



ماتیریل لیب

Material Lab

Test Report

Fire Resistance Test  
On  
Fire Rated Steel Double Door

Test Sponsor:  
Karachi Steel Services





ماتيبريال لاب - القوز - دبي، صندوق بريد: ١١٤٧١٧، هاتف: ٠٩٧١ ٣٤٠٥٦٧٧، فاكس: ٠٩٧١ ٣٤٣٥٦٦٧  
 ماتيبريال لاب لخدمات الفحص ذ.م.م. مجمع دبي للاستثمار - دبي، صندوق بريد: ١١٤٧١٧، هاتف: ٠٩٧١ ٣٣٣٥٦٦٧  
 ماتيبريال لاب لخدمات الفحص ذ.م.م. أبو ظبي، صندوق بريد: ٦١٨٣١١، هاتف: ٠٩٧١ ٥٥٠٣٠٤١، فاكس: ٠٩٧١ ٥٥٠٣٠٤١  
 Material Lab - Al Quoz, Dubai, P.O. Box: 114717, Tel: +971 4 3405678, Fax: +971 4 3405677, Email: mlab@mlab.ae Website: www.mlab.ae  
 Material Lab Testing Services L.L.C. - DIP, Dubai, P.O. Box: 114717, Tel: +971 4 3339562  
 Material Lab Testing Services L.L.C. - Abu Dhabi, P.O. Box: 61831, Tel: +971 2 5503040, Fax: +971 2 5503041

### 3: Door Conditioning

The specimen was sampled and delivered to the lab on 01/10/2018 by representatives of the client. The door assembly was stored in ambient conditions of 20°C - 26°C and the moisture content of the supporting construction constituents were determined.

### 4: Specimen Description:

The specimen under observation was a single - action, latched, double-leaf steel door assembly with 45 mm steel leaf having Rockwool infill and 54 mm steel frame having grout infill. All components used for the assembly of the fire rated steel double door, including all hardware, are provided in table 2.1.

Name	Manufacturer/Supplier	Physical Properties	Additional Details (provided by test sponsor)
Fire Rated Steel Double Door Leaf	Karachi Steel Services (Manufacturer)	Overall Thickness: 45 mm	2mm thick hot dipped galvanized steel sheet bent to form hollow steel leaf profile and filled in with Rockwool
Fire Rated Steel Double Door Frame	Karachi Steel Services (Manufacturer)	Jamb Width: 200 mm	2mm thick galvanized Iron sheet bent to form hollow steel frame profile and filled in with Cebex Cable Grout
SS Pivots for Fire Rated Steel Double Door	Karachi Steel Services (Manufacturer)	Overall Length: 175mm Thickness: 22mm	8 Nos. of Stainless steel pivots, 4 for each door leaf
Mortise Lock Details for Fire Rated Steel Double Door	Hager (Supplier)	Overall Dimension: (110 x 152 x 25) mm	3800 series Grade 1 mortise
Overhead Door Closer for Fire Rated Steel Double Door	Hager (Supplier)	Overall Dimension: 255mm x 90mm	Model No.: 5300 series, Silver color Over Head Door Closer
Flush Bolt for Fire Rated Steel Double Door	CONSORT (Supplier)	Overall Dimension: (171 x 27 x 25) mm	Model No.: CH282D, Lever action flush bolt in SS Plate finish
MS Square Tube for Fire Rated Steel Double Door	Karachi Steel Services (Supplier)	Overall Dimension: (50 x 50 x 2) mm	(50 x 50 x 2) mm Square Tubes for internal framing.
MS Flat Bar for Fire Rated Steel Double Door	Karachi Steel Services (Supplier)	Overall Dimension: (5 x 50) mm	5 x 50 mm Flat Bar for astragal
Rockwool Infill for Fire Rated Steel Double Door	INCOM ROCKWOOL (PVT) LIMITED, Karachi, Pakistan	50mm thick	Wired Mat Type Rockwool having stated density of 100 kg/m <sup>3</sup> used as leaf infill
Glass for Vision Panel of Fire Rated Steel Double Door	KERALITE SAINT GOBAIN (Manufacturer)	Nominal Thickness: 5 mm	Trade Name: KERALITE, 5mm Fire Rated Glass
Tape for Vision Panel Glass of Fire Rated Steel Double Door	KERAFIX 2000	Nominal Dimension: 3 mm x 15 mm	Trade Name: KERAFIX 2000

Table 2.1: Items used for design of fire rated steel double door

Comprehensive detail regarding the fire rated steel double door frames is provided in table 2.2.

Comprehensive detail regarding the fire rated steel double door leaf is provided in table 2.3.

Details on all essential hardware (ironmongery) applied to the fire rated double door set is provided in tables 2.4 to 2.8.

R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1



Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 2 of 25



ماتيريل لاب - القوز - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٧، فاكس: +٩٧١ ٤ ٣٣٩٥٦٢  
ماتيريل لاب لخدمات الفحص ذ.م.م. مجمع دبي للاستثمار - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٣٩٥٦٢  
ماتيريل لاب لخدمات الفحص ذ.م.م. أبو ظبي، صندوق بريد: ٦١٨٣١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١  
Material Lab - Al Quoz, Dubai, P.O. Box: 114717, Tel: +971 4 3405678, Fax: +971 4 3405677, Email: mlab@mlab.ae Website: www.mlab.ae  
Material Lab Testing Services L.L.C. - DIP, Dubai, P.O. Box: 114717, Tel: +971 4 3339562  
Material Lab Testing Services L.L.C., Abu Dhabi, P.O. Box: 61831, Tel: +971 2 5503040, Fax: +971 2 5503041



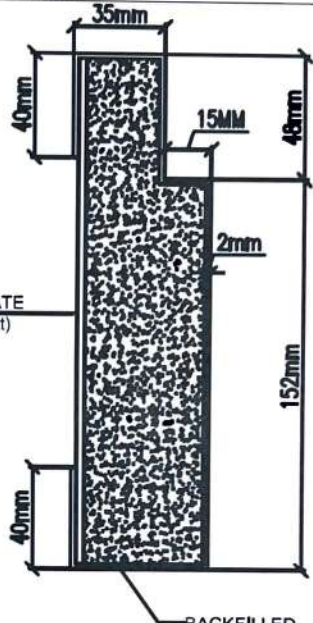
Fire Rated Steel Double Door Frame	
Overall Dimension of Frame	Height x Width: (2400 x 2400) mm
Overall Width of Jamb	200 mm
Type of Frame	Steel Hollow Frame with Cebex Cable Grout as infill
Frame Constituents	2mm thick Galvanized Iron Sheet bent to form frame outer profile
	(196 x 200) mm frame backing plate 3mm thick
	(100 x 12) mm anchor bolts, 3 on each side
Frame Dimensions	
	Rebate Face: 35 mm
	Frame Stop: 15 mm
	Rebate: 48 mm
	Soffit: 152 mm

Table 2.2: Steel Double Door Frame Details

Fire Rated Steel Double Door Leaves	
Overall Dimension of Leaves	Height x Width: 2356 x (Right Leaf: 1160; Left Leaf: 1160) mm
Overall Thickness of Leaves	45 mm
Core Type	Rockwool Infill
Leaf Constituents	2mm thick galvanized Iron sheet bent to form hollow steel leaf profile
	50mm x 50mm MS Square Tube on the top corners
	5mm x 50mm MS Flat Bar for astragal
	Wired Mat Type Rockwool having stated density of 100 kg/m <sup>3</sup> used as infill
	Top & Bottom Rails (50mm wide x 41mm depth with 2mm thickness) Stiles (50mm wide x 41mm depth with 2mm thickness)

Table 2.3: Steel Double Door Leaf Details

R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1



Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 3 of 25



ماتيريل لاب - القوز - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٧، فاكس: +٩٧١ ٤ ٣٣٣٩٥٦٢  
ماتيريل لاب لخدمات الفحص ذ.م.م. مجمع دبي للاستثمار - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٣٣٩٥٦٢  
ماتيريل لاب لخدمات الفحص ذ.م.م. أبو ظبي، صندوق بريد: ١١٨٣١١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١  
Material Lab - Al Quoz, Dubai, P.O. Box: 114717, Tel: +971 4 3405678, Fax: +971 4 3405677, Email: mlab@mlab.ae Website: www.mlab.ae  
Material Lab Testing Services L.L.C. - DIP, Dubai, P.O. Box: 114717, Tel: +971 4 3339562  
Material Lab Testing Services L.L.C., Abu Dhabi, P.O. Box: 61831, Tel: +971 2 5503040, Fax: +971 2 5503041

LB-008-TEST

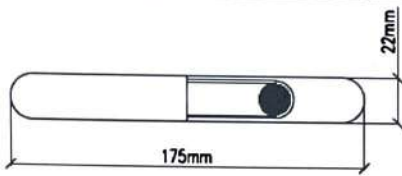
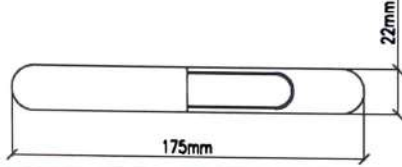
SS Pivot for Fire Rated Steel Double Door	
Manufacturer	Karachi Steel Services
Overall Dimension	Length x Thickness: (175 x 22) mm
Material	Stainless Steel
No. of Pivots used	8 (4 for each leaf)
Pivot Location for both leaves	1) 185 mm from top leaf edge to top of 1 <sup>st</sup> hinge 2) 150 mm from bottom of 1 <sup>st</sup> hinge and top of 2 <sup>nd</sup> hinge 3) 585.5 mm from bottom of 2 <sup>nd</sup> hinge and top of 3 <sup>rd</sup> hinge 4) 585.5 mm from bottom of 3 <sup>rd</sup> hinge and top of 4 <sup>th</sup> hinge 5) 150 mm from bottom leaf edge to bottom of 4 <sup>th</sup> hinge
Pivot Dimension Details	 

Table 2.4: Steel Double Door Hinge Details

Lock Set Details for Fire Rated Steel Double Door	
Brand/Supplier (Model No.)	Hager(3800 Series Sectional )
Finish	Silver Color
Additional Details	-
Lock Case Figure	

Table 2.5: Steel Double Door Lock Set Details

R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1



Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 4 of 25

ماتيريل لاب - القوز - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٧، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧  
ماتيريل لاب لخدمات الفحص ذ.م.م. مجمع دبي للاستثمار - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٣٣٩٥٦٢  
ماتيريل لاب لخدمات الفحص ذ.م.م. أبو ظبي، صندوق بريد: ١١٨٣١١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤١، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١  
Material Lab - Al Quoz, Dubai, P.O. Box: 114717, Tel: +971 4 3405678, Fax: +971 4 3405677, Email: mlab@mlab.ae Website: www.mlab.ae  
Material Lab Testing Services L.L.C. - DIP, Dubai, P.O. Box: 114717, Tel: +971 4 3339562  
Material Lab Testing Services L.L.C., Abu Dhabi, P.O. Box: 61831, Tel: +971 2 5503040, Fax: +971 2 5503041

Table 2.6: Overhead Door Closer DetailsTable 2.7: Flush Bolt Details

Table 2.7: Flush Bolt Details



ماتييريال لاب - الفؤز - دبي، صندوق بريد : ١١٤٧١٧، هاتف : ٢٢٤٤٣٧٨ - فاكس : ٩٧١ ٤ ٣٤٠٥٦٧٧  
 ماتييريال لاب لخدمات الفحم - مجمع دبي للاستثمار ، صندوق بريد : ١١٤٧١٧، هاتف : ٣٣٣٩٥٢١ - فاكس : ٩٧١ ٤ ٣٣٣٩٥٢١  
 ماتييريال لاب لخدمات الفحم، أبو ظبي، صندوق بريد : ١١٨٣٨١، هاتف : ٥٥٠٣٠٤١ - فاكس : ٩٧١ ٢ ٥٥٠٣٠٤١  
 Material Lab - Al Quoz, Dubai, P.O. Box: 114717, Tel: +971 4 3405678, Fax: +971 4 3405677, Email: mlab@mlab.ae Website: www.mlab.ae  
 Material Lab Testing Services L.L.C - DIP, Dubai, P.O. Box: 114717, Tel: +971 4 3339562  
 Material Lab Testing Services L.L.C, Abu Dhabi, P.O. Box: 61831, Tel: +971 2 5503040, Fax: +971 2 5503041



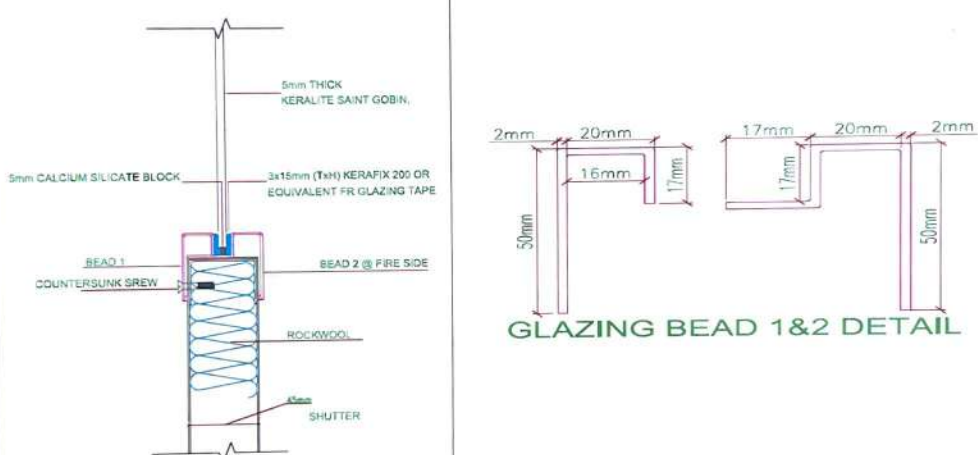
Vision Panel Details for Fire Rated Steel Double Door	
Glass Trade Name	KERALITE SAINT GOBAIN
No. of Vision Panels	2 (1 on each leaf)
Vision Panel Overall Dimensions	(255 x 350) mm
Glass Nominal Thickness	5 mm
Aperture Dimension	(200 x 300) mm
Glass Overall Dimension	(180 x 275) mm
Visible Glass Dimension	(155 x 250) mm
Glass Seal Details	3 mm Kerafix2000 glazing tape in between beading and glass and 5mm Calcium Silicate blocks on bottom of glass, 6mm air space on the upper side between glass and steel beading.
Glass Frame Detail	(50 x 20) mm, 2 mm thick channel
Glass Fixing to Frame	Steel M4 Screws, 2 on vertical and horizontal Non fire side of vision panel and screwed at 90° and welded at fire side of vision panel.
	

Table 2.8: Vision Panel Details

R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1



Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 6 of 25



ماتيريال لاب - القوز - دبي، صندوق بريد: ١١٤٧١٧، هاتف: ٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: ٩٧١ ٤ ٣٤٠٥٦٧٧  
ماتيريال لاب لخدمات الفحص ذ.م.م. مجمع دبي للاستثمار - دبي، صندوق بريد: ١١٤٧١٧، هاتف: ٩٧١ ٤ ٣٣٣٩٥٩٢  
ماتيريال لاب لخدمات الفحص ذ.م.م. أبو ظبي، صندوق بريد: ٦١٨٣١١، هاتف: ٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: ٩٧١ ٢ ٥٥٠٣٠٤١  
Material Lab - Al Quoz, Dubai, P.O. Box: 114717, Tel: +971 4 3405678, Fax: +971 4 3405677, Email: mlab@mlab.ae Website: www.mlab.ae  
Material Lab Testing Services L.L.C. - DIP, Dubai, P.O. Box: 114717, Tel: +971 4 3339562  
Material Lab Testing Services L.L.C., Abu Dhabi, P.O. Box: 61831, Tel: +971 2 5503040, Fax: +971 2 5503041



Gap at sill level between the steel door panel and the floor was approximately 6mm. Gap between the Steel double door panel and frame on fire exposed side along vertical and horizontal sides, was 3mm & 3.5mm, respectively. Gap between the steel double door panel and frame on front side, both vertical and horizontal sides, was less than 3mm. Gap at meeting stile edge between both leaves on fire and non-fire side was 3mm. Figure 1.1 to 1.5 illustrates front, side and fixing details of the completed steel door panel and frame assembly.

Figure 1.1: Non Fire side view of the assembled steel double door set

ماتييريال لاب - القوز - دبي، صندوق بريد : ١١٤٧١٧، هاتف : ٩٧١ ٤٣٤٠٥٦٧٧، فاكس : ٩٧١ ٤٣٣٩٥٦٧  
 ماتييريال لاب لخدمات الفحص ذ.م.م. جميع دبي للاستثمار - دبي، صندوق بريد : ١١٤٧١٧، هاتف : ٩٧١ ٤٣٣٩٥٦٧  
 ماتييريال لاب لخدمات الفحص ذ.م.م. ابو ظبي، صندوق بريد : ٦١٨٣١١، هاتف : ٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس : ٩٧١ ٢ ٥٥٠٣٠٤٠  
 Material Lab - Al Quoz, Dubai, P.O. Box: 114717, Tel: +971 4 3405678, Fax : +971 4 3405677, Email : mlab@mlab.ae Website : www.mlab.ae  
 Material Lab Testing Services L.L.C. - DIP, Dubai, P.O. Box: 114717, Tel: +971 4 3339562  
 Material Lab Testing Services L.L.C. Abu Dhabi, P.O. Box: 61831, Tel: +971 2 5503040, Fax: +971 2 5503041

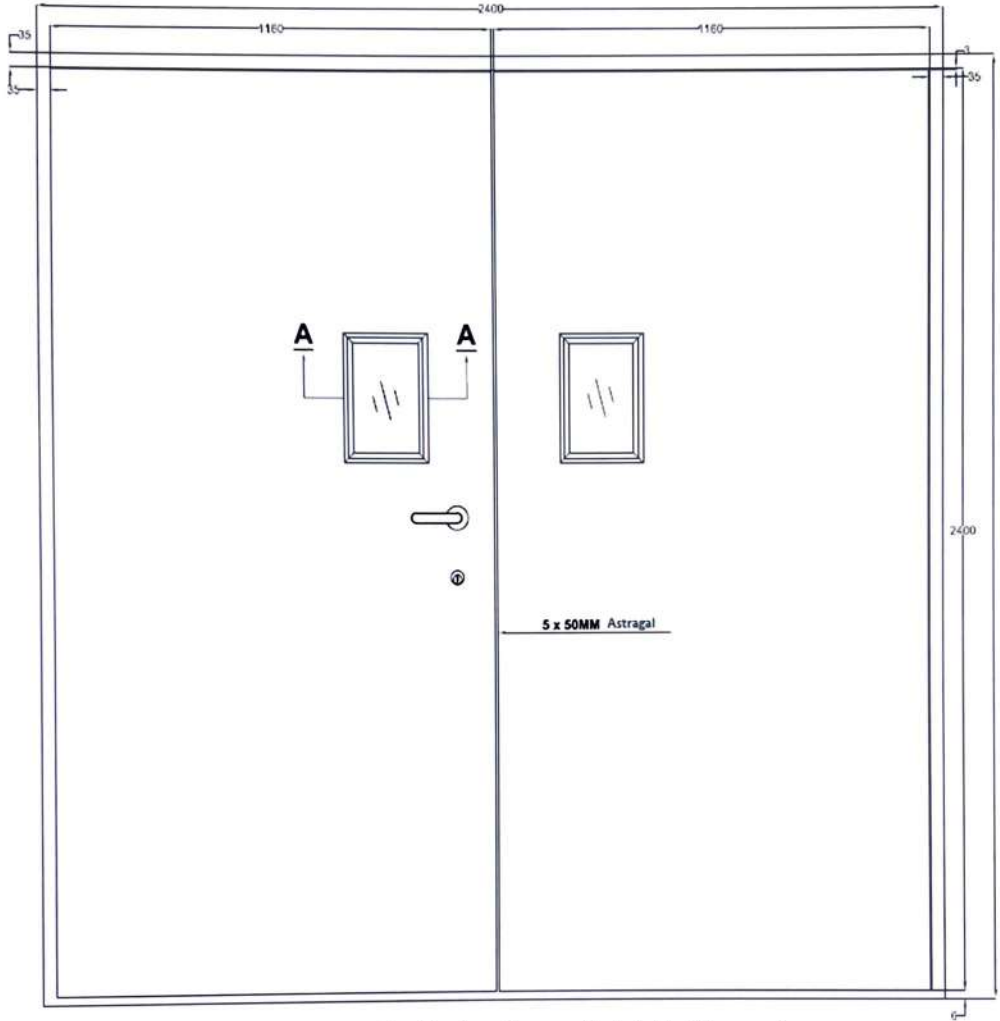


Figure 1.2: Fire side view of the assembled steel double door set



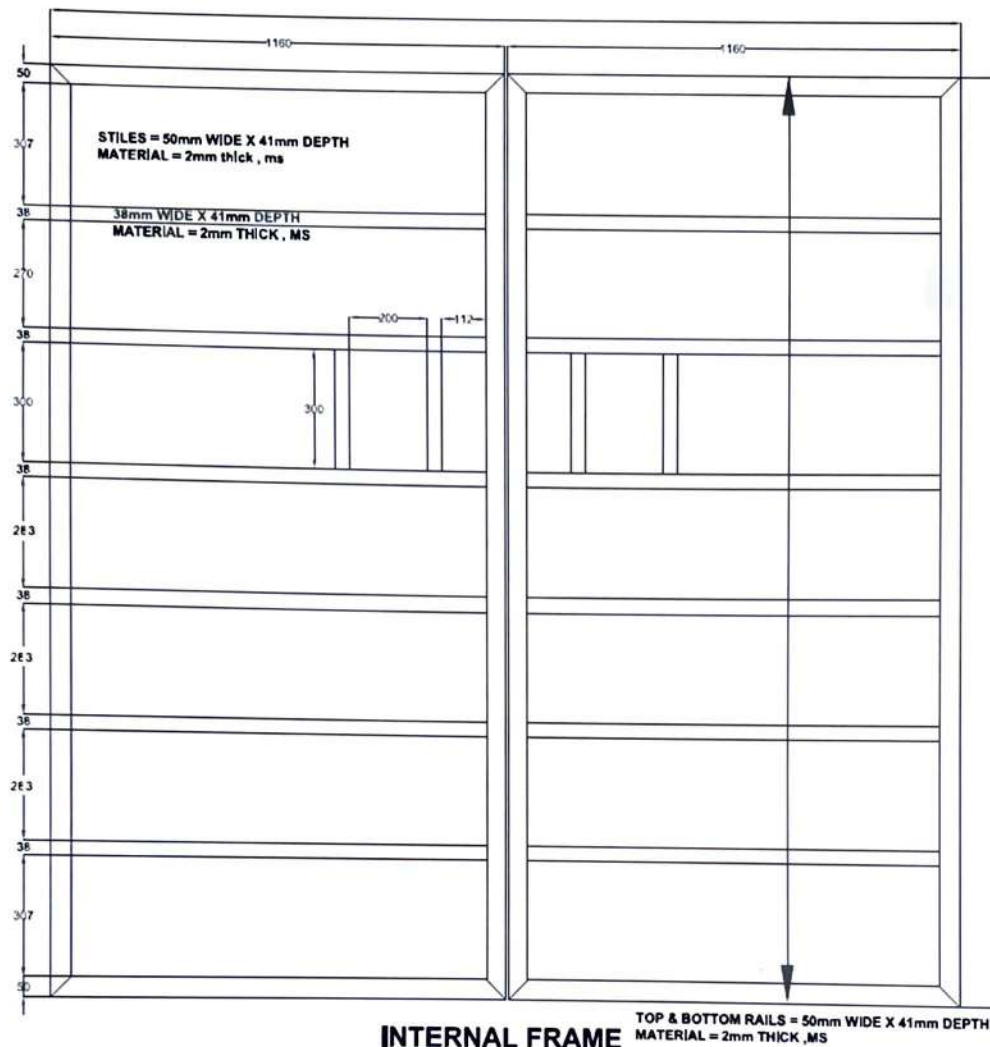
R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1

Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 8 of 25



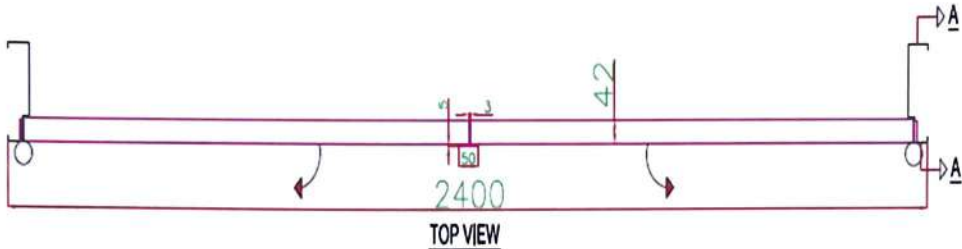
ماتيريل لاب - القوز - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧  
ماتيريل لاب لخدمات الفحص ذ.م.م. مجمع دبي للاستثمار - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٣٣٩٥٦٢  
ماتيريل لاب لخدمات الفحص ذ.م.م. أبو ظبي، صندوق بريد: ٦١٨٣١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١  
Material Lab - Al Quoz, Dubai, P.O. Box: 114717, Tel: +971 4 3405678, Fax: +971 4 3405677, Email: mlab@mlab.ae Website: www.mlab.ae  
Material Lab Testing Services L.L.C.- DIP, Dubai, P.O. Box: 114717, Tel: +971 4 3339562  
Material Lab Testing Services L.L.C., Abu Dhabi, P.O. Box: 61831, Tel: +971 2 5503040, Fax: +971 2 5503041

LB-008-TEST





(a)



(b)

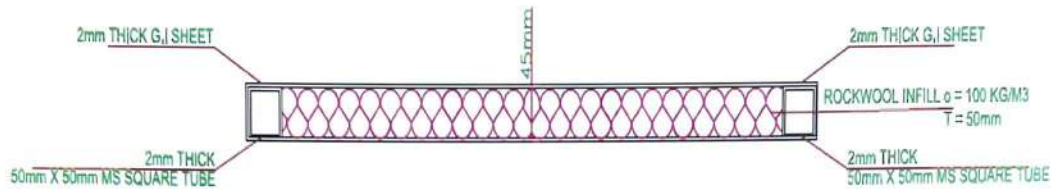


Figure 1.4: (a) Top view showing meeting stile section fixing details of assembled steel double door set, (b) Top view of section showing details of leaf of steel double door set

Sr. No.	Component	Height
1	Door Leaf	2356
2	Frame Rebate Face	35
3	Average Vertical Door Gap between Frame and Leaf	3
4	Door Gap between Door Leaf and Floor	6
<b>Total Height</b>		<b>2400</b>

Table 2.9: Dimensional verification of height of Steel Double Door dimension from exposed side

Sr. No.	Component	Width
1	Door Right Leaf	1160
2	Door Left Leaf	1160
3	Frame Rebate Face	35 * 2
4	Door Gap at Meeting Stile between both Leaves	3
4	Average Door Gap between Frame and Leaf	3.5 * 2
<b>Total Width</b>		<b>2400</b>

Table 2.10: Dimensional verification of width of Steel Double Door dimension from exposed side

R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1



Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 10 of 25

## 5: Specimen Preparation

A rigid steel frame with fire resistive concrete blocks fixed on its internal perimeter having an opening of 3.05 x 3.05 meter was used to prepare the specimen for testing. Masonry concrete blocks were used as rigid supporting construction, in accordance with clause 10.1 of ANSI/UL 10C-2009, as these blocks had a fire resistance greater than the specimen and had the strength to hold the specimen rigidly throughout the fire endurance period and the hose stream test. The blocks were assembled in the testing frame by the laboratory's skilled workers. An opening of 2420mm x 2410mm was left in the center of this supporting construction for installation of the fire rated steel double door assembly.

The Steel double door was then fixed in to the supporting construction opening by the sponsor's representative. The steel double door frame was fixed to the supporting construction with expansion anchor bolts after which Cebex Cable grout was filled in to the hollow steel frame and gaps in between the frame and blocks were sealed using mortar. In accordance with ANSI/UL 10C-2009 clause 9.1, opening of the swinging double door was kept inside towards the furnace.

After fixation, the specimens were verified to be in accordance with technical drawings provided by the sponsor. Gap measurements were taken. The specimen was left in its closed position. No locks were engaged and only the lock latch bolt and flush bolts on the inactive leaf were engaged in accordance with clause 15.2 of ANSI/UL 10C-2009.

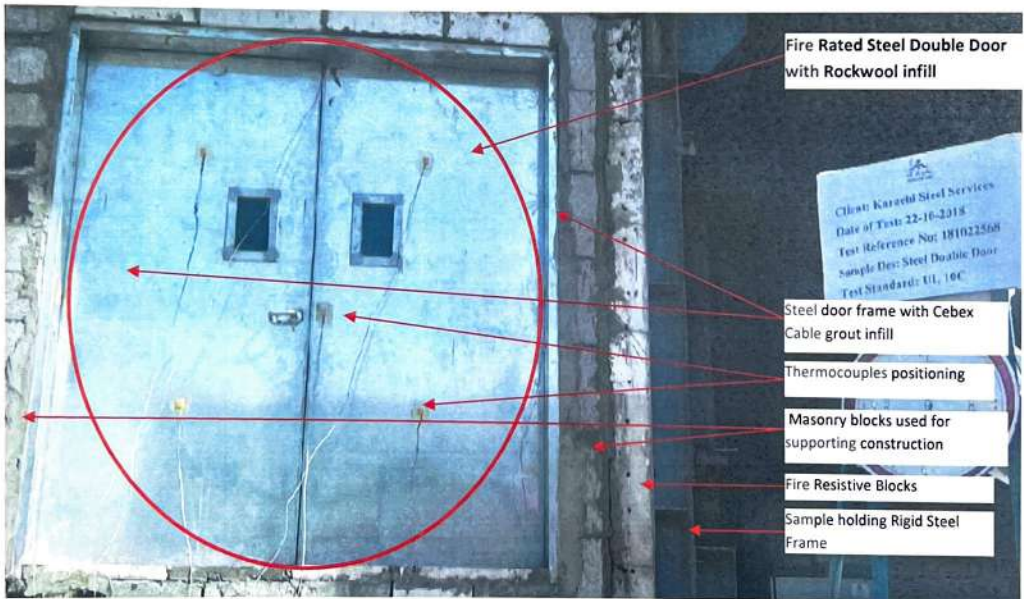


Figure 2: Test specimens mounted in frame for testing



R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1

Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 11 of 25



## 6: Application of Instruments

Nine internal K type thermocouples, protected using sealed tubes specified in clause 5.1 of ANSI/UL 10C-2009, were distributed evenly for measurement of internal temperature of the furnace. The junctions of the thermocouples were located 152 mm away from the exposed surface of the test assembly. A positioning diagram, figure 7, for the internal thermocouples has been provided in appendix 3.

Two pressure sensing head, located at 1 m above the furnace floor and one at approximately 2 m above furnace floor level were installed to monitor furnace pressure as per the requirements of clause 7 of ANSI/UL 10C-2009.

In order to measure temperature rise on unexposed surface temperature of the steel double door, 8 K type thermocouples brazed to the center of face of copper disc and under dry felted pads were installed on unexposed surface of the steel double door as per the requirements of clause 6.3 and 6.4 of ANSI/UL 10C-2009.

As per clause 6.2 of ANSI/UL 10C-2009, for measuring temperature rise, five thermocouples (TC-1 to TC-5) were located on steel double door leaves. The thermocouples were placed at the center of leaf and at the center of each quarter section of double door leaves. Three additional thermocouples (TC-6 to TC-8) were located at the center of each frame member. None of these thermocouples were placed on internal stiffeners, vision panels or nearer than 305 mm from any edge of the door leaves.

A positioning diagram, figure 8, for thermocouples placed on the unexposed surface of the double door has been provided in appendix 3. Graph showing unexposed surface temperature rise on the double door can be seen in appendix 2, figure 5.

Four infrared sensors were set up for measuring the deflection at mid height of steel double door. D1 was set at mid height of the fire rated steel double door left frame member and D4 was set at mid height of the fire rated steel double door right frame member. D2 and D3 were set at mid height of each of the door leaves. Results have been provided in table 5.2.

As per clause 12.2 requirements of ANSI/UL 10C-2009 for the hose stream test, a hose having diameter of 64mm connected to a standard Play pipe having discharge tip of 29mm was used to deliver a steady stream of water at the end of the test to evaluate the specimens performance against the hose stream test. A calibrated pressure gauge near the end of discharge nozzle tip was used to keep the pressure at the base of the nozzle steady as per the water pressure requirements of clause 12 of ANSI/UL 10C-2009.



R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1

Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 12 of 25



## 7: Test Procedure

The preparation and fixation of the thermocouples were followed by mounting of the test frame in front of the furnace. Prior to test commencement, proper functionality of all sensors and thermocouples were ensured for accurate display and data acquisition.

The specimen and its associated supporting construction was thoroughly inspected for cracks or damage. Any gaps between the door frame and the supporting construction was filled in with mortar and where possible Rockwool.

Ambient air temperature surrounding the laboratory was noted. Values characterizing ambient environment directly before and after the test are given in table 3. The client was informed of the standard limitations prior commencement of test.

Ambient temperature @12:02 p.m. before start of test (°C)	Ambient temperature @03:02 p.m. at end of test (°C)	Difference between ambient at start and end of test (°C)
35.4	40.0	4.6

Table 3: Ambient air temperature surrounding the laboratory

The furnace was then initiated to commence the actual test and a trained fire testing engineer was instructed to take specimen observations throughout the test duration. These observations have been tabulated in Test Results section. A video camera was set up to record the full duration of the test. A DVD containing a PDF copy of the test report, pictures from the test and complete video recording of the test has been provided along with this report.

A trained fire testing engineer continually ensured that furnace conditions during the test, such as temperature and pressure, were kept in accordance with clause 4 and 7 of ANSI/UL 10C-2009, respectively. During the test a neutral pressure plane was set up 1m above the furnace floor and the pressure at the top of the furnace was not allowed to exceed 20 Pa.

The fire testing engineer also ensured that the temperature inside the furnace did not deviate and remained within the tolerance limits set in clause 5.4 of ANSI/UL 10C-2009. The graph representing regulation of internal temperature of the furnace in accordance with ANSI/UL 10C-2009 has been provided in figure 3 of appendix 2.

Immediately after the fire endurance test the test frame holding the specimen was removed within 90 seconds from the furnace and the hose stream test was conducted. The hose stream was delivered through a 64mm hose with 29mm discharge tip of standard taper. The steady stream was delivered at 30 psi for duration of 82 seconds following the stream pattern specified in clause 12.2 of ANSI/UL 10C-2009.



R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1

Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 13 of 25

## 8: Test Results

### OBSERVATIONS:

Observations shown in table 4 form an integral part of this report:

Time [min]	Observation on unexposed side of specimen during fire endurance and hose stream test
<b>OBSERVATIONS DURING FIRE ENDURANCE TEST:</b>	
0	Commencement of Test.
6	Light smoke escaping from in between leaves at meeting stile top edge.
13	Discoloration of both leaf skins observed at top horizontal edge and slight outwards deflection observed along top horizontal edge of both leaves.
26	Slight outwards deflection observed at astragal on meeting stile top edge, Charring observed at left horizontal and vertical leaf edges of specimen.
30	Further outwards deflection observed at astragal on meeting stile top edge.
31	Deformation of both leaf skins at various locations at top portion of specimen.
35	Discoloration and formation of dark patches along left and right vertical edges of left and right leaf, respectively.
50	Light smoke observed escaping from right vertical edge of right leaf from in between frame and leaf.
60	Specimen was stable.
75	Formation of black patches along top portion of meeting stile, left leaf.
103	Inwards deflection of astragal on meeting stile edge above door handle.
120	Specimen was stable.
150	Specimen was stable.
180	Termination of fire endurance test.
<b>OBSERVATIONS DURING HOSE STREAM TEST:</b>	
1.	Immediately after the fire endurance test the specimen test frame was removed from the furnace within 90 seconds and the hose stream test was conducted for duration of 91 seconds.
2.	There was no through hole or gap formed during or after the hose stream test.
3.	Movement at the edges or along perimeter of door frame and leaves or at the meeting stiles was not observed. Door frames remained fastened to the wall on all sides and no openings developed.
4.	No dislodging of vision panel or crack or breakage in glass was observed. The glazing assembly was not loosened from its fastenings. Separation of glass from frame to create openings was not observed.
5.	There was no deterioration, dislodging or separation of astragal at meeting stile. Separation of astragal in direction parallel to plane of doors more than 19.1 mm did not occur.

Table 4: Observations of fire rated steel double door during fire endurance test

After being exposed for a total duration of 3 hours for fire endurance test and after being subjected to the hose stream test, the specimen assembly was evaluated against the acceptance criteria set in clause 14 and 15 of ANSI/UL 10C-2009. The door system was found to achieve the following fire resistance properties illustrated in table 5.1.

R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1

Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 14 of 25



### Fire Resistance of Double Leaf Steel Door Assembly after 180 minutes of testing:

Fire Rated Steel Double Door Assembly with Rockwool Infill, Overall Frame: (2400 x 2400)mm		
Test Parameters	Results	Remarks
<b>Fire Endurance: 3 Hours</b>		
1. Sustained Flaming	No Failure	No Sustained flaming observed for more than 10 seconds up till 180 minutes of testing
2. Cotton Pad	No Failure	No ignition or glowing of cotton pad after 76 minutes of testing. Use of cotton pad was discontinued after 76 minutes of testing as temperature on unexposed side had exceeded 250 °C on TC-1.
<b>Hose Stream Test: No Failure</b>		
3. Hose Stream Test	No failure	Specimen complied with the hose stream requirements set in clause 14 and 15 of UL 10C

Table 5.1: Evaluation of Fire Rated Steel Door According to ANSI/UL 10C-2009

### Total Deflection on Steel Double Door after 180 minutes:

Infra-red Sensor Number	D1	D2	D3	D4
Deflection (mm)	7	19	24	8

Table 5.3: Deflection Results

## 9: Limitations

This report details the method of construction, specimen and test preparations, test conditions and the results which were obtained strictly following only the procedures outlined in ANSI/UL 10C-2009. The test results refer only to the items tested and does not apply to assemblies with different dimensions or different components. Any interpretations or opinions expressed in this report are outside the scope of DAC accreditation. The test was carried out under standard conditions using testing equipment that is property of the Material Lab, Dubai. This report shall not be reproduced except in full, without the written approval of the laboratory.

Material Lab is an accredited independent laboratory. It is not associated / affiliated with any certification agency, manufacturer or producer in or out side of United Arab Emirates. Material Lab was not involved in any selection of the sampling procedure. The specimens were supplied by representatives of the client. Information regarding the source and model no. of intumescent and hardware were provided by the client. There was no variation in method of testing from the testing standards utilized i.e. UL 10C.

The test method and test report do not provide the following:

- Full information as to performance of all door assemblies in walls constructed and materials other than those tested.
- Evaluation of the degree by which the door assembly contributes to the risk of fire by generation of smoke, toxic gases, or other products of combustion.
- A temperature limit on the unexposed side of the door assembly.

R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1



Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 15 of 25

ماتيريل لاب - القوز - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٧، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧  
ماتيريل لاب لخدمات الفحص ذ.م.م. مجمع دبي للاستثمار - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٣٣٩٥٦٢  
ماتيريل لاب لخدمات الفحص ذ.م.م. أبو ظبي، صندوق بريد: ٦١٨٣١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١  
Material Lab - Al Quoz, Dubai, P.O. Box: 114717, Tel: +971 4 3405678, Fax: +971 4 3405677, Email: mlab@mlab.ae Website: www.mlab.ae  
Material Lab Testing Services L.L.C. - DIP, Dubai, P.O. Box: 114717, Tel: +971 4 3339562  
Material Lab Testing Services L.L.C., Abu Dhabi, P.O. Box: 61831, Tel: +971 2 5503040, Fax: +971 2 5503041





- A limit on the number of openings allowed in glazed areas or of the number and size of lateral openings between door and frame.
- Measurement of the degree of control or limitation of passage of smoke or products of combustion through the door assembly. Note: See limitations for the passage of smoke detailed in the Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives, NFPA 105.

Tested and Prepared By

Verified By

Syed Lateefur Rahman  
Fire Testing Engineer

Sohail Zafar  
Laboratory Manager



R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1

Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No. 16 of 25



**Appendix 1:**

Specimen drawings as provided by the sponsor (All dimensions are in 'mm')



R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1

Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 17 of 25



ماتيريال لاب - القوز - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧  
ماتيريال لاب لخدمات الفحص ذ.م.م. مجمع دبي للاستثمار - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٣٣٩٥٦٢  
ماتيريال لاب لخدمات الفحص ذ.م.م. أبو ظبي، صندوق بريد: ٦١٨٣١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١  
Material Lab - Al Quoz, Dubai, P.O. Box: 114717, Tel: +971 4 3405678, Fax: +971 4 3405677, Email: mlab@mlab.ae Website: www.mlab.ae  
Material Lab Testing Services L.L.C. - DIP, Dubai, P.O. Box: 114717, Tel: +971 4 3339562  
Material Lab Testing Services L.L.C., Abu Dhabi, P.O. Box: 61831, Tel: +971 2 5503040, Fax: +971 2 5503041

## Appendix 2:

### Data Results & Graphical Illustrations:

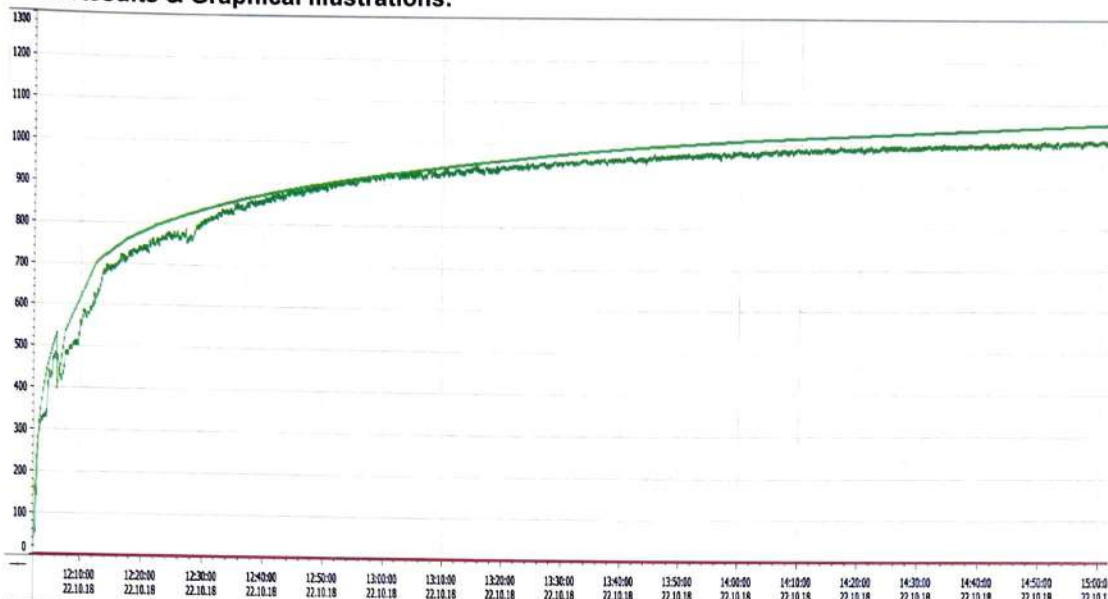


Figure 3: Average Temperature graph of internal furnace thermocouples for complete duration of the test

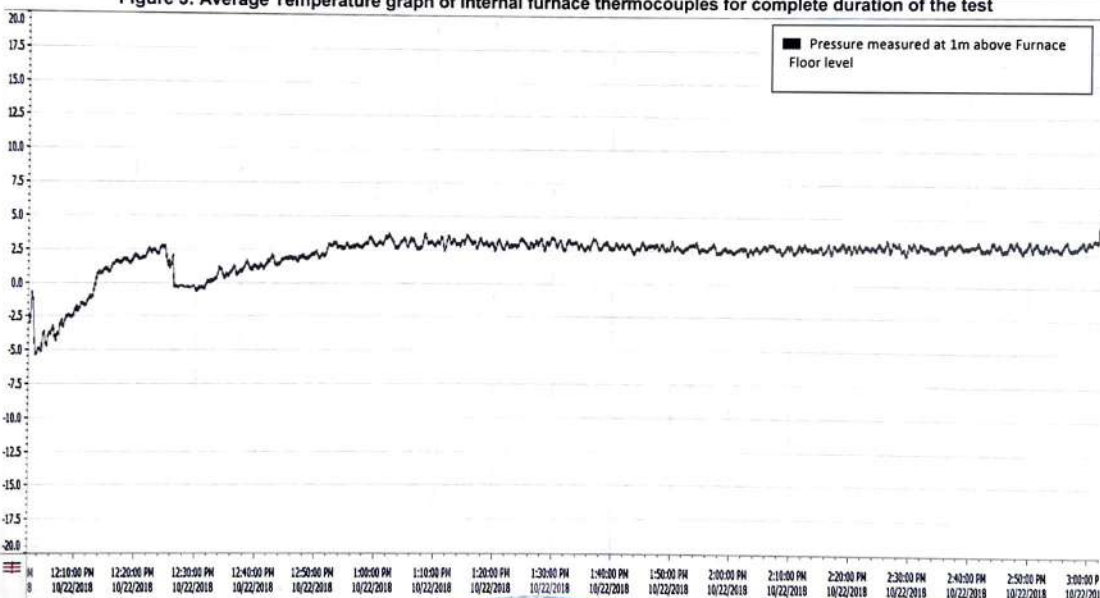
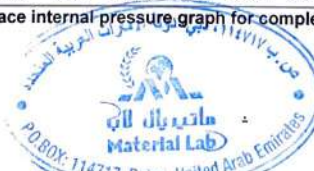


Figure 4: Furnace internal pressure graph for complete duration of the test

R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1



Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 18 of 25



ماتيريل لاب - القوز - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧  
ماتيريل لاب لخدمات الفحص ذ.م.م. مجمع دبي للاستثمار - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٣٣٩٥٦٢  
ماتيريل لاب لخدمات الفحص ذ.م.م. أبو ظبي، صندوق بريد: ٦١٨٣١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١  
Material Lab - Al Quoz, Dubai, P.O. Box: 114717, Tel: +971 4 3405678, Fax: +971 4 3405677, Email: mlab@mlab.ae Website: www.mlab.ae  
Material Lab Testing Services L.L.C. - DIP, Dubai, P.O. Box: 114717, Tel: +971 4 3339562  
Material Lab Testing Services L.L.C., Abu Dhabi, P.O. Box: 61831, Tel: +971 2 5503040, Fax: +971 2 5503041

LB-008-TEST



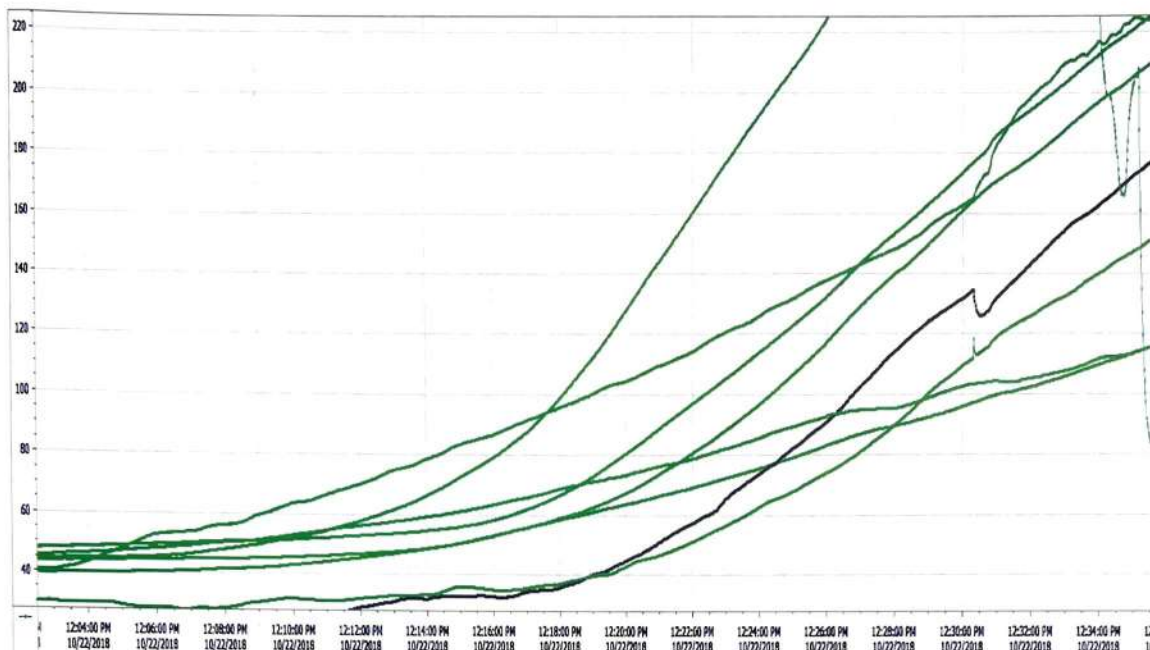


Figure 6: Thermocouple graphs used for obtaining unexposed surface temperature of steel double door assembly (TC1 to TC8) for 30 min duration of test



R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1

Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 19 of 25



ماتيريل لاب - القوز - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧  
ماتيريل لاب لخدمات الفحص ذ.م.م. مجمع دبي للاستثمار - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٣٣٩٥٦٢  
ماتيريل لاب لخدمات الفحص ذ.م.م. أبو ظبي، صندوق بريد: ٦١٨٣١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١  
Material Lab - Al Quoz, Dubai, P.O. Box: 114717, Tel: +971 4 3405678, Fax: +971 4 3405677, Email: mlab@mlab.ae Website: www.mlab.ae  
Material Lab Testing Services L.L.C.- DIP, Dubai, P.O. Box: 114717, Tel: +971 4 3339562  
Material Lab Testing Services L.L.C., Abu Dhabi, P.O. Box: 61831, Tel: +971 2 5503040, Fax: +971 2 5503041

### Appendix 3:

Instrumentation Positioning: (Not to scale, all dimensions in 'mm')

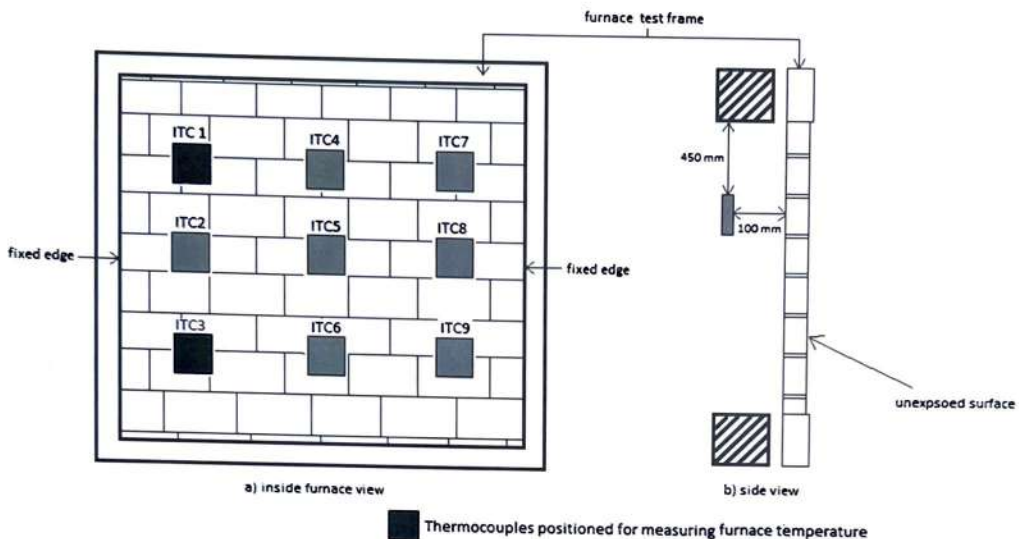


Figure 7: Front view of furnace showing positions of furnace internal thermocouple



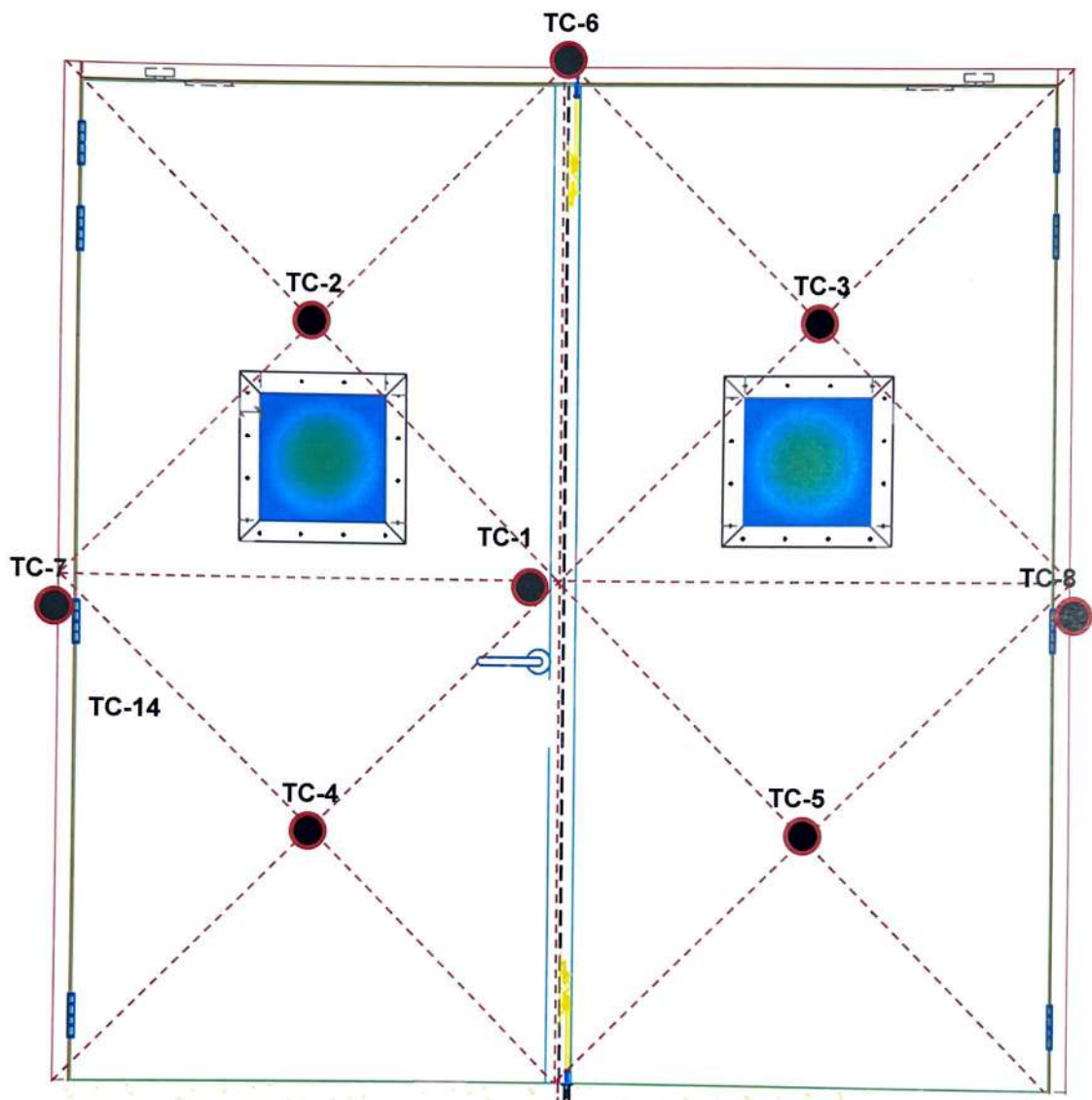


Figure 8: Positioning of thermocouples used to determine unexposed surface of the steel double door.



R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1

Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 21 of 25



ماتيريال لاب - القوز - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧  
ماتيريال لاب لخدمات الفحص ذ.م.م. مجمع دبي للاستثمار - دبي، صندوق بريد: ١١٤٧١٧، هاتف: +٩٧١ ٤ ٣٣٣٩٥٦٢  
ماتيريال لاب لخدمات الفحص ذ.م.م. أبو ظبي، صندوق بريد: ١١٨٣١١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١  
Material Lab - Al Quoz, Dubai, P.O. Box: 114717, Tel: +971 4 3405678, Fax: +971 4 3405677, Email: mlab@mlab.ae Website: www.mlab.ae  
Material Lab Testing Services L.L.C. - DIP, Dubai, P.O. Box: 114717, Tel: +971 4 3339562  
Material Lab Testing Services L.L.C., Abu Dhabi, P.O. Box: 61831, Tel: +971 2 5503040, Fax: +971 2 5503041



#### Appendix 4: Photographs



Specimen after 30mins of testing



Specimen after 60mins of testing

Figure 9.1: Unexposed side of specimen during exposure to fire

R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1

Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 22 of 25





Specimen after 90mins of testing



Specimen after 120mins of testing

Figure 9.2: Unexposed side of specimen during exposure to fire

R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1



Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 23 of 25



ماتيريل لاب - القوز - دبي، صندوق بريد: ١١٤٧١٧، هاتف: ٠٦٧١٤٣٤٠٦٧٨، فاكس: ٠٦٧١٤٣٤٠٦٧٧  
ماتيريل لاب لخدمات الفحص ذ.م.م. مجمع دبي للاستثمار - دبي، صندوق بريد: ١١٤٧١٧، هاتف: ٠٦٧١٤٣٣٩٥٦٢  
ماتيريل لاب لخدمات الفحص ذ.م.م. أبو ظبي، صندوق بريد: ٦١٨٣١، هاتف: ٠٦٧١٢٥٥٠٣٠٤١، فاكس: ٠٦٧١٢٥٥٠٣٠٤١  
Material Lab - Al Quoz, Dubai, P.O. Box: 114717, Tel: +971 4 3405678, Fax: +971 4 3405677, Email: mlab@mlab.ae Website: www.mlab.ae  
Material Lab Testing Services L.L.C. - DIP, Dubai, P.O. Box: 114717, Tel: +971 4 3339562  
Material Lab Testing Services L.L.C., Abu Dhabi, P.O. Box: 61831, Tel: +971 2 5503040, Fax: +971 2 5503041



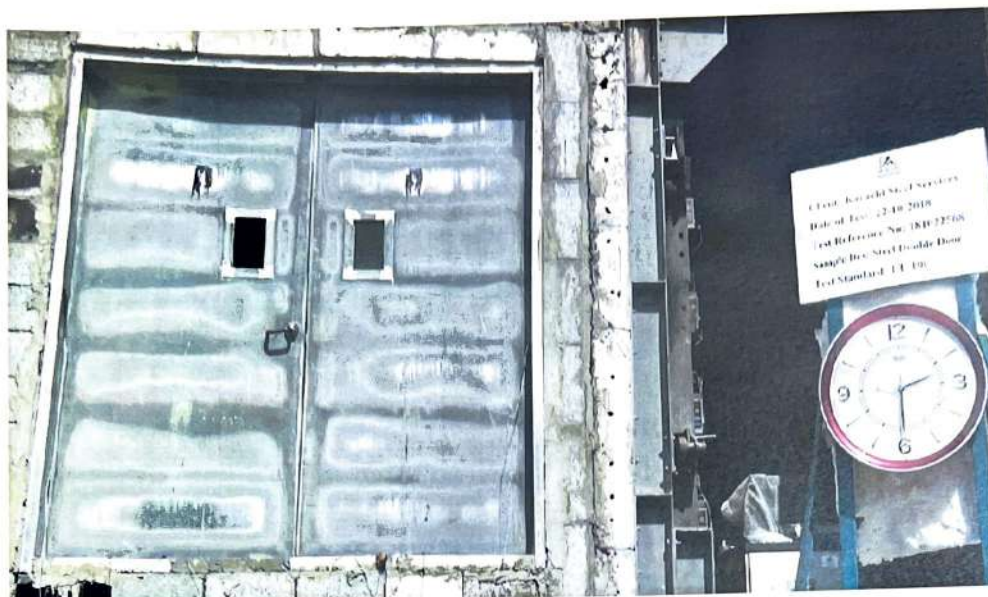


Figure 9.3: Unexposed side of specimen during exposure to fire

R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1



Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 24 of 25



ماتيريال لاب - القوز - دبي، صندوق بريد: ١١٤٧١٧، هاتف: ٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: ٩٧١ ٤ ٣٤٠٥٦٧٧  
ماتيريال لاب لخدمات الفحص ذ.م.م. مجمع دبي للاستثمار - دبي، صندوق بريد: ١١٤٧١٧، هاتف: ٩٧١ ٤ ٣٣٣٩٥٦٢  
ماتيريال لاب لخدمات الفحص ذ.م.م. أبو ظبي، صندوق بريد: ٦١٨٣١١، هاتف: ٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: ٩٧١ ٢ ٥٥٠٣٠٤١  
Material Lab - Al Quoz, Dubai, P.O. Box: 114717, Tel: +971 4 3405678, Fax: +971 4 3405677, Email: mlab@mlab.ae Website: www.mlab.ae  
Material Lab Testing Services L.L.C. - DIP, Dubai, P.O. Box: 114717, Tel: +971 4 3339562  
Material Lab Testing Services L.L.C., Abu Dhabi, P.O. Box: 61831, Tel: +971 2 5503040, Fax: +971 2 5503041



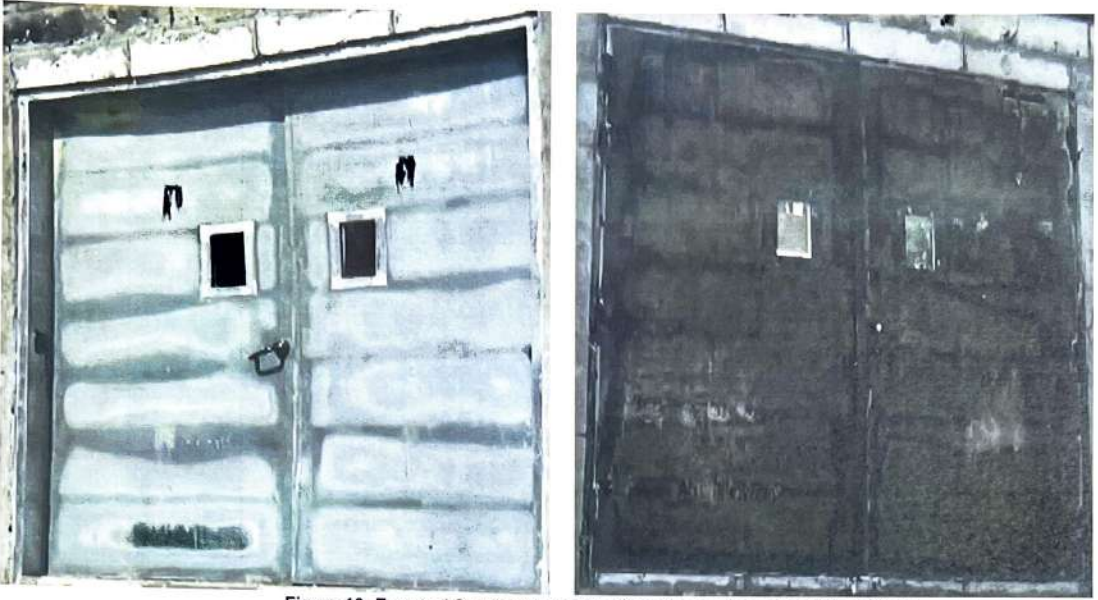


Figure 10: Exposed & unexposed side of specimen after completion of test



Figure 11: Specimen exposed and unexposed sides immediately after being subjected to hose stream test

--- END OF TEST REPORT ---

R-FT-UL-10C-01  
Issue Date: 01/01/2018  
Issue No. 1

Lab Report No.: FRR-1812/883 SN 1/1  
Lab Project: P - 3725  
Page No: 25 of 25