 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.

3.1.1.4 Ironmongery

The door leaf was supported into the door frame by 4 numbers of concealed hinge.
A concealed door closer was installed into the groove at the top edge of the door leaf with the sliding channel fitted into the door frame.
A rim lock with cylinder was installed 945 mm above the bottom edge of the active leaf.
A lever handle was installed 1040 mm above the bottom edge of the active leaf on the non-fire exposed side.
Intumescent materials and fire sealant were 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 Frame

Manufacturer:	Shun Hing Wood Working Company Limited
Material:	Hardwood + Fire Board +Intumescent Pad + Timber Veneer
Density:	Hardwood - 550 - 700 kg/m^3 *
Moisture Content:	Hardwood - 12 - 17 % *
Overall Sizes:	1144 mm x 2853 mm
Dimensions:	65 mm x 62 mm
Connection Method of Door Frame Head and Jambs:	By Tongue and Groove Joint and Fixed by ø5 mm x 50 mm Screws or Nails
Fixing Method to Sub-frame:	By M4 x 40 mm Screws at Approximate 200 mm to 250 mm Centre to Centre
Gap Filling between Door Frame and Sub-frame	Ceramic Fibre and Fire Sealant

Sub-frame

Manufacturer:	Shun Hing Wood Working Company Limited
Material:	Film Plywood
Density:	350 kg/m^3 *
Sizes:	55 mm x 18 mm
Fixing Method to Concrete Supporting Frame:	By M10 x 135 mm Door Frame Anchor at Approximate 620 mm to 670 mm Centre to Centre

Architraves

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 mm - 400 mm Centre to Centre

Door Leaf

Manufacturer:		Shun Hing Wood Working Company Limited
Overall Sizes:		1050 mm x 2756 mm x 62 mm
Skeleton	Material:	Softwood *
	Width:	Main Stiles and Rails - 3 x 25 mm Mid Rails and Aperture of Glazed Element - 25 mm
	Thickness:	32 mm
	Density:	350 - 450 kg/m^3 *
	Moisture Content:	12 - 17 % *
Core	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/m^3 *
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 Leaf 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/m^3 *
Moisture Content:	12 - 17 % *
Thickness:	10 mm

Glass Pane

Supplier:	Kwok Shing Construction Limited
Brand:	Keymax *
Thickness:	42 mm
Overall Sizes:	407 mm x 407 mm
Visual Sizes:	357 mm x 357 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

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

Conceal Door Closer

Supplier:	Tung Fat Ho Building Material Limited
Brand:	Valance - ECO *
Model:	VAL-ITS-MG0EN2-5 *
Material:	Stainless Steel *

Conceal Hinge

Supplier:	Garish Crown Fire Engineering & Consultancy
Brand:	Ying Mu *
Model:	YM-100-20 *
Material:	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

Intumescent Material

Supplier:		Garish Crown Fire Engineering & Consultancy	
Brand:		Ying Mu	
Door Frame	Model:	YM3004	YM1004
	Size:	30 mm x 4 mm	10 mm x 4 mm
Door Leaf	Model:	YM3004	YM1004
	Size:	30 mm x 4 mm	10 mm x 4 mm

Smoke Seal

Supplier:	Garish Crown Fire Engineering & Consultancy
Brand:	Ying Mu
Model:	YM1212
Sizes:	12 mm x 12 mm

Intumescent Pad

Supplier:	Garish Crown Fire Engineering & Consultancy
Brand:	Ying Mu
Model:	YM100
Thickness:	2 mm
Location Applied:	At the Concealed Faces of the Ironmongeries, Underneath the Intumescent Seals and Door Frame

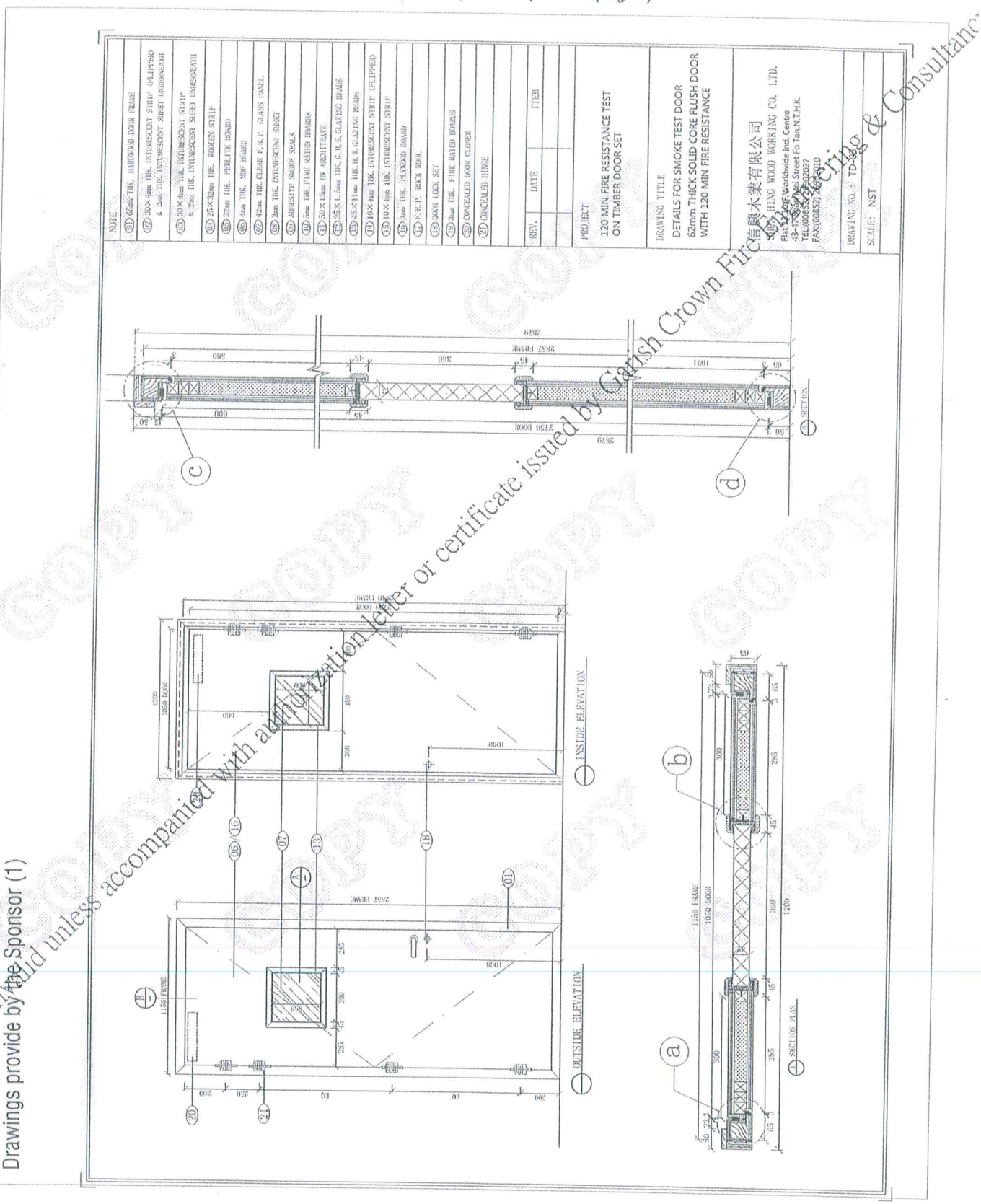
Fire Sealant

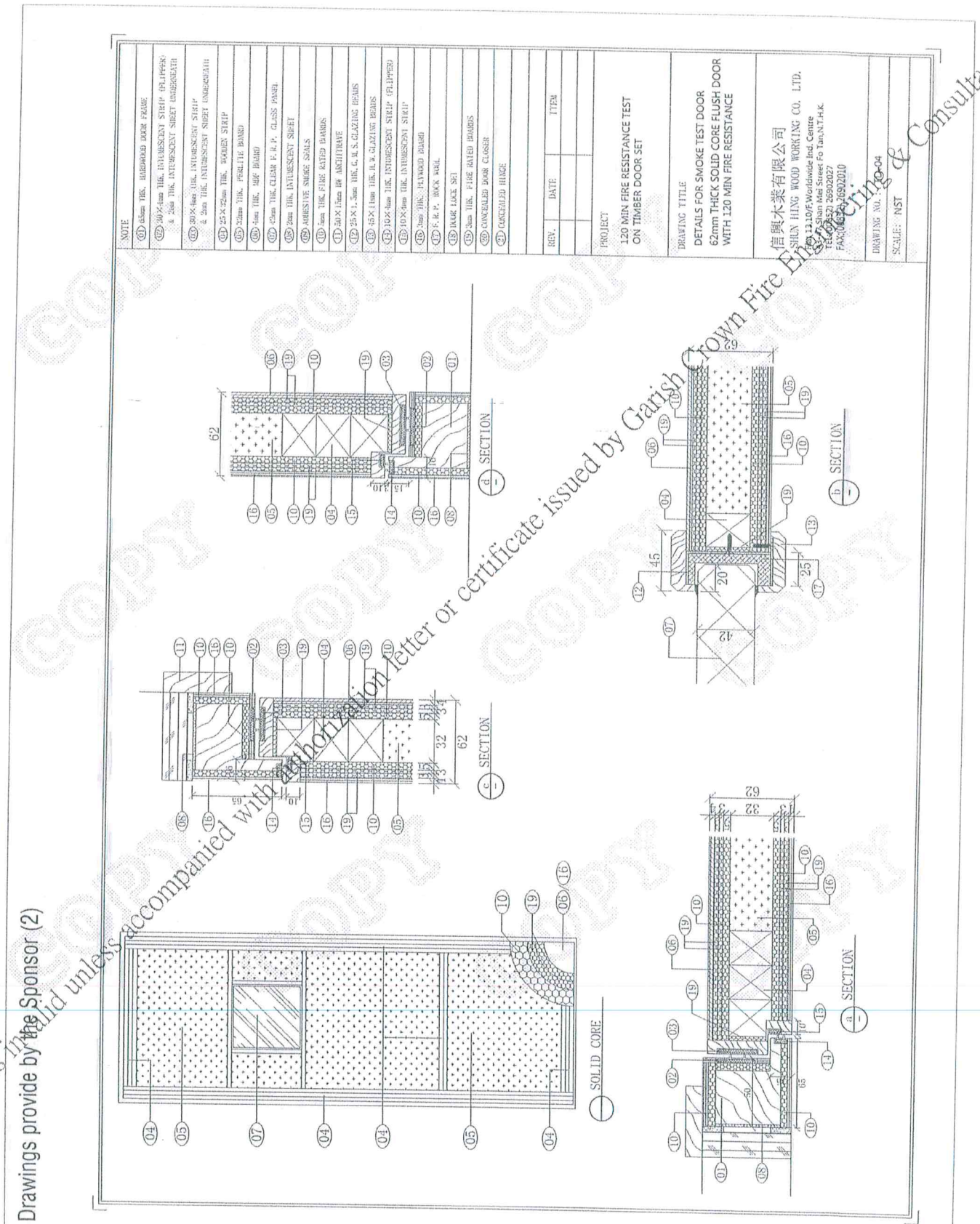
Supplier:	Garish Crown Fire Engineering & Consultancy
Brand:	Firemate
Locations of Application:	Between the Gap Along the Door Frame, Sub-frame and the Test Frame

Glue

Supplier:	Shun Hing Wood Working Company Limited
Brand:	Not Provided
Type:	木膠粉

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





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); whereas Door B was installed into one sized 1200 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 leaf on specimen could only be swung inwards the furnace.

The door lock was UNLATCHED and UNLOCKED 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 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 17 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 supplementary procedure – Classification I_1 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
U31 – U35	Door Leaf	For average and maximum unexposed surface temperature rise
U36 – U39; U48 – U51	Door Leaf	For maximum unexposed surface temperature rise **(Supplementary Procedure, I_1)**
U40 – U43	Door Frame	For maximum unexposed surface temperature rise
U44 – U45	Glazed Element	For average and maximum unexposed surface temperature rise
U46 – U47	Glazed Element	For maximum unexposed surface temperature rise

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

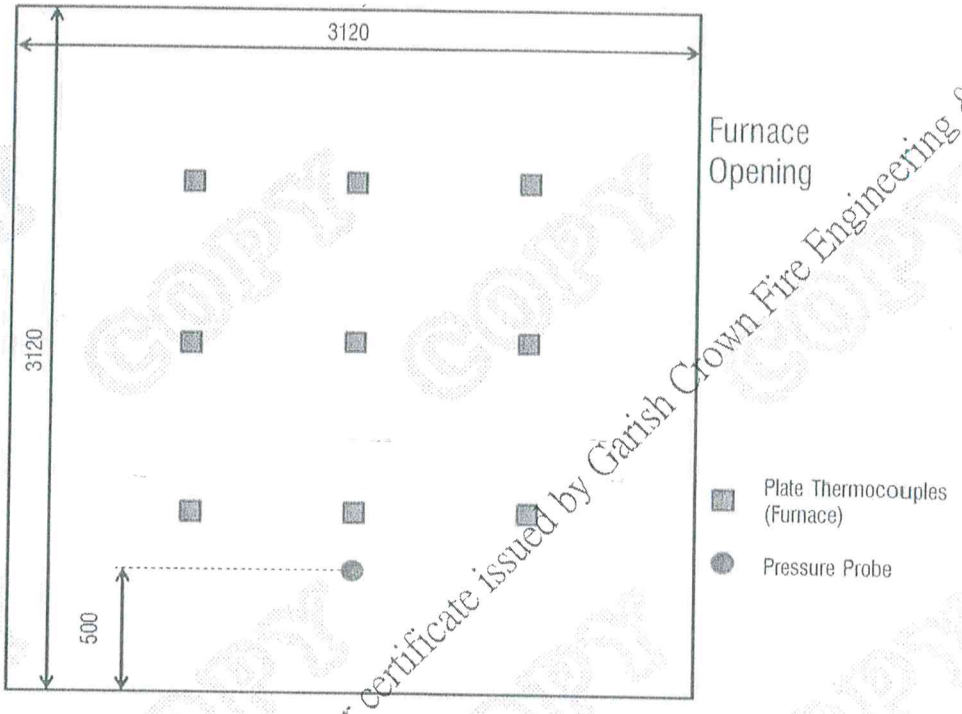


Figure 2. Primary gaps measurement positions on the Specimen.

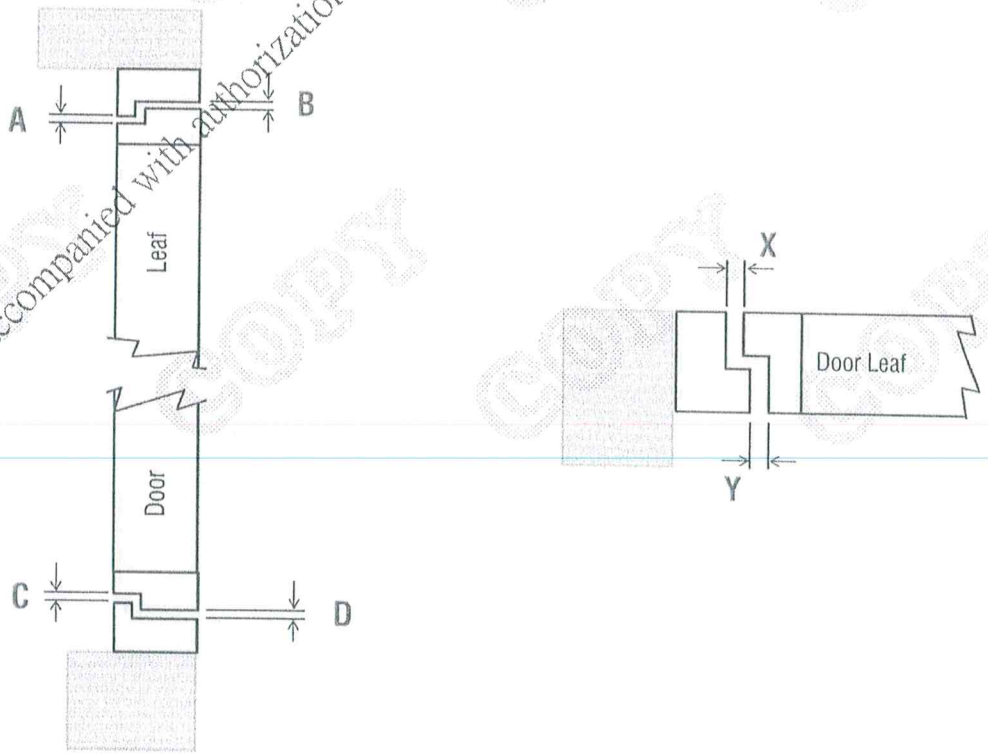


Figure 3. Positions of fixed surface thermocouples (U) on the Specimen.

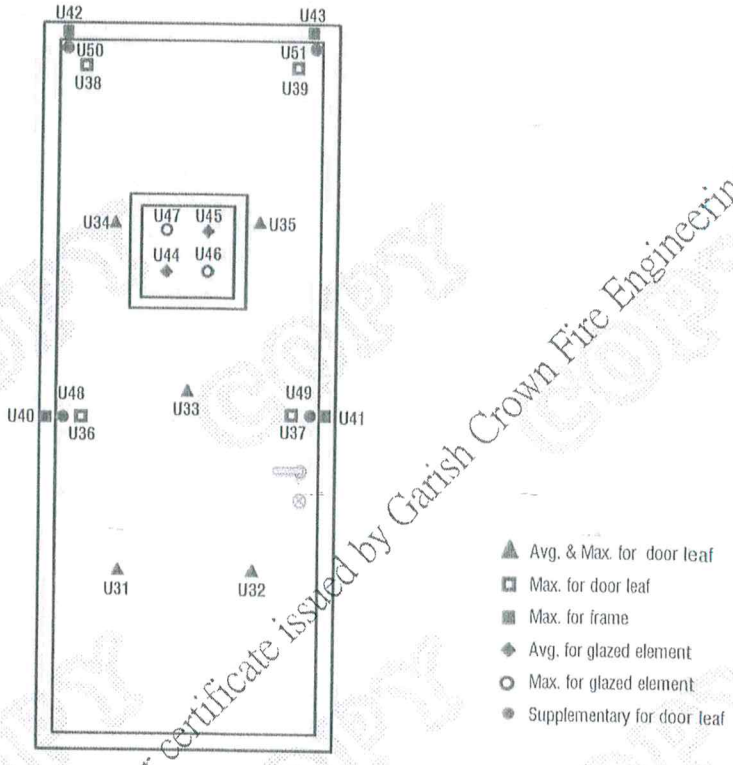
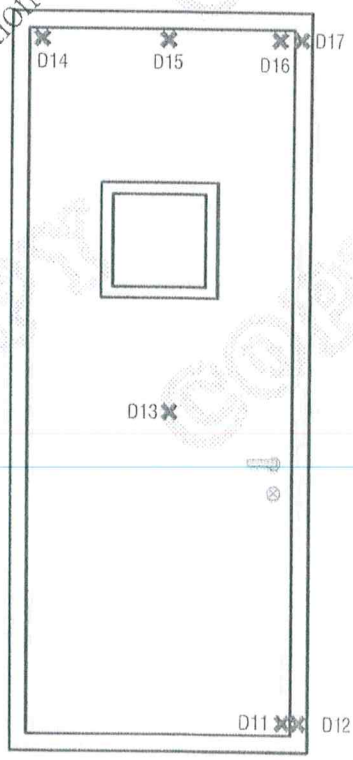


Figure 4. Positions of deflection measurement points (D) on the Specimen.



6. Test Data

6.1 Retention Forces

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

Push	Pull
228.2 N	298.0 N

6.2 Gaps Measurement

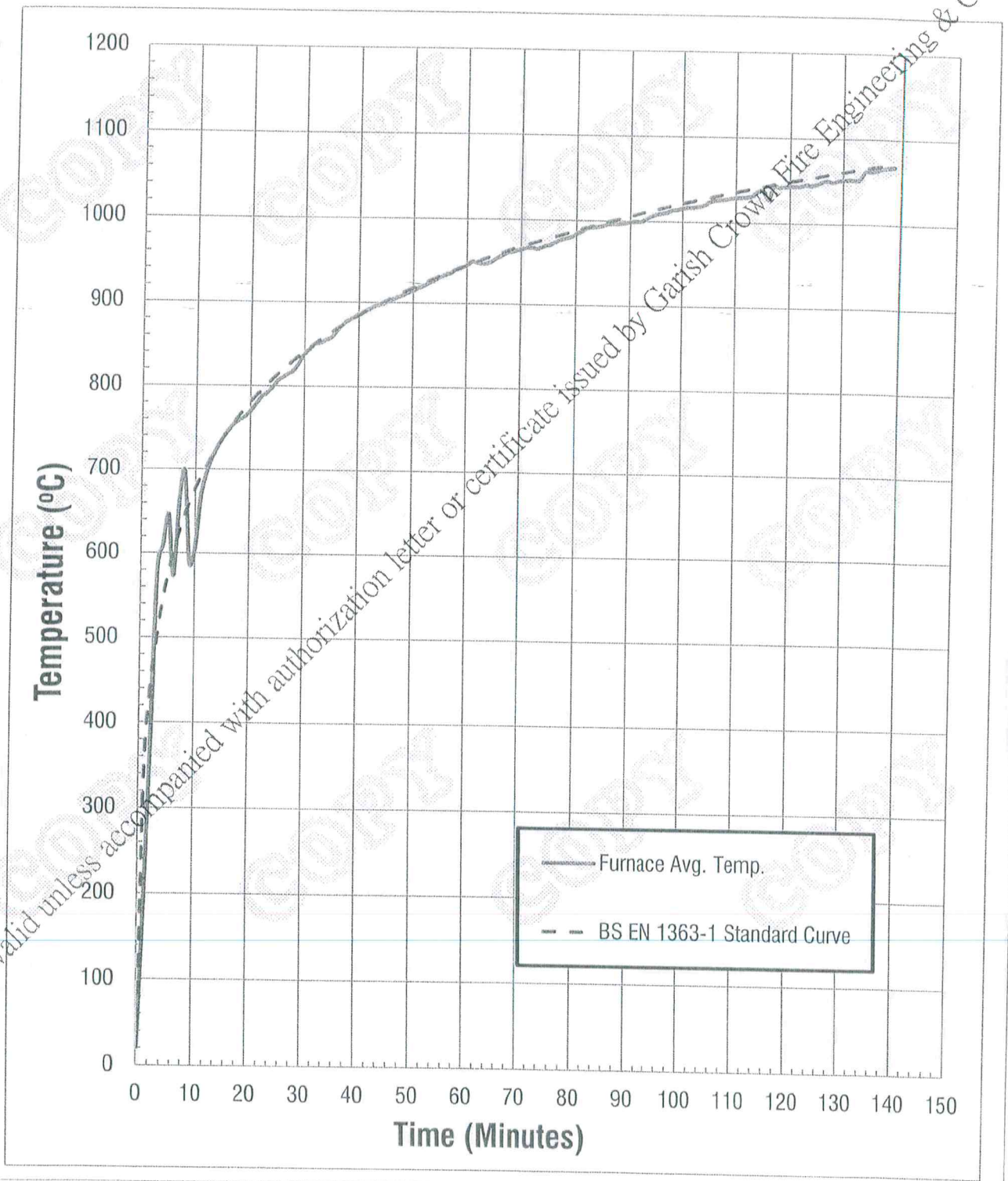
Primary gaps of the specimen were measured and summarized in the following table. Measurements were taken in mm.

Gap	Measured		
	Minimum	Maximum	Average
A	3.9	4.1	4.0
B	3.2	3.3	3.3
C	3.2	3.8	3.5
D	2.7	4.5	3.8
X	1.8	4.6	3.6
Y	2.7	4.9	3.4

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.



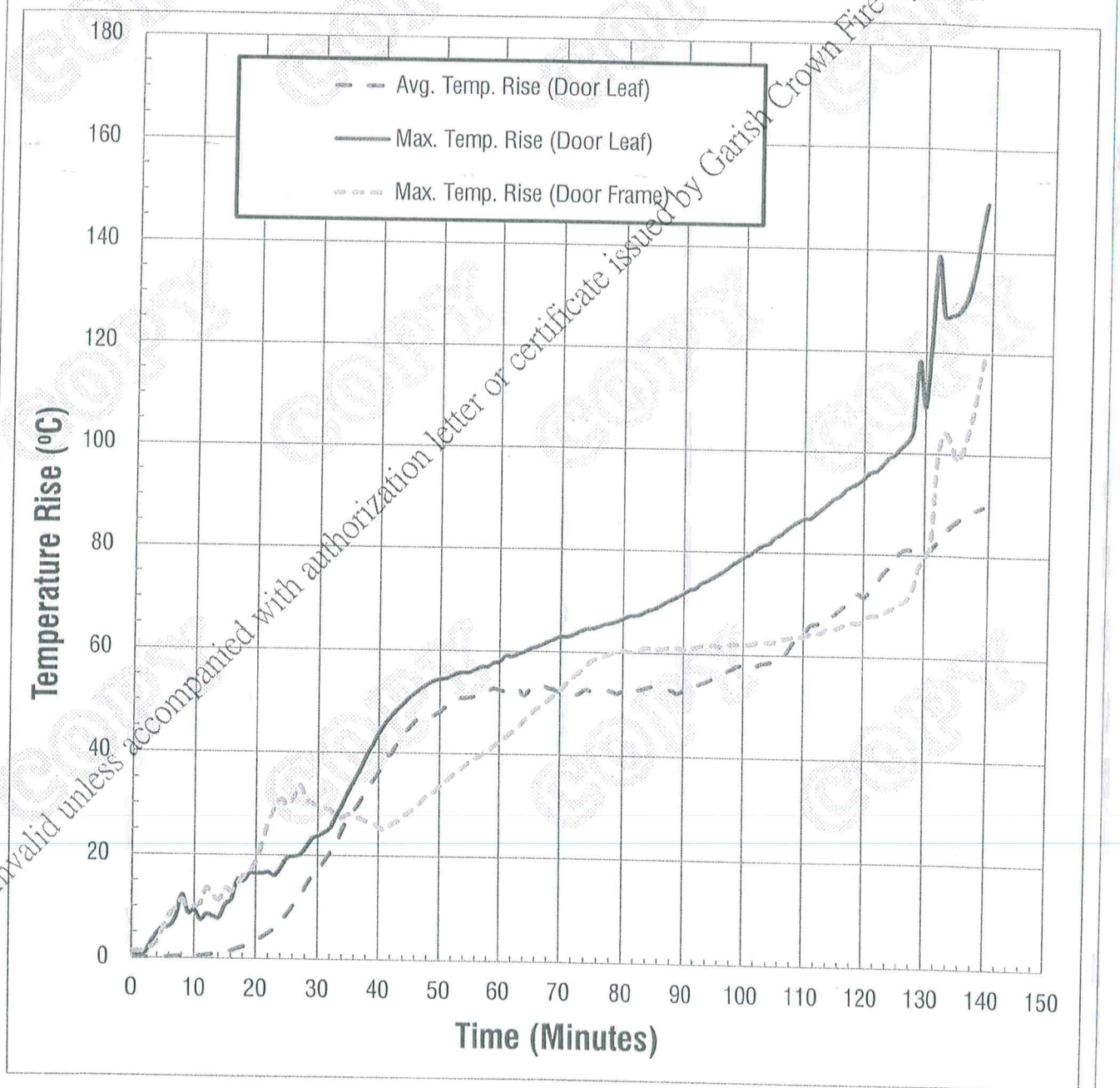
6.4 Unexposed Surface Temperature Rise

6.4.1 Fixed Surface Thermocouples – Door Leaf and Door Frame

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

Fire board was applied on to the glazed element of the specimen on 120 minute of test; therefore the data obtained from thermocouple (U34 & U35) was discarded afterward.

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



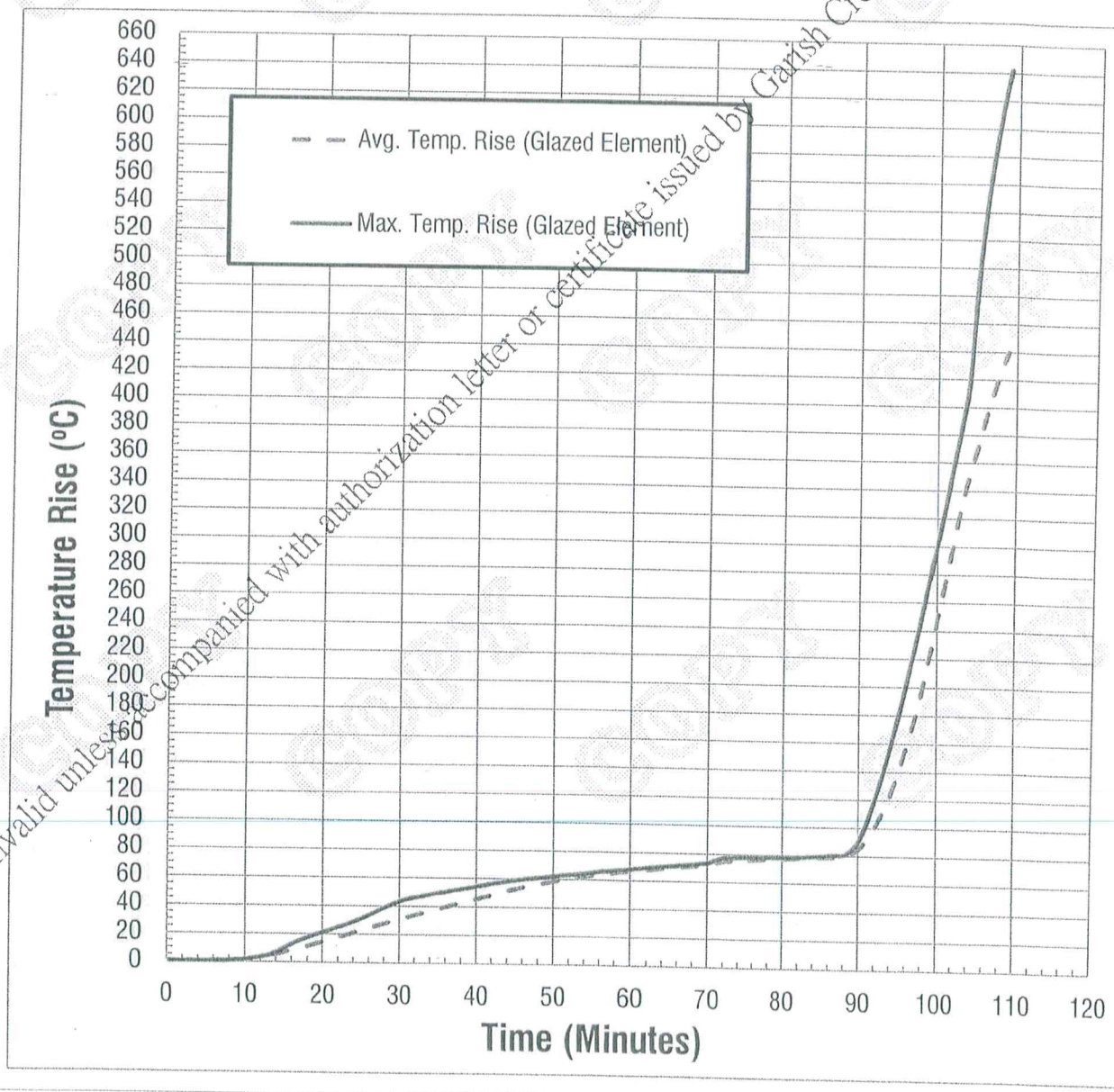
6.4.2 Fixed Surface Thermocouples – Glazed Element

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

The thermocouples on the glazed element was damaged on 109 minute of test, therefore no data was obtained from the thermocouple afterward.

The average temperature rise of the glazed element measured at 95 minute of test was 140.7°C which was in excess of 140°C limit. The maximum temperature rise of the glazed element measured at 95 minute of test at U45 was 181.4°C which was in excess of 180°C limit.

Figure 7. Average and maximum temperature rise on the glazed element 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 - Fire board was applied on to the glazed element of the specimen on 120 minute of test; therefore the data obtained from thermocouples (U34 & U35) was discarded afterward.

NA - The thermocouples (U44 to U47) on the glazed element was damaged on 109 minute of test; therefore no data was obtained from the thermocouple afterward.

Temperature outputs from unexposed surface temperature U31 to U40

Time (min)	U31	U32	U33	U34	U35	U36	U37	U38	U39	U40
0	13.9	13.8	14.7	14.5	14.7	14.8	15.2	14.6	15.1	13.5
10	14.5	14.2	15.1	14.9	15.0	15.4	15.4	18.4	15.7	15.3
20	17.5	16.8	17.8	18.0	18.7	18.2	17.9	18.7	17.3	23.2
30	31.9	24.8	31.3	35.4	33.8	30.1	30.7	26.6	24.4	30.9
40	49.3	40.2	48.6	58.2	57.0	44.1	45.3	41.6	32.9	38.6
50	64.0	50.8	60.9	67.8	68.8	56.3	55.8	57.6	39.9	47.9
60	68.8	59.5	65.1	69.5	70.7	62.6	62.2	66.5	41.1	56.7
70	69.3	55.9	66.1	70.0	70.8	64.0	64.6	70.3	42.6	66.8
80	68.8	57.4	67.0	70.4	70.7	65.5	66.4	71.5	42.5	74.6
90	69.2	57.6	67.5	70.9	71.3	66.4	68.8	72.1	43.4	75.1
91	69.1	59.1	67.8	70.6	71.4	65.9	69.6	71.9	45.5	75.5
92	69.2	60.8	68.4	70.7	71.5	65.8	69.3	71.7	45.0	75.6
93	69.5	60.8	69.7	71.2	71.7	66.8	69.4	71.9	43.2	75.9
94	69.4	61.6	71.8	71.1	71.7	67.0	69.6	72.4	44.1	76.0
95	69.5	61.1	74.7	71.4	71.7	67.0	69.6	72.6	43.8	76.2
100	69.9	63.3	82.2	72.6	72.5	66.9	71.1	72.7	46.6	76.4
110	73.8	68.6	89.7	81.1	78.9	73.7	78.9	76.3	44.3	77.4
120	86.6	84.8	86.4	90.4	91.1	88.4	78.3	86.6	49.1	79.4
130	100.1	97.3	86.6	Discard	Discard	91.6	81.5	102.8	77.4	83.6
135	106.1	103.0	94.2	Discard	Discard	81.1	87.3	130.0	128.1	88.7
136	107.1	104.2	96.0	Discard	Discard	81.2	88.6	135.5	132.7	89.7
137	107.2	105.3	97.2	Discard	Discard	81.3	90.4	134.1	138.3	90.7
138	107.3	104.8	98.5	Discard	Discard	81.5	91.8	138.5	132.2	92.6
139	107.6	104.4	100.1	Discard	Discard	82.2	94.3	146.8	131.7	92.7

Temperature outputs from unexposed surface temperature U41 to U51

Time (min)	U41	U42	U43	U44	U45	U46	U47	U48	U49	U50	U51
0	13.8	13.8	15.6	13.5	13.9	12.7	12.2	13.0	13.6	13.2	12.6
10	14.4	24.4	16.1	15.2	15.4	14.2	14.0	17.8	14.0	23.7	13.4
20	15.8	33.1	17.2	27.5	28.2	26.5	34.8	20.2	17.7	30.8	19.5
30	20.4	43.9	23.1	43.8	44.9	42.7	57.0	27.2	25.6	38.1	30.6
40	27.2	39.8	31.1	58.3	59.9	57.9	67.9	37.8	37.1	54.1	46.6
50	37.6	41.1	40.0	70.6	73.8	70.5	75.9	50.6	50.6	67.5	62.6
60	50.5	44.3	50.5	79.0	81.5	79.4	81.7	59.5	63.4	72.3	71.1
70	62.9	51.4	56.4	84.6	87.0	85.0	86.4	64.7	70.9	77.3	75.5
80	68.6	59.0	61.6	90.3	91.9	90.3	91.4	69.7	75.3	81.0	79.4
90	71.1	70.9	70.1	93.1	104.2	92.0	95.2	73.2	78.6	86.1	81.8
91	71.6	71.7	70.2	93.6	116.8	92.1	95.4	74.7	79.5	86.8	82.4
92	71.4	72.3	64.5	95.1	132.8	92.4	95.7	75.7	79.3	87.2	82.9
93	71.7	72.7	61.7	98.2	150.3	93.5	97.0	76.9	79.8	88.2	83.2
94	71.8	73.4	62.3	103.7	170.0	96.6	99.1	77.9	80.0	88.7	83.4
95	72.0	73.7	61.7	111.9	191.2	104.3	102.0	79.1	80.5	89.5	83.9
100	73.1	75.9	72.6	207.1	314.4	216.3	203.9	83.9	84.9	93.4	86.2
110	77.2	78.1	65.1	NA	NA	NA	NA	95.4	94.4	101.1	91.3
120	80.0	81.3	44.7	NA	NA	NA	NA	105.7	95.9	109.3	98.9
130	80.5	93.8	32.5	NA	NA	NA	NA	115.8	107.0	123.6	112.3
135	83.0	113.0	107.1	NA	NA	NA	NA	110.2	109.6	142.4	137.7
136	83.4	116.1	113.3	NA	NA	NA	NA	110.2	112.0	144.9	138.0
137	83.9	121.0	118.6	NA	NA	NA	NA	112.2	108.2	149.7	143.3
138	85.7	128.0	117.7	NA	NA	NA	NA	113.7	108.8	157.0	143.9
139	86.3	134.0	122.4	NA	NA	NA	NA	114.5	110.9	163.8	145.9

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.

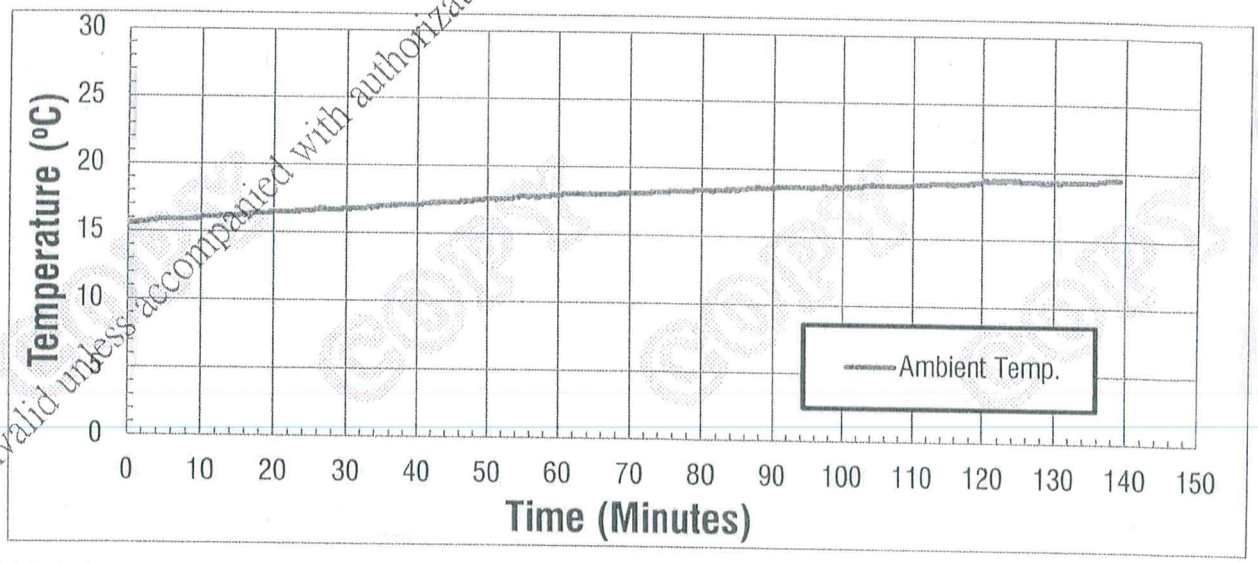
Time (min)	Pressure	Time (min)	Pressure	Time (min)	Pressure
6	0.7	55	2.0	105	1.0
10	-0.2	60	-0.4	110	0.6
15	0.5	65	-1.4	115	-0.9
20	0.2	70	-0.9	120	-0.2
25	0.3	75	-1.3	125	-0.5
30	-1.0	80	1.0	130	-0.3
35	-0.7	85	0.2	135	1.7
40	1.2	90	0.3	139	-0.7
45	0.5	95	-0.1		
50	0.8	100	-0.6		

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
D11	+0	+7	+5	+8	+8	+8	+8	+7
D12	+0	+1	+1	+1	+1	+1	-4	-4
D13	+0	+8	+21	+28	+39	+48	+46	+45
D14	+0	+5	+10	+15	+18	+17	+16	+18
D15	+0	+7	+9	+12	+15	+17	+19	+20
D16	+0	+4	+3	+6	+6	+4	+6	+7
D17	+0	+0	+1	-2	-2	-6	-6	-8

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.
13.54	Interlayer of the glass panes reacted.
20.17	The glass pane turned yellowish white. Staining mark appears at upper part of the left hinged edge and the head of the door frame.
30.00	**No integrity failure had occurred.**
31.26	Smoke release reduced.
60.00	**No integrity failure had occurred.**
61.30	Smoke released from the lockset position. The dark staining mark appeared around the lockset.
70.08	The area of staining mark around the cylinder lock expanded.
72.30	A red spot was observed on the glass pane.
78.47	The red spot at the glass pane turned milky again
85.00	The middle of the door leaf bended towards into the furnace.
88.02	The middle portion of glass pane turned dark and red.
90.00	**No integrity failure had occurred.**
90.11	Red spots were observed on the middle right portion of the glass pane.

Time (min.sec)	Observation Cont'd (from unexposed side)
94.56	The area of the red sport on glass pane enlarged.
102.54	The smoke release from lockset reduced. No crack on the glass pane.
106.43	More Red spots was observed on the glass pane and most of the interlayer of the glass pane was turned to black colour. Cotton fibre pad test was carried out at middle of the glass pane. No flaming or glowing was observed on the cotton pad. Smoke staining mark appeared at the top left corner of the door leaf.
112.43	Cotton fibre pad test was carried out at middle of the glass pane. No flaming or glowing was observed on the cotton pad.
118.52	Black staining mark was observed above the glazed element.
119.55	Cotton fibre pad test was carried out at middle of the glass pane and the cotton pad was flaming. **INTEGRITY FAILURE OCCURRED.**
120.05	Stataining flaming appeared at the glazed element. Fire board applied to cover the glazed element at requeste of the Sponsor. **FIRE RESISTANCE EVALUATION ON DOOR CEASED.**
130.00	Black staining mark was observed at the top hinged edge.
139.13	**Test was terminated at request of the Sponsor.**

6.9 Photos

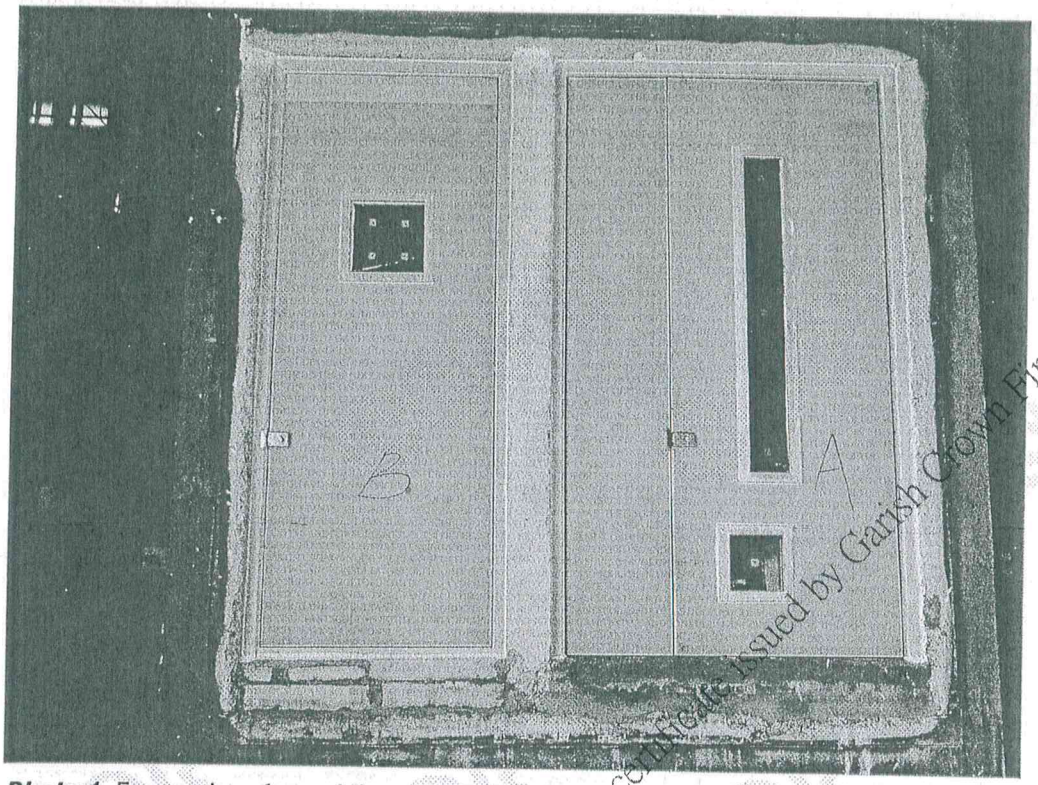


Photo 1. Exposed surface of the specimen before test. (Left: Door B; Right: Door A)

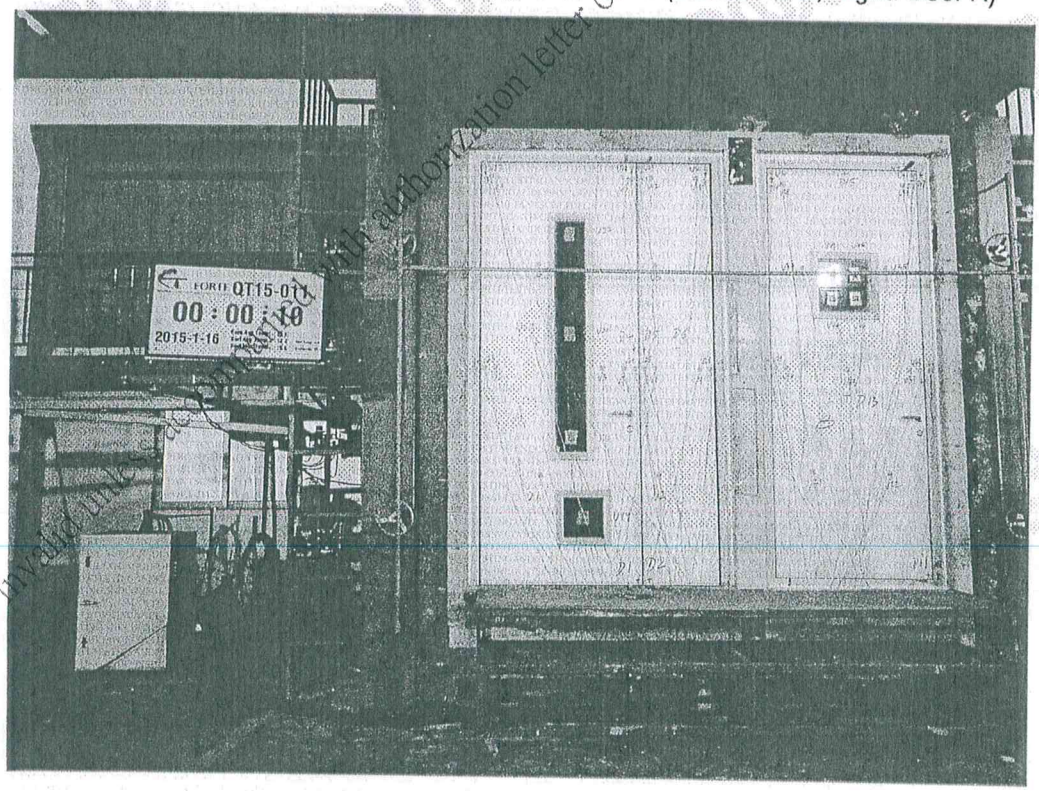


Photo 2. Unexposed surface of the specimen just after the commencement of test. (Left: Door A; Right: Door B)

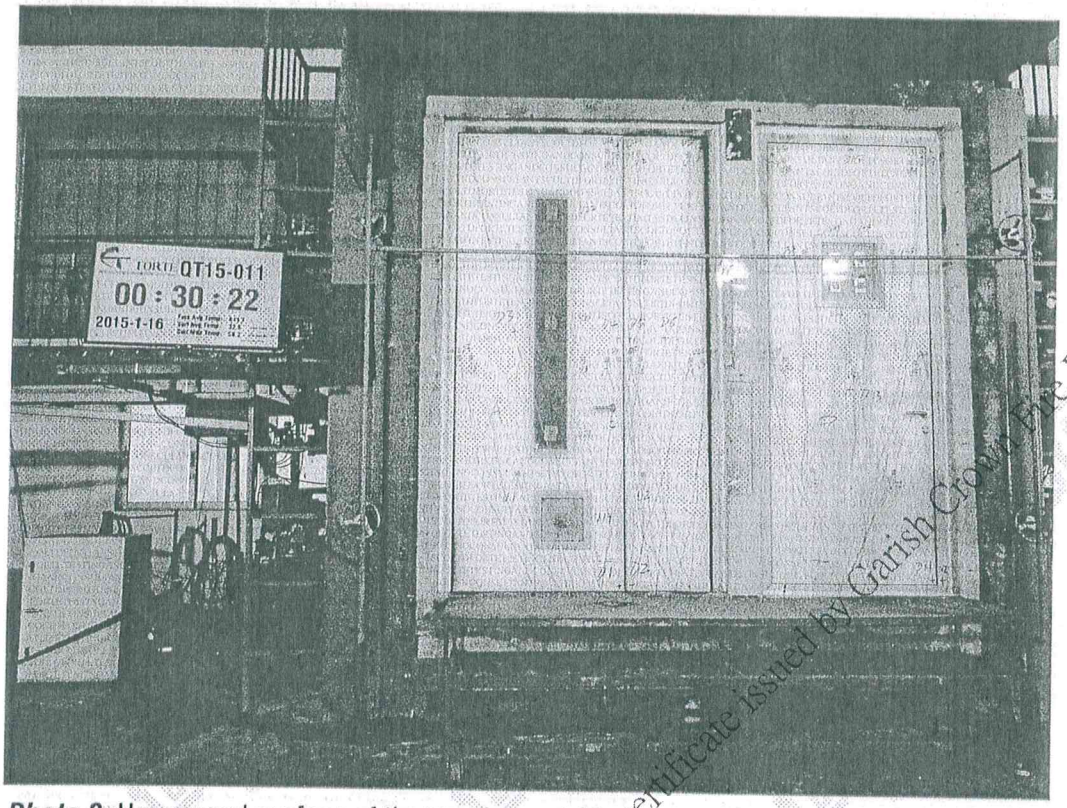


Photo 3. Unexposed surface of the specimen at 30 minute of test.

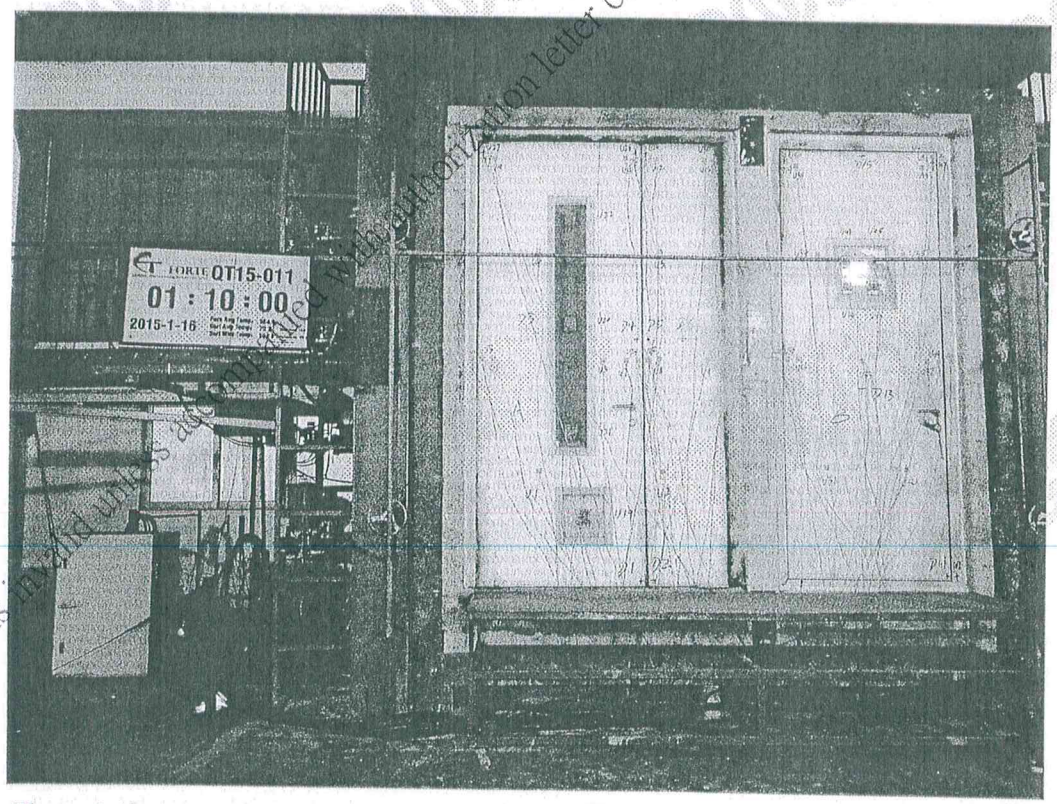


Photo 4. Unexposed surface of the specimen at 70 minute of test.

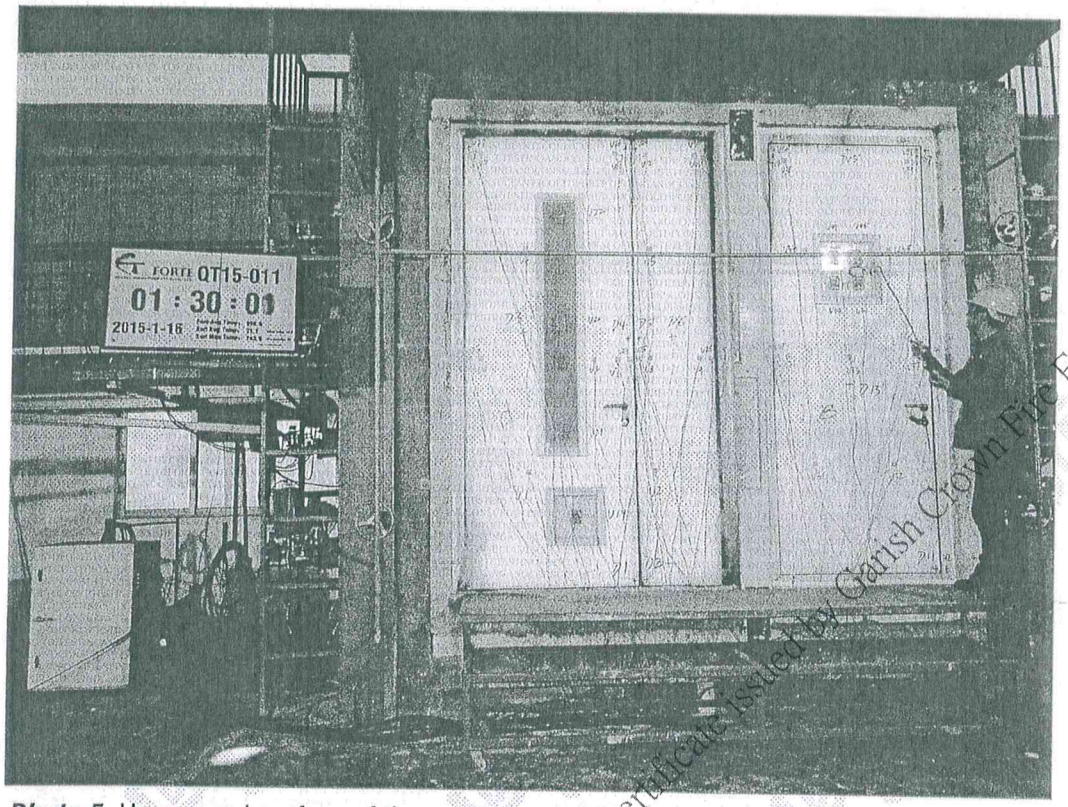


Photo 5. Unexposed surface of the specimen at 90 minute of test.

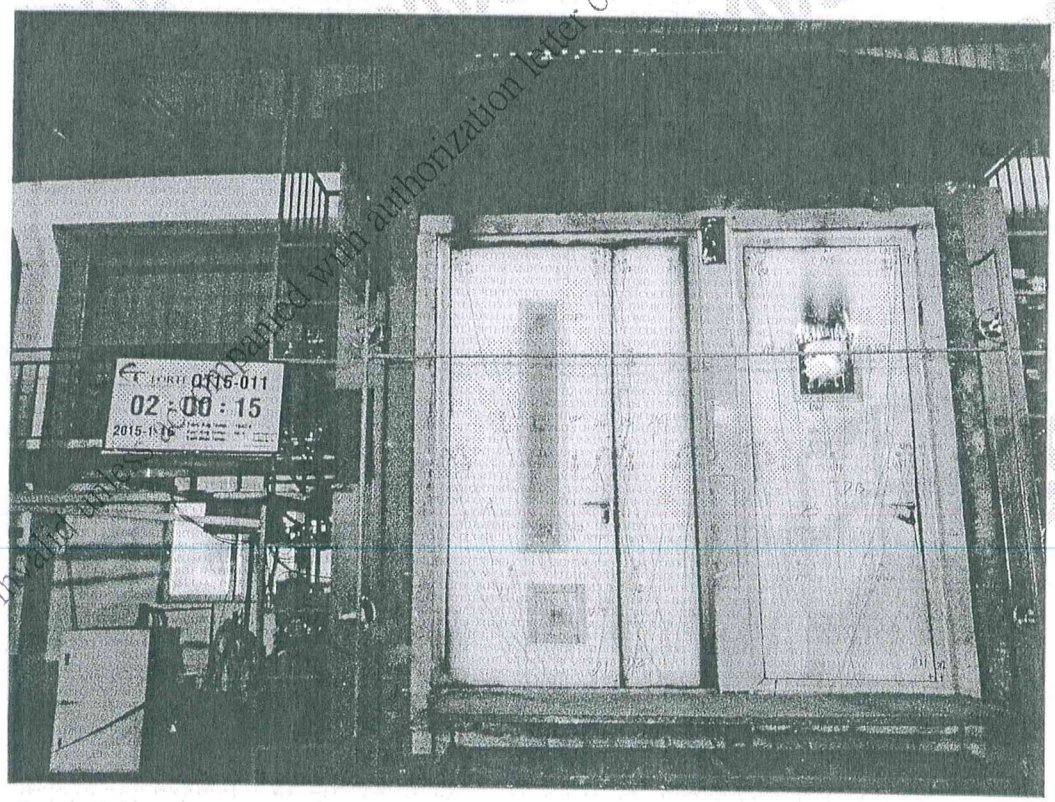


Photo 6. Unexposed surface of the specimen at 120 minute of test.

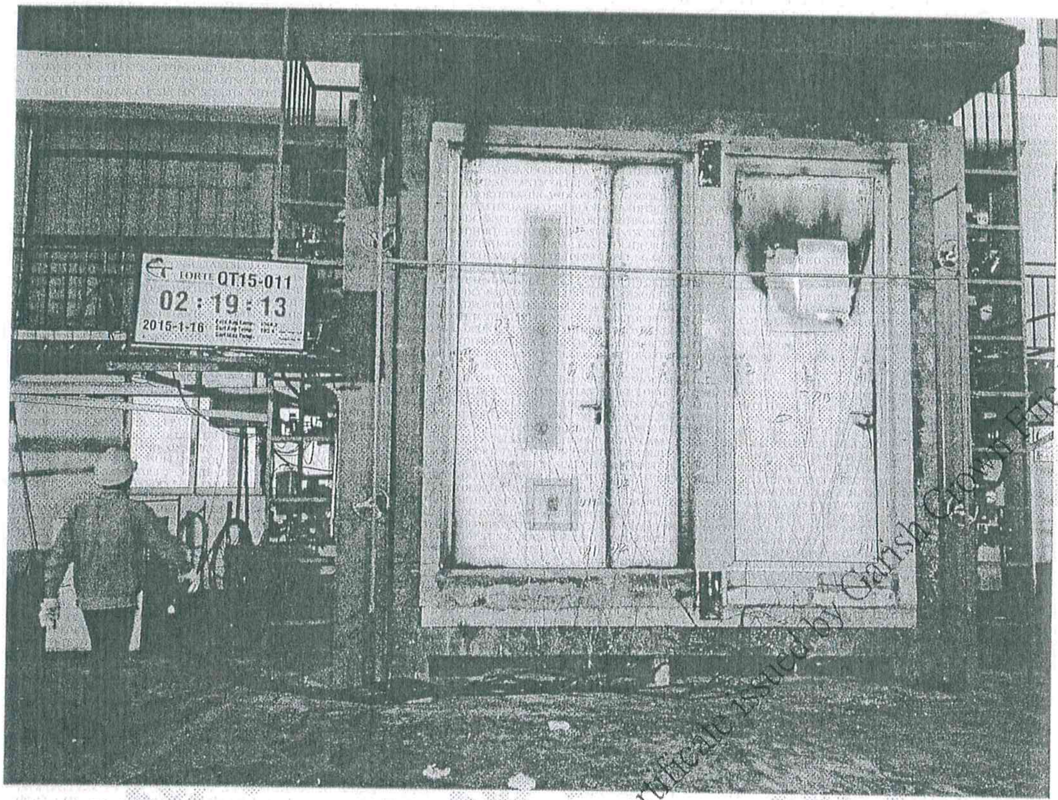


Photo 7. Unexposed surface of the specimen at the end of test.

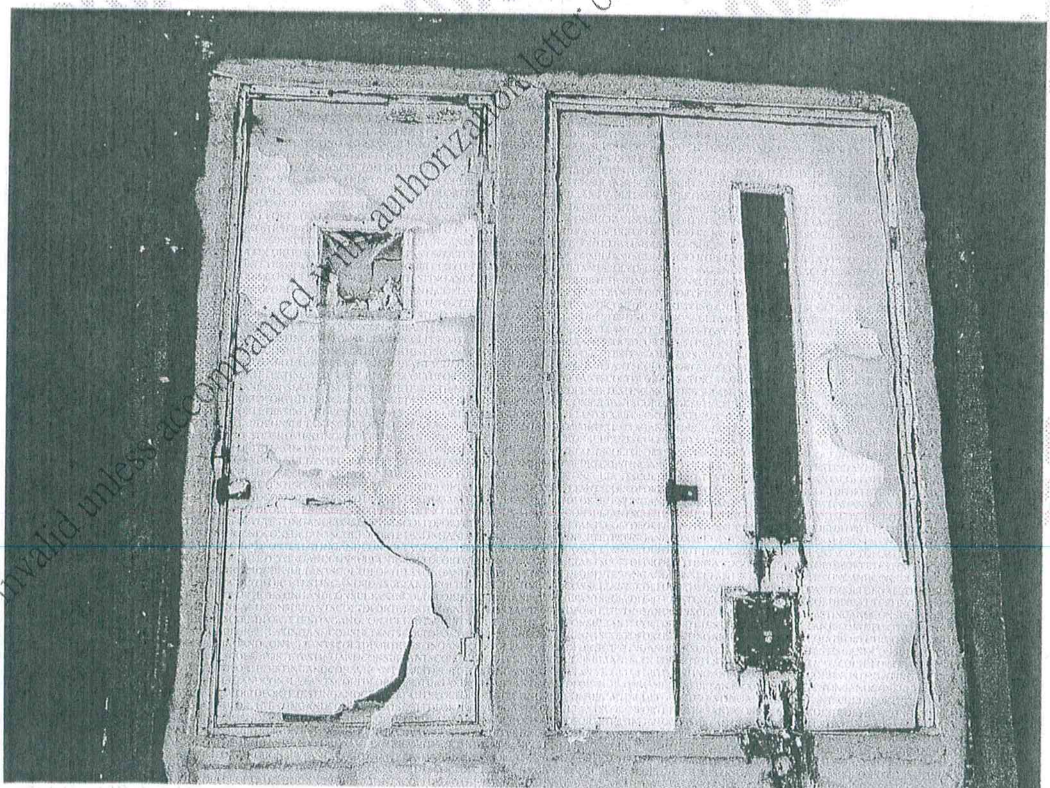


Photo 8. Exposed surface of the specimen after the test. (Left: Door B; Right: Door A)

7. Test Results

The fire resistance evaluation on Specimen, Door B, was ceased at 120 minute of test because fire board was applied on the glazed element of the specimen 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	120 minutes (No Failure)
Gap Gauge	Ø6 mm	Penetration of the gauge into the furnace through the specimen and movable along a 150 mm gap	120 minutes (No Failure)
	Ø25 mm	Penetration of the gauge into the furnace through the specimen	
Cotton Pad		Ignition of the cotton pad	119 minutes

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	119 minutes	
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 Leaf]	120 minutes (No Failure)
			[Glazed Element]	95 minutes
Maximum Temperature Rise **[Supplementary Procedure, I_1]**		An increase of temperature at any other point of the specimen above the initial average temperature by more than 180 °C	[Door Leaf]	120 minutes (No Failure)
			[Door Frame]	120 minutes (No Failure)
			[Glazed Element]	95 minutes

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.

END OF REPORT