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FIRE RESISTANCE TEST REPORT

PARTITION SYSTEM with SINGLE LAYER LINING

in accordance with **BS EN 1364-1: 1999**

Test Sponsor: Kingtec Building Materials (HK & Macau) Limited
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Report Number: IT 14-190

Date of Issue: 2014-10-20

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HOKLAS Approved Signatory:



Ir. Dr. Chan Yuk Kit

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1. Scope of Test

This report is a record of a fire resistance test conducted by Forte Testing and Consultants Co., Ltd. in conformity with requirements in BS EN 1364-1: 1999 "Fire resistance tests for non-loadbearing elements – Part 1: Walls" and particular requirements in BS EN 1363-1: 1999 "Fire resistance tests – Part 1: General requirements".

The test subject was a partition system. The partition comprised of a single layer of "Hawk Pan" fire board lining with nominal thickness of 9 mm, and steel framework which was protected by 9 mm thick fillet boards. The specimen was supplied for test by Kingtec Building Materials (HK & Macau) Limited, the Sponsor.

The specimen achieved the following fire resistance:

INTEGRITY (E)		INSULATION (I)	
Sustained Flaming	255 Minutes	Average Temp. Rise	6 Minutes
Gap Gauge	255 Minutes	Max. Temp. Rise	7 Minutes
Cotton Pad	255 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:	Kingtec Building Materials (HK & Macau) Limited		
ID no. of the Specimen:	QT 14-223A		
Date Received:	2014-08-25		
Test Number:	QT 14-223		
Date Tested:	2014-09-02	Start Time:	14:26
Approved Test Operators from FORTE:	Ms. Cheng San Mei, Sammi		
Witness of the Test:	Mr. Sammy Chan, Mr. James Yung and Ms. Lilian Tse– Official Delegates of the Sponsor		
Report Issue Record:	Version 1 – 2014- 10 - 20		



3.2 Material Schedule

Parts specifications of the specimen were summarized in the following tables.
A star mark "*" indicates those not being verified by FORTE.

Fire Board

Supplier:	Kingtec Building Materials (HK & Macau) Limited
Brand:	Hawk Pan
Material:	Calcium Silicate *
Nominal Density:	950 kg/m ³ *
Nominal Thickness:	9 mm
Location Applied:	Linings of the Specimen and Fillet on the Structural Framework

U-channel

Supplier:	Kingtec Building Materials (HK & Macau) Limited
Material:	Galvanized Steel
Sizes:	24 mm x 50 mm x 0.5 mm

C-channel

Supplier:	Kingtec Building Materials (HK & Macau) Limited
Material:	Galvanized Steel
Sizes:	32 mm x 50 mm x 0.5 mm

Fixing – Screws

Supplier:	Kingtec Building Materials (HK & Macau) Limited
Type:	Self-tapping Screws
Sizes:	Ø3.5 mm X 35 mm

Fixing – Rivets

Supplier:	Kingtec Building Materials (HK & Macau) Limited
Type:	Blind Rivet
Material:	Aluminum
Sizes:	Ø4 mm X 10 mm

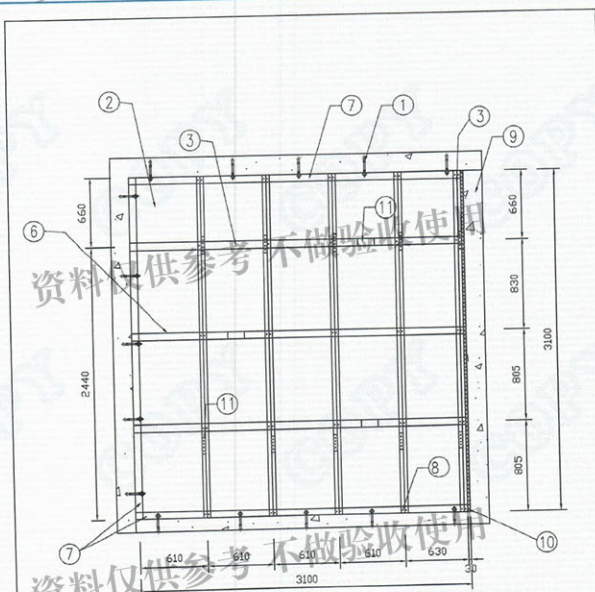
Fixing – Anchor Bolts

Supplier:	Kingtec Building Materials (HK & Macau) Limited
Type:	Expansion Anchor Bolt
Material:	Steel
Sizes:	Ø6 mm x 60 mm
Location Applied:	Perimeter Framework to Test Rig

Fire Sealant

Supplier:	Kingtec Building Materials (HK & Macau) Limited
Brand:	Lorient
Material:	Intumescent Mastics
Location Applied:	Joints Between Boards and Framework of Specimen – Fire and Non Fire Exposed Surface

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



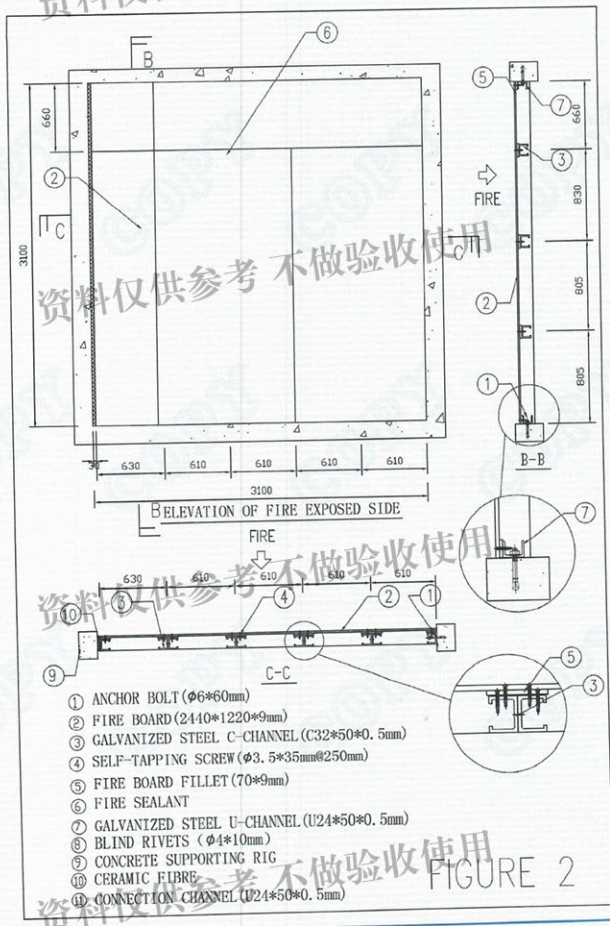
(STRUCTURAL FRAMEWORK)

- ① ANCHOR BOLT ($\phi 6 \times 60$ mm)
- ② FIRE BOARD (2440*1220*9mm)
- ③ GALVANIZED STEEL C-CHANNEL (C32*50*0.5mm)
- ④ SELF-TAPPING SCREW ($\phi 3.5 \times 35$ mm@250mm)
- ⑤ FIRE BOARD FILLET (70*9mm)
- ⑥ FIRE SEALANT
- ⑦ GALVANIZED STEEL U-CHANNEL (U24*50*0.5mm)
- ⑧ BLIND RIVETS ($\phi 4 \times 10$ mm)
- ⑨ CONCRETE SUPPORTING RIG
- ⑩ CERAMIC FIBRE
- ⑪ CONNECTION CHANNEL (U24*50*0.5mm)

FIGURE 1

Drawings of Specimen provided by the Sponsor (1)

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Drawings of Specimen provided by the Sponsor (2)

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4. Specimen Condition

4.1 Selection of the Specimen

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

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

4.2 Verification of the Specimen

Additional components of the specimen such as lining and steel studs were transferred to the Test Location on 2014-08-25 by the Sponsor. Samples of the components were taken randomly for verification.

FORTE verified the specimen description given by the Sponsor to the best of its ability. 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 3110 mm (w) x 3110 mm (h).

4.4 Installation of the Specimen

The specimen was assembled and installed by workers delegated by the Sponsor on 2014-08-26 to 2014-08-29.

4.5 Specimen Conditioning

The specimen was stored in the Test Location from 2014-08-25, the date which components of the specimen were received, to 2014-09-02, the date which fire resistance test performed.

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

Ambient Temperature (°C)	Relative Humidity (%)
32 ± 5	70 ± 5

4.6 Direction of Fire Side and Others

The Sponsor designated and installed that the steel framework was standing on the unexposed side.

The vertical free edge was set adjacent to the smaller board on the exposed face.

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

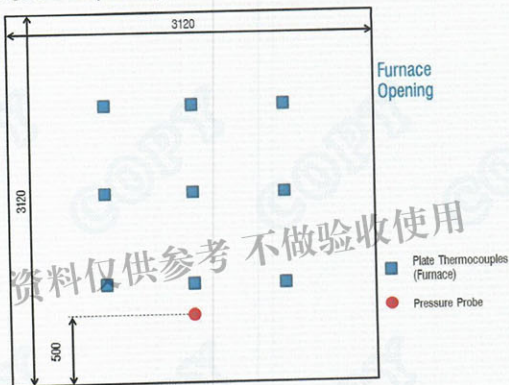
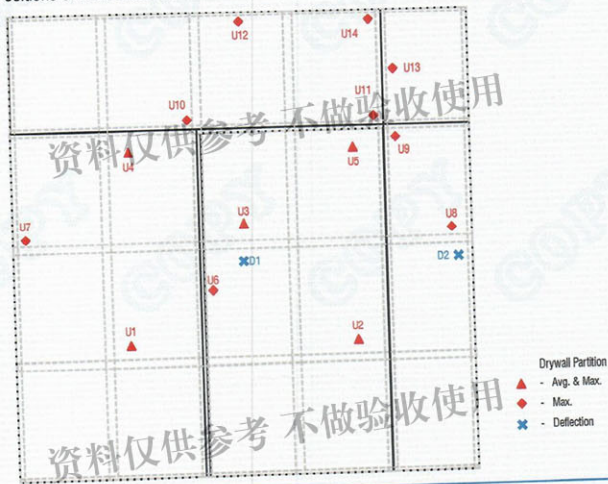


Figure 2. Positions of fixed surface thermocouples (U) and deflection measuring points (D) on the specimen.



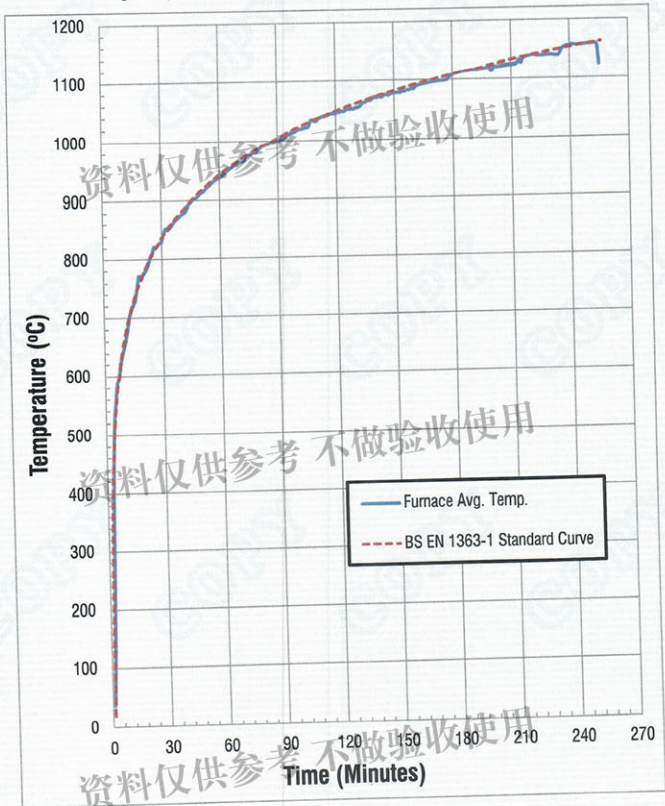
6. Test Data

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6.1 Furnace Temperature

The furnace average temperature over the test period is shown in *Figure 3*.

Figure 3. Furnace average temperature over the test period.



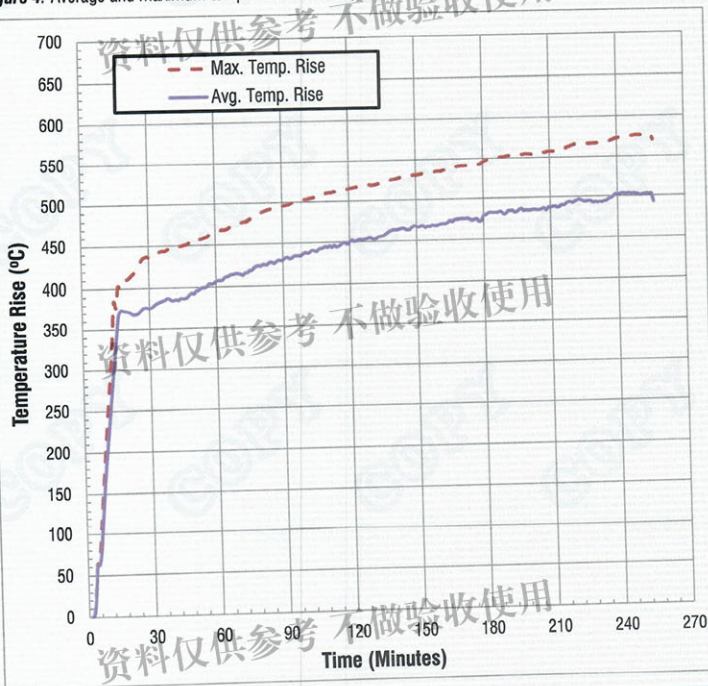
6.2 Unexposed Surface Temperature Rise

6.2.1 Fixed surface thermocouples

The temperature rises of unexposed surface of specimen measured by fixed surface thermocouples over the test period are shown in *Figure 4*.

The maximum temperature rise measured on U6 at 7.24 minute of test was 180.8°C , which was in excess of 180°C limit. The average temperature rise measured at specimen at 6.48 minute of test was 141.8°C , which was in excess of 140°C limit.

Figure 4. Average and maximum temperature rise of specimen over the test period.



6.2.2 Fixed surface thermocouples – Detailed Temperature Records

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

Temperature outputs from unexposed surface temperature U1 to U8

Time (min)	U1	U2	U3	U4	U5	U6	U7	U8
0.0	34.7	34.7	34.9	34.8	35.2	34.4	33.6	33.4
1.0	35.8	35.9	36.5	36.7	37.0	36.3	34.9	34.2
2.0	49.3	52.9	57.0	56.5	63.7	57.4	48.6	46.7
3.0	94.3	94.6	95.9	98.4	97.7	95.1	88.4	89.9
4.0	95.4	96.6	97.0	98.9	100.1	97.9	94.8	94.0
5.0	97.6	106.0	110.8	122.0	131.5	128.0	101.9	95.3
6.0	128.6	141.2	147.5	159.5	169.2	167.7	136.1	109.4
7.0	162.9	172.1	180.8	194.3	200.2	202.5	162.6	140.8
8.0	198.3	204.6	212.9	225.2	230.1	239.1	195.8	170.5
9.0	227.9	230.6	241.5	250.4	255.4	272.3	218.0	196.5
10.0	256.0	258.1	271.5	278.1	280.5	307.3	236.9	223.3
20.0	378.8	395.3	400.0	428.1	428.4	407.7	369.5	422.3
30.0	381.4	404.8	402.8	435.7	435.9	420.7	397.5	400.1
40.0	392.4	412.0	406.9	446.9	443.6	426.4	421.1	414.1
50.0	402.0	426.6	419.1	452.5	455.8	441.2	424.0	414.7
60.0	413.1	437.0	431.5	466.2	466.6	454.9	437.1	426.0
70.0	417.2	442.5	436.4	477.4	474.8	462.5	433.6	439.4
80.0	428.3	450.3	444.8	489.2	488.4	474.6	441.6	443.5
90.0	434.2	455.0	454.1	497.4	496.1	481.6	450.7	448.5
100.0	440.0	459.2	458.4	503.8	501.6	492.0	457.5	457.0
110.0	444.7	470.5	467.4	510.5	512.0	497.8	468.8	467.3
120.0	451.5	477.5	474.9	516.4	517.5	501.4	475.0	473.8
130.0	453.8	475.9	476.4	519.4	516.1	508.1	483.9	474.7
140.0	460.5	486.6	489.7	526.7	531.0	511.6	487.1	489.2
150.0	463.1	490.4	491.0	532.2	533.9	515.1	492.9	489.9
160.0	467.8	496.9	491.2	536.0	534.7	517.5	500.9	494.5
170.0	473.1	503.5	494.8	542.7	540.6	524.2	501.5	500.3
180.0	475.2	503.9	501.4	550.4	542.9	526.4	515.8	505.9
190.0	481.0	511.3	502.6	553.1	546.5	532.7	512.9	510.3
200.0	480.4	511.5	503.8	554.1	547.9	534.0	515.2	510.4
210.0	484.5	513.9	508.0	559.7	550.0	536.2	523.8	515.7
220.0	489.0	524.0	515.0	562.5	558.3	543.5	517.2	521.6
230.0	488.0	521.2	510.5	562.7	556.8	545.7	518.1	520.7
240.0	495.7	530.0	521.5	570.3	568.6	552.0	524.4	527.1
250.0	497.1	529.6	520.1	570.7	565.0	553.6	528.0	528.6
255.0	487.1	521.7	512.6	561.2	556.4	541.1	521.2	522.3



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Temperature outputs from unexposed surface temperature U9 to U14

Time (min)	U9	U10	U11	U12	U13	U14
0.0	33.4	34.4	34.3	34.8	34.2	35.0
1.0	34.2	35.7	36.2	36.2	35.6	36.3
2.0	46.7	56.8	55.6	55.1	55.0	53.7
3.0	89.9	97.3	96.8	95.9	97.2	96.3
4.0	94.0	98.3	98.1	97.8	98.1	98.2
5.0	95.3	124.1	125.1	122.5	121.6	118.1
6.0	109.4	158.8	162.7	157.4	159.3	154.3
7.0	140.8	188.2	194.9	187.1	187.5	181.4
8.0	170.5	215.6	223.4	213.5	212.8	207.2
9.0	196.5	239.3	246.7	234.8	231.3	227.9
10.0	261.3	272.8	257.0	251.7	247.7	232.9
20.0	422.1	447.7	441.0	438.7	424.5	441.5
30.0	440.9	471.6	465.1	443.0	428.7	454.9
40.0	448.0	484.4	477.7	451.1	438.2	461.4
50.0	456.8	488.9	483.5	453.4	444.0	470.5
60.0	467.7	501.7	490.7	463.2	456.2	476.3
70.0	474.5	511.9	500.5	474.1	462.6	485.9
80.0	481.2	523.7	512.3	490.1	475.9	498.8
90.0	489.7	530.9	521.4	498.8	484.7	509.0
100.0	494.1	538.3	527.6	504.3	489.1	516.4
110.0	503.4	545.9	536.7	510.3	498.0	523.6
120.0	507.2	551.2	542.1	515.2	504.5	529.0
130.0	517.2	554.5	547.4	518.1	506.9	534.5
140.0	520.9	561.8	556.2	524.6	515.7	541.3
150.0	522.6	566.5	560.6	529.5	518.7	546.4
160.0	526.7	570.0	560.9	532.2	521.6	546.7
170.0	528.2	576.5	564.1	538.7	525.5	550.6
180.0	532.1	582.4	570.1	542.8	529.3	555.0
190.0	537.9	588.5	574.8	548.7	532.9	561.5
200.0	540.3	589.8	576.6	550.5	534.1	563.7
210.0	538.5	593.1	580.2	552.3	537.4	565.5
220.0	546.4	600.7	588.1	560.5	544.9	573.9
230.0	547.5	601.9	589.7	561.6	544.5	576.7
240.0	556.9	608.2	597.8	569.3	555.4	583.9
250.0	556.8	610.8	601.4	571.0	555.1	587.7
265.0	548.3	604.8	592.1	560.2	546.9	578.4

6.3 Pressure

The furnace pressure over the test period is summarized in the following table.

Time (min)	Pressure: 500 mm above notional floor level	Time (min)	Pressure: 500 mm above notional floor level
6	-2.5	140	0.8
10	-2.0	150	1.2
20	1.7	160	-1.5
30	1.5	170	1.1
40	-0.2	180	0.2
50	-0.9	190	0.5
60	2.8	200	-1.2
70	-1.0	210	-0.4
80	-0.7	220	-1.8
90	-1.4	230	0.5
100	-0.8	240	1.3
110	-1.2	250	-2.0
120	0.0	260	0.8
130	0.1	263	-1.7

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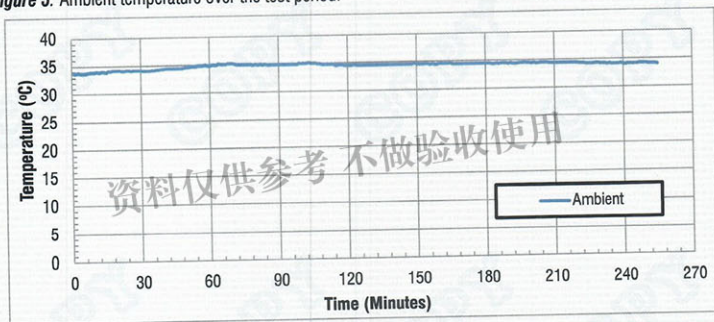
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6.4 Ambient Temperature

The ambient temperature over the test period was recorded and is shown in Figure 5.

The ambient temperature at the commencement of test was 32.3°C.

Figure 5. Ambient temperature over the test period.



6.5 Lateral Deflections

Measured lateral deflections over the test period are summarized in the following table. A positive measurement indicates a movement towards into the furnace and vice versa.

Measurements were taken in mm.

Maximum deflection measured on specimen was +68 mm at D1 at 240 and 250 minute of the test period.

Position \ Time (min)	0	30	60	90	120	150	180	210	220	
D1	+0	+25	+57	+63	+63	+65	+66	+66	+66	
D2	+0	+5	+10	+14	+14	+16	+13	+15	+18	
Position \ Time (min)	230	240	250							
D1	+67	+68	+68							
D2	+18	+14	+19							

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6.7 Photos

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Photo 1. Exposed surface of the specimen before test.

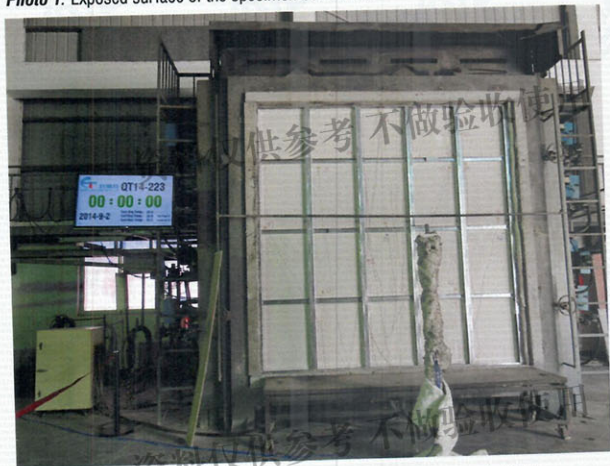


Photo 2. Unexposed surface of the specimen before commencement of test.



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REPORT no.: IT 14-190

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Photo 5. Unexposed surface of the specimen at 100 minute of test.



Photo 6. Unexposed surface of the specimen at 140 minute of test.



Test Results

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Test was terminated after a period of 255 minutes at request of the Sponsor.

The test data obtained from the fire resistance test was assessed against performance criteria given in BS EN 1364-1: 1999. The test results are summarized in the following table.

Performance Criteria		Elapsed Time before Failure Occurrence
Integrity (E)		255 minutes
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	255 minutes (No Failure)
Gap Gauge	Ø6 mm Penetration of the gauge into the furnace through the specimens and movable along a 150 mm gap	255 minutes (No Failure)
	Ø25 mm Penetration of the gauge into the furnace through the specimens	
Cotton Pad	Ignition of the cotton pad	255 minutes (No Failure)
Performance Criteria		Elapsed Time before Failure Occurrence
Insulation (I)		6 minutes
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	255 minutes (No Failure)
Average Temperature Rise	An increase of the average temperature of unexposed surface of the specimens above the initial average temperature by more than 140 °C	6 minutes
Maximum Temperature Rise	An increase of temperature at any other point of the specimens above the initial average temperature by more than 180 °C	7 minutes

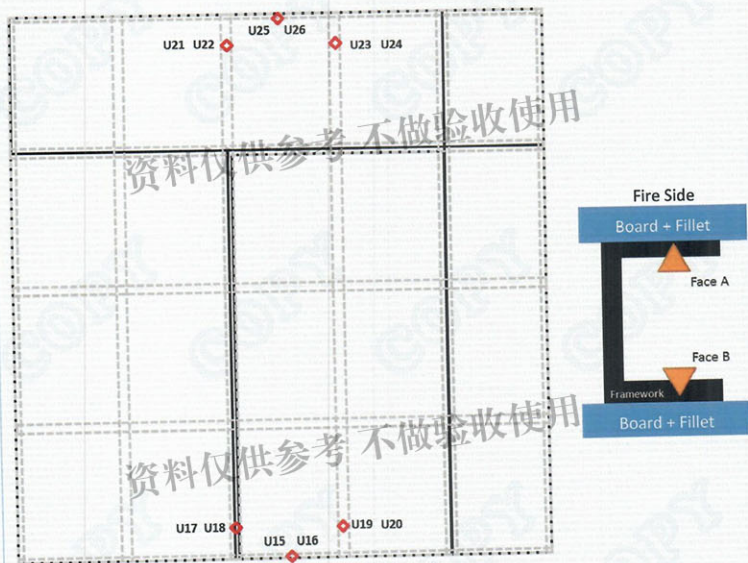
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Appendix A

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A.1 Additional Temperature – Framework

Fixed surface thermocouples were attached to different locations of the framework to obtain additional information. Locations of these thermocouples are shown and summarized in the following figure and table.



Location of Additional Thermocouples

Position	Face A	Face B
100 mm below Top Edge	U22, U24	U21, U23
500 mm above Bottom Edge	U18, U20	U17, U19
Centre of Top Track	U26	U25
Centre of Bottom Track	U16	U15

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A.2 Additional Thermocouples – Detailed Temperature Records

The outputs of the additional thermocouples on framework of the specimen are summarized in the following tables. Measurements were taken in °C.

Temperature outputs from unexposed surface temperature U15 to U20

Time (min)	U15	U16	U17	U18	U19	U20
0.0	32.8	32.0	34.0	33.8	34.2	34.2
5.0	39.7	36.2	57.4	44.4	58.3	43.8
10.0	93.2	68.5	97.7	85.2	97.2	84.7
20.0	98.3	91.4	159.9	120.6	171.5	120.2
30.0	151.6	110.4	236.2	150.4	252.0	158.2
40.0	183.6	132.2	278.7	174.0	288.9	180.3
50.0	201.4	142.7	298.4	186.0	305.3	188.8
60.0	215.7	150.8	312.7	193.6	316.4	195.4
70.0	223.8	150.8	318.4	190.9	321.1	193.4
80.0	228.8	153.3	318.1	187.4	320.3	190.4
90.0	235.8	158.0	321.7	188.9	322.4	191.4
100.0	242.8	161.7	327.3	191.5	325.1	194.1
110.0	250.3	167.6	332.2	196.1	328.8	196.1
120.0	256.1	172.9	335.2	198.2	332.7	197.8
130.0	262.5	176.8	336.4	198.4	334.4	199.1
140.0	270.4	186.9	343.2	205.1	340.5	204.8
150.0	274.4	187.9	343.6	204.7	341.7	204.1
160.0	279.4	192.5	343.3	207.8	344.2	207.9
170.0	285.2	196.8	345.9	209.4	349.2	212.5
180.0	285.1	196.4	343.9	206.3	346.4	207.7
190.0	290.1	199.5	347.6	208.2	348.9	209.1
200.0	292.8	199.9	349.1	209.0	348.7	208.2
210.0	296.6	204.4	352.6	212.5	351.4	212.4
220.0	299.6	208.4	356.3	215.6	354.0	215.5
230.0	301.9	207.9	356.6	214.8	353.3	211.6
240.0	304.2	211.0	360.5	218.6	357.5	218.5
250.0	306.4	213.2	362.6	217.6	356.9	213.3
255.0	307.6	213.6	361.4	214.9	356.3	215.1



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Temperature outputs from unexposed surface temperature U21 to U26

Time (min)	U21	U22	U23	U24	U25	U26
0.0	34.5	33.1	33.1	32.3	32.9	32.9
5.0	57.2	49.2	57.6	48.3	76.6	46.4
10.0	91.2	93.3	96.1	92.8	95.1	77.2
20.0	161.1	147.0	182.9	151.6	115.2	117.1
30.0	247.5	199.2	266.3	196.7	182.0	145.7
40.0	293.4	229.4	309.9	222.6	220.7	165.3
50.0	315.2	239.7	336.8	234.0	241.0	174.6
60.0	331.0	250.5	352.4	242.7	257.6	185.5
70.0	335.1	253.3	360.8	246.7	270.8	192.2
80.0	337.1	254.6	364.3	247.5	283.3	199.6
90.0	341.2	257.5	369.4	250.8	295.3	206.4
100.0	343.2	260.8	373.3	253.5	304.0	210.8
110.0	346.9	264.9	376.6	257.6	309.8	214.4
120.0	350.1	268.4	379.9	261.3	314.9	216.7
130.0	352.4	268.8	383.0	261.4	321.8	221.1
140.0	353.7	271.2	385.4	266.2	324.7	223.5
150.0	357.5	274.0	386.5	267.4	329.7	226.4
160.0	359.1	274.8	388.0	268.9	333.1	228.2
170.0	359.9	275.2	389.3	268.7	336.5	233.2
180.0	362.7	278.9	389.4	270.5	341.3	236.0
190.0	365.0	279.4	392.7	271.6	345.3	238.9
200.0	366.2	279.2	394.5	271.4	349.5	243.4
210.0	344.0	286.0	395.2	274.2	352.4	245.2
220.0	341.1	286.7	397.8	274.5	356.4	249.2
230.0	344.8	285.8	400.3	274.6	360.9	251.9
240.0	129.3	288.7	403.6	279.3	360.4	250.4
250.0	123.0	291.6	405.1	280.2	369.4	257.6
255.0	120.3	293.2	404.9	281.1	369.2	256.4

资料仅供参考 不做验收使用

END OF REPORT