

1. Scope of Test

This report was 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 single-leaf composite timber door with a glazed element and overhead panel, namely Door A, a single-leaf composite timber sliding door with air transfer grilles, namely Door B. This report was only record the results of Door A. The specimens were supplied for test by Garish Crown Fire Engineering & Consultancy, the Sponsor.

Door A achieved the following fire resistance:

INTEGRITY		(E)
	Sustained Flaming	135 Minutes
	Gap Gauge	135 Minutes
	Cotton Pad	135 Minutes
INSULATION		(I)
Door Frame	Max. Temp. Rise (I ₁)	135 Minutes
Door Leaf	Average Temp. Rise	135 Minutes
	Max. Temp. Rise (I ₁)	135 Minutes
Glazed Element and Glazed Overhead Panel	Average Temp. Rise	135 Minutes
	Max. Temp. Rise	135 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		
ID no. of the Specimen:	Door A: QT19-052A; Door B: QT19-052B		
Date Received:	2019-04-13		
Test Number:	QT19-052		
Date Tested:	2019-04-23	Start Time:	17:05
Test Operator from FORTE:	Ms. Cheng San Mei, Sammi		
Witness of the Test:	Mr. Ho Siu Ping – Official Delegate of the Sponsor		
Report Issue Record:	Version 1 – 2019-08-30		

3. Construction Details of Specimen

3.1 Specimen Description

3.1.1 Door Frame

The overall size of the composition door frame was 1200 mm (width) x 2740 mm (height). The sectional dimensions of the L-profile door frame and share transom were 65 mm (w) x 100 mm (thickness) with 25 mm (depth) rebate. The framework of transom with rectangular profile had sectional dimensions of 46 mm (w) x 100 mm (t).

The door frame fixed onto the test supporting frame by $\phi 10$ mm x 50 mm (length) door frame anchor at approximate 385 mm to 535 mm center to center. There were 4 numbers of fixing at each jamb and 1 number at head.

30 mm (w) x 4 mm (t) intumescent seal with 2 mm intumescent pad underling was centrally fitted into the groove along each jamb. The door frame was made of timber post, fire board any plywood and head of door frame. Smoke seal was fitted along the rebated corner of the door frame.

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

3.1.2 Door Leaf

The specimen comprised of a door leaf sized 1114 mm (w) x 2240 mm (h) x 100 mm (t).

The stiles, rails and mid-rail were made of 2 x 25 mm (w) timber slabs. The space between stiles and rails were filled with 33 mm (t) timber strips. The door leaf was made by fire board sub-facing, rockwool, steel plate, acoustic mat and medium density fibre board. 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 door lipping was made of 10 mm (t) timber strip.

30 mm (w) x 4 mm (t) intumescent seal and 15 mm (w) x 4 mm (t) intumescent seal with 2 mm intumescent pad underling were centrally fitted into the groove along each jamb vertical and horizontal edges of the door leaf. Concealed drop seal was centrally fitted into the groove along bottom edge of door leaf.

3.1.3 Glazed Element

The specimen was comprised of one glazed element with a visual size of 250 mm (w) x 1800 mm (h). The glazed element was installed at 200 mm away from the top edge and 200 mm away from the leading edge of the door leaf.

The glazed element consisted of 42 mm (t) interlayered glass pane.

The glass panes were lined with 3 mm (t) ceramic fibre tapes on both sides along the edges. It was clamped by 1.2 mm (t) steel plates, steel angles and glazing beads sizes 20 mm (width, parallel to the glass) x 13.5 mm (thickness, perpendicular to the glass). The steel plates, steel angles and glazing bead were fixed to the stiles and rails for glazed element by self-tapping screws on both sides at approximate 130 mm – 280 mm centre to centre. The gaps between glazing beads and glass pane were caulked with fire sealant.

3.1.4 Glazed Overhead Panel

The glazed overhead panel had visual size of 1070 mm (w) x 354 mm (h). The glazed element comprised of a piece of 42 mm (t) laminated glass pane. The glass panes were lined with 3 mm (t) ceramic fibre tapes on both sides along the edges. It was clamped by 1.2 mm (t) steel plates, steel angles and glazing beads sizes 25 mm (width, parallel to the glass) x 20 mm (thickness, perpendicular to the glass on fire exposed side) and 43 mm (thickness, perpendicular to the glass on fire unexposed side). The steel plates, steel angles and glazing bead were fixed into the perimeter frame on both sides at approximate 200 - 280 mm center to center. 12 mm thick sign board was fixed into the aperture of overhead panel on the unexposed fire side. The gaps between glazing beads and glass pane were caulked with fire sealant.

3.1.5 Ironmongery

The door leaf was supported onto the door frame by 4 numbers of butt hinge. The top and bottom hinge was 180 mm away from the top and the bottom rim of the door leaf respectively. The maximum distance between hinges was 795 mm.

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

A surface mounted door closer was installed at the top edge of the door leaf on the fire exposed side.

A concealed bottom drop seal was installed along the bottom edge of the door leaf.

An exit sign light box was installed at the top edge of the overhead panel on the fire exposed side.

Intumescent material was applied at the concealed faces of the ironmongeries.

3.2 Material Schedule

Parts Specifications were provided by the Sponsor.

Italics: Information checked by FORTE.

Door Frame

Supplier:	Garish Crown Fire Engineering & Consultancy
Material:	Timber (Hardwood)
Overall Sizes:	1200 mm x 2740 mm
Sectional Dimensions:	65 mm x 100 mm / 46 mm x 100 mm
Rebate:	25 mm
Density:	550 – 700 kg/m ³
Connection Method of Head to Jamb:	Mitred Joint with Tongue and Groove and Fixed by Wood Screws
Gap Filling between Door Frame and Sub-frame:	Ceramic Fibre and Lined Up with Fire Sealant
Fixing method to Concrete Supporting Frame:	Wood Screws and Metal Pins

Intumescent Seal - Door Frame

Supplier:		Garish Crown Fire Engineering & Consultancy
Brand:		Ying Mu
Head & Jamb	Model:	YM3004
	Sizes:	30 mm x 4 mm

Intumescent Material – Smoke Seal

Supplier:	Garish Crown Fire Engineering & Consultancy	
Brand:	Ying Mu	
Model:	YM1212	YM1502
Sizes:	12 mm x 12 mm	15 mm x 4 mm
Location Applied:	Framework Rebate Corner	Door Leaf Edge

Door Leaf Lipping

Supplier:	Garish Crown Fire Engineering & Consultancy
Material:	Timber (Hardwood)
Thickness:	10 mm
Density:	550 - 700 kg/m ³

Door Leaf Facing

Supplier:	Garish Crown Fire Engineering & Consultancy
Material:	Plywood
Thickness:	3 mm
Density:	450 - 550 kg/m ³

Door Leaf

Supplier:		Garish Crown Fire Engineering & Consultancy
Overall Sizes:		1114 mm x 2240 mm
Nominal Thickness:		100 mm
Measured Thickness:		102.81 mm
Stiles and Rails	Material:	Wooden Slabs
	Width:	Main Stiles and Rails – 25 x 3 mm; Mid Rails – 25 mm
	Thickness:	33 mm
	Density:	350 - 450 kg/m ³
	Moisture Content:	12 – 17 %
Core	Material:	Fireproof Rockwool
	Thickness:	33 mm
	Density:	100 kg/m ³
	Moisture Content:	12 – 17 %
Other Composite Materials	Plywood Facing:	3 mm + 3 mm
	Rockwool:	20 mm
	Medium Density Fiber:	3 mm + 3 mm + 4 mm + 5 mm
	Acoustic Mat:	3 mm + 3 mm
	Metal Plate:	1.2 mm + 1.2 mm + 2 mm
	Magnesium Oxide:	3 mm + 5 mm + 5 mm + 3 mm

Fire Board

Supplier:	Garish Crown Fire Engineering & Consultancy
Description:	Magnesium Oxide
Thickness:	3 mm & 5 mm
Nominal Density:	950 kg/m ³

Glazing Element

Supplier:	Shenzhen Zhongxinchang Technology Company Limited
Brand:	YM
Combination of the Glass Pane:	3 Layers of 8 mm Clear Glass + 2 Layers of 8.5 mm Intumescent Gel
Nominal Thickness:	42 mm
Measured Thickness:	42.12 mm(at Door Leaf); 42.31 mm(at Overhead)
Full Sizes:	290 mm x 1840 mm (Door Leaf) 1110 mm x 394 mm (Overhead)
Visual Sizes:	250 mm x 1800 mm 1070 mm x 354 mm
Glass Edge Covering Depth:	20 mm
Fixing Method:	Set and Lined with Mineral Wool then Clamped with 1.2 mm Metal Plate & angle and Timber Glazing Beads on Both Sides

Glazing Bead

Supplier:	Garish Crown Fire Engineering & Consultancy
Material:	Timber (Hardwood)
Sizes:	20 mm x 13.5 mm
Density:	550 - 700 kg/m ³
Fixing Method:	By Self-tapping Screws at Maximum 200 - 280 mm Centre to Centre

Glazed Element - Fixing Angle

Supplier:	Garish Crown Fire Engineering & Consultancy	
Material:	Steel	
Sizes:	50 mm x 17 mm x 1 mm	17 mm x 15 mm x 1 mm
Fixing Method:	Self-tapping Screws at Maximum 200 mm Centre to Centre	

Lock

Supplier:	ABS Building Product Company Limited
Brand:	Glutz
Model:	4829
Material:	Steel
Sizes:	99 mm x 165 mm

Electric Strike

Supplier:	ABS Building Product Company Limited
Brand:	Locktronix
Model:	ES-770
Material:	Steel
Sizes:	124 mm x 32 mm x 33 mm

Hinge

Supplier:	ABS Building Product Company Limited
Brand:	ABS
Model:	HIAB00455 (SS-CC010)
Material:	Stainless Steel
Sizes:	114 mm x 114 mm x 3 mm

Door Closer

Supplier:	Garish Crown Fire Engineering & Consultancy
Brand:	YING MU
Model:	7300 EN2-4
Material:	Precise Cast Aluminum Body & Steel Arm

Intumescent Pad

Supplier:	Garish Crown Fire Engineering & Consultancy
Brand:	Ying Mu
Thickness:	2 mm

Fire Sealant

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

Exit Sign Light Box

Supplier:	Garish Crown Fire Engineering & Consultancy
Brand:	Melite
Model:	MISE-4808-03

Sign Board

Supplier:	Garish Crown Fire Engineering & Consultancy
Material /Thickness :	12 mm thick Plywood

Acoustic Mat – Door Leaf

Supplier:	Garish Crown Fire Engineering & Consultancy
Brand / Model:	Not Provide
Thickness	3 mm

Metal Plate – Door Leaf

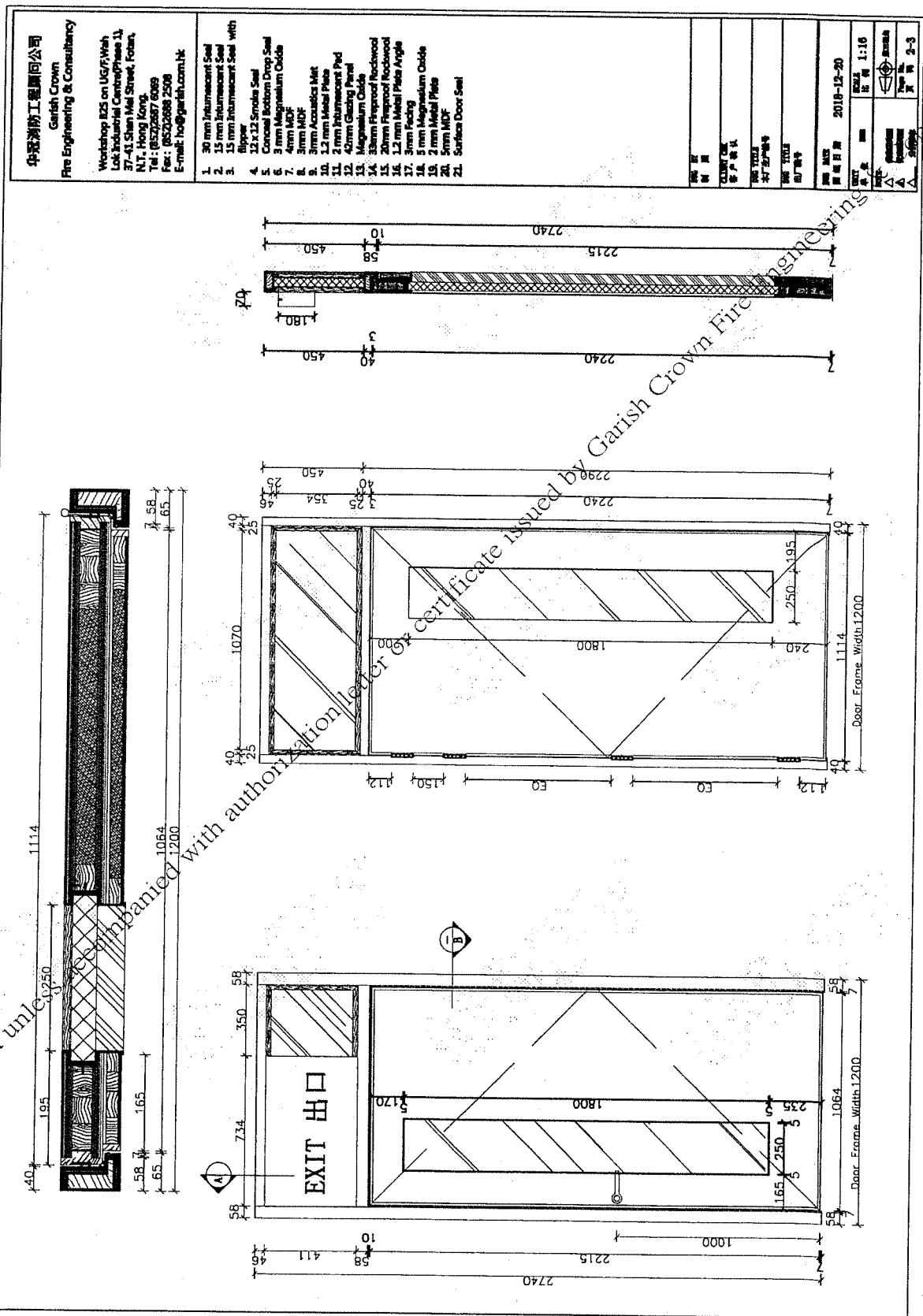
Supplier:	Garish Crown Fire Engineering & Consultancy
Thickness	1.2 mm

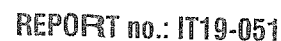
Glue

Supplier:	Garish Crown Fire Engineering & Consultancy
Type:	木膠粉

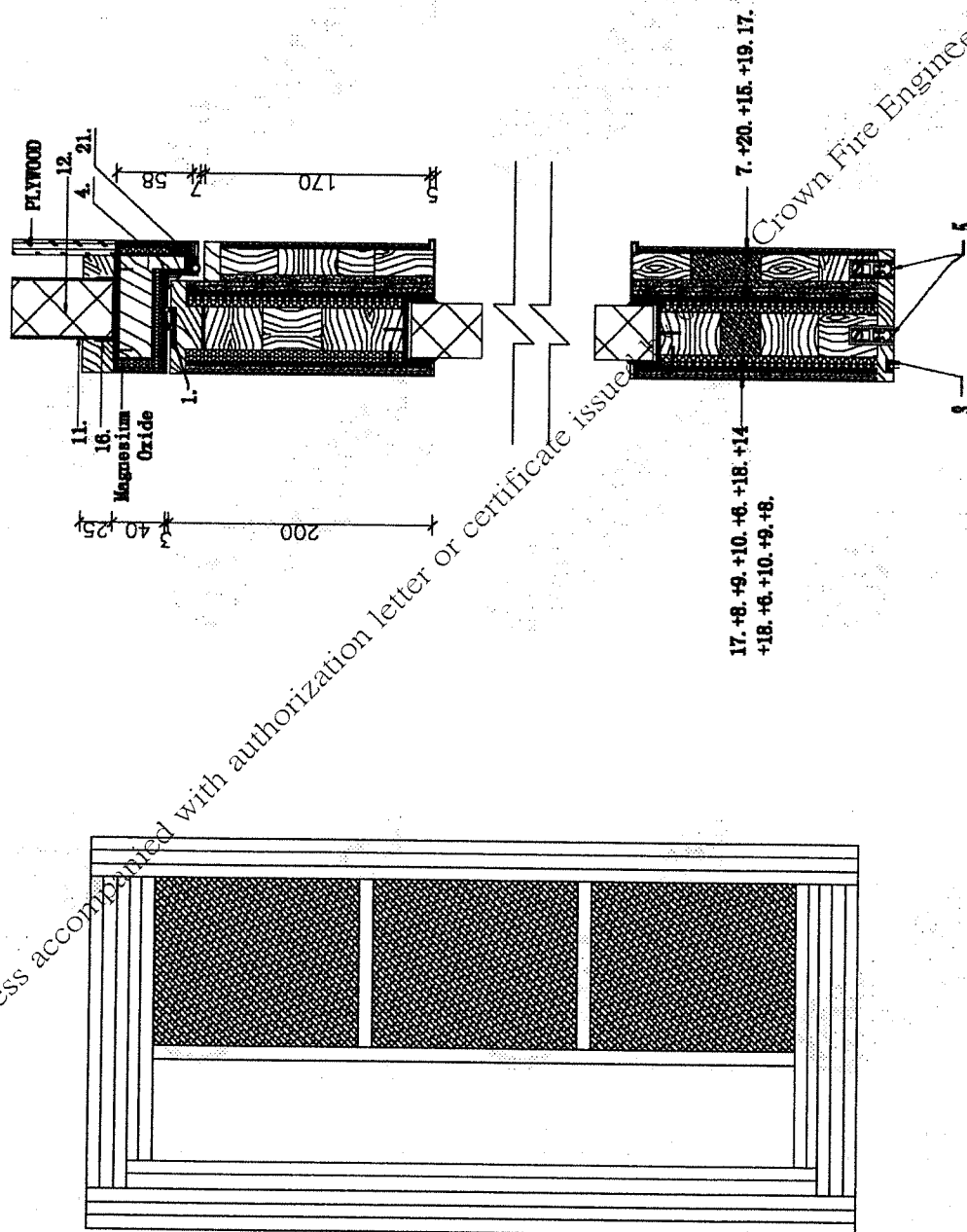
3.3 Drawings on the Specimen provided by the Sponsor (Total 2 pages)

Drawings provide by the Sponsor (1)





Drawings provide by the Sponsor (2)



4. Specimen Condition

4.1 Selection of the Specimen

The specimen were 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

A specimen was transferred to the Test Location on 2019-04-13 by the Sponsor.

Parts of the manufacturing processes were over seen by FORTE delegates.

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. The concrete slabs formed a structural opening 1240 mm (w) x 2780 mm (h) for Door A

4.4 Installation of the Specimen

The specimen were assembled and installed by workers delegated by the Sponsor from 2019-04-15 to 2019-04-18.

4.5 Specimen Conditioning

The specimen was stored in the Test Location from 2019-04-13, the date which specimen was received, to 2019-04-23, the date which fire resistance test performed.

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

Ambient Temperature (°C)	Relative Humidity (%)
27.3 ± 5	75 ± 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.

Door A: The door were UNLOCKED and UNLATCHED during the test.

5. Test Method

5.1 Pre-test Conditioning

The pre-test conditioning of each specimen was carried out on 2019-04-22 prior to the fire test with reference to BS EN 1634-1: 2008 and clause 5.1.1.1 and 5.1.1.3, BS EN 14600: 2005.

Operability test of the specimen:

Each specimen should be tested for operability in the fire test frame by operating from fully closed to fully open at 90 degrees for 25 cycles.

Shakedown conditioning for core material:

Due to the material of the door core was friable material. The specimen should be subjected to 5000 cycles of operation prior to the fire test.

Self-closing for doorsets without coordinating devices:

Each specimen had each leaf opened to $10^{\circ} \pm 2^{\circ}$ and held for $20\text{s} \pm 2\text{s}$ and then without shock and allowed to closed at the speed between one-tenth of the leaf width per second up to a maximum leading edge speed of 300 mm/s.

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 were shown in *Figure 1*.

5.4 Door Gaps

The widths of frame-to-leaf or leaf-to-leaf gaps were measured after the door assembly and prior to the test. Measurement positions were shown in *Figure 2*.

5.5 Unexposed Surface Temperature

The unexposed surface temperatures of the specimen were measured by 37 numbers of type K thermocouples.

The temperature rise was calculated by subtracting the initial average temperature from the unexposed temperature measured. Door A was evaluated against the maximum temperature rise criterion given by supplementary procedure – Classification I₁ 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 were shown in *Figure 3*.

The locations of thermocouples were explained in the following table.

Thermocouple	Area	Description
Door A	U1 – U5	Door Leaf
	U12 – U15; U25 – U28	Door Leaf
	U16 – U21	Framework
	U22	Glazed Element
	U23 – U24	Glazed Element
	U29 – U31	Overhead Panel
	U32 – U43	Overhead Panel
		(Supplementary Procedure, I ₁)

5.6 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.

5.7 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 were shown in *Figure 4*.

The diagram illustrates the layout of the furnace opening, which is a square with dimensions of 3120 mm by 3120 mm. The layout includes nine plate thermocouples (represented by small squares) and one pressure probe (represented by a small circle). The pressure probe is located at the bottom center, with a vertical distance of 500 mm from the bottom edge. The plate thermocouples are arranged in a 3x3 grid. A legend on the right side of the diagram identifies the symbols: a square for 'Plate Thermocouples (Furnace)' and a circle for 'Pressure Probe'.

The diagram illustrates a door assembly with the following components and dimensions:

- Components:** Glass pane, Leaf, and Door.
- Dimensions:** A, B, and C.
- Labels:** Glass pane, Leaf, Door, A, B, C.

The diagram shows a cross-section of a door assembly. The top part is a glass pane, followed by a leaf, and then the door. The dimensions A, B, and C are indicated by arrows. A is the width of the leaf, B is the height of the leaf, and C is the height of the door. The labels 'Glass pane', 'Leaf', and 'Door' are placed next to their respective components. The labels 'A', 'B', and 'C' are placed next to their respective dimension arrows.

Figure 3. Positions of fixed surface thermocouples (U) on Door A.

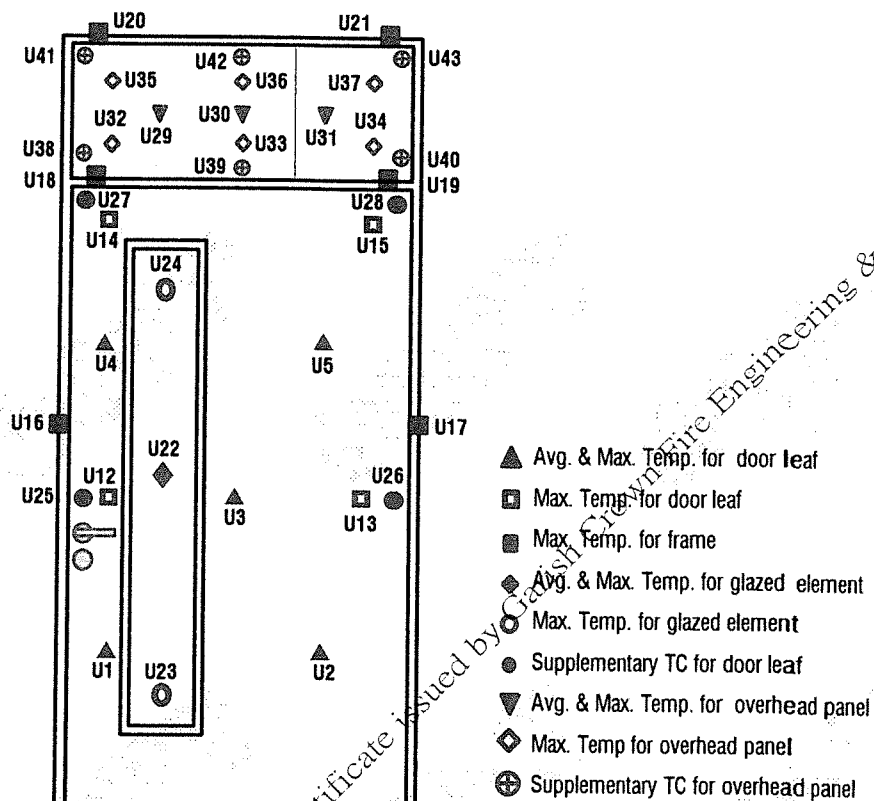
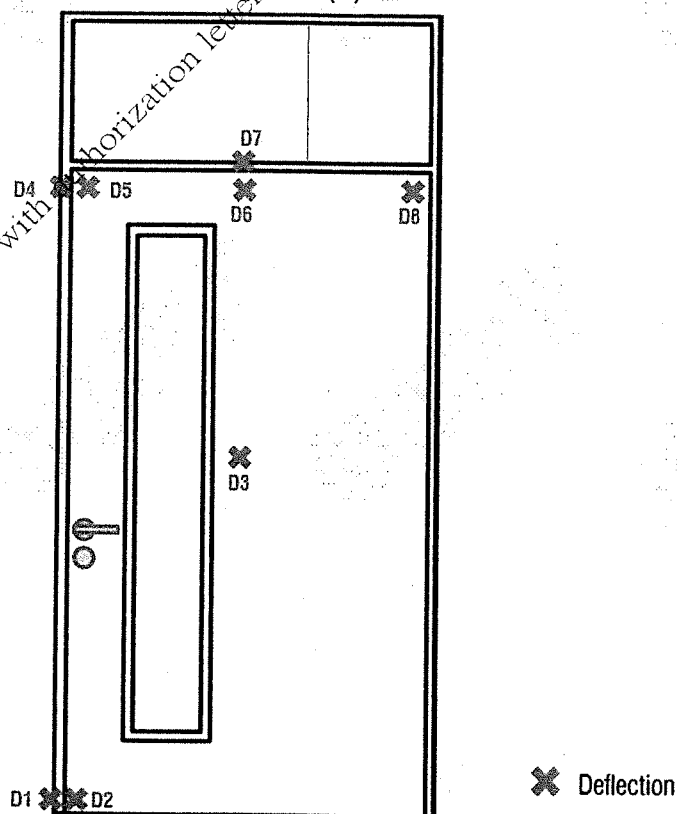


Figure 4. Positions of deflection measurement points (D) on Door A.



6. Test Data

6.1 Retention Forces and Pre-Conditioning of the Specimen

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

Leaf	Push	Pull
Door A	45.1 N	47.6 N

Operability test of the specimen:

Each specimen had been tested for operability in the fire test frame by operating from fully closed to fully open at 90 degrees for 25 cycles. Closing speed of each specimen without coordinating devices:

Leaf	Leading Edge Speed (mm/s)
Door A	131.97

6.2 Gaps Measurement

Primary gaps of the specimen were measured according to *BS EN 1634-1: 2008* clause 10.1.2 "There shall be minimum of three measurements made along each side, top and bottom of each leaf. Measurements to determine the gaps shall be made at distances not greater than 750 mm apart."

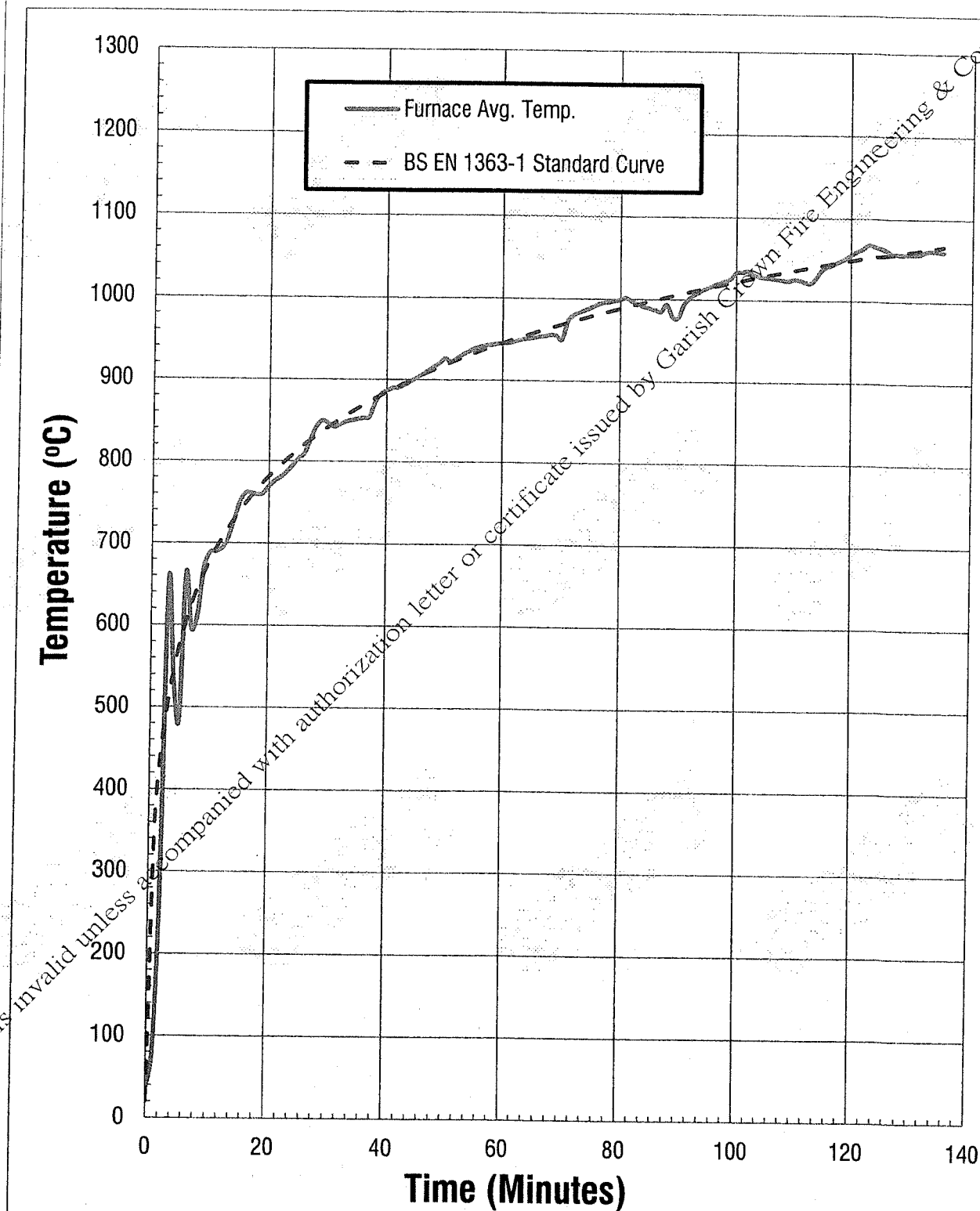
The measured record was summarized to the minimum, maximum and average value in the following table. Measurements were taken in mm.

Gap		Measured		
		Minimum	Maximum	Average
Door A	A	2.2	5.4	3.8
	B	2.6	7.0	4.8
	C	3.0	6.8	4.1
	X	2.2	6.6	3.6
	Y	2.5	7.5	3.9

6.3 Furnace Temperature

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

Figure 5. Furnace average temperature over the test period.

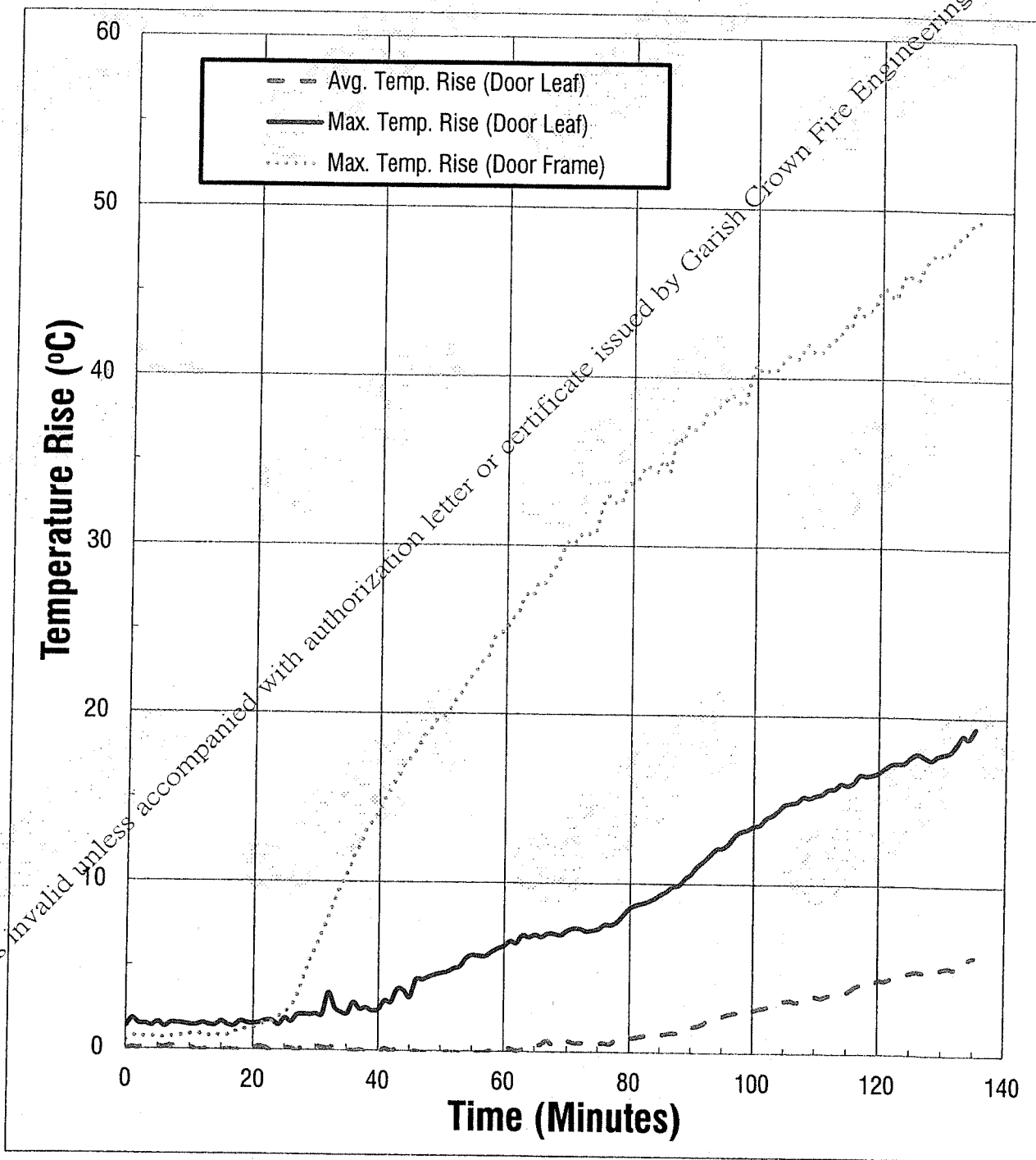


6.4.1 Door A

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 were shown in *Figure 6*.

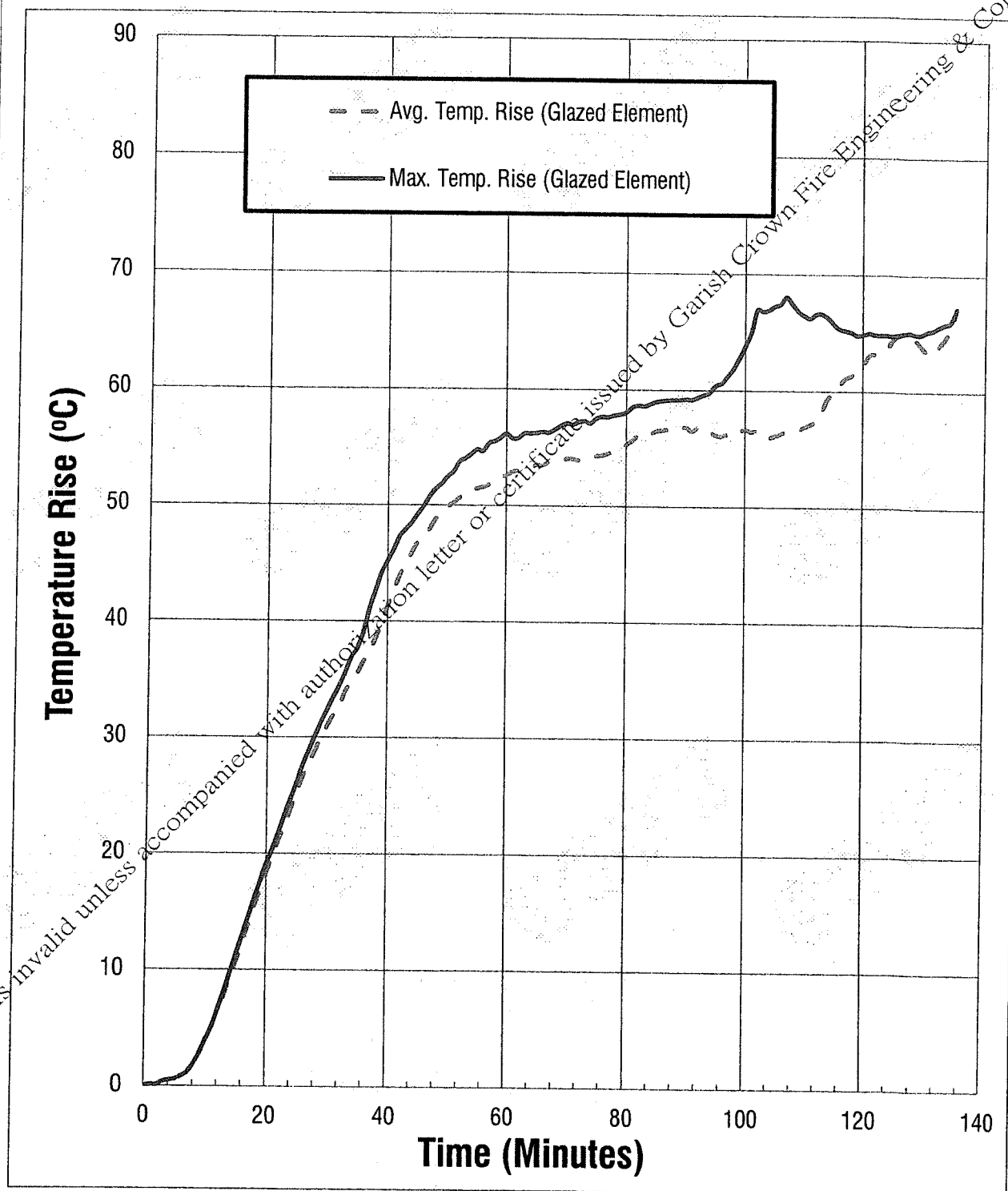
Figure 6. Average and maximum temperature rise on door leaf and door frame of Door A over the test period.



6.4.1.2 Fixed Surface Thermocouples – Glazed Element

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

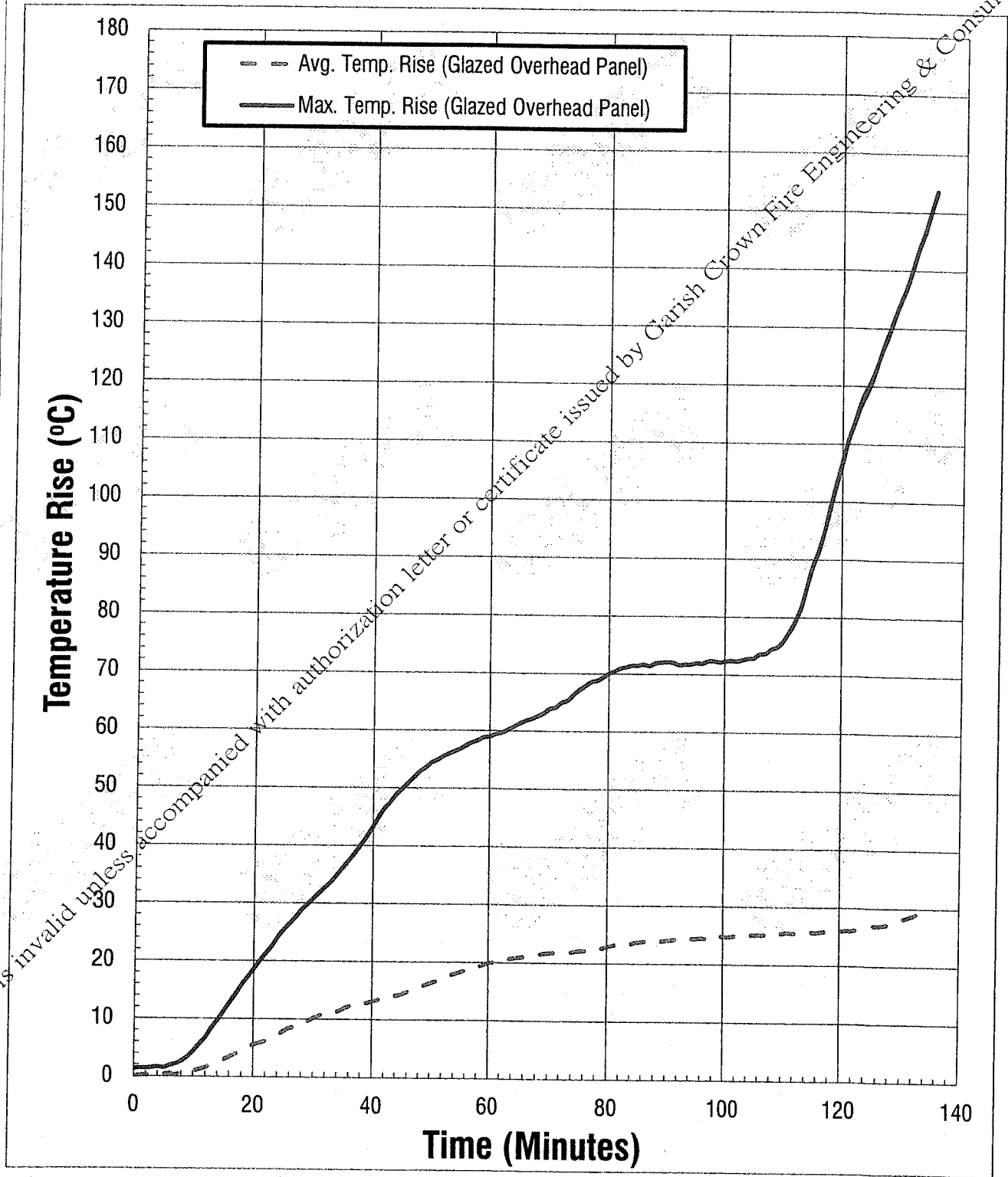
Figure 7. Average and maximum temperature rise on the glazed element of Door A over the test period.



6.4.1.3 Fixed Surface Thermocouples – Glazed Overhead Panel

The temperature rises of unexposed surface of glazed overhead panel of Door A measured by fixed surface thermocouples over the test period were shown in *Figure 8*.

Figure 8. Average and maximum temperature rise on the glazed overhead panel of Door A over the test



6.4.2 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.

Temperature outputs from unexposed surface temperature U1 to U5 & U12 to U17

Time (min)	U1	U2	U3	U4	U5	U12	U13	U14	U15	U16	U17
0	30.1	29.9	30.0	30.5	30.5	30.3	30.3	30.1	29.7	28.9	29.6
10	30.2	30.2	30.2	30.6	30.6	30.4	30.5	30.5	30.1	29.2	30.1
20	30.3	30.0	30.1	30.7	30.5	30.7	30.5	30.6	30.1	29.3	30.1
30	30.3	30.2	30.3	30.6	30.8	31.0	30.5	30.5	30.0	29.4	36.4
40	29.9	29.4	30.5	30.4	30.4	31.3	30.1	30.2	29.7	29.6	44.5
50	29.9	29.2	30.5	30.5	30.5	32.1	30.1	30.4	29.9	31.4	50.0
60	30.4	29.4	30.6	30.8	30.5	32.9	30.4	31.0	30.8	33.9	54.2
65	30.6	29.8	30.1	31.1	31.0	33.7	31.1	31.7	31.5	35.9	56.3
70	31.5	29.5	31.0	31.6	30.6	34.2	30.6	31.9	31.5	37.9	57.3
75	31.0	29.4	30.9	32.2	30.0	34.8	30.8	32.2	31.7	39.2	57.5
80	31.6	29.6	31.1	32.2	30.8	35.5	31.6	32.9	32.7	41.5	59.3
85	31.6	29.6	31.4	32.3	31.3	36.0	31.7	33.5	33.1	43.7	60.3
90	31.9	30.0	31.9	33.0	31.8	36.9	32.5	33.9	33.8	46.1	61.2
95	32.4	30.7	32.6	33.7	32.4	37.7	33.3	34.7	34.6	47.9	62.6
100	33.1	31.0	32.8	34.4	32.3	38.6	33.5	35.3	34.9	49.6	63.3
105	33.8	31.1	33.3	35.0	32.9	39.4	34.2	36.2	35.7	51.2	64.3
110	34.5	31.2	34.0	35.7	32.7	40.5	34.5	36.9	36.1	52.8	65.0
115	34.6	31.5	34.4	35.9	32.9	40.9	35.1	37.4	36.7	53.7	65.6
120	35.9	31.9	35.1	37.0	33.1	42.2	35.8	38.3	37.4	55.2	66.8
125	36.2	32.4	35.7	37.6	33.4	42.6	36.5	38.8	37.9	56.1	67.7
130	36.8	32.1	36.0	38.3	33.4	42.8	36.5	39.4	38.3	56.9	67.7
131	37.0	32.0	36.1	38.5	33.4	42.8	36.5	39.5	38.3	57.1	68.1
132	37.1	32.0	36.0	38.3	33.4	43.4	37.0	39.8	38.7	57.5	68.6
133	37.4	32.7	36.4	38.8	33.8	44.2	37.4	40.2	39.0	58.1	68.7
134	37.1	33.0	36.6	38.8	33.9	43.5	37.5	40.0	39.1	57.6	68.9
135	37.4	33.0	36.7	39.0	34.1	44.0	37.7	40.2	39.2	58.4	69.0

Temperature outputs from unexposed surface temperature U18 to U28

Time (min)	U18	U19	U20	U21	U22	U23	U24	U25	U26	U27	U28
0	30.1	30.4	30.2	30.7	31.6	30.6	30.9	31.1	31.0	31.3	31.6
10	30.4	30.9	30.4	31.1	35.4	33.5	35.2	31.1	31.0	31.6	31.7
20	30.6	31.0	30.9	31.5	49.8	45.6	50.6	31.3	31.1	31.8	31.6
30	31.2	32.0	32.8	34.2	62.5	55.6	64.0	32.1	31.4	31.9	32.4
40	32.1	34.8	36.6	40.6	72.9	62.6	76.8	32.4	31.1	31.6	32.7
50	34.4	40.8	43.7	49.6	81.4	72.0	84.0	33.6	31.5	32.2	34.8
60	40.0	44.3	50.7	55.3	84.2	76.9	87.7	35.1	32.1	33.4	36.5
65	43.3	45.2	53.6	58.0	85.1	79.4	87.8	36.1	33.1	34.2	37.1
70	42.2	46.2	55.7	60.6	85.6	78.5	88.7	36.5	32.9	35.2	37.4
75	42.3	47.5	57.5	62.4	85.9	79.5	89.1	37.0	32.9	35.1	37.5
80	46.0	49.0	59.8	64.0	86.9	80.0	89.6	38.4	33.9	35.5	38.8
85	59.2	52.6	61.5	65.3	88.0	80.5	90.6	39.4	34.3	37.1	39.6
90	58.5	55.0	63.9	67.1	88.4	81.5	90.8	40.8	34.8	38.6	40.4
95	66.1	54.9	66.1	68.9	87.7	81.9	92.0	42.4	35.6	39.7	41.1
100	68.8	54.9	67.9	71.0	88.2	86.2	95.4	43.7	35.9	40.3	41.5
105	64.7	55.0	69.9	71.5	87.7	91.0	98.8	45.0	36.7	41.2	42.3
110	62.8	55.4	71.4	71.7	88.5	86.4	98.1	45.5	37.7	42.3	43.1
115	62.7	56.3	71.7	73.2	91.4	83.9	97.4	46.1	38.0	42.6	43.4
120	55.3	56.6	73.5	75.5	93.8	81.6	96.4	46.9	38.8	43.9	44.2
125	53.5	57.5	74.2	76.0	96.1	87.3	96.4	47.8	39.2	44.4	44.7
130	54.0	57.6	76.2	77.8	95.0	90.7	96.7	48.1	39.7	44.9	45.2
131	53.4	57.9	76.7	78.5	94.9	88.0	96.9	48.2	39.8	45.0	45.3
132	52.6	58.3	76.8	78.6	95.5	88.0	97.2	48.6	40.1	45.1	45.6
133	54.1	58.8	76.7	79.1	96.1	88.0	97.4	49.2	40.8	45.7	46.1
134	52.9	59.3	76.9	79.5	97.1	88.0	97.6	49.0	40.3	45.3	46.1
135	52.7	59.3	77.5	79.5	98.8	89.5	97.8	49.6	40.7	45.6	46.3

Temperature outputs from unexposed surface temperature U29 to U39

Time (min)	U29	U30	U31	U32	U33	U34	U35	U36	U37	U38	U39
0	32.0	31.2	32.4	30.3	30.8	32.5	30.8	30.5	33.2	30.4	30.0
10	32.0	31.6	34.7	30.5	31.0	35.6	31.1	30.7	36.2	30.5	30.2
20	33.0	32.2	47.0	31.3	31.5	49.0	32.3	31.7	50.5	30.8	30.4
30	35.2	33.7	57.1	32.4	33.2	60.8	34.8	33.9	62.8	31.6	31.2
40	36.7	35.0	63.5	31.9	34.6	68.6	37.8	36.4	71.3	33.0	32.0
50	38.8	36.7	69.1	33.4	36.4	74.2	41.2	39.1	79.6	35.1	33.7
60	40.9	38.6	76.0	35.7	38.4	80.5	44.4	41.8	86.3	39.3	36.0
65	41.7	39.3	77.3	36.1	39.6	82.4	45.9	43.3	87.8	41.4	37.1
70	42.7	39.7	78.4	36.3	40.3	83.4	47.1	44.3	89.1	39.5	37.7
75	42.8	39.9	79.1	37.8	40.7	84.3	48.1	45.2	90.0	39.8	38.3
80	43.7	40.5	80.2	44.9	41.3	84.5	48.9	45.8	90.4	42.3	39.2
85	44.2	41.1	81.3	37.7	41.6	85.1	49.6	46.6	91.0	53.4	39.8
90	44.7	41.1	81.9	37.0	42.1	85.6	49.9	47.0	91.6	58.0	40.4
95	45.3	41.5	82.0	37.4	42.4	85.8	50.4	47.7	91.4	57.0	40.8
100	45.5	41.4	83.1	39.9	42.6	86.3	51.1	48.0	92.4	49.3	41.5
105	46.0	41.5	83.5	40.9	42.7	86.6	51.6	48.3	95.1	53.9	42.1
110	46.4	41.3	84.3	40.2	42.9	86.8	52.4	48.5	98.7	51.6	42.5
115	46.5	41.5	84.9	40.7	43.3	86.9	53.1	48.9	98.8	54.4	43.0
120	47.2	41.6	84.9	40.4	43.3	87.3	53.2	49.2	65.6	62.8	43.1
125	47.5	42.2	86.8	41.0	44.7	88.5	53.3	49.6	52.1	60.7	46.8
130	47.5	42.6	89.8	40.9	44.9	90.8	53.5	50.1	49.9	55.8	47.3
131	47.8	42.6	90.4	40.5	44.8	91.8	53.8	50.1	51.7	55.5	46.2
132	47.8	43.2	90.9	41.4	47.0	92.6	54.1	50.4	51.8	54.5	50.0
133	48.3	43.8	90.9	41.8	47.7	93.2	54.2	50.8	51.8	58.9	49.2
134	48.3	43.6	90.6	41.8	46.3	93.6	54.2	50.4	53.2	56.9	47.9
135	48.4	43.5	90.8	41.6	46.3	94.1	54.2	50.5	54.2	55.6	48.3

Temperature outputs from unexposed surface temperature U40 to U43

Time (min)	U40	U41	U42	U43
0	30.9	30.2	30.1	31.7
10	33.8	30.3	30.2	35.0
20	46.7	30.9	30.8	49.0
30	59.3	32.7	32.8	62.6
40	70.7	34.8	35.1	75.2
50	82.2	37.7	37.7	86.3
60	86.6	41.3	40.7	90.9
65	87.7	43.0	42.4	93.2
70	88.2	44.4	43.7	95.7
75	88.6	45.9	44.7	99.0
80	90.1	47.9	45.8	101.9
85	91.1	49.0	47.1	103.3
90	92.4	50.4	47.7	104.0
95	94.9	51.7	49.0	103.8
100	97.0	52.7	49.6	104.2
105	98.2	53.8	50.2	104.8
110	98.9	54.0	50.8	107.7
115	99.7	53.9	51.2	120.5
120	101.2	55.2	51.8	138.7
125	101.1	55.5	51.7	155.2
130	100.9	56.6	52.5	169.0
131	100.7	56.9	52.5	172.2
132	100.8	57.1	52.8	175.7
133	100.8	57.3	52.9	178.5
134	101.4	57.5	52.7	182.0
135	101.8	58.1	53.0	185.5

6.5 Pressure

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

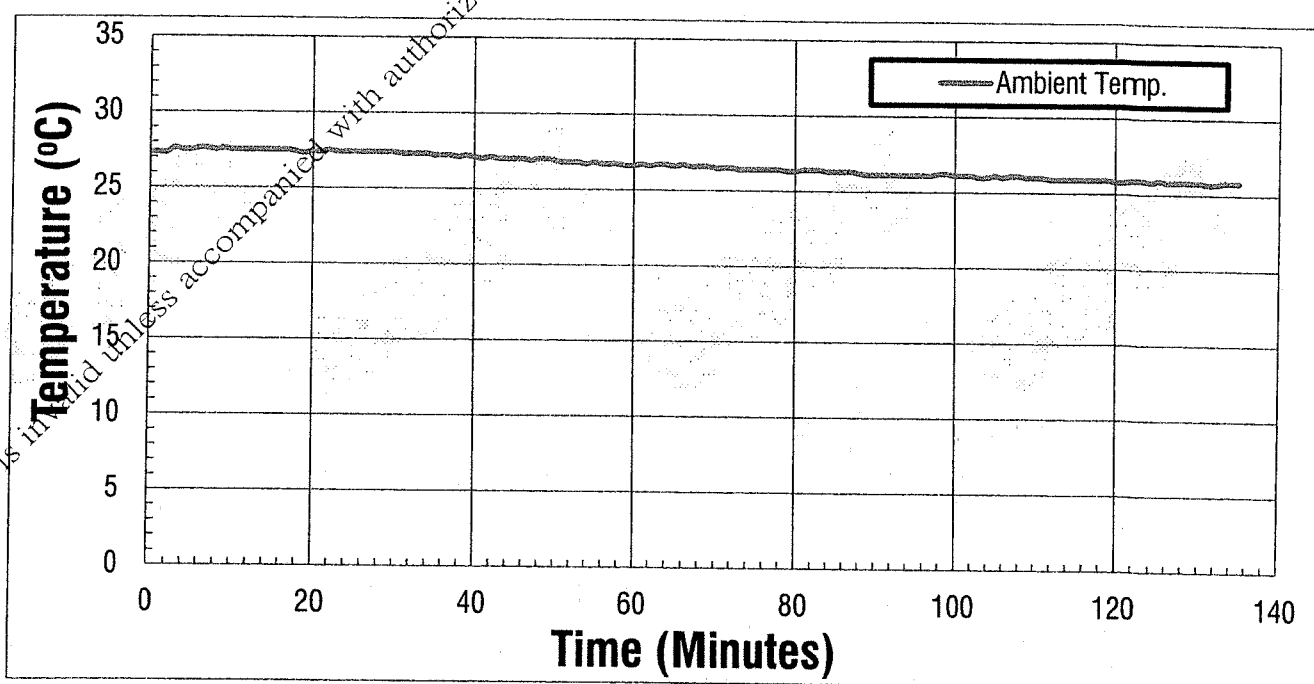
Time (min)	Pressure (Pa)	Time (min)	Pressure (Pa)
6	2.3	75	-1.8
10	1.4	80	-0.7
15	2.1	85	0.2
20	-0.7	90	0.9
25	-1.5	95	1.3
30	2.1	100	0.9
35	-0.3	105	1.8
45	0.1	110	-0.2
50	-2.6	115	-2.8
55	-0.7	120	-0.3
60	3.0	125	-0.1
65	-2.4	130	0.3
70	1.3	135	-1.1

6.6 Ambient Temperature

The ambient temperature over the test period was recorded and shown in *Figure 9*.

The ambient temperature at the commencement of test was 27.3 °C.

Figure 9. Ambient temperature over the test period.



6.7 Lateral Deflections

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

Maximum deflection of each specimen was BOLDED in the following table.

Position \ Time (min)		0	20	40	60	80	100	110	120	130
Door A	D1	+0	+3	+5	+5	+5	+5	+5	+5	+5
	D2	+0	+5	+5	+6	+7	+6	+5	+5	+5
	D3	+0	+10	+10	+10	+10	+17	+17	+17	+16
	D4	+0	+10	+13	+10	+8	+10	+13	+11	+10
	D5	+0	+5	+10	+8	+10	+5	+9	+5	+5
	D6	+0	+12	+14	+14	+14	+14	+14	+14	+14
	D7	+0	+7	+12	+12	+12	+12	+12	+12	+12
	D8	+0	+12	+14	+14	+14	+14	+14	+14	+14

6.8 Observations

Significant behaviours of the specimen during the test period were summarized in the following table. Photos taken during the test period were also attached.

Time (min.sec)	Observation (from unexposed side)
00.00	Test Started.
02.20	The interlayer of glass panels started reacted.
05.18	Light smoke released from top and vertical edges of the door leaf.
09.14	The interlayer of glass panels turn milky.
16.15	Area near the left side of the vision panel on the door leaf had stain mark.
20.30	The mid-height and the top edge of door leaf slightly bended towards the furnace.
30.00	No integrity failure had occurred.
49.40	Smoke released from the top right corner of door leaf with dark stain marks.
58.20	Cotton fibre pad test was carried out on area near door lock. No flaming or glowing on the cotton pad was observed.
60.00	No integrity failure had occurred.
60.30	The mid-height and the top edge of door leaf further bended towards the furnace.
90.00	No integrity failure had occurred.
110.30	The mid-height and the top left corner of door leaf further bended towards the furnace.
117.08	Cotton fibre pad test was carried out on the glass pane of the overhead panel. No flaming or glowing on the cotton pad was observed.
118.02	Cotton fibre pad test was carried out on the top left corner of the door leaf. No flaming or glowing on the cotton pad was observed.
120.00	No integrity failure had occurred.
135.31	Test was terminated at request of the Sponsor.

6.9 Photos

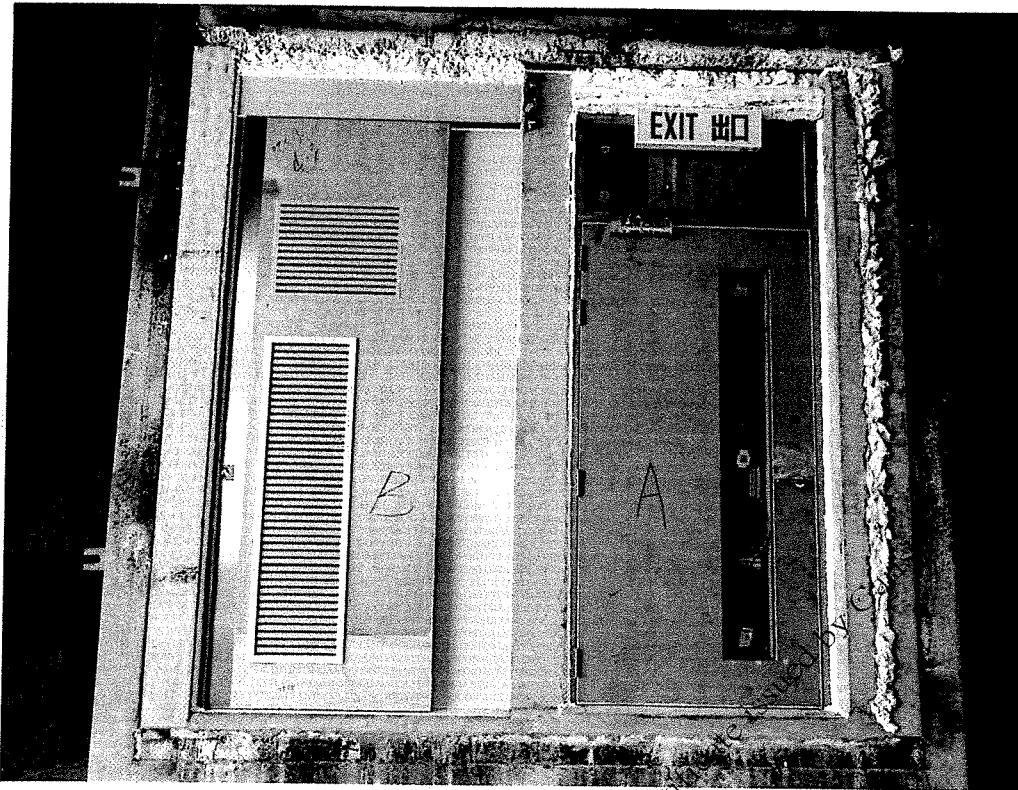


Photo 1. Exposed surface of the specimens before test. (Left: Door B; Right: Door A)

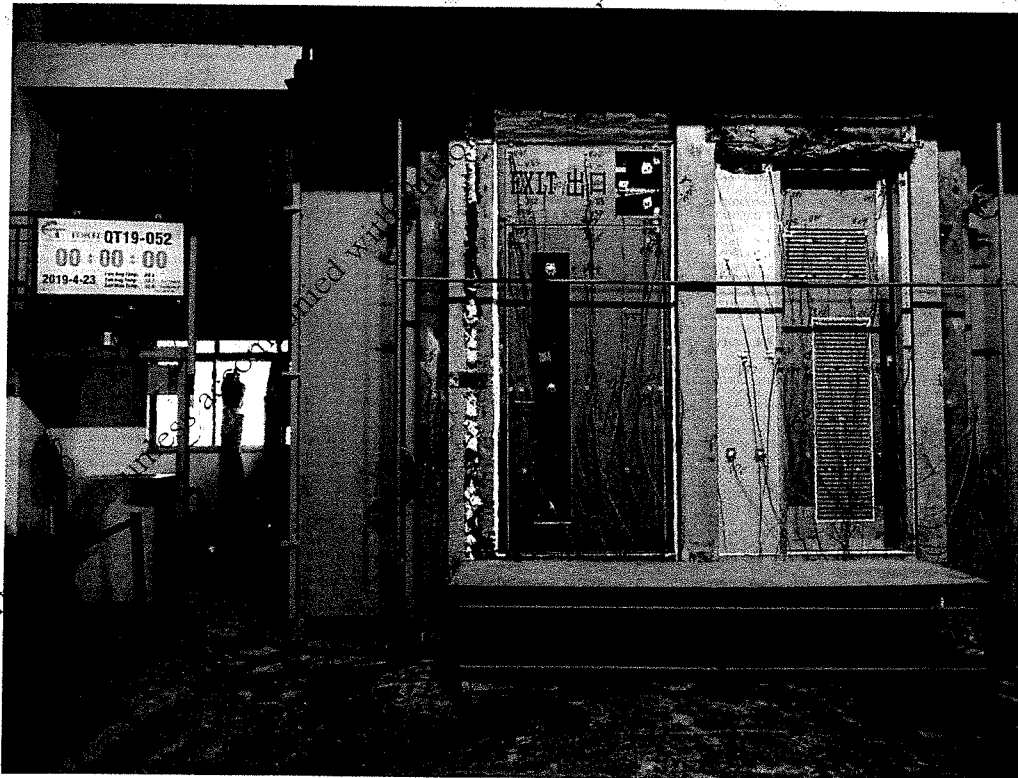


Photo 2. Unexposed surface of the specimens before test. (Left: Door A; Right: Door B)



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

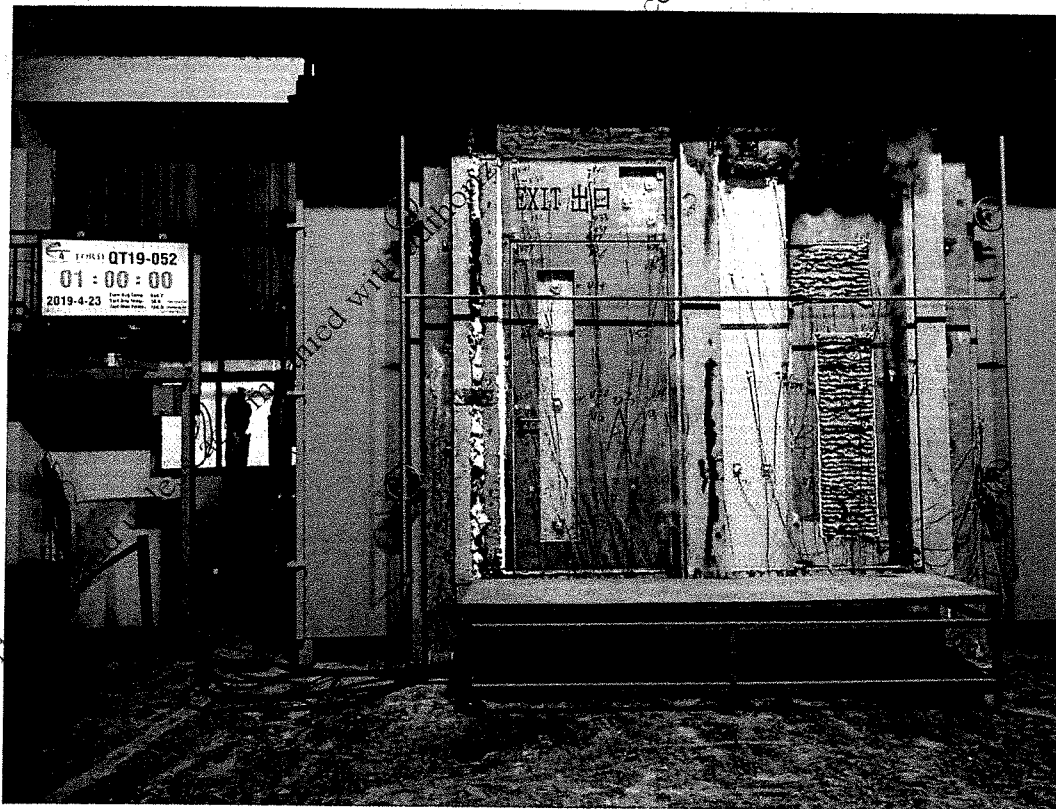
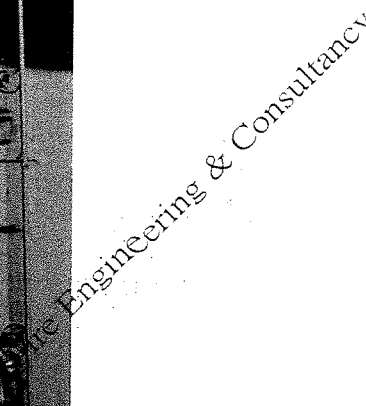


Photo 4. Unexposed surface of the specimens at 60 minutes of test.



90 minutes



Photo 6. Unexposed surface of the specimens at 120 minutes of test.



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

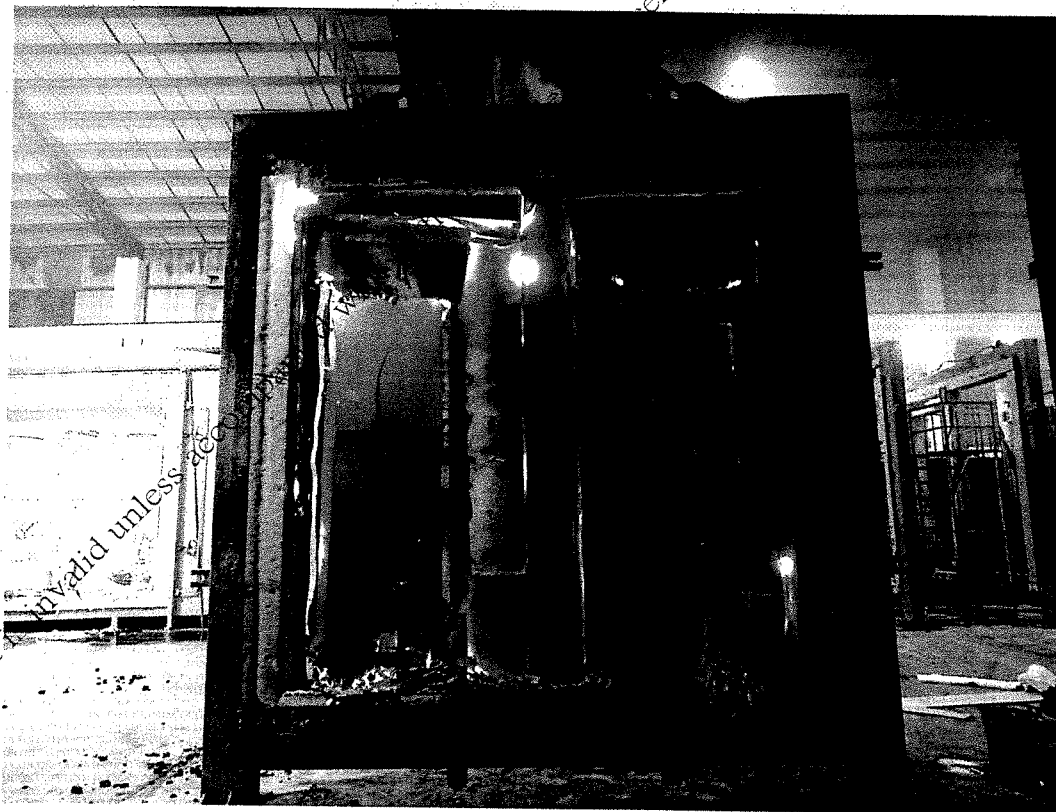


Photo 8. Exposed surface of the specimens at after test. (Left: Door B; Right: Door A)

7. Test Results

The test on Door A was terminated after a test period of 135 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 were 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	135 minutes (No Failure)
Gap Gauge	Ø6 mm	Penetration of the gauge into the furnace through the specimen and movable along a 150 mm gap	135 minutes (No Failure)
	Ø25 mm	Penetration of the gauge into the furnace through the specimen	
Cotton Pad		Ignition of the cotton pad	135 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	135 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 Leaf]	135 minutes (No Failure)
		[Glazed Overhead Panel]	135 minutes (No Failure)
		[Glazed Element]	135 minutes (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 Leaf]	135 minutes (No Failure)
		[Glazed Overhead Panel]	135 minutes (No Failure)
		[Door Frame]	135 minutes (No Failure)
		[Glazed Element]	135 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, and edge or end conditions other than those allowed under the field of direct application in the relevant test method was 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 was 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 were 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