FORTE
TESTING AND CONSULTANTS CO., LTD.

HOKLAS 191
TEST

FIRE RESISTANCE TEST REPORT

SINGLE-LEAF COMPOSITE TIMBER SLIDING DOOR with GLAZED ELEMENT and AIR TRANSFER GRILLES & SINGLE-LEAF COMPOSITE TIMBER DOOR with GLAZED OVERHEAD PANEL

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

Test Sponsor: **Garish Crown Fire Engineering & Consultancy**
Unit 25, Upper G/F., Block B, Wah Lok Industrial Centre (Phase 1),
37-41 Shan Mei Street, Fo Tan, N.T. Hong Kong.
Tel: 852-2698 0801 Fax: 852-2688 2508

Test Laboratory: **Forte Testing and Consultants Company Limited**
Contact Information:
Flat 31, 5/F., My Loft, 9 Hoi Wing Road,
Tuen Mun, Hong Kong.
Tel: 852-2152 0638 Fax: 852-3186 2737

Report Number: IT19-050

Date of Issue: **2019-09-16**

HKAS has accredited this laboratory (Reg. No. HOKLAS 191) under HOKLAS for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with terms of accreditation. Opinions and interpretations expressed herein are outside the scope of HOKLAS accreditation. This report may not be reproduced, except in full, without prior written approval from FORTE.

HOKLAS Approved Signatory:

CHENG San Mei, Sammi

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

The specimens achieved the following fire resistance:

DOOR A			**DOOR B**		
INTEGRITY	**(E)**		**INTEGRITY**	**(E)**	
	Sustained Flaming	**59** Minutes		Sustained Flaming	61 Minutes
	Gap Gauge	61 Minutes		Gap Gauge	61 Minutes
	Cotton Pad	61 Minutes		Cotton Pad	61 Minutes
INSULATION	**(I)**		**INSULATION**	**(I)**	
Door Frame	Max. Temp. Rise (I_1)	61 Minutes	Door Frame	Max. Temp. Rise (I_1)	61 Minutes
Door Leaf	Average Temp. Rise	61 Minutes	Door Leaf	Average Temp. Rise	61 Minutes
	Max. Temp. Rise (I_1)	**45** Minutes		Max. Temp. Rise (I_1)	61 Minutes
Glazed Element	Average Temp. Rise	61 Minutes	Glazed Overhead Panel	Average Temp. Rise	61 Minutes
	Max. Temp. Rise	61 Minutes		Max. Temp. Rise	61 Minutes
Air Transfer Grilles	Average Temp. Rise	61 Minutes			
	Max. Temp. Rise	61 Minutes			

* The earliest elapsed time before any integrity or insulation failure occurrence was bolded above.

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 Specimens:	Door A: QT19-051A; Door B: QT19-051B
Date Received:	2019-04-13
Test Number:	QT19-051
Date Tested:	2019-04-23 **Start Time:** 10:04
Approved 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 – 2019-06-08

3. Construction Details of Specimens

3.1 Door A

3.1.1 Door Frame

The timber door frame with clear opening sizes were 750 mm (width) x 2100 mm (height). The sectional dimension of the head and the vertical flush jamb were 50 mm (w) x 85 mm (thick), whereas the composite leading edge jamb sized 50 mm (w) x 100 mm (t) with 40 mm recess.

The door frame fixed to the concrete support frame by door frame anchor bolts. There were 4 numbers of fixings at each jamb and 1 number of fixings on head.

A 38 mm (w) x 4 mm (t) intumescent seal was fitted into the groove at the inner sides of the recess.

The space between the door frame and concrete support frame filled with ceramic fibre and lined up with fire sealant.

3.1.2 Sliding Door Leaf

The specimen comprised of a door leaf sized 1000 mm (w) x 2400 mm (h) with nominal 54 mm thick.
The stiles and rails of the door leaf were made of timber slabs sized 150 mm (w) x 38 mm (t), whereas the mid-rails were made of a timber slab sizes 74 mm (w) x 38 mm (t). The stiles, rails and mid-rails were fixed together by steel staples. The space between stiles and rails were filled with 38 mm (t) perlite core. Both sides of the core were covered by dual layers of 3 mm (t) fire board sub-facing and 2 mm (t) medium density fabric board facing. The sub-facing was fixed onto the stiles and rails by nails; the facing was fixed onto the sub-facing by glue. The door lippings were made of 10 mm (t) timber strips. 30 mm (w) x 4 mm (t) intumescent seal was centrally fitted into the groove along the door leaf opposite the head and the vertical flush jamb. 2 numbers of 10 mm (w) x 4 mm (t) intumescent seal with plastic fins were centrally fitted into the groove along the bottom edge of the door leaf. There was a groove at the bottom edge of the door leaf for fitting a floor guide.

3.1.3 Glazed Element

The specimen was comprised of one glazed element with a visual size of 217 mm (w) x 705 mm (h). The glazed element was installed at 850 mm away from the top edge and 150 mm away from the leading edge of the door leaf. The glazed element consisted of 27 mm (t) interlayered glass pane. Each glazed element comprised of a piece of 25 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 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. 1 mm thick with 100 mm width stainless steel decoration plate was applied on the door leaf next to the leading edge.

3.1.4 Air Transfer Grilles

The specimen comprised of 2 air transfer grilles at the door leaf.
The air transfer grilles sized 500 mm (w) x 300 mm (h) x 54 mm (t) & 500 mm (w) x 400 mm (h) x 54 mm (t) and fixed in the apertures of the door leaf. The fire louver was made of 1 mm (t) steel plates and intumescent pads. Each blade was Z-shape sized 21 mm x 54 mm.
Fire sealant was caulked along the outer perimeter of the fire louver. The top fire louver was installed 200 mm below the top edge of the door leaf and 250 mm away from the leading edge. The bottom fire louver was installed 200 mm above the bottom edge of the door leaf and 250 mm away from the leading edge.

3.1.5 Ironmongery

The door leaf was mounted onto the testing frame by sliding system with mechanical self-closing function. Two door hangers fixed on the top edge of the door leaf at 150 mm away the vertical edge of the door leaf and were suspended from the aluminium track. The sliding system was covered by a 25 mm (t) composite panel on fire exposed. The composite panel was made of 9 mm (t) fire rated board and plywood facing. Steel angle holding system with intumescent materials was applied on the top and vertical edge of the doorset. Cylinder deadbolt lock was installed 1000 above the bottom edge of door leaf.

3.2 Door B

3.2.1 Door Frame

The overall size of the timber door frame was 1200 mm (width) x 2850 mm (height). The sectional dimension of the L- profile door frame and share transom was 46 mm (w) x 100 mm (t) with 15 mm (depth) rebate.
The door frame fixed onto the test supporting frame by ø10 mm x 138 mm (length) door frame anchor at approximate 380 mm to 570 mm center to center. There were 4 numbers of fixing at each jamb and 1 number at head.
15 mm (w) x 4 mm (t) intumescent seal with plastic fins was fitted into the groove along each jamb of the door frame at 29 mm away from the fire exposed side. 30 mm (w) x 4 mm (t) intumescent seals with plastic fins were fitted into the groove along the head of the door frame at 15 mm away from the fire exposed side.
The space between door frame and test supporting frame was filled with ceramic fibre and lined up with fire sealant.

3.2.2 Door Leaf

The specimen comprised of a door leaf sized 1132 mm (w) x 2310 mm (h) x 54 mm (t).
The stiles, rails and mid-rail were made of 4 x 35 mm (w) timber slabs. The space between stiles and rails were filled with 38 mm (t) timber strips. Both sides of the door core were covered by a layer of 5 mm (t) fire board sub-facing and finished by a layer of nominal 3 mm (t) medium density fibre facing. 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 was fitted into the groove along the vertical and horizontal edges of the door leaf. A 10 mm (w) x 4 mm (t) intumescent seal was fitted into the grooves along bottom edge of each door leaf at 10 mm away the fire exposed side. Concealed drop se

3.2.3 Glazed Overhead Panel

The glazed overhead panel had visual size of 1108 mm (w) x 450 mm (h). The glazed element comprised of a piece of 25 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.

3.2.4 Ironmongery

The door leaf was supported onto the door frame by 4 numbers of butt hinge. The top and bottom hinge was 185 mm away from the top and the bottom rim of the door leaf respectively. The maximum distance between hinges was 855 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.
A 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.

3.3 Material Schedule

Parts Specifications were provided by the Sponsor.
Italics: Information checked by FORTE.

3.3.1 Door A

Door Frame

Supplier:	Garish Crown Fire Engineering & Consultancy
Material:	*Timber* (Hardwood)
Overall Sizes:	*850 mm x 2150 mm*
Sectional Dimensions:	*50 mm x 85 mm / 50 mm x 100 mm*
Recess:	*40 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:	By M10 x 138 mm Frame Anchor Bolts at 390 – 565 mm Centre to Centre

Intumescent Seal - Door Frame

Supplier:		Garish Crown Fire Engineering & Consultancy
Brands:		Ying Mu
Inner of Recess	Model:	YM3804
	Sizes:	*38 mm x 4 mm*
Opposite of Leading Edge	Model:	YM2004 with Plastic Fins
	Sizes:	*20 mm x 4 mm*

Door Leaf

Supplier:		Garish Crown Fire Engineering & Consultancy
Overall Sizes:		*1000 mm x 2400 mm*
Nominal Thickness:		54 mm
Measured Thickness:		54.03 mm
Stiles and Rails	Material:	*Timber* (Softwood)
	Width:	Main Stiles and Rails – 150 mm Mid Rails – 75 mm
	Thickness:	38 mm
	Density:	350 - 400 kg/m^3
	Moisture Content:	12 – 17 %
Core	Material:	Perlite
	Brand:	Jintemei
	Thickness:	38 mm
	Density:	380 kg/m^3
	Moisture Content:	12 – 17 %

Door Leaf Lipping

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

Fire Board

Supplier:	Garish Crown Fire Engineering & Consultancy
Brand:	Jintemei
Thickness:	3 mm
Density:	950 - 1050 kg/m^3
Location Applied:	Door Leaf Sub-facing

Door Leaf Facing

Material:	Medium Density Fibreboard (MDF)
Thickness:	3 mm
Density:	450 - 550 kg/m^3 *

Intumescent Material

Supplier:	Garish Crown Fire Engineering & Consultancy	
Brands:	Ying Mu	
Door Edges	Model:	YM3004
	Sizes:	30 mm x 4 mm
Bottom Edge	Model:	YM1002 with Plastic Fins
	Sizes:	10 mm x 4 mm

Glazing Element

Supplier:	Shenzhen Zhongxinchang Technology Company Limited
Brand:	ZXC *
Combination of the Glass Pane:	3 Layers of 5 mm Clear Glass with 2 Layers of 5.5 mm Intumescent Gel
Nominal Thickness:	26 mm
Measured Thickness:	26.17 mm
Full Sizes:	251 mm x 739 mm
Visual Sizes:	*217 mm x 705 mm*
Glass Edge Covering Depth:	17 mm
Fixing Method:	Lined with Intumescent Pad and Set on Fire Board; Clamped by Steel Angle and Timber Glazing Beads

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 130 -280 mm Centre to Centre

Glazed Element - Fixing Angle

Supplier:	Garish Crown Fire Engineering & Consultancy	
Material:	Steel	
Sizes:	17 mm x 25 mm x 1 mm	17 mm x 15 mm x 1 mm
Fixing Method:	Self-tapping Screws at Maximum 200 mm Centre to Centre	

Air Transfer Grille

Supplier:	Garish Crown Fire Engineering & Consultancy
Brand:	Ying Mu
Overall Dimensions:	500 mm x 300 mm; 500 mm x 400 mm
Configuration of Each Louver Blade:	Multi-layer of 2 mm Intumescent Pad with 1 mm Galvanized Iron Cladding with Veneer
Section Sizes of Each Louver Blade:	21 mm x 54 mm

Sliding System

Supplier:	ABS Building Product Company Limited
Brand:	Saheco
Model:	SF
Material:	Steel + Alumimium

Lock

Supplier:	ABS Building Product Co., Ltd
Brand:	Comit
Model:	NIC 101
Material:	Steel
Sizes:	100 mm x 70 mm x 16 mm

Intumescent Pad

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

Decoration Plate

Material:	Stainless Steel
Sizes	100 mm x 1 mm
Fixing Method	Glued

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

Glue

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

3.3.2 Door B

Door Frame

Supplier:	Garish Crown Fire Engineering & Consultancy
Material:	*Timber* (Hardwood)
Overall Sizes:	*1200 mm x 2850 mm*
Sectional Dimensions:	*46 mm x 100 mm*
Rebate:	*15 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:	By M10 x 138 mm Frame Anchor Bolts at 390 – 565 mm Centre to Centre

Intumescent Seal - Door Frame

Supplier:		Garish Crown Fire Engineering & Consultancy
Brand:		Ying Mu
Head	Model:	YM3802 with Plastic Fins
	Sizes:	*38 mm x 4 mm*
Jamb	Model:	YM1502 with Plastic Fins
	Sizes:	*15 mm x 4 mm*

Door Leaf

Supplier:		Garish Crown Fire Engineering & Consultancy
Overall Sizes:		*1132 mm x 2310*
Nominal Thickness:		54 mm
Measured Thickness:		53.55 mm
Stiles and Rails	Material:	*Timber* (Softwood)
	Width:	Main Stiles and Rails – 35 x 4 mm Mid Rails – 37 x 2 mm
	Thickness:	38 mm
	Density:	350 - 450 kg/m^3
	Moisture Content:	12 – 17 %
Core	Material:	*Timber* (Softwood)
	Thickness:	38 mm
	Density:	350 - 450 kg/m^3
	Moisture Content:	12 – 17 %

Door Leaf Lipping

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

Fire Board

Supplier:	Garish Crown Fire Engineering & Consultancy
Brand:	Jintemei
Thickness:	*5 mm*
Density:	950 - 1050 kg/m^3

Door Leaf Facing

Material:	Medium Density Fibreboard (MDF)
Thickness:	*3 mm*
Density:	450 - 550 kg/m^3 *

Intumescent Material

Supplier:	Garish Crown Fire Engineering & Consultancy	
Brands:	Ying Mu	
Vertical and Horizontal Top Edges	Model:	YM3004
	Sizes:	*30 mm x 4 mm*
Bottom Edge	Model:	YM1004
	Sizes:	*10 mm x 4 mm*

Glazing Element

Supplier:	Shenzhen Zhongxinchang Technology Company Limited
Brand:	ZXC *
Combination of the Glass Pane:	3 Layers of 5 mm Clear Glass with 2 Layers of 5.5 mm Intumescent Gel
Nominal Thickness:	26 mm
Measured Thickness:	26.23 mm
Full Sizes:	1154 mm x 496 mm
Visual Sizes:	*1108 mm x 450 mm*
Glass Edge Covering Depth:	23 mm
Fixing Method:	Lined with Intumescent Pad and Set on Fire Board; Clamped by Steel Angle and Timber Glazing Beads

Glazing Bead

Supplier:	Garish Crown Fire Engineering & Consultancy
Material:	*Timber* (Hardwood *)
Sizes:	25 mm x 20 mm / 25 mmx 43 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:	17 mm x 25 mm x 1 mm	17 mm x 15 mm x 1 mm
Fixing Method:	Self-tapping Screws at Maximum 200 mm Centre to Centre	

Sign Board

Supplier:	Garish Crown Fire Engineering & Consultancy
Overall Dimensions:	500 mm x 744 mm
Material	5 mm Plywood
Fixing Method	Nails or Wood Screws at Approximate 450 mm c/c

Mortise Lock

Supplier:		Garish Crown Fire Engineering & Consultancy
Brand:		Glutz
Model:		4829-7/60
Lock Case	Material:	Steel
	Sizes:	165 mm x 99 mm x 25 mm
Cylinder & Turn	Material:	Brass
	Model:	ASB CYAB00020
Lever Handle	Material:	Stainless Steel
	Sizes:	ABS LH104

Hinge

Supplier:	Garish Crown Fire Engineering & Consultancy
Brand:	Ying Mu
Model:	Not Provided
Material:	Stainless Steel
Sizes:	102 mm x 102 mm x 3 mm

Door Closer

Supplier:	ABS Building Products Company Limited
Brand:	ABS
Model:	8500
Material:	Aluminium

Bottom Seal

Supplier:	Garish Crown Fire Engineering & Consultancy
Brand:	Ying Mu
Model:	Not Provided

Exit Sign Light Box

Supplier:	Garish Crown Fire Engineering & Consultancy
Brand:	Melite
Model:	MISE-4808-03
Size:	650 mm x 180 mm x 70 mm

Intumescent Pad

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

Fire Sealant

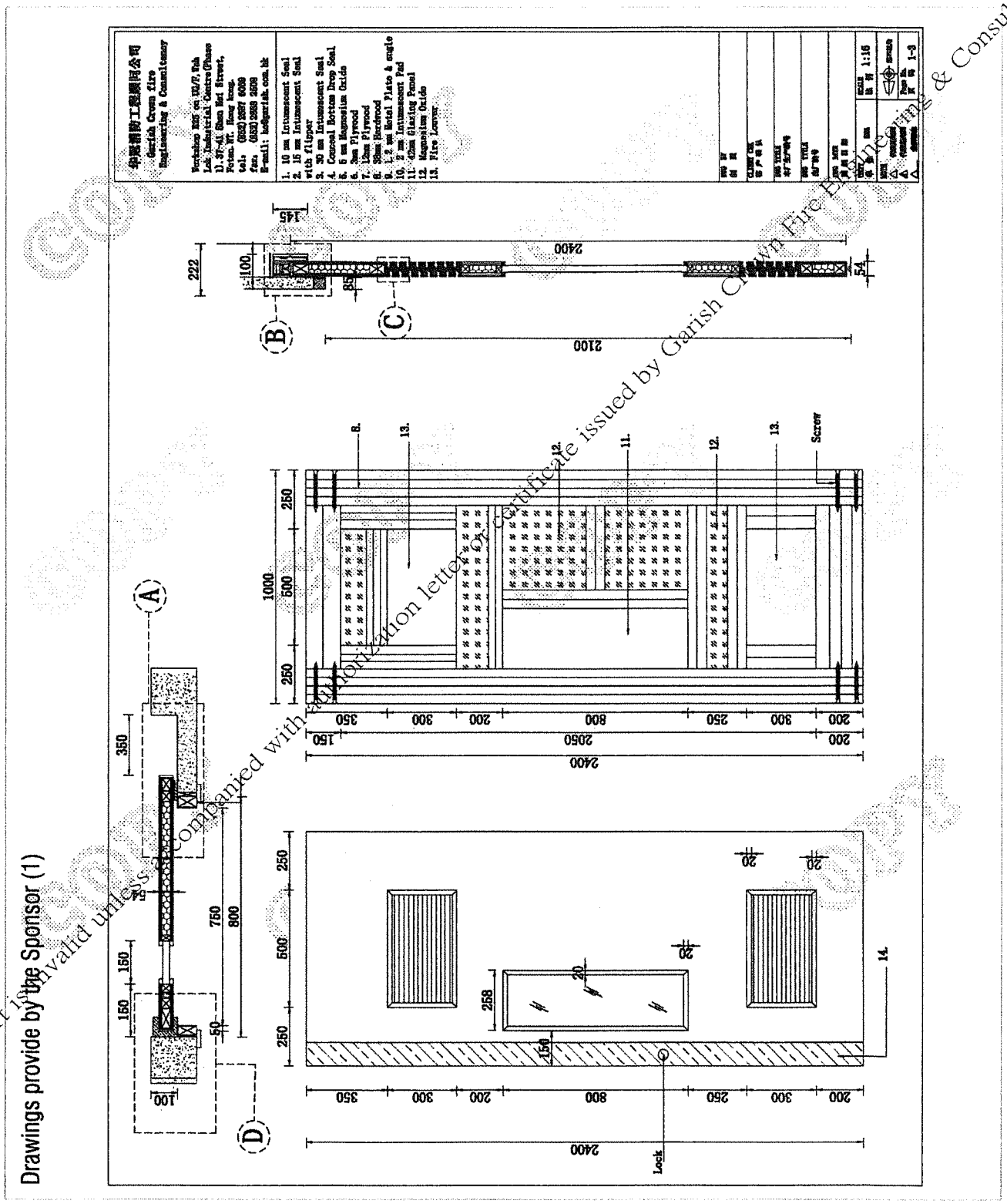
Supplier:	Garish Crown Fire Engineering & Consultancy
Brand:	Firemate
Location Applied:	Between the Gap Along the Door Frame, Sub-frame and the Test Frame

Glue

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

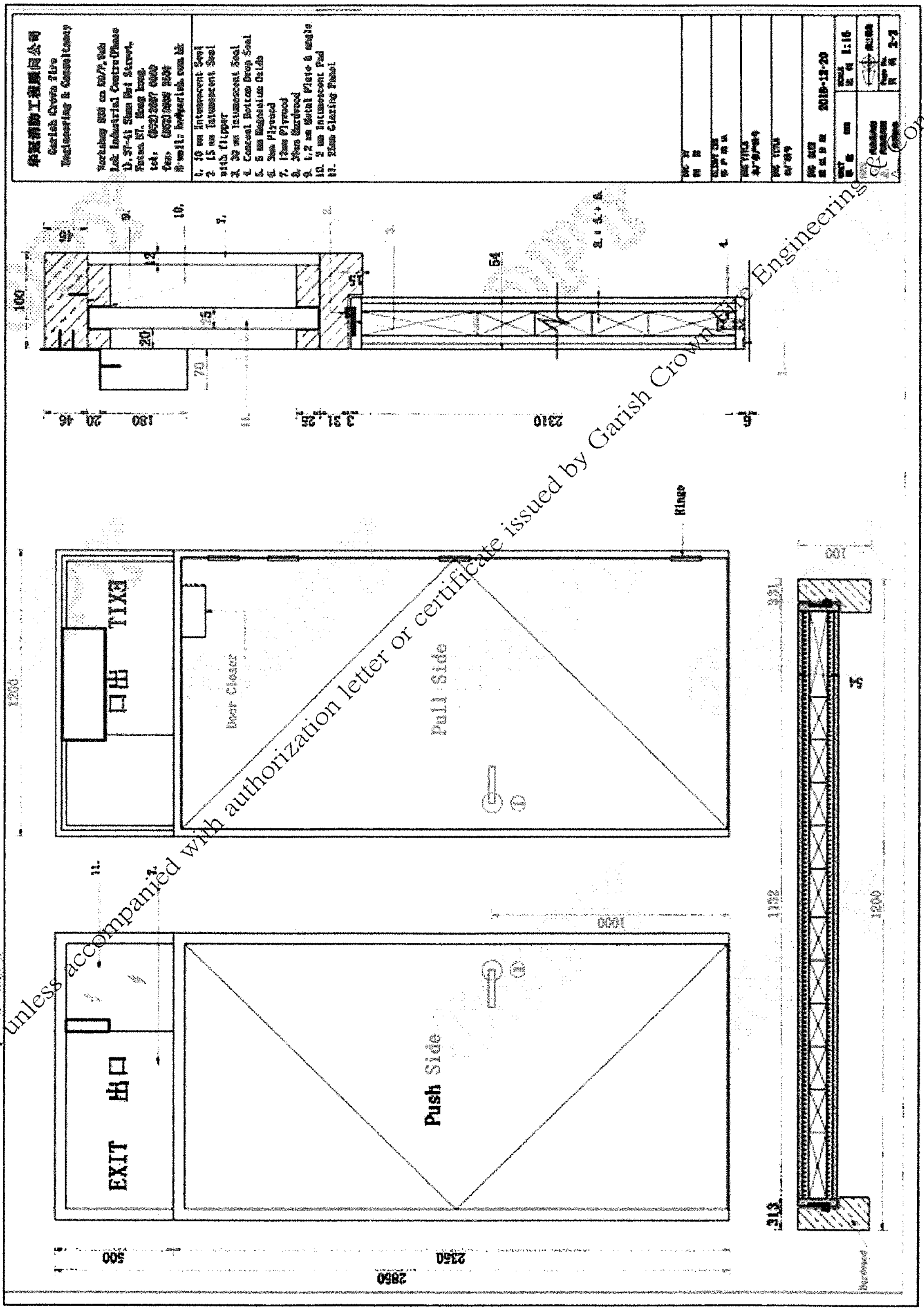
3.4 Drawings on the Specimens provided by the Sponsor (Total 3 pages)

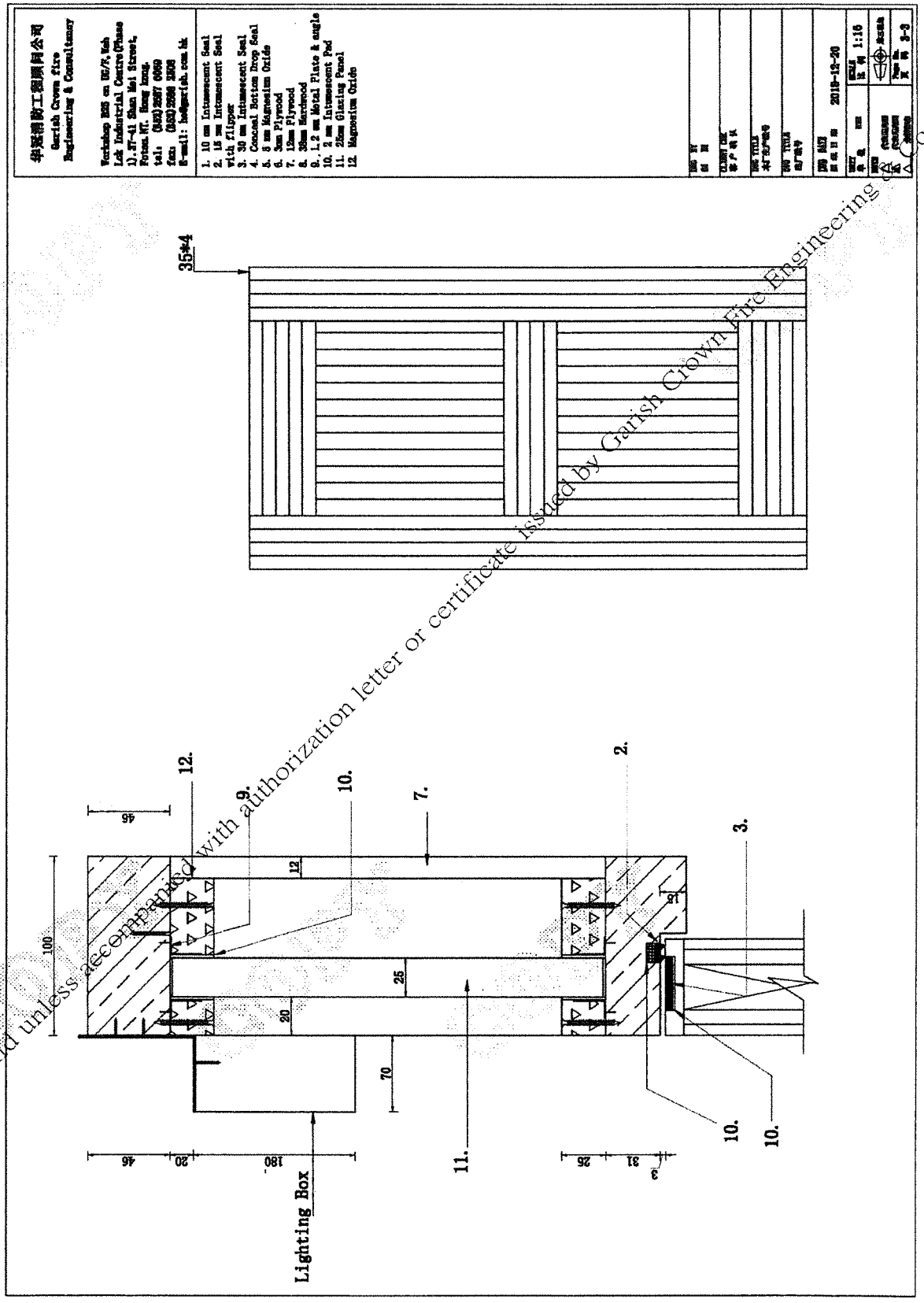
(Drawings of the specimens on specific construction kept as confidential information in the Test Sponsor and FORTE)



Drawings provide by the Sponsor (1)

Drawings provide by the Sponsor (2)





Drawings provide by the Sponsor (3)

4. Specimens Condition

4.1 Selection of the Specimens

The specimens were selected by the Sponsor and submitted to the Test Location. FORTE did not involve in the selection of the specimens.

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

4.2 Verification of the Specimens

Three specimens were 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 specimens were fixed into a supporting construction made of fully cured reinforced normal density concrete slabs provided by FORTE. Door A was installed into one sized 1370 mm (w) x 2400 mm (h); whereas Door B was installed into one sized 1215 mm (w) x 2870 mm (h).

4.4 Installation of the Specimens

The specimens were assembled and installed by workers delegated by the Sponsor from 2019-04-13 to 2019-04-16.

4.5 Specimens Conditioning

The specimens were stored in the Test Location from 2019-04-13, the date which specimens were 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 (%)
25.8 ± 5	96 ± 5

4.6 Direction of Fire Side and Others

The Sponsor designated and installed the specimens in the following orientation.

Door A: The Sponsor had designated and installed the specimen that hanging system located at fire side and it was UNLOCKED and UNLATCHED during the test.

Door B: The door leaf can swung only inwards to the furnace and it was UNLOCKED and UNLATCHED during the test.

5. Test Method

5.1 Pre-test Conditioning

The pre-test conditioning of Door A & Door B were carried out from 2019-04-21 prior to the fire test with reference to *BS EN 1634-1: 2008* and *clause 5.1.1.1, 5.1.1.2 and 5.1.1.3, BS EN 14600: 2005*.

Operability test of the specimens:

Each specimen should been 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° ± 2° and held for 20s ± 2s 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 gaps were measured after the door assembly and prior to the test. Measurement positions were shown in *Figure 2a & 2b*.

5.5 Unexposed Surface Temperature

The unexposed surface temperatures of the specimens were measured by 72 numbers of type K thermocouples. The temperature rise was calculated by subtracting the initial average temperature from the unexposed temperature measured.

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

The positions of unexposed surface temperature measurement points were shown in *Figure 3a & 4a*. The locations of thermocouples were explained in the following table.

Thermocouple		Area	Description
Door A	U1 – U5	Door Leaf	For average and maximum unexposed surface temperature rise
	U12 – U15 U23 – U26	Door Leaf	For maximum unexposed surface temperature rise **(Supplementary Procedure, I_1)**
	U16 – U19	Door Frame	For maximum unexposed surface temperature rise
	U20	Glazed Element	For average and maximum unexposed surface temperature rise
	U21 – U22	Glazed Element	For maximum unexposed surface temperature rise
	U27 – U36	Louver	For average and maximum unexposed surface temperature rise
	U37 – U44	Louver	For maximum unexposed surface temperature rise
Door B	U7 – U11	Door Leaf	For average and maximum unexposed surface temperature rise
	U45 – U48 U55 – U58	Door Leaf	For maximum unexposed surface temperature rise **(Supplementary Procedure, I_1)**
	U49 – U54	Door Frame	For maximum unexposed surface temperature rise
	U59 – U61	Overhead Panel	For average and maximum unexposed surface temperature rise
	U62 – U73	Overhead Panel	For maximum unexposed surface temperature rise **(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 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 were shown in *Figure 3b & 4b*.

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

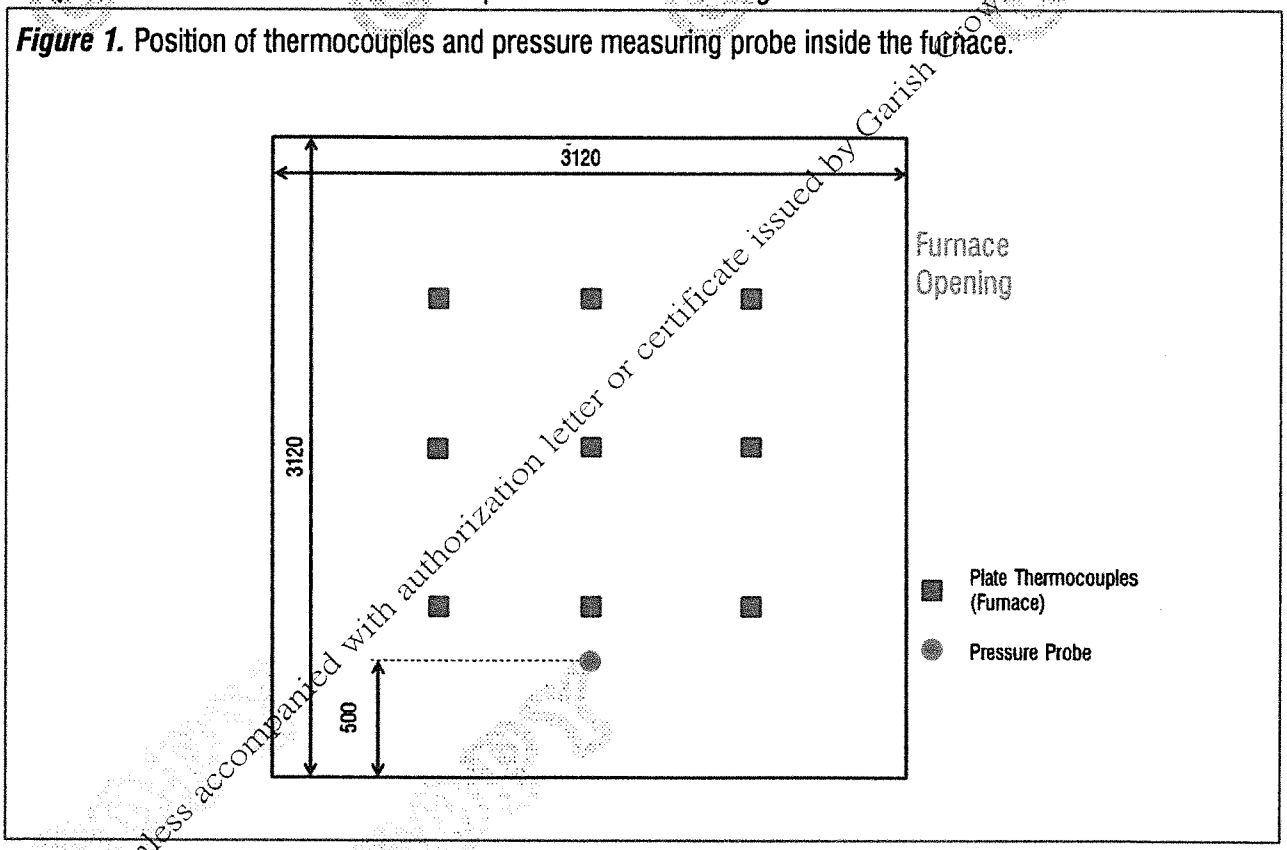


Figure 2a. Primary gaps measurement positions on Door A.

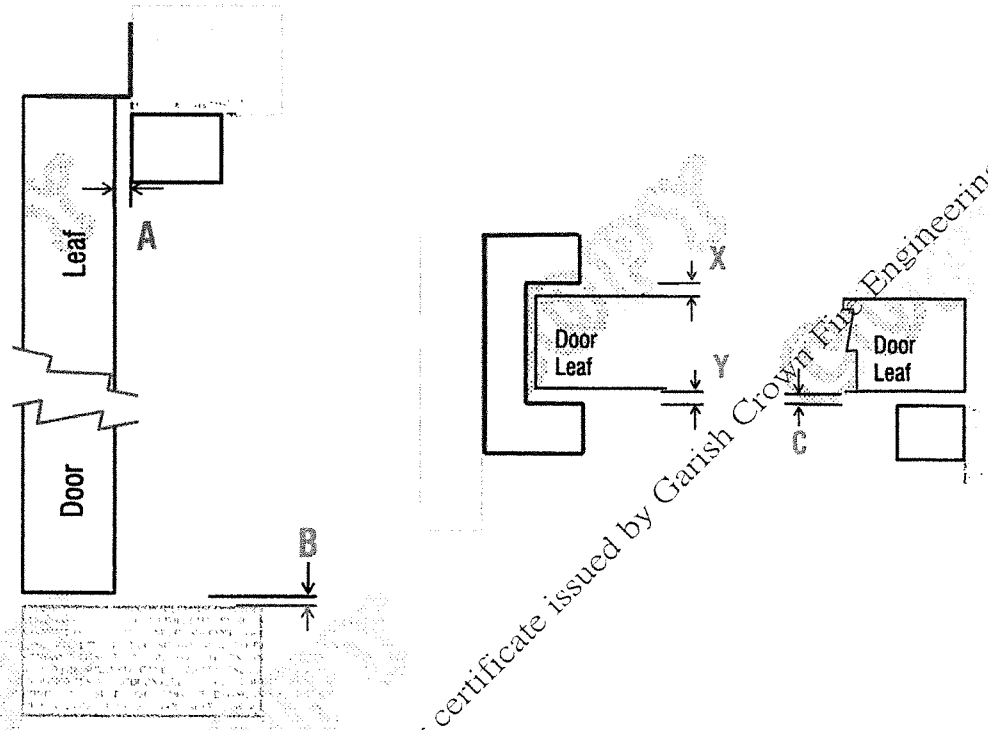


Figure 2b. Primary gaps measurement positions on Door B.

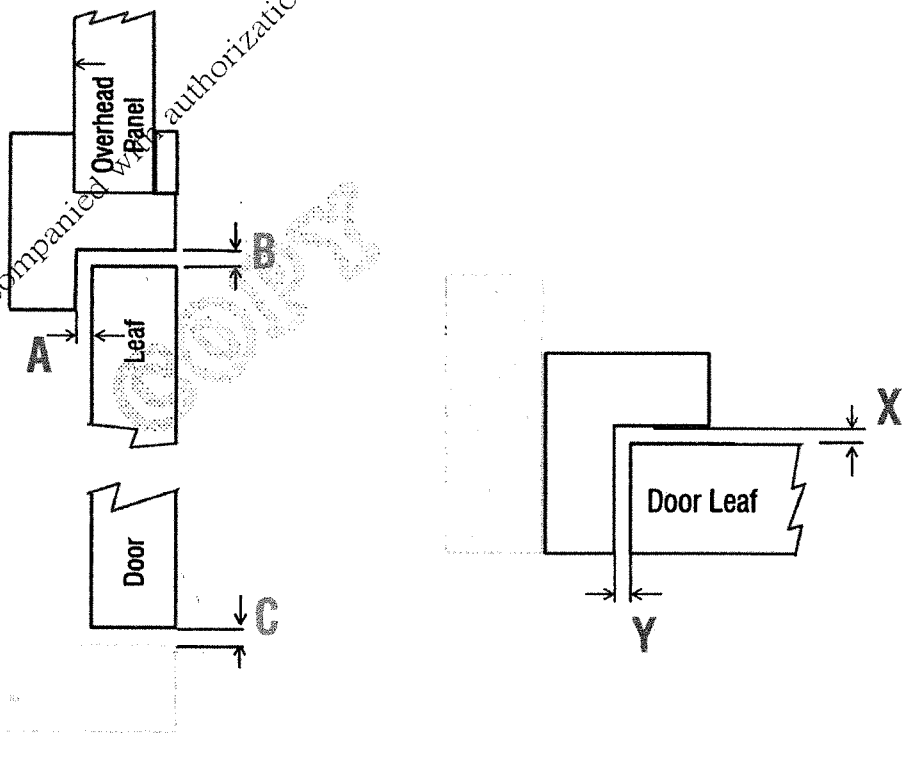


Figure 3a. Positions of fixed surface thermocouples (U) on Door A.

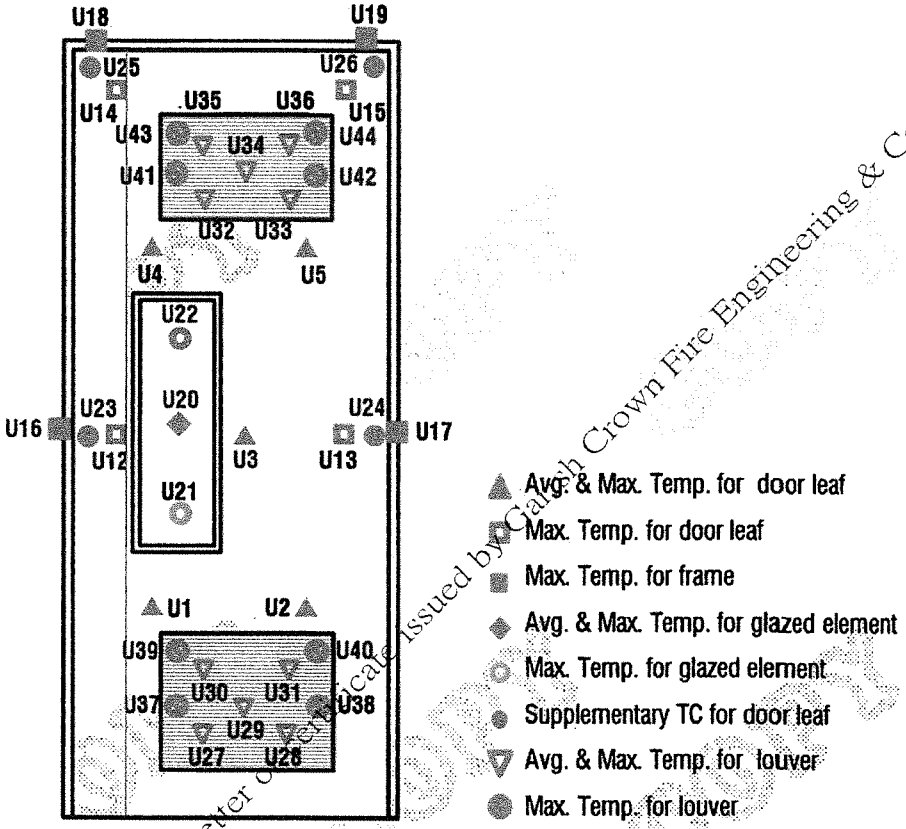


Figure 3b. Positions of deflection measuring points (D) on Door A.

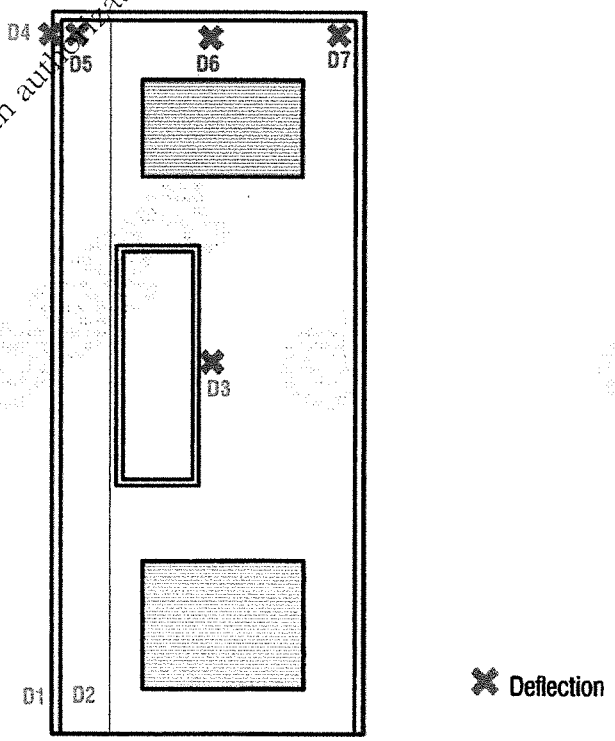


Figure 4a. Positions of fixed surface thermocouples (U) on Door B.

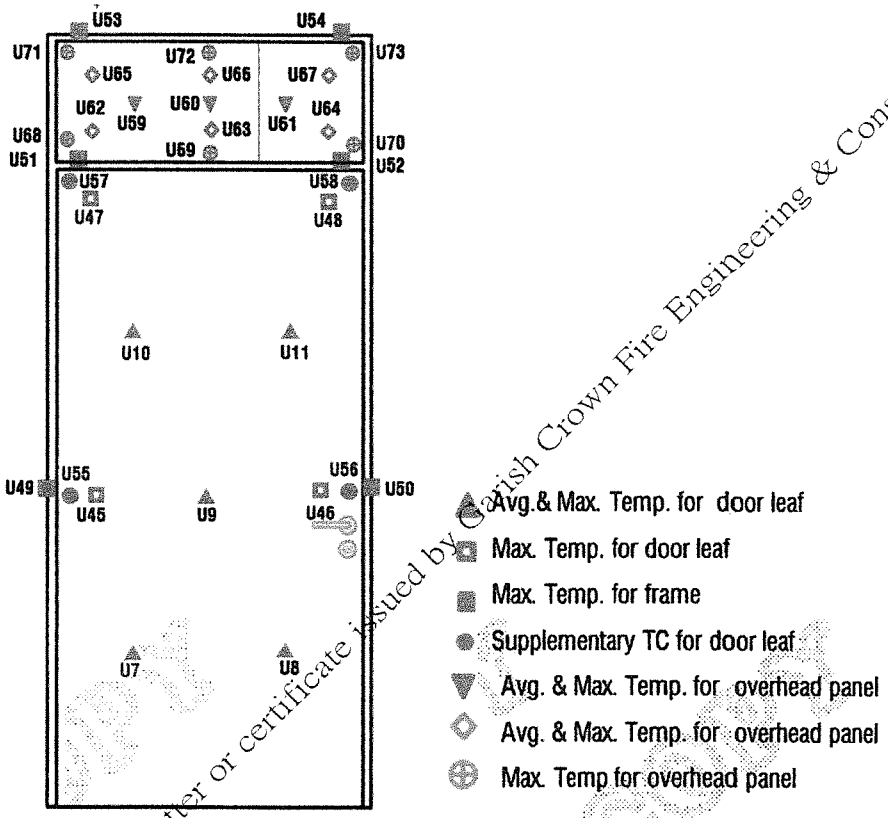
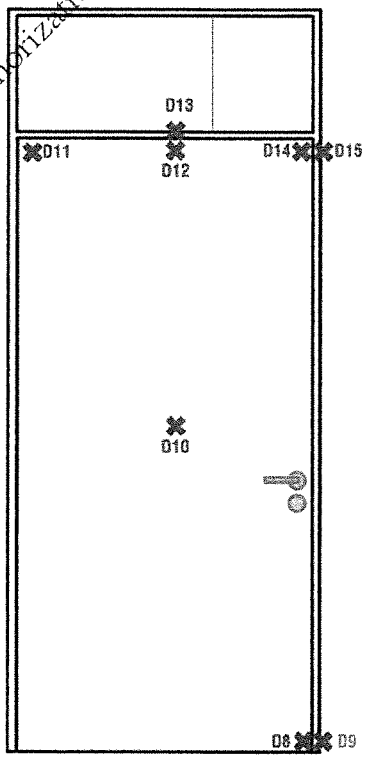


Figure 4b. Positions of deflection measurement points (D) on Door B.



6. Test Data

6.1 Retention Forces and Pre-Conditioning of the Specimens

The retention forces on each door leaf of Door A and B for each direction of opening were determined on the fire unexposed side. The respective highest gauge measurements were summarized in the following table.

Leaf	Push	Pull
Door A	81.3 N	82.3 N
Door B	30.7 N	30.0 N

Operability test of the specimens:
Door A and B had been 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. Door A and B were subjected to 5000 cycles of operation prior to the fire test.
Closing speed of Door A and B without coordinating devices:

Leaf	Leading Edge Speed (mm/s)
Door A	65.86
Door B	124.82

6.2 Gaps Measurement

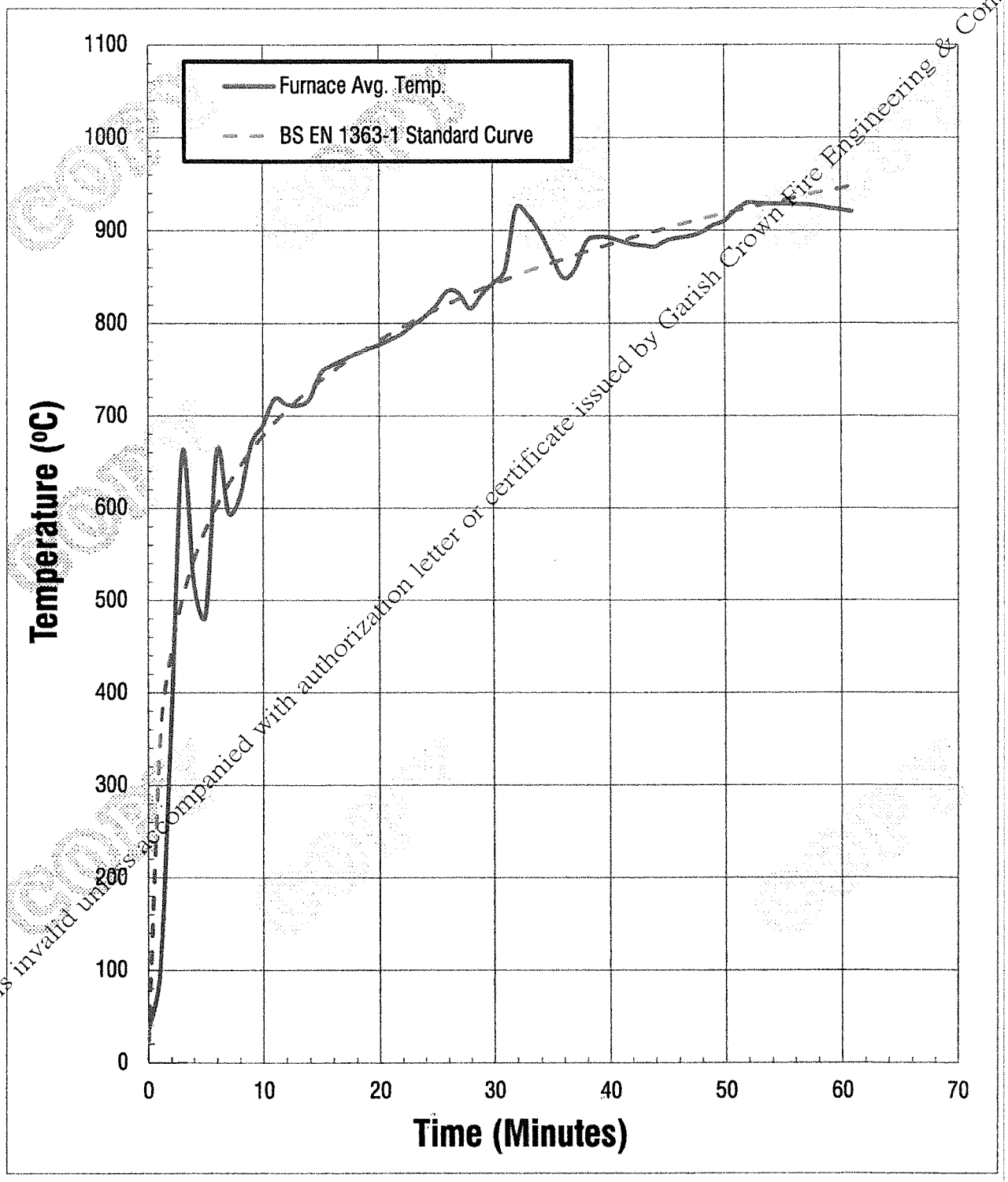
Primary gaps of the specimens were measured according to *BS EN 1634-1: 2008* clause 10.1.2 "There shall be minimum of three measurements made along each side, top and bottom of each leaf. Measurements to determine the gaps shall be made at distances not greater than 750 mm apart."
The measured record 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	5.0	6.5	5.7
	B	6.7	7.5	7.0
	C	5.0	12.5	8.7
	X	3.5	4.5	4.0
	Y	3.0	4.0	3.7
Door B	A	1.5	3.0	2.2
	B	4.0	4.3	4.1
	C	5.3	5.5	5.4
	X	1.5	4.8	3.3
	Y	1.5	4.5	3.5

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 Unexposed Surface Temperature Rise

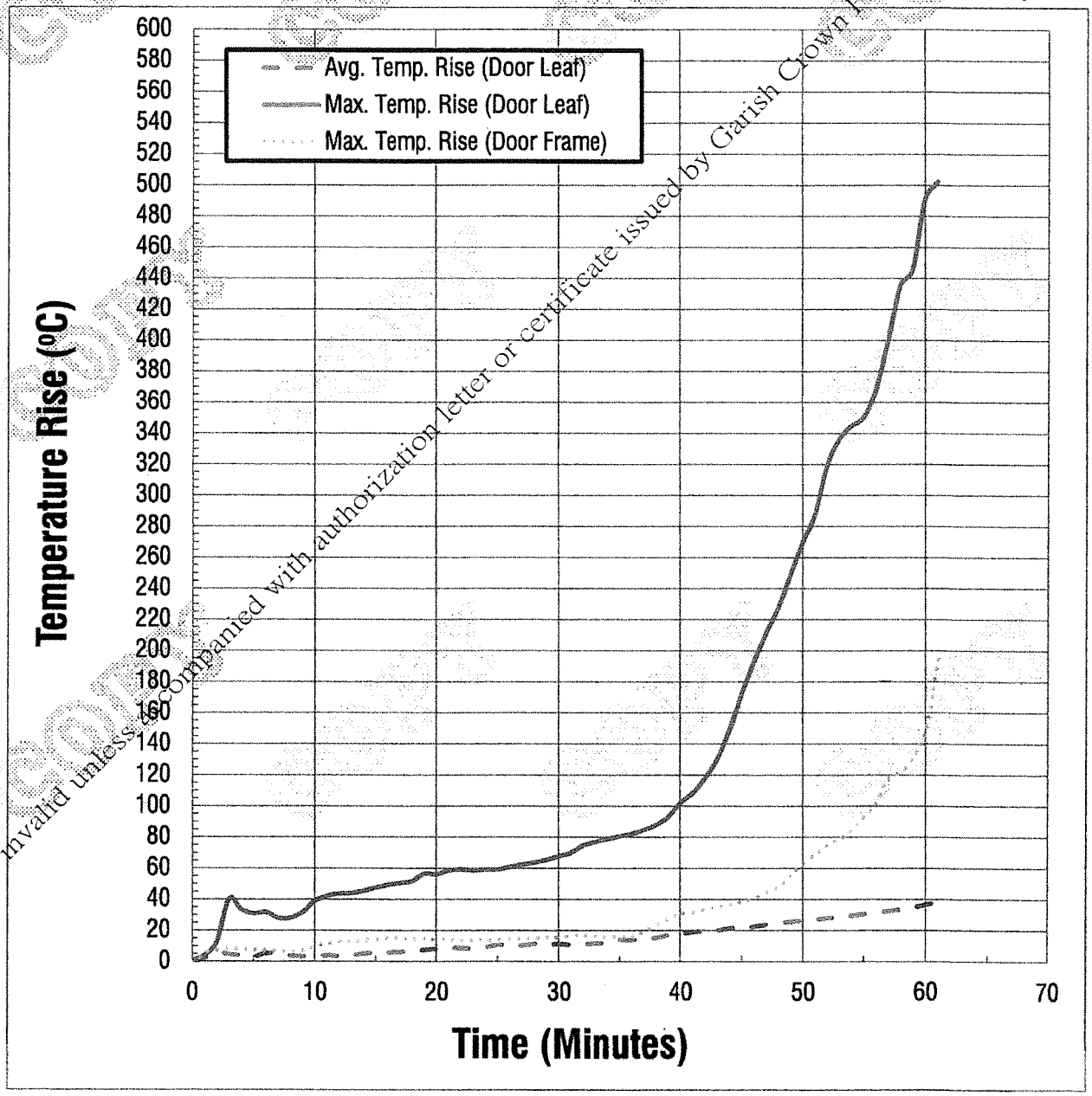
6.4.1 Door A

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 were shown in *Figure 6.*

The maximum temperature rise of door leaf measured at 45.3 minute of test at U26 was 182°C which was in excess of 180°C limit.

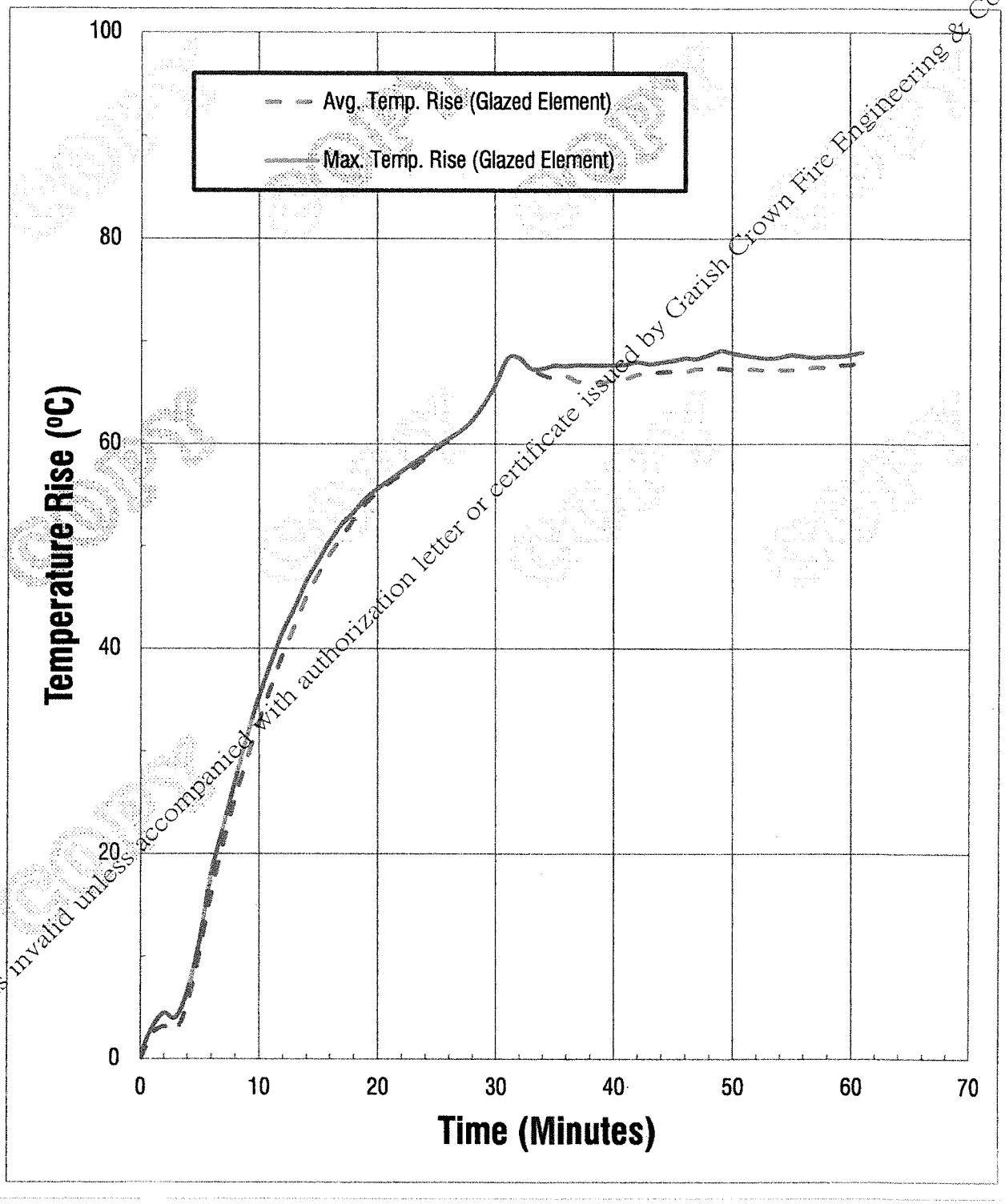
Figure 6. Average and maximum temperature rise on door leaf and door frame of Door A over the test period.



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.

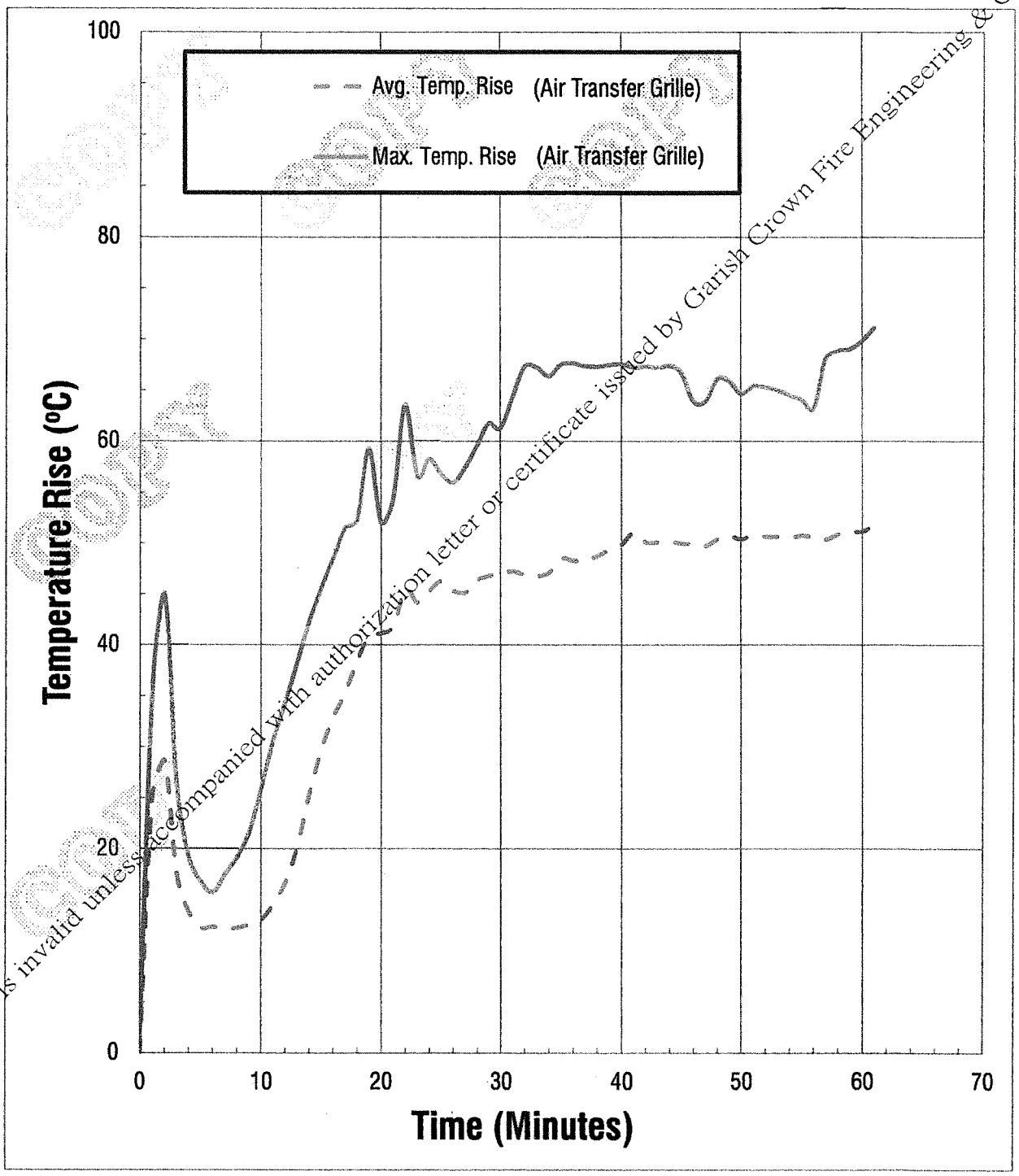
Figure 7. Average and maximum temperature rise on glazed element of Door A over the test period.



6.4.1.3 Fixed Surface Thermocouples – Air Transfer Grilles

The temperature rises of unexposed surface of Air Transfer Grilles 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 Air Transfer Grilles of Door A over the test period.

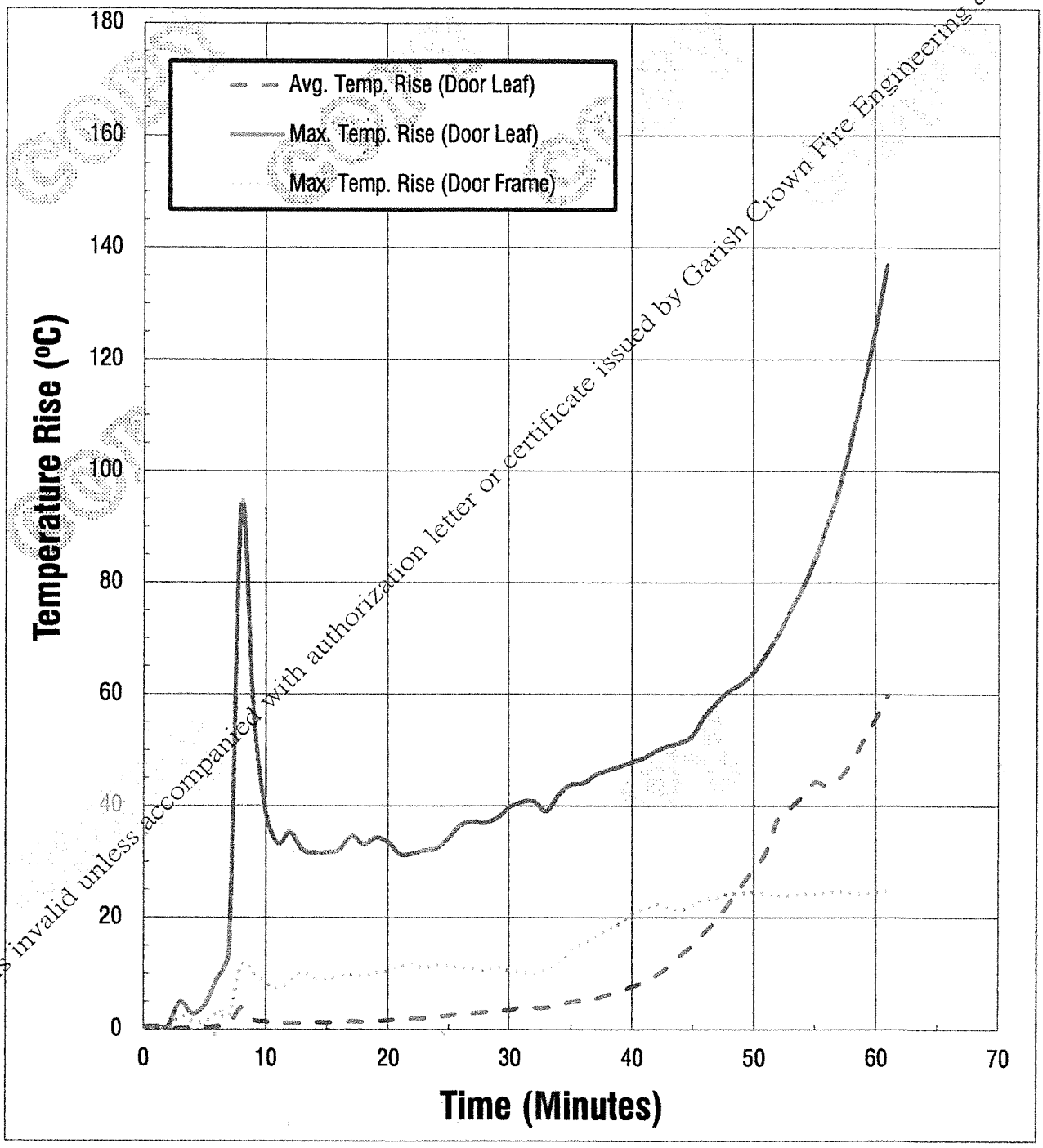


6.4.2 Door B

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 were shown in *Figure 9.*

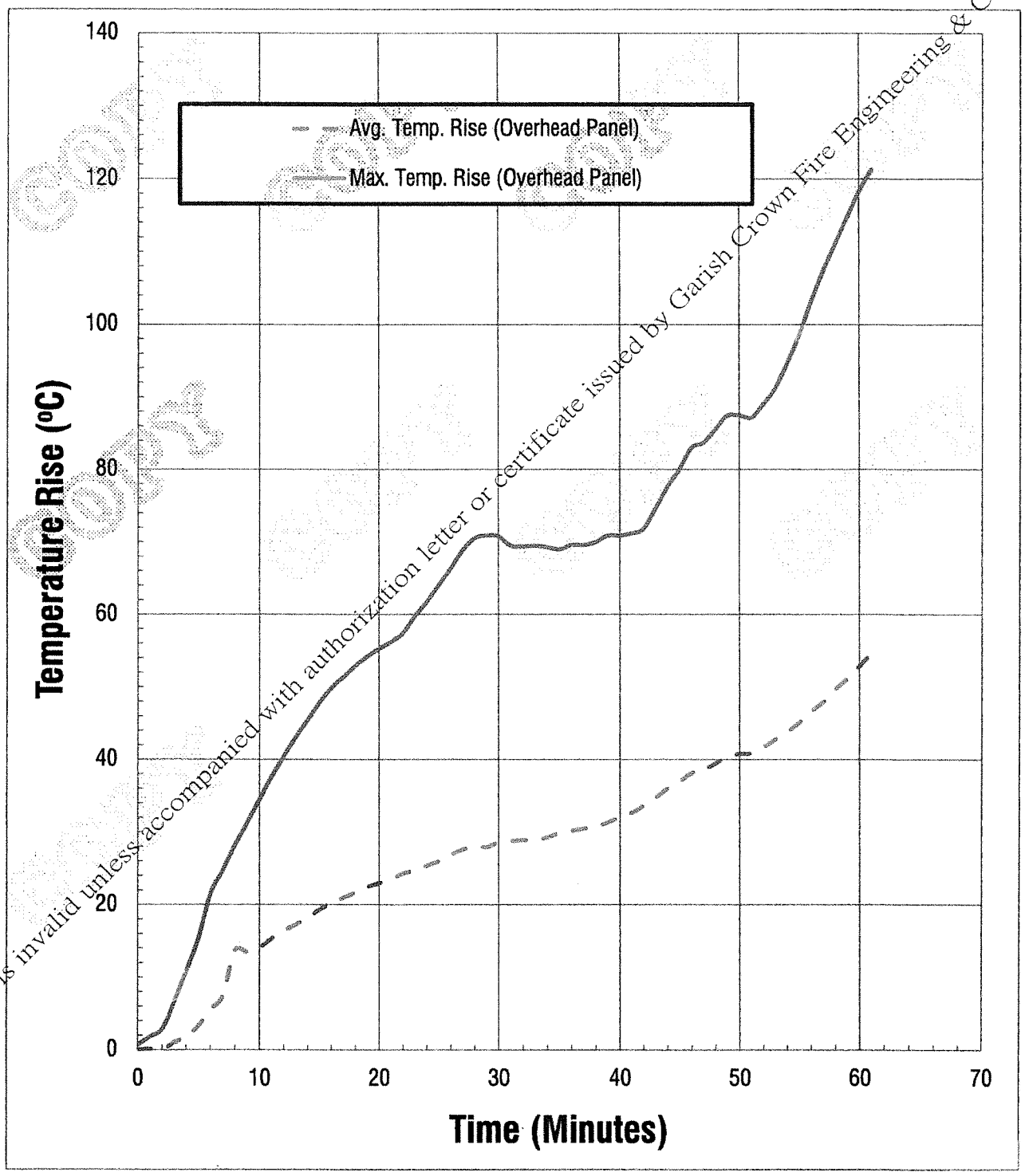
Figure 9. Average and maximum temperature rise on door leaf and door frame of Door B over the test period.



6.4.2.2 Fixed Surface Thermocouples – Glazed Overhead Panel

The temperature rises of unexposed surface of overhead panel of Door B measured by fixed surface thermocouples over the test period were shown in *Figure 10.*

Figure 10. Average and maximum temperature rise on the glazed overhead panel of Door B over the test



6.4.3 Fixed Surface Thermocouples – Detailed Temperature Records

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

Temperature outputs from unexposed surface temperature U1 to U5 and U7 to U10

Time (min)	U1	U2	U3	U4	U5	U7	U8	U9	U10
0	28.4	28.5	28.4	28.6	28.9	27.8	27.1	28.6	28.3
10	32.3	31.7	30.8	31.7	31.5	27.9	27.5	28.8	28.7
15	31.2	31.5	30.5	33.0	31.0	28.5	28.0	29.4	30.1
20	33.4	33.1	30.9	40.5	31.4	28.5	28.2	29.5	29.7
25	39.3	38.2	32.3	41.0	33.1	29.0	28.6	29.9	29.9
30	42.9	41.6	33.0	41.0	36.2	29.8	29.3	30.7	30.9
35	46.5	39.7	33.2	40.7	38.5	30.7	29.8	31.9	31.8
40	49.4	40.0	33.6	42.7	44.8	32.3	31.1	33.4	33.5
45	49.7	42.0	37.1	46.8	55.7	35.2	32.1	36.0	36.8
50	49.4	45.3	41.1	49.3	66.2	40.5	35.0	41.0	45.3
55	51.2	48.8	46.3	54.3	72.4	52.0	39.0	50.8	65.5
56	56.0	55.0	52.7	61.5	73.8	70.8	47.6	65.8	83.4
57	57.6	56.1	53.6	62.6	74.1	74.0	48.2	67.7	82.3
58	58.1	57.8	54.7	63.5	76.5	77.3	49.4	70.4	83.7
59	60.3	58.6	55.5	64.7	78.2	81.4	53.7	73.0	86.6
60	62.1	61.2	57.2	65.4	80.0	83.5	55.6	75.2	91.4
61	63.6	63.4	60.7	66.6	80.6	83.4	57.0	77.2	100.0

Temperature outputs from unexposed surface temperature U11 to U20

Time (min)	U11	U12	U13	U14	U15	U16	U17	U18	U19	U20
0	28.6	27.7	28.6	27.8	27.3	26.5	27.5	27.5	27.4	28.7
10	29.0	32.0	32.2	45.1	44.5	27.7	28.0	35.4	36.3	38.9
15	31.4	36.6	31.4	52.1	47.4	27.5	28.1	38.2	35.9	61.5
20	30.7	36.5	31.9	49.9	45.2	27.5	28.3	42.5	36.9	75.9
25	31.2	53.9	50.3	48.4	50.6	27.8	28.7	42.5	38.5	84.0
30	31.8	56.9	67.9	46.2	55.2	28.1	29.6	42.1	41.5	88.2
35	33.3	52.6	71.6	46.2	54.5	28.5	30.1	44.2	39.9	94.4
40	34.4	52.8	90.4	46.2	55.1	28.9	31.0	44.3	42.2	95.1
45	38.5	57.4	116.3	48.7	56.9	29.2	31.6	46.0	59.5	94.8
50	53.7	58.8	178.6	49.4	60.7	29.6	32.9	44.5	67.0	95.8
55	76.3	61.7	221.5	50.8	67.1	30.8	34.3	44.2	91.7	95.9
56	90.7	67.0	267.2	53.8	85.0	30.8	35.8	43.9	130.2	96.0
57	92.2	68.3	281.4	54.5	88.4	31.0	36.2	43.8	146.1	96.1
58	98.2	69.3	333.1	55.1	94.3	31.2	36.7	44.3	150.4	96.1
59	104.2	70.1	466.2	55.6	100.5	31.4	37.1	44.7	159.7	96.3
60	112.3	71.3	519.6	56.7	104.5	31.5	37.5	46.5	176.5	96.4
61	121.4	72.8	530.8	57.7	107.6	31.7	38.1	47.8	223.7	96.7

Temperature outputs from unexposed surface temperature U21 to U30

Time (min)	U21	U22	U23	U24	U25	U26	U27	U28	U29	U30
0	29.1	28.5	26.5	26.8	28.1	28.0	33.1	32.0	32.7	31.4
10	40.0	39.1	37.8	52.9	55.4	59.5	48.7	44.3	43.9	43.2
15	62.4	64.0	41.3	44.3	66.7	67.5	47.1	43.4	42.8	42.9
20	76.0	77.2	61.6	38.7	71.9	76.1	61.7	64.1	60.6	53.8
25	83.3	84.3	84.7	40.1	84.4	81.6	81.8	72.5	63.0	68.3
30	87.0	88.4	84.7	49.0	86.8	87.8	66.1	88.7	70.6	71.8
35	90.1	92.1	80.1	58.0	84.0	96.3	58.8	93.2	62.3	76.4
40	95.2	96.3	78.3	72.8	85.1	109.2	62.8	99.5	53.6	79.4
45	95.2	96.4	81.7	84.3	84.9	130.5	59.4	99.5	60.4	81.4
50	96.0	96.8	79.5	83.9	85.1	200.5	56.9	98.7	59.0	83.3
55	97.6	96.1	83.0	105.9	85.7	298.5	59.2	96.6	51.7	85.7
56	97.2	96.8	87.4	257.3	87.0	395.8	59.3	95.2	46.3	87.7
57	97.1	96.7	87.6	315.6	87.4	427.6	59.4	94.8	43.1	87.8
58	97.2	96.5	87.8	388.4	88.3	464.0	59.9	96.9	43.7	88.2
59	97.2	96.4	88.2	429.6	88.6	474.3	59.3	96.5	46.5	88.6
60	97.4	96.6	89.0	452.5	89.1	483.3	58.9	96.8	44.8	88.9
61	97.6	96.7	89.2	462.5	89.7	488.8	59.2	97.2	49.0	89.1

Temperature outputs from unexposed surface temperature U31 to U40

Time (min)	U31	U32	U33	U34	U35	U36	U37	U38	U39	U40
0	30.6	31.5	31.9	32.4	32.3	31.6	30.4	29.1	28.5	27.9
10	42.2	44.1	43.0	44.6	44.4	43.3	41.4	42.9	41.6	39.2
15	48.3	44.7	43.9	43.3	46.3	47.3	47.6	55.4	50.2	49.1
20	59.8	52.0	62.1	63.3	66.2	71.7	64.0	58.0	73.3	75.0
25	67.9	67.4	73.8	84.0	73.1	78.6	64.1	54.4	67.9	66.8
30	78.6	76.1	86.3	87.7	72.8	82.6	57.7	50.4	60.4	60.0
35	83.7	81.2	79.8	89.4	79.4	84.9	57.0	49.7	59.6	51.0
40	86.0	82.7	80.9	88.7	83.5	86.3	69.3	55.7	67.5	49.5
45	89.6	84.0	80.7	89.6	86.4	86.7	66.3	54.6	54.9	50.2
50	90.8	84.5	79.8	90.5	87.2	87.9	67.7	49.0	56.1	47.8
55	93.5	86.3	79.8	92.1	89.0	89.3	74.4	51.5	57.9	47.6
56	95.0	86.8	80.6	93.3	89.7	90.9	62.3	54.3	59.1	48.7
57	95.1	87.1	80.6	93.4	89.8	91.3	65.3	54.9	61.0	46.0
58	95.4	87.6	80.9	93.3	90.3	91.5	64.5	53.7	59.5	47.6
59	95.0	87.8	81.1	93.7	90.4	91.9	64.1	53.7	60.1	47.9
60	95.1	88.3	81.3	93.7	90.6	92.3	63.6	55.6	61.9	49.4
61	95.5	88.4	81.6	93.8	90.6	92.8	64.0	54.6	60.9	49.7

Temperature outputs from unexposed surface temperature U41 to U49

Time (min)	U41	U42	U43	U44	U45	U46	U47	U48	U49
0	29.6	29.1	29.9	29.9	28.5	28.1	27.7	27.8	27.3
10	43.4	40.3	45.7	44.9	28.7	30.2	28.3	28.4	27.5
15	49.5	44.2	57.9	54.3	30.2	34.9	30.6	49.0	28.1
20	65.5	58.8	77.4	76.5	29.6	32.4	29.8	38.6	28.3
25	72.8	68.6	79.0	77.3	30.1	32.0	30.4	36.6	28.4
30	60.0	62.6	59.4	70.2	31.1	33.2	31.2	36.0	29.2
35	50.7	61.0	66.6	72.6	32.8	34.3	33.1	36.9	30.8
40	49.8	60.8	69.6	73.8	35.4	35.8	35.1	38.3	33.7
45	52.5	59.8	65.7	71.2	41.8	39.1	38.6	42.0	37.6
50	55.5	64.7	69.4	77.9	53.9	43.5	45.5	49.7	40.7
55	56.3	67.6	73.2	83.6	72.7	51.4	56.5	63.9	43.6
56	64.0	73.2	79.4	86.4	82.7	57.1	75.3	76.6	46.2
57	63.6	74.6	80.2	100.0	84.1	70.2	78.1	77.3	46.5
58	63.4	82.3	79.5	100.8	85.7	73.4	80.2	78.7	47.5
59	62.8	89.6	79.4	101.0	87.5	75.5	81.4	79.6	48.2
60	59.8	96.6	79.0	101.8	90.5	76.6	83.0	81.0	48.8
61	61.1	101.9	76.8	103.1	93.2	77.9	85.0	82.7	49.1

Temperature outputs from unexposed surface temperature U50 to U59

Time (min)	U50	U51	U52	U53	U54	U55	U56	U57	U58	U59
0	27.5	27.4	28.2	27.9	27.3	27.2	26.6	27.6	27.3	28.6
10	27.8	27.9	29.3	28.3	27.6	27.4	32.4	29.3	30.6	29.1
15	28.9	32.3	36.4	30.1	30.5	35.0	57.4	63.3	66.8	32.3
20	29.7	37.0	34.3	31.2	30.7	32.8	59.5	59.7	50.7	33.7
25	29.6	38.5	34.0	32.2	31.7	34.6	58.1	61.6	51.0	35.7
30	29.8	39.3	34.0	33.4	32.9	38.5	53.9	62.4	52.5	38.0
35	30.2	38.6	35.0	36.1	34.7	44.4	59.6	67.8	58.9	40.3
40	30.7	38.5	37.0	42.3	36.3	51.9	57.4	71.9	65.6	41.6
45	31.3	40.6	38.4	48.7	38.6	65.4	62.1	76.0	71.5	43.7
50	32.2	42.7	38.6	50.2	40.7	80.6	60.6	79.6	74.9	45.3
55	32.9	43.3	40.9	52.7	42.9	91.9	69.1	82.5	80.2	47.4
56	34.3	45.8	42.6	52.6	45.5	118.1	81.7	98.4	83.9	50.2
57	34.6	46.4	42.6	52.7	45.9	124.6	83.4	103.3	85.6	50.8
58	34.7	48.0	43.3	52.5	45.8	133.2	85.0	109.7	87.5	51.9
59	35.2	49.3	44.1	52.3	46.4	142.9	87.0	115.0	89.9	52.6
60	35.2	50.0	44.5	52.6	46.4	153.2	88.2	121.1	92.3	53.8
61	35.7	52.3	45.1	52.9	47.0	165.0	89.2	129.9	95.2	54.7

Temperature outputs from unexposed surface temperature U60 to U68

Time (min)	U60	U61	U62	U63	U64	U65	U66	U67	U68
0	28.7	28.8	28.6	29.0	28.8	29.4	29.2	28.9	28.9
10	29.2	37.6	28.9	30.0	43.1	30.8	30.1	44.0	29.7
15	33.4	62.6	34.3	33.6	61.0	37.4	33.5	63.2	36.8
20	33.9	76.6	38.0	34.4	71.8	39.4	35.3	76.3	37.7
25	35.3	84.0	37.9	36.1	77.7	41.7	37.9	83.6	39.2
30	37.0	89.0	39.3	37.8	82.9	45.1	40.4	87.9	39.3
35	38.9	92.6	39.9	39.6	87.4	47.2	43.1	92.6	39.0
40	40.3	93.8	40.9	41.4	92.0	49.8	45.9	95.0	41.7
45	41.7	96.5	42.9	42.4	91.5	50.1	47.2	95.2	44.5
50	42.7	108.8	45.4	44.1	92.1	51.2	49.3	95.5	45.9
55	44.8	116.2	46.5	46.2	91.3	51.5	51.3	96.2	47.5
56	47.2	128.2	49.9	48.9	91.9	56.1	53.5	96.9	53.5
57	47.2	131.8	50.4	49.6	92.9	55.6	53.9	97.1	55.0
58	47.8	135.4	51.9	50.3	92.6	57.6	54.4	97.1	56.2
59	48.3	138.4	52.7	51.1	92.8	58.6	54.8	97.2	59.8
60	49.0	141.9	53.9	51.8	93.1	60.8	55.4	97.3	62.4
61	49.6	145.7	56.0	52.3	93.1	60.9	55.9	97.2	64.8

Temperature outputs from unexposed surface temperature U69 to U73

Time (min)	U69	U70	U71	U72	U73
0	29.0	28.5	28.8	28.9	28.1
10	30.3	42.1	29.3	29.7	38.7
15	33.6	61.4	32.4	32.6	56.5
20	33.6	74.6	34.3	34.2	68.3
25	34.9	82.8	36.1	36.6	76.2
30	36.0	92.7	38.3	39.0	82.2
35	37.4	99.5	40.3	41.3	87.4
40	39.0	97.7	43.1	44.0	95.4
45	40.2	99.6	46.0	45.6	96.1
50	42.4	102.2	47.7	47.5	96.7
55	45.0	107.0	50.0	49.2	97.9
56	48.6	131.6	54.4	51.8	100.9
57	49.5	135.9	55.1	52.2	101.3
58	50.4	139.7	55.6	52.9	101.7
59	51.3	143.4	56.2	53.4	103.0
60	52.4	147.0	57.1	54.2	103.5
61	53.1	150.0	57.8	54.8	105.0

6.5 Pressure

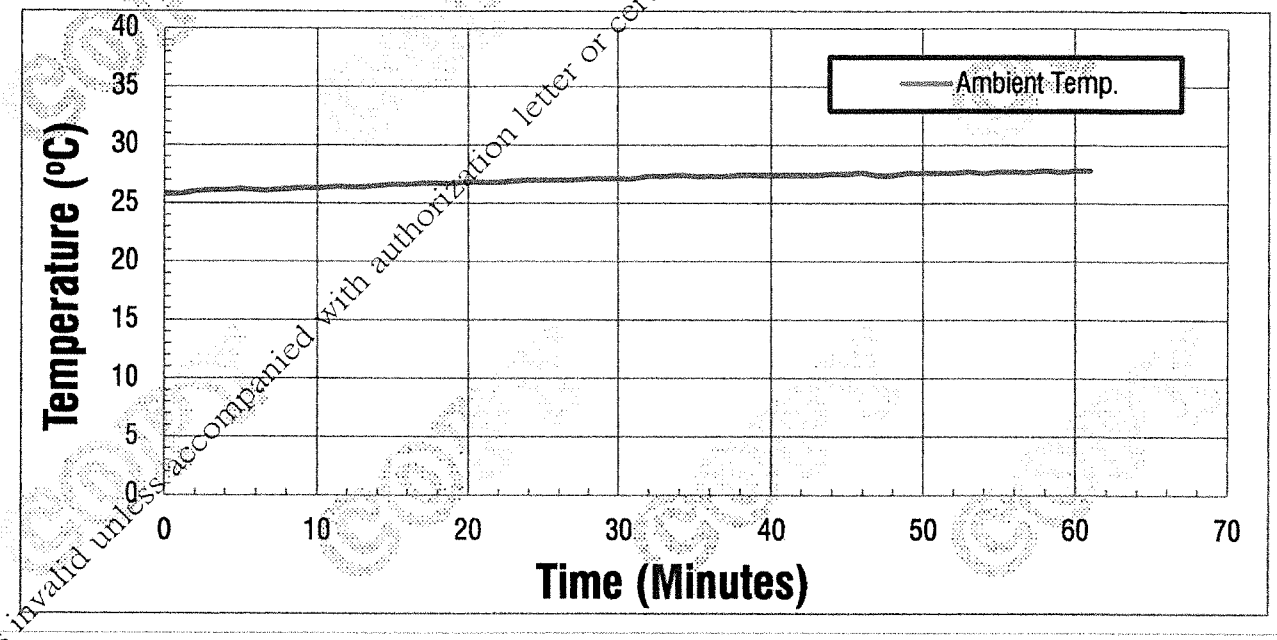
The furnace pressure differential with respect to the atmosphere at 500 mm above notional floor level over the test period was summarized in the following table.

Time (min)	Pressure (Pa)	Time (min)	Pressure (Pa)
6	-1.1	35	-0.7
10	-1.7	40	-2.4
15	1.0	45	-1.4
20	-1.0	50	-2.5
25	1.9	55	-2.3
30	0.0	60	0.8
		61	0.9

6.6 Ambient Temperature

The ambient temperature over the test period was recorded and shown in *Figure 11*.
The ambient temperature at the commencement of test was 25.8 °C.

Figure 11. Ambient temperature over the test period.



6.7 Lateral Deflections

Measured lateral deflections over the test period were 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 of each specimen was BOLDED in the following table.

Position \ Time (min)		0	10	20	30	40	50	55	60
Door A	D1	+0	+1	+1	+1	+1	+1	+1	+1
	D2	+0	-3	-3	-5	+2	+5	+5	+7
	D3	+0	+8	+10	+15	+15	+13	+15	+17
	D4	+0	+6	+9	+14	+14	+14	+14	+14
	D5	+0	+3	+5	+10	+5	+10	+10	+10
	D6	+0	+4	+9	+17	+17	+19	+19	+21
	D7	+0	+7	+14	+24	+22	+24	**+29**	**+29**
Door B	D8	+0	-3	-1	+1	+1	+5	+6	+6
	D9	+0	**-51**	-50	-49	-50	-46	-48	-49
	D10	+0	+10	+14	+13	+16	+16	+23	+37
	D11	+0	+1	+13	+16	+18	+21	+23	+21
	D12	+0	+5	+10	+13	+16	+20	+26	+25
	D13	+0	+2	+7	+10	+11	+7	+10	+9
	D14	+0	+0	+5	+6	+10	+14	+10	+10
	D15	+0	+0	+0	+5	+5	+5	+5	+5

6.8 Observations

Significant behaviours of the specimens 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.
02.33	**Door A and B:** Cracks appeared on the glass pane on fire exposed side. Glass pane's interlayer turned to semi-transparent.
03.33	**Door B:** Smoke released at fire louvers.
04.59	**Door A:** Light smoke released at top corners of the door leaf.
07.58	**Door B:** Light smoke released at top corners of the door leaf.
09.30	**Door A and B:** Glass pane's interlayer turned fully white colour.
16.24	**Door A:** Smoke released at the top edge of door leaf increased.
28.52	**Door A:** Stain mark observed at the leading edge of the door leaf.
29.30	**Door A:** Smoke released at the leading edge of door leaf increased.
30:00	**Door A & B : No integrity failure had occurred.**
31.10	**Door B:** Smoke released at the key hole.
40.00	**Door A and B:** Deformation of the door leaf observed.
45.21	**Door A:** Staining mark at top corners of the door leaf.
57.15	**Door A:** Cotton fibre pad test was carried out over top left corner of the door leaf. No flaming or glowing on the cotton pad was observed.
58.30	**Door A:** Cotton fibre pad test was carried out over top right corner of the door leaf. No flaming or glowing on the cotton pad was observed.
59.13	**Door B:** Stain mark observed at the door leaf.
59.07	**Door A:** Cotton fibre pad test was carried out over top left corner of the door leaf and the cotton pad glowed. **INETGRITY FAILURE OCCURRED.**
60.00	**Door B: No integrity failure had occurred.**
61:24	**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.

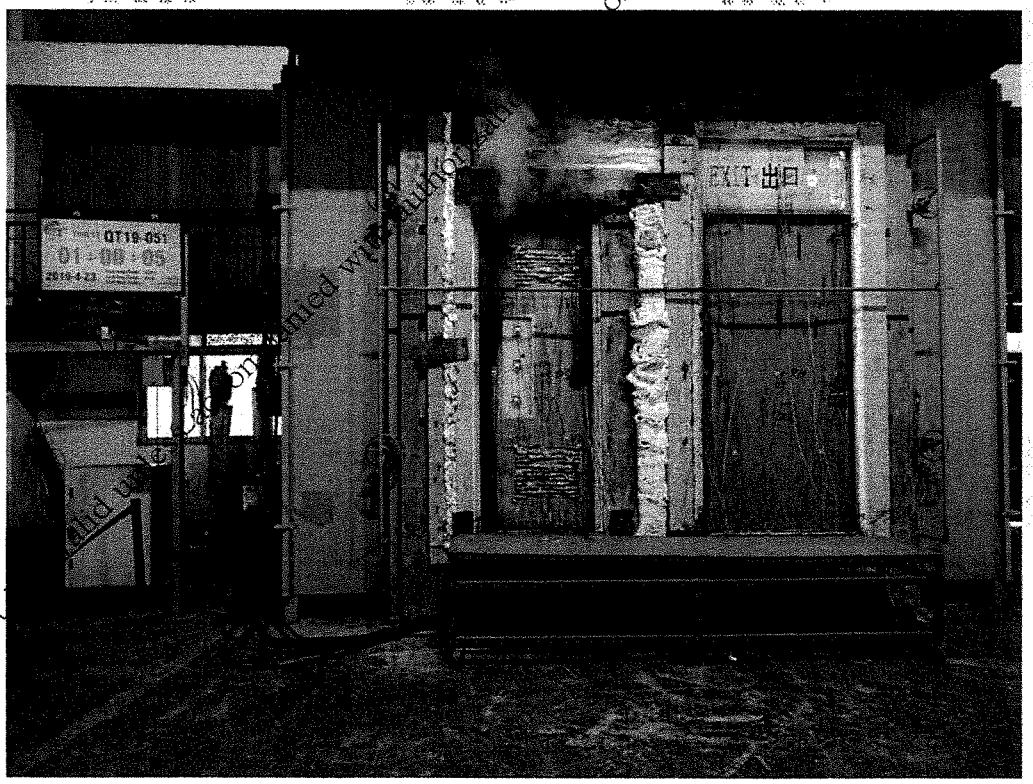


Photo 4. Unexposed surface of the specimens at 60 minutes of test.

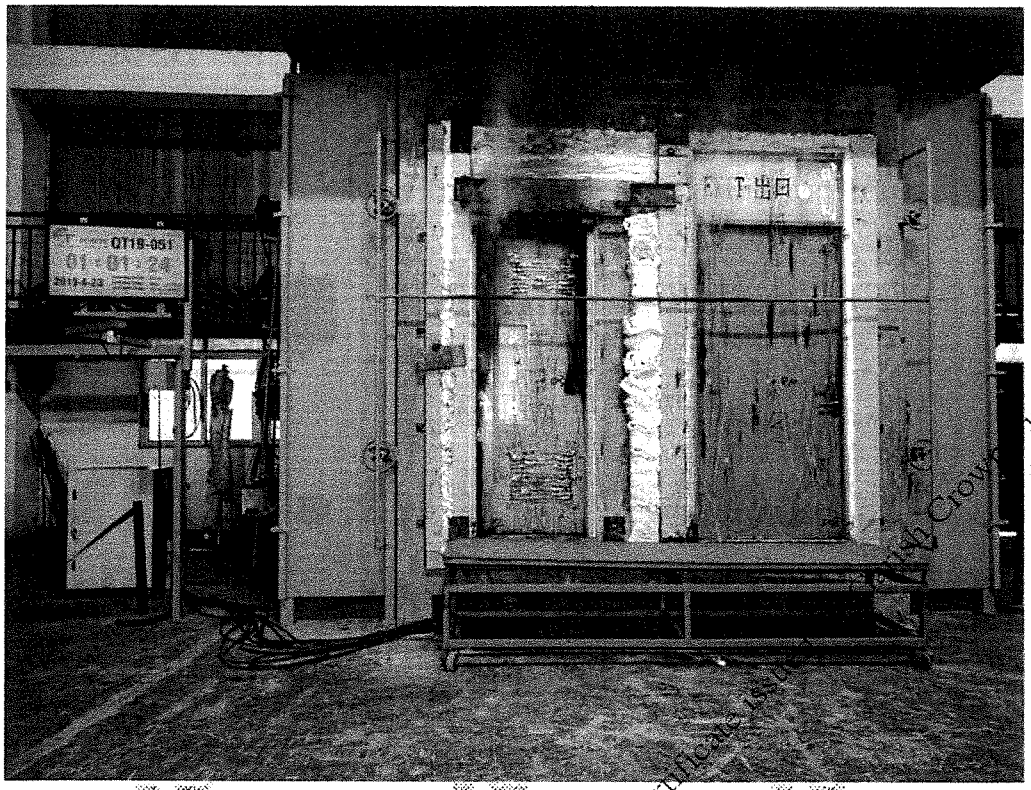


Photo 5. Unexposed surface of the specimens at the end of test.

Photo 6. Exposed surface of the specimens at after test. (Left: Door B; Right: Door A).

7. Test Results

7.1 Door A

The test on Door A was terminated after a test period of 61 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.
The earliest elapsed time before any integrity or insulation failure occurrence was bolded.

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	**59 minutes**
Gap Gauge	Ø6 mm	Penetration of the gauge into the furnace through the specimen and movable along a 150 mm gap	61 minutes
	Ø25 mm	Penetration of the gauge into the furnace through the specimen	
Cotton Pad		Ignition of the cotton pad	61 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	61 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]	61 minutes (No Failure)
			[Glazed Element]	61 minutes (No Failure)
			[Air Transfer Grilles]	61 minutes (No Failure)
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]	**45 minutes**
			[Door Frame]	61 minutes (No Failure)
			[Glazed Element]	61 minutes (No Failure)
			[Air Transfer Grilles]	61 minutes (No Failure)

7.2 Door B

The test on Door B was terminated after a test period of 61 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	61minutes (No Failure)
Gap Gauge	Ø6 mm	Penetration of the gauge into the furnace through the specimen and movable along a 150 mm gap	61 minutes (No Failure)
	Ø25 mm	Penetration of the gauge into the furnace through the specimen	
Cotton Pad		Ignition of the cotton pad	61 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	61 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]	61 minutes (No Failure)
			[Glazed Overhead Panel]	61 minutes (No Failure)
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]	61 minutes (No Failure)
			[Door Frame]	61 minutes (No Failure)
			[Glazed Overhead Panel]	61 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.

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

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