

FIRE RESISTANCE TEST IN ACCORDANCE WITH BS EN 1634-1:2008
On a Fully Insulated Single-acting, Unequal Double-leaf Composite Timber DoorsetTest Report No.: R17B14-1A
Identification No.: Q17B19

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Testing Location:
RED Hong Kong Main Laboratory
DD 134, Lung Kwu Tan, Tuen Mun,
N.T., Hong Kong

Test Sponsor

Faith Mark Consultants Limited
G/F, 120 Camp Street, Sham Shui Po, Kowloon, Hong Kong

APPROVED SIGNATORY:

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DATE: 13 JUN 2017

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CONTENT

Section	Description	Page
1	SUMMARY	3
2	INTRODUCTION	4
3	TEST INFORMATION	4
4	EQUIPMENT	5
5	CONDITIONING	5
6	TEST SPECIMEN CONSTRUCTION	5
7	VERIFICATION OF TEST SPECIMEN	5
8	PRE-TEST MEASUREMENTS	6
9	TEST PROCEDURES	6
10	TEST DATA AND INFORMATION	7
11	RESULTS	8
12	LIMITATIONS	9
APPENDIX A	PHOTOS AND TEST RECORD	10
APPENDIX B	OBSERVATION	23
APPENDIX C	DATA RECORDED DURING THE TEST	24
APPENDIX D	INFORMATION FROM TEST SPONSOR	28

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1

2

1 SUMMARY

Fire resistance test conducted in accordance with BS EN 1634-1:2008 on a fully insulated single-acting, unequal double-leaf composite timber doorset.

A specimen of fully insulated single-acting, unequal double-leaf composite timber doorset had been subjected to a test in accordance with BS EN 1634-1:2008. As requested by the test sponsor, the specimen was mounted within concrete lined specimen holder by test sponsor such that the door leaves were swinging toward the heating conditions. The specimen was asymmetrical and only one side of the specimen was tested as per test sponsor's request, for which the fire side was determined by the test sponsor.

The specimen had overall dimensions of 1,990 mm wide by 2,548 mm high by 110 mm frame thickness. It was comprised of a composite door frame and unequal door leaves with 2 nos. of glazed panels. Both door leaves were constructed by nominal 35 mm thick ceramic fibre wool door core sandwiched by 9 mm thick fire rated boards, with nominal 3 mm thick plywood facings on both sides and nominal 1 mm thick plastic laminate on exposed side of door leaves only (refer to test sponsor's drawings). The left door leaf was with sizes of 1,200 mm wide by 2,500 mm high by nominal 60 mm thick and hung to the door frame by 4 nos. of 'MARCO POLO' stainless steel butt hinges with sizes of 114 mm by 114 mm by 3 mm thick. The right door leaf was with sizes of 700 mm wide by 2,500 mm high by nominal 60 mm thick and hung to the door frame by 4 nos. of 'MARCO POLO' stainless steel spring hinges with sizes of 114 mm by 114 mm by 3 mm thick. A nominal 40 mm thick 'Mingan' insulated glazed panel with vision sizes of 500 mm wide by 500 mm high was incorporated into the left door leaf. A nominal 40 mm thick 'Mingan' insulated glazed panel with vision sizes of 300 mm wide by 1,200 mm high was incorporated into the right door leaf.

1 no. of 'Lorient' 12 mm by 12 mm smoke seal and 1 no. of 'Lorient' 15 mm wide by 4 mm thick fire seal were installed at each jamb and head of door frame. 1 no. of 'Vica' 40 mm wide by 4 mm thick fire seal was installed at the top and hinging edges of both door leaves and meeting edge of right door leaf. 2 nos. of 'Lorient' 15 mm wide by 4 mm thick fire seal were installed at the meeting edge of left door leaf. 2 nos. of 'Pyroplex' 20 mm wide by 4 mm thick fire and smoke ball seal were installed at the bottom edge of right door leaf. 1 no. of 'Fan Qiu' 34 mm high by 15 mm thick automatic bottom drop seal was installed at the bottom edge of left door leaf.

A 'MARCO POLO' surface mounted overhead door closer was installed at the exposed side of left door leaf. A 'MARCO POLO' lockset was installed at the left door leaf. A 'MARCO POLO' flush bolt was installed at the top and bottom portions of right door leaf. A 'MARCO POLO' door selector was installed on the exposed side of door frame. A handle was installed on both sides of right door leaf. The doorset was unlocked, unlatched and unbolted during the test.

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3

The specimen satisfied the performance requirements specified in BS EN 1634-1:2008 for the following periods:

Integrity:	Cotton Pad	109 Minutes ^a
	Gap Gauge	109 Minutes ^a
	Sustained Flaming	109 Minutes ^a
Insulation (l, doorset excluding the glazed panels):		109 Minutes ^b
Insulation (left glazed panel):		109 Minutes ^b
Insulation (right glazed panel):		106 Minutes

The test was discontinued after a heating period of 132 minutes.

^aNote: Insulation performance was deemed not to be satisfied as a consequential effect of failing integrity performance as mentioned in clause 11.4.2 of BS EN 1363-1:2012. The insulation performance of the specimen against mean and maximum temperature rises criteria were as given in pages 8 and 9 of this report.

^bNote: The right glazed panel was covered by fire rated board with ceramic fibre blanket as requested by test sponsor after a heating period of 109 minutes due to insulation failure.

2 INTRODUCTION

The objective of the test is to determine the fire resistance performance of specimen of a fully insulated single-acting, unequal double-leaf composite timber doorset when tested in accordance with BS EN 1634-1:2008, 'Fire resistance tests for door and shutter assemblies - Part 1: Fire doors and shutters'.

This test report should be read in conjunction with BS EN 1363-1:2012, 'Fire resistance tests - Part 1: General requirements'.

3 TEST INFORMATION

3.1 Test Sponsor

Faith Mark Consultants Limited
G/F, 120 Camp Street, Sham Shui Po, Kowloon, Hong Kong

3.2 Testing Location

Research Engineering Development Facade Consultants Limited, Hong Kong Main Laboratory of
DD 134, Lung Kwu Tan, Tuen Mun, New Territories, Hong Kong

3.3 Date of Test

28th February 2017

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4

3.4 Witness of the test

The test was led by Mr. Solaris Chan of Research Engineering Development Façade Consultants Limited (RED) and was witnessed by Mr. H.F. Chan and Mr. S.K. Kwan, the representatives of the test sponsor.

4 EQUIPMENT

Nine (9) type 'K' thermocouples to monitor the temperature of the furnace, which were kept at 100 mm from the exposed face of the specimen (see Figure 1).
Thirty-four (34) type 'K' thermocouples to monitor the temperature of the unexposed face of the specimen (see Figure 2).
A type 'K' roving thermocouple to measure temperature on hot spots of unexposed surface.
A micro-manometer provided to monitor the furnace pressure.
Cotton pads, 6 mm and 25 mm gap gauges.
A steel ruler relative to taut wires to monitor the lateral deflection of the specimen.
A radiometer placed at 1,000 mm away from the unexposed surface to measure the radiation of unexposed surface of the specimen.

5 CONDITIONING

The specimen's storage, construction, and test preparation took place in the test laboratory over a total, combined time of 5 days. Throughout this period of time, both of the temperature and humidity of the laboratory were measured and recorded as being within a range of 11 °C to 24 °C and 43 % to 88 % respectively.

6 TEST SPECIMEN CONSTRUCTION

A comprehensive description of the test specimen construction is presented in the appendix, which is based on a survey of the specimen and information supplied by the test sponsor.

7 VERIFICATION OF TEST SPECIMEN

In order to ensure the description of the test specimen, and in particular its construction, is on conformity with the test specimen, the laboratory shall either oversee the fabrication of the test specimens or request an additional test specimen.

In this case, RED's representative had visited the test sponsor to verify the construction of doorset in its factory. Other constructions details of the specimen were verified by RED in the testing laboratory as shown in 'Appendix D - Information from Test Sponsor'.

8 PRE-TEST MEASUREMENTS

8.1 Pre-cycling

The specimens were conditioned to equilibrium as specified in BS EN 1363-1.
Mechanical conditioning as required in Clause 8.2 of BS EN 1634-1 in terms of operational ability with the test method referenced to Clause 5.1.1.1 of BS EN 14600:2005 had been conducted prior to test. The specimens to be tested were checked for operability in the test frame by operating from fully closed to fully open to the maximum possible or at least 90° for 25 cycles.

8.2 Door Perimeter Gaps

The manufacturer did not declare a working range so the doorset was installed to open and close freely, maintaining gaps, where possible, to a range of 1.5 – 5.0 mm. The gaps between the edge of the door leaves and frame(s) were measured prior to test. The measurements (in mm) are given in Figure 3.

8.3 Retention Forces

The retention force was measured in accordance with BS EN 1634-1:2008, Section 10.1.3.

Door Leaves	Device	Opening Force (Nm)
Left door leaf	Overhead door closer	101.8
Right door leaf	Spring Hinges	25.2

8.4 Method of Installation

The specimen was installed into a concrete specimen holder with pre-prepared opening to form the test construction. The details of the fixings are outlined in Appendix D.

9 TEST PROCEDURES

The test was conducted in accordance with the procedures specified in BS EN 1634-1:2008. The ambient temperature of the test area during the test was measured. After the first 5 minutes of the test, the furnace pressure was maintained at 0 ± 3 Pa relative to atmosphere, at 500 mm from the notional floor level.

The furnace was monitored by nine (9) thermocouples so that the mean furnace temperature complied with the requirements of Clause 4.5.1.1 of BS EN 1363-1:2012.

The temperature of the unexposed face was monitored by means of thirty-two (32) thermocouples fixed to the unexposed surface (see Figure 2 for the locations and reference numbers of the thermocouples). Thermocouples S1 – S5 were fixed on the door leaves for mean and maximum temperatures of the unexposed surface of doorset excluding the glazed panels.

Thermocouples S6 – S28 were fixed on the door leaves and door frame respectively for maximum temperature of the unexposed surface of specimen only. Thermocouples S29 – S31 were fixed on the left glazed panel for mean and maximum temperatures of the unexposed surface of left glazed panel. Thermocouples S32 – S34 were fixed on the right glazed panel for mean and maximum temperatures of the unexposed surface of right glazed panel. The mean and maximum temperatures were recorded.

The cotton pads and gap gauges were used, if considered appropriate, to determine compliance with the integrity criterion of the standard. The occurrence of sustained flaming on the unexposed surface was monitored to determine compliance with this criterion. The lateral deflection of the specimen was measured by a steel ruler relative to taut wires and recorded. The radiation of the specimen was measured and recorded.

10 TEST DATA AND INFORMATION

The ambient temperature of the test area during the test was 23 °C.
The furnace was controlled so that the mean furnace temperature complied with the requirements of Clause 4.5.1.1 of BS EN 1363-1:2012. The temperature recorded is shown graphically in Figure 5.
The mean and maximum temperatures of the unexposed surface of the door leaves (I₁) excluding the glazed panels are shown graphically in Figure 6.
The mean and maximum temperatures of the unexposed surface of left glazed panel are shown graphically in Figure 7.
The mean and maximum temperatures of the unexposed surface of right glazed panel are shown graphically in Figure 8.
The furnace pressure is shown graphically in Figure 9.
The radiation is shown graphically in Figure 10.
A summary of the observations made on the general behaviour of the specimen is given in the appendix.
The deflection obtained is summarized in Table 1.
The mean furnace temperature obtained is summarized in Table 2.
The temperature rises of specimen obtained are summarized in Tables 3 to 4.
The test was discontinued after a heating period of 132 minutes.

11 RESULTS

When tested in accordance with BS EN 1634-1:2008, the requirements of the standard were satisfied for the following periods:

Integrity:	Cotton Pad	109 Minutes ^a
	Gap Gauge	109 Minutes ^a
	Sustained Flaming	109 Minutes ^a
Insulation (I ₁ , doorset excluding the glazed panels):		109 Minutes ^a
Insulation (left glazed panel):		109 Minutes ^a
Insulation (right glazed panel):		106 Minutes

^a and ^b see note on page 4

Insulation - It is required that the mean temperature rise of the unexposed surface shall not be greater than 140 °C and that maximum temperature rise shall not be greater than 180 °C. Insulation failure also occurs simultaneously with integrity failure.

Doorset excluding the glazed panels (I₁):

The 140 °C rise of the mean temperature of the unexposed surface of specimen did not reach during the test. The 180 °C rise of the maximum temperature of the unexposed surface of specimen did not reach during the test. The maximum temperature rise was 144 °C measured by unexposed thermocouple S1 after a heating period of 132 minutes. Insulation performance was deemed not to be satisfied as a consequential effect of failing integrity performance as mentioned in clause 11.4.2 of BS EN 1363-1:2012.

Left glazed panel:

The 140 °C rise of the mean temperature of the unexposed surface of specimen reached after a heating period of 129 minutes. The 180 °C rise of the maximum temperature of the unexposed surface did not reach during the test. The maximum temperature rise was 164 °C measured by thermocouple S30 after a heating period of 132 minutes. Insulation performance was deemed not to be satisfied as a consequential effect of failing integrity performance as mentioned in clause 11.4.2 of BS EN 1363-1:2012.

Right glazed panel:

The 140 °C rise of the mean temperature of the unexposed surface of specimen did not reach during the test. The 180 °C rise of the maximum temperature of the unexposed surface of specimen reached and measured by roving thermocouple after a heating period of 106 minutes. The maximum temperature rise was 188 °C measured by roving thermocouple after a heating period of 106 minutes.
The right glazed panel was covered by fire rated board with ceramic fibre blanket as requested by the test sponsor after a heating period of 109 minutes.

Integrity - It is required that there is no collapse for the specimen, no sustained flaming on the unexposed surface and no loss of impermeability.

The right glazed panel was covered by fire rated board with ceramic fibre blanket as requested by test sponsor after a heating period of 109 minutes.

The specimen was deemed not to meet the integrity requirements after a heating period of 109 minutes.

12 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 EN 1363-1, and where appropriate EN 1363-2. Any significant deviation with respect to size, constructional details, loads, stresses, edge or end conditions other than those allowed under the field of direct application in the relevant test method is not covered by this report.

The test results are valid only for the conditions under which the test was conducted.

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result. Therefore, the results are not intended to be the sole criteria for assessing the potential fire performance of the element in use nor do they reflect the actual behaviour in fires.

APPENDIX A – Photos and Test Record



Photo 1: The unexposed face of the specimen before the test.



Photo 2: The unexposed face of the specimen after a heating period of 30 minutes.

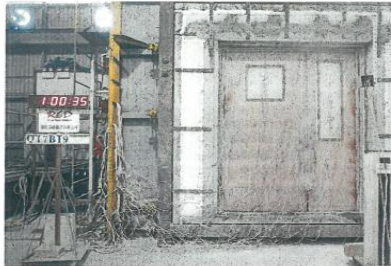


Photo 3: The unexposed face of the specimen after a heating period of 60 minutes.

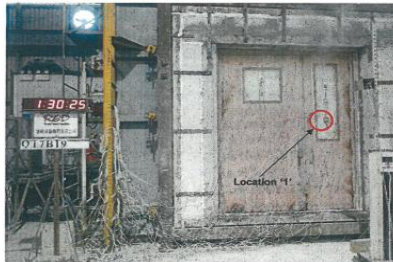


Photo 4: The unexposed face of the specimen after a heating period of 90 minutes.



Photo 5: The unexposed face of the specimen after a heating period of 120 minutes.



Photo 6: The unexposed face of the specimen after the test.



Photo 7: The exposed face of the specimen after the test.

13

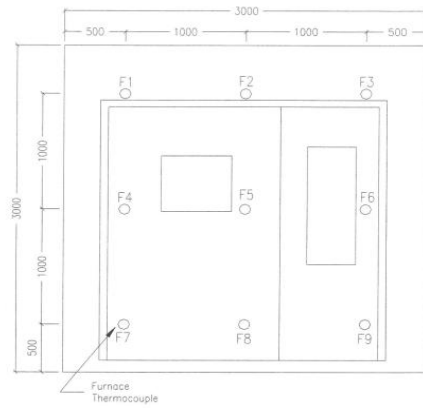


Figure 1 – Locations and reference numbers of furnace thermocouples.
(This figure is not to scale and all dimensions are in millimetres.)

14

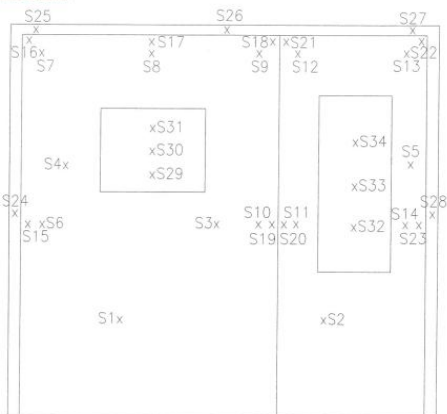


Figure 2 – Locations and reference number of thermocouples to monitor the temperature of unexposed surface of the specimen.
(This figure is not to scale.)

15

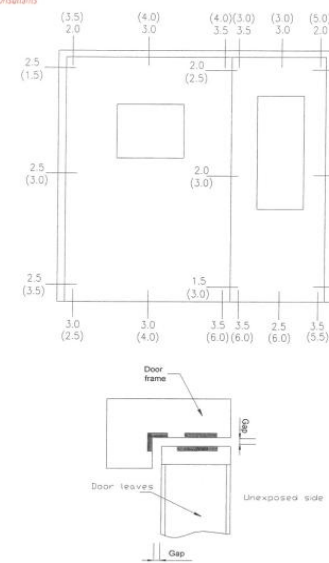


Figure 3 – Door gaps in mm, measured from unexposed face.
(Measurements from exposed face are in brackets.)
(This figure is not to scale.)

16

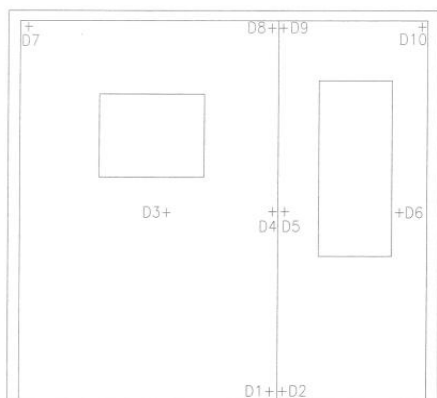


Figure 4 – Locations and reference numbers of displacement measurement.
(This figure is not to scale.)

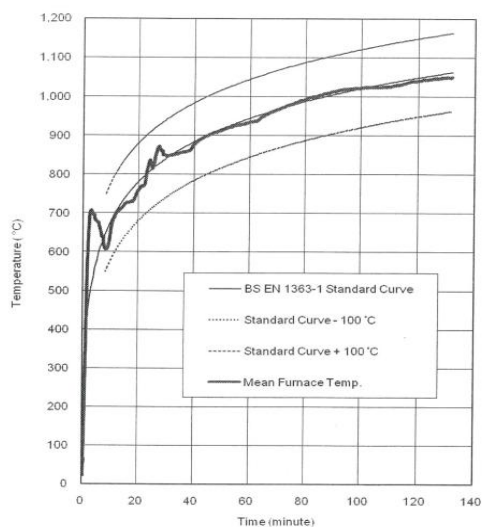


Figure 5 – Mean furnace temperature.

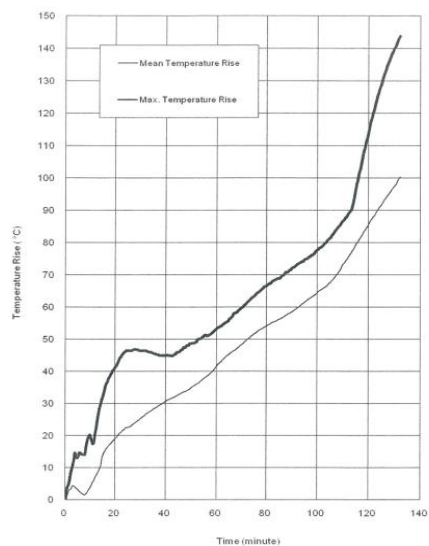


Figure 6 – Temperature rises of unexposed surface of door leaves (l₁) excluding the glazed panels.

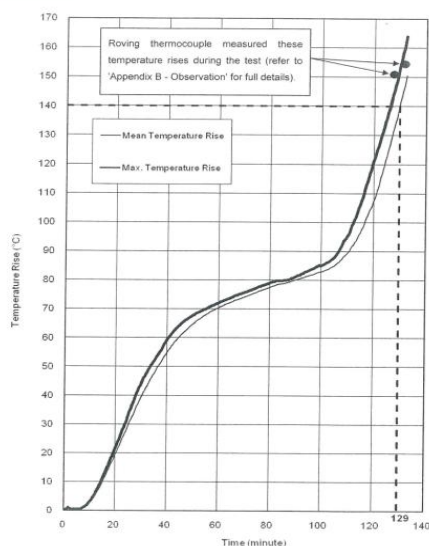


Figure 7 – Temperature rises of unexposed surface of left glazed panel.

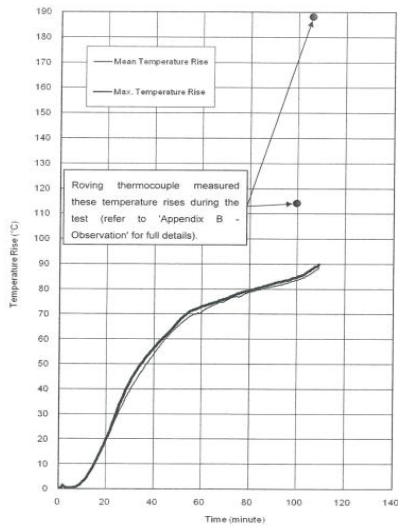


Figure 8 – Temperature rises of unexposed surface of right glazed panel.

Note: The right glazed panel was covered by fire rated board with ceramic fibre blanket after a heating period of 109 minutes.

After the first 5 minutes of the test, the furnace pressure was maintained at 0 ± 3 Pa relative to atmosphere, at 500 mm from the notional floor level.

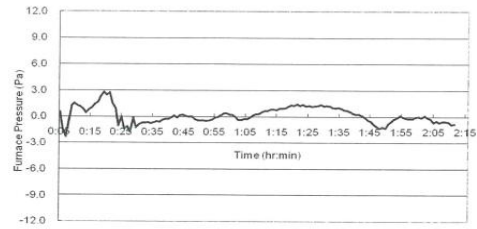


Figure 9 – Furnace pressure.

A radiometer placed at 1,000 mm away from the unexposed surface to measure the radiation of unexposed surface of the specimen.

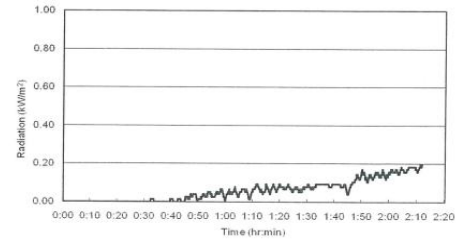


Figure 10 – Radiation.

APPENDIX B – Observation

Time (min:sec)	Exposed (E) or Unexposed (U)	Observation
00:00	-	Test started.
00:20	U	Smoke started releasing from the perimeter of specimen.
00:45	U	'Pop' sound was heard from the specimen.
01:55	U	Intermittent flaming was observed at the bottom edge of left door leaf.
05:10	U	Both glazed panels turned white.
06:20	U	The right edge of right door leaf turned brown.
07:45	U	The middle portion of left edge of left door leaf turned brown.
20:30	E	Flaming was observed at both glazing beads.
30:00	U	The specimen satisfied the integrity and insulation requirements performance.
47:00	U	Visible deformation observed from the specimen.
59:57	U	Cotton pad test applied at the top portion of meeting edge of door leaves and the cotton pad test passed.
60:00	U	The specimen satisfied the integrity and insulation requirements performance.
85:15	U	Smoke release increased from the perimeter of specimen.
86:00	U	Smoke started releasing from the glazing bead of right glazed panel.
88:05	U	The bottom edge of left door leaf turned dark.
90:00	U	The specimen satisfied the integrity and insulation requirements performance.
99:55	U	Roving thermocouple applied at the left edge of right glazed panel and 136.5 °C was measured.
106:06	U	Roving thermocouple applied at the left edge of right glazed panel and 210.4 °C was measured (refer to location '1' in photo 4). Insulation failed.
109:30	U	The right glazed panel was covered by fire rated board with ceramic fibre blanket as requested by test sponsor (refer to location '2' in photo 5). The specimen was deemed to be integrity failed.
119:55	U	Cotton pad test applied at the top portion of meeting edge of door leaves and the cotton pad test passed.
127:30	U	Roving thermocouple applied at the left edge of left glazed panel and 173.4 °C was measured.
131:37	U	Roving thermocouple applied at the left edge of left glazed panel and 176.9 °C was measured.
132:14	-	Test was terminated as requested by test sponsor.

APPENDIX C – Data Recorded During the Test

Table 1 - Lateral deflection of the specimen during the test, as viewed from the unexposed face

(All dimensions are measured in millimetres)

Location	Time (mins)	0	15	30	45	60	75	90	105
D1	0	1	2	2	2	-3	--	--	--
D2	0	-2	-1	-4	-5	-6	--	--	--
D3	0	-8	-6	-10	-8	-1	3	--	--
D4	0	2	-7	-14	-16	-17	-16	-8	--
D5	0	2	-6	-14	-16	-18	-18	-12	--
D6	0	6	5	5	7	9	10	--	--
D7	0	4	8	12	14	15	--	--	--
D8	0	3	5	6	4	4	--	--	--
D9	0	2	4	2	1	2	--	--	--
D10	0	5	9	12	14	16	--	--	--

Negative deflection indicates movement away from the furnace (see also Figure 4 for the locations).

The maximum deflection of the specimen occurred at location D5 was 18 mm moving away from the furnace after a heating period of 75 minutes.

Table 2- Mean furnace temperature

Time (minute)	BS EN 1363-1 Standard Temp. Curve (°C)	Actual Mean Furnace Temp. (°C)
0	20	23
5	579	679
10	681	662
15	742	725
20	780	758
25	815	817
30	842	849
35	866	857
40	886	880
45	902	901
50	918	915
55	933	927
60	946	936
65	958	953
70	968	967
75	979	981
80	989	994
85	998	1005
90	1007	1014
95	1014	1019
100	1022	1023
105	1029	1025
110	1036	1026
115	1042	1034
120	1049	1041
125	1055	1047
130	1061	1050
132	1064	1051

Notes: Locations of furnace thermocouples are shown in Figure 1.

The test was terminated as requested by the test sponsor after a heating period of 132 minutes.

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25

Table 3 - Time and related temperature rise measured by thermocouples S1 – S17

Time (min)	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	1	1	5	8	0	4	0	1	1	1	1	8	7	0	5	1
10	10	1	4	2	4	1	1	0	1	1	0	0	3	7	1	7	1
15	33	4	15	18	1	26	3	2	1	17	1	1	1	2	24	9	3
20	41	10	23	19	2	35	3	3	3	28	5	3	2	3	36	17	6
25	46	13	28	23	3	37	4	4	5	31	5	5	4	4	40	19	8
30	47	17	32	27	5	40	6	6	7	30	6	7	6	7	43	26	12
35	46	21	33	33	7	41	10	9	10	30	8	10	10	10	43	27	16
40	45	26	35	37	11	42	14	13	14	31	12	14	14	13	43	32	21
45	44	30	36	39	15	42	20	16	18	33	15	18	18	17	43	37	26
50	45	33	35	44	18	43	29	20	22	35	20	21	21	21	43	44	30
55	45	36	37	50	22	43	35	24	25	37	25	25	25	26	43	49	35
60	46	38	44	53	27	43	38	28	30	40	31	29	29	31	44	53	39
65	48	40	51	56	32	46	40	31	35	43	35	33	33	35	46	56	43
70	50	45	53	57	37	49	42	35	40	45	37	37	36	39	47	60	47
75	53	53	54	58	41	51	44	39	42	45	38	40	40	42	48	63	49
80	55	57	56	60	44	52	46	42	43	47	40	43	43	44	49	67	52
85	56	59	58	62	46	54	48	44	45	48	41	45	47	45	51	69	54
90	58	59	63	66	48	55	50	46	47	48	49	49	50	46	52	72	57
95	60	61	68	70	50	56	52	48	48	50	55	52	53	48	53	75	59
100	62	61	74	75	52	58	55	49	50	51	57	54	55	50	55	78	62
105	64	62	80	80	53	58	61	50	52	53	59	57	56	52	56	82	64
110	78	63	85	85	55	58	65	52	55	54	62	64	58	55	57	87	65
115	96	63	91	90	56	59	71	55	59	56	65	68	60	59	58	92	67
120	114	64	98	95	58	59	85	58	63	57	69	70	62	61	59	99	70
125	129	68	103	100	59	60	101	61	67	58	76	74	63	62	61	106	73
130	140	74	108	105	61	61	115	64	73	61	83	79	63	66	62	115	78
132	144	80	110	107	61	63	121	65	79	65	87	83	64	70	63	120	81

Notes: Locations of thermocouples S1 – S17 are shown in Figure 2.

The test was terminated as requested by the test sponsor after a heating period of 132 minutes.

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26

Table 4 - Time and related temperature rise measured by thermocouples S18 – S34

Time (min)	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27	S28	S29	S30	S31	S32	S33	S34
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	7	6	3	14	10	13	0	5	1	10	4	0	0	0	0	1	0
10	9	4	4	17	10	20	1	4	1	6	3	2	3	3	3	2	2
15	10	12	9	21	10	11	2	4	2	4	4	9	12	10	10	10	9
20	20	16	13	27	13	9	4	6	3	4	5	17	22	20	20	20	19
25	32	22	17	33	17	8	6	6	5	5	25	32	29	29	32	28	28
30	38	25	21	36	23	9	8	7	6	6	7	35	44	39	39	43	37
35	41	28	25	40	28	12	9	8	7	8	7	44	52	47	47	51	44
40	43	31	28	43	33	16	11	10	9	10	9	51	59	54	54	56	51
45	46	36	31	46	38	21	12	13	11	12	10	58	65	60	62	62	59
50	49	40	35	49	42	25	14	17	13	14	12	62	68	65	66	67	63
55	51	42	38	49	45	29	15	20	15	16	14	65	70	69	69	71	67
60	52	44	40	51	49	34	18	22	17	18	16	68	72	72	72	73	68
65	54	46	42	52	52	39	20	24	20	20	18	70	74	73	74	75	72
70	55	48	43	54	56	43	22	27	23	23	20	72	76	75	76	76	74
75	57	50	43	57	59	47	24	30	26	25	22	74	77	76	78	78	75
80	59	52	46	59	62	50	26	32	29	27	24	76	79	78	80	79	78
85	61	54	47	62	65	53	27	34	32	28	26	78	80	79	81	80	79
90	63	57	48	64	66	55	29	37	34	30	27	79	81	80	82	81	80
95	66	59	51	65	68	58	30	38	36	32	29	80	83	81	84	83	81
100	69	62	53	67	69	60	32	40	38	34	31	82	85	82	85	84	82
105	71	65	55	68	71	61	34	41	40	35	32	83	88	84	87	86	84
110	75	68	58	72	75	63	35	42	41	37	33	86	95	88	--	--	--
115	80	73	60	76	81	64	35	43	42	38	34	90	106	94	--	--	--
120	85	80	61	84	89	65	36	45	43	39	35	96	121	105	--	--	--
125	93	88	62	93	97	65	37	47	44	41	36	110	136	124	--	--	--
130	103	97	65	103	106	68	38	49	45	43	38	126	154	144	--	--	--
132	108	102	67	109	110	70	38	51	45	43	38	134	164	154	--	--	--

Notes: Locations of thermocouples S18 – S34 are shown in Figure 2.

Thermocouples S32 – S34 detached due to right glazed panel was covered by fire rated board with ceramic fibre blanket after a heating period of 109 minutes.

The test was terminated as requested by the test sponsor after a heating period of 132 minutes.

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27

APPENDIX D – Information from Test Sponsor

(The information provided by the test sponsor, which was not verified by RED or unless specified.)

Item	Description
1	Door Frame
Material	: 31 mm x 86 mm hardwood sandwiched by 9 mm and 12 mm thick fire rated boards, with 30 mm x 25 mm hardware rebate.
Overall sizes	: 1,990 mm wide x 2,548 mm high.*
Section sizes	: 65 mm x 110 mm thick x 25 mm rebate (L-shape).*
Density	: Hardwood - 550 kg/m ³ . Fire rated board - 800 kg/m ³ .
Frame to aperture fixing	: By 4 nos. of M6 x 106 mm long anchor bolts at max. 680 mm nominal centres at each jamb.*
Jambs to head jointing method	: Bolts & nuts.
Gap insulation between door frame and concrete testing rig	: Fully filled with mineral wool and intumescent sealant.*
2	Door Leaves
Door leaf sizes	: Left door leaf - 1,200 mm wide x 2,500 mm high.* Right door leaf - 700 mm wide x 2,500 mm high.*
Thickness	: 60 mm.*
Fixing method	: Fixed by 4 nos. of butt hinges at left door leaf and 4 nos. of spring hinges at right door leaf.*
Construction details	: Constructed by nominal 35 mm thick ceramic fibre wool door core sandwiched by 9 mm thick fire rated boards, with nominal 3 mm thick plywood facings on both sides and nominal 1 mm thick plastic laminate on exposed side of door leaves only.
3	Door Leaves Core
Brand	: Minye Ceramic Fiber.
Material	: Ceramic fibre wool.
Thickness	: 35 mm.
Density	: 350 kg/m ³ .
Fixing method	: By adhesive.

Notes: * Verified on site by RED.

As shown on the test construction.

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28

Information from Test Sponsor (Con't)

(The information provided by test sponsor, which is not verified by RED or unless specified.)

Item	Description
4 Fire Rated Board	
Brand	: Fire Star board,
Material	: Calcium silicate board.
Thickness	: 6 mm, 9 mm and 12 mm.
Density	: 800 kg/m ³ .
Applied locations	: Sandwiched the ceramic fibre wool door core and door frame.
Fixing method	: By adhesive.
5a Door Leaf Facings	
Material	: Plywood.
Thickness	: 3 mm.*
Density	: 350 kg/m ³ .
Fixing method	: By adhesive.
Applied location	: On both sides of door leaves.
5b Door Leaf Facings	
Brand	: Formica.
Material	: Plastic laminate.
Thickness	: 1 mm.*
Density	: 1,230 kg/m ³ .
Fixing method	: By adhesive.
Applied location	: On exposed side of door leaves.
6 Door Leaf Stiles / Rails	
Material	: 80 mm wide x 23 mm thick hardwood sandwiched by 6 mm thick fire rated boards on both sides.
Density	: Hardwood - 550 kg/m ³ .
Sizes of Stiles & Rails	: Fire rated board - 800 kg/m ³ .
Fixing method	: 80 mm wide by 35 mm thick (overall).*
	: Glue and nail.
7 Door Leaf Lippings	
Material	: Hardwood.
Density	: 650 kg/m ³ .
Sizes	: 8 mm wide by 60 mm thick.*
Fixing method	: Glue and nail.

* and # refer to page 28

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29

Information from Test Sponsor (Con't)

(The information provided by test sponsor, which is not verified by RED or unless specified.)

Item	Description
8 Glazing Beads	
Material	: Hardwood.
Section sizes	: 33 mm x 18 mm.
Fixing method	: M4 self tapping screws.
9 Ceramic Glazing Tape	
Brand	: Gluske.
Sizes	: 15 mm wide x 3 mm thick.
Applied locations	: At the perimeter of glazed panels.
10 Glazed Panels	
Brand	: Mingan.
Thickness	: 40 mm.
Composition	: 5 mm thick glazed layer + 30 mm thick interlayer gel + 5 mm thick glazed layer.
Aperture sizes	: Left glazed panel - 530 mm wide x 530 mm high. Right glazed panel - 330 mm wide x 1,230 mm high.
Vision sizes	: Left glazed panel - 500 mm wide x 500 mm high.* Right glazed panel - 300 mm wide x 1,200 mm high.*
Fixing method	: Held by glazing beads at 215 mm away from the top edge for left glazed panel and 140 mm away from the top edge for right glazed panel.
11 Smoke Seal	
Brand	: Lorient.
Model	: IS 1212 Batwing.
Sizes	: 12 mm x 12 mm.*
Applied locations	: 1 no. at each jamb and head of door frame.*
12a Intumescent Fire Seal	
Brand	: Lorient.
Model	: LP 15x4.
Sizes	: 15 mm wide by 4 mm thick.*
Applied locations	: 1 no. of seal at each jamb and head of door frame.* 2 nos. of seals at meeting edge of left door leaf.*

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30

Information from Test Sponsor (Con't)

(The information provided by test sponsor, which is not verified by RED or unless specified.)

Item	Description
12b Intumescent Fire Seal	
Brand	: Vica.
Model	: F40L21-B.
Sizes	: 40 mm wide by 4 mm thick.*
Applied locations	: 1 no. at top and hinging edges of both door leaves and meeting edge of right door leaf.*
13 Intumescent Fire and Smoke Ball Seal	
Brand	: Pyroplex.
Model	: Bubble Ball Seal.
Sizes	: 20 mm wide by 4 mm thick.*
Applied locations	: 2 nos. at bottom edge of right door leaf.*
14 Automatic Bottom Drop Seal	
Brand	: Fan Qiu.
Model	: FQ-E006.
Overall sizes	: 34 mm high x 15 mm thick.*
Material of gasket	: Silicone gasket.
Applied location	: Concealed fixed at the bottom edge of left door leaf.*
16 Butt Hinges	
Brand	: MARCO POLO.#
Model	: MP-SH-3045-2 BB/SSS.
Material	: Stainless Steel.*
Overall sizes	: 114 mm x 114 mm x 3 mm thick.*
Applied Location	: Left door leaf.*
Fixing method	: Screws fixing and 250 mm away from the edge.*
16 Spring Hinges	
Brand	: MARCO POLO.#
Model	: MP-SH-3045-316 SS/2BB.
Material	: Stainless Steel.*
Overall sizes	: 114 mm x 114 mm x 3 mm thick.*
Applied Location	: Right door leaf.*
Fixing method	: Screws fixing and 250 mm away from the edge.*

* and # refer to page 28

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31

Information from Test Sponsor (Con't)

(The information provided by test sponsor, which is not verified by RED or unless specified.)

Item	Description
17 Overhead Door Closer	
Brand	: MARCO POLO.#
Model	: T2000B-AB/DA-AS.
Material	: Zinc alloy.
Body sizes	: 236 mm wide x 60 mm high.
Fixing method	: Screws fixing at exposed side of left door leaf.#
18 Lockset	
Brand	: MARCO POLO.
Model	: MP-GN200-6401-US32/US32D.
Material	: Stainless Steel.*
Fixing method	: Screws fixing at left door leaf.*
Status during the test	: Unlocked and unlatched.*
19 Flush Bolts	
Brand	: MARCO POLO.
Model	: MP-4908A + 4912A-SSS.
Material	: Stainless steel.*
Overall sizes	: Top - 300 mm x 22 mm. Bottom - 200 mm x 22 mm.
Applied location	: Top and bottom portions of right door leaf.#
Status during the test	: Unbolted.*
20 Door Selector	
Brand	: MARCO POLO.
Model	: MP-D70-250-SSS.
Material	: Stainless steel.
Body sizes	: 20 mm wide x 275 mm high.
Fixing method	: Screws fixing at exposed side of door frame.#

* and # refer to page 28

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32

Information from Test Sponsor (Con't)

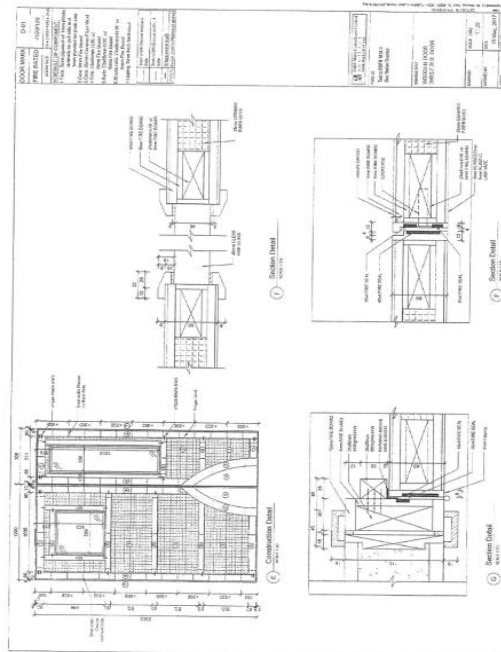
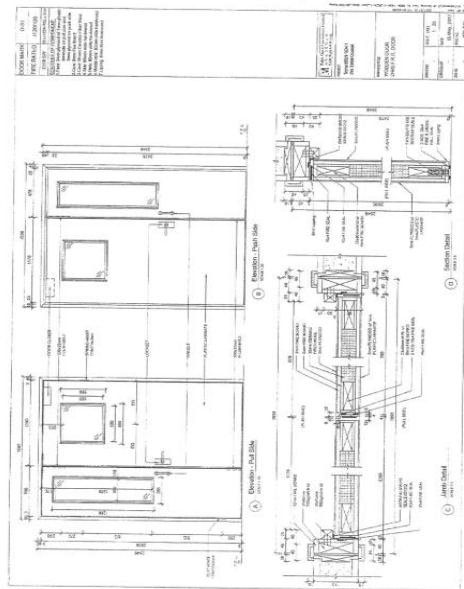
(The information provided by test sponsor, which is not verified by RED or unless specified.)

Item	Description
21 Handle	
Brand	: MARCO POLO
Model	: MP-4H192/230-SSS
Material	: Stainless steel
Overall sizes	: 19 mm diameter x 230 mm long
Fixing method	: Screws fixing at both sides of right door leaf
22 Firestop Spray	
Brand	: Lorient
Reference	: Firestop Joint Spray CFS-SP WB (red) *
Applied Location	: Perimeter of door frame and glazing beads #

* and # refer to page 28

Drawings from Test Sponsor

(The drawings provided by test sponsor, which was not verified by RED, except those specified and described in "Information from test sponsor".)



- End of report -