

FIRE RESISTANCE TEST IN ACCORDANCE WITH BS EN 1634-1: 2014

On 2 nos. of Fully Insulated Single-acting, Composite Timber Doorsets with Transom Panels

Test Report No.: R19M24-1A

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Test Sponsor

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Unit B, 22nd Floor, Johnson Centre, 13 Hau Fook Street,
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APPROVED SIGNATORY: _____

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1 SUMMARY

Fire resistance test conducted in accordance with BS EN 1634-1: 2014 on 2 nos. of fully insulated, single-acting, composite timber doorsets with transom panels.

Two (2) nos. of specimens of insulated, single-acting composite timber doorsets with transom panels, namely doorsets 'A' and 'B' (refer to photo 1) had been subjected to a test in accordance with BS EN 1634-1: 2014, in order to determine its fire resistance performance. As requested by the test sponsor, the specimens were mounted within concrete lined specimen holder and the fixing details were shown in the test sponsor's drawings (see the appendix). The specimens were mounted such that the specimens were swinging towards the furnace. The specimens were asymmetrical and only one side of the specimens was tested as per test sponsor's request.

Doorset 'A' had overall dimensions of 700 mm wide by 2,500 mm high. It was comprised of a composite 4-sided timber door frame, single-acting, single door leaf and transom panel. The door leaf and transom panel were constructed with 34 mm thick perlite core and sandwiched by a layer of 5 mm thick fire rated board on both sides with 2 mm thick plywood facing (refer to test sponsor's drawings). The door leaf was with sizes of 669 mm by 2,103 mm high by 48 mm thick and hung to the door frame by 4 nos. of stainless steel spring hinges with sizes 102 mm by 102 mm by 3 mm thick. The transom panel was with sizes 675 mm wide by 400 mm high by 48 mm thick and hold to the door frame screws fixing. A 25 mm thick 'Pyrotech' glazed panel with vision sizes of 260 mm wide by 1,210 mm high was incorporated with door leaf.

One (1) no. of 'UA' fire seal with sizes of 20 mm wide by 4 mm thick was installed at four sides of door frame, top and bottom of mullion. One (1) no. of 'UA' fire and smoke seal with sizes of 20 mm wide by 4 mm thick was installed at all edges of transom panel and door leaf. A 'GAMMA' mortise lockset was installed at the door leaf. The doorset was unlatched and unlocked during the test.

Doorset 'B' had overall dimensions of 2,250 mm wide by 2,950 mm high. It was comprised of a composite timber door frame, single-acting, unequal double door leaves and transom panel. Both door leaves and transom panel were constructed with 34 mm thick perlite core and sandwiched by a layer of 5 mm thick fire rated board on both sides with 2 mm thick plywood facing (refer to test sponsor's drawings). An unequal rebate with sizes of 15 mm wide by 10 mm deep was incorporated at the meeting edge of door leaves. Left door leaf was with sizes of 1,200 mm by 2,506 mm high by 48 mm thick and hung to the door frame by 4 nos. of stainless steel butt hinges with sizes 102 mm by 102 mm by 3 mm thick. Right door leaf was with sizes of 840 mm wide by 2,506 mm high by 48 mm thick and hung to the door frame by 4 nos. of concealed hinges with sizes of 115 mm long by 45 mm deep by 28 mm wide. The transom panel was with sizes 2,050 mm wide by 400 mm high by 48 mm thick and hold to the door frame screws fixing. A 25 mm thick 'Pyrotech' glazed panel with vision sizes of 680 mm wide by 2,110 mm high was incorporated with left door leaf. Two nos. of nominal 25 mm thick 'Pyrotech' glazed panels with vision sizes of 410 mm wide by 510 mm high was incorporated with right door leaf.

One (1) no. of 'UA' fire seal with sizes of 20 mm wide by 4 mm thick was installed at each jamb and head of door frame, top and bottom of mullion and meeting edge of right door leaf. One (1) no. of 'UA' fire and smoke seal with sizes of 20 mm wide by 4 mm thick was installed at all edges of transom panel, both vertical edges of left door leaves and hinging edge of right door leaf. A bottom drop seal was installed at bottom edge of both door leaves.

A surface mounted overhead door closer was installed at exposed side of left door leaf. A 'DORMA' concealed door closer was installed at right door leaf. A 'Yale' electric lockset was installed at the mullion, above left door leaf. A 'GAMMA' mortise lockset was installed at right door leaf. A flush bolt was installed at the top and bottom of meeting edge of right door leaf. The doorset was unbolted, unlatched and unlocked during the test.

The specimen satisfied the performance requirements specified in BS EN 1634-1: 2014 for the following periods:

Doorset 'A'

Integrity:	Cotton Pad	72 Minutes (No failure)
	Gap Gauge	72 Minutes (No failure)
	Sustained Flaming	72 Minutes (No failure)
Insulation (I₁ doorset excluding the panels):		72 Minutes
Insulation (I₁ transom panel):		72 Minutes
Insulation (Glazed panel):		55 Minutes

Doorset 'B'

Integrity:	Cotton Pad	72 Minutes (No failure)
	Gap Gauge	72 Minutes (No failure)
	Sustained Flaming	72 Minutes (No failure)
Insulation (I₁ doorset excluding the panels):		38 Minutes
Insulation (I₂ doorset excluding the panels):		72 Minutes
Insulation (I₁ transom panel):		72 Minutes
Insulation (Left glazed panel):		61 Minutes
Insulation (Right glazed panels):		53 Minutes

The test was discontinued after a heating period of 72 minutes.

2 INTRODUCTION

The objective of the test is to determine the fire resistance performance of specimen of 2 nos. of fully insulated, single-acting, composite timber doorsets with transom panels when tested in accordance with BS EN 1634-1: 2014, '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 INFORMATION

3.1 Test Sponsor

HK Pro-Tech Fire Prevention Building Materials Ltd.

Unit B, 22nd Floor, Johnson Centre, 13 Hau Fook Street, Tsim Sha Tsui, Kowloon, Hong Kong

3.2 Testing Location

Research Engineering Development Façade Consultants Limited, Huizhou Laboratory
Route YE60, Shan Pi Village, Lilin Town, Zhong Kai Gao Xin District, Huizhou City,
Guang Dong Province, China

3.3 Test Date

15th January 2020

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. K.W. Cheung, the representative of the test sponsor.

4 EQUIPMENT

Twelve (12) 'type K' thermocouples to monitor the temperature of the furnace, which were kept at 100 mm from the exposed face of the specimens (see Figure 1).

Ninety (90) 'type K' thermocouples to monitor the temperature of the specimens (see Figure 2).

A 'type K' roving thermocouple to measure temperature on hot spots of the unexposed surface of specimens.

A micro-manometer provided to monitor the furnace pressure.

Cotton pads, 6 mm and 25 mm gap gauges.

Laser distance meters to monitor the lateral deflection of the specimens.

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

5 CONDITIONING

The specimens' storage, construction, and test preparation took place in the test laboratory over a total, combined time of 6 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 14 °C to 28 °C and 50 % to 84 % respectively.

6 TEST SPECIMENS CONSTRUCTION

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

7 VERIFICATION OF TEST SPECIMENS

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

In this case, additional test specimens were supplied by the test sponsors. One of the test specimens was chosen randomly by RED to be submitted to the fire resistance test, while the other was used for the verification of construction.

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 doorsets was installed to open and close freely, maintaining gaps, where possible, to a range of 0.0 mm – 3.0 mm for doorset 'A' and 0.0 mm - 3.0 mm for doorset 'B'. 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: 2014, Section 10.1.3.

Doorsets	Device	Opening Force (Nm)
Door leaf of doorset 'A'	Spring hinges	23
Left door leaf of doorset 'B'	Surface Mounted door closer	123
Right door leaf of doorset 'B'	Concealed door closer	35

8.4 Method of Installation

The specimens were installed into a concrete specimen holder with 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: 2014. 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 twelve (12) 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 ninety (90) thermocouples fixed to the specimens (see Figure 2 for the locations and reference numbers of the thermocouples). Thermocouples S1 - S5 were fixed on door leaf of doorset 'A' for mean and maximum temperatures of the unexposed surface of doorset 'A' excluding the panels. Thermocouples S6 - S12 & S24 - S31 were fixed on both door leaves and, mullion and door frame respectively for maximum temperature of the unexposed surface of doorset 'A' excluding the panels only. Thermocouples S13 - S15 were fixed on transom panel of doorset 'A' for mean and maximum temperatures of the unexposed surface of transom panel of doorset 'A'. Thermocouples S16 - S23 and S24 - S31 were fixed on transom panel and, mullion and door frame respectively for maximum temperature of the unexposed surface of transom panel of doorset 'A'. Thermocouples S32 - S34 were fixed on the glazed panel of doorset 'A' for mean and maximum temperatures of the unexposed surface of glazed panel of doorset 'A'. Thermocouples S35 - S39 were fixed on both door leaves of doorset 'B' for mean and maximum temperatures (Insulation I₁ & I₂) of the unexposed surface of doorset 'B' excluding the panels. Thermocouples S40 - S48, S73 - S76 & S78 - S80 were fixed on both door leaves, door frame and mullion respectively for maximum temperature (Insulation I₁ & I₂) of the unexposed surface of doorset 'B' excluding the panels only. Thermocouples S49 - S57 were fixed on both door leaves, 25 mm away from the edges for maximum temperature

(Insulation I_1) of the unexposed surface of doorset 'B' excluding the panels only. Thermocouples S58 – S60 were fixed on transom panel of doorset 'B' for mean and maximum temperatures of the unexposed surface of transom panel of doorset 'B'. Thermocouples S61 – S72 and S73 – S80 were fixed on transom panel and, mullion and door frame respectively for maximum temperature of the unexposed surface of transom panel of doorset 'B'. Thermocouples S81 – S83 were fixed on the left glazed panel of doorset 'B' for mean and maximum temperatures of the unexposed surface of left glazed panel of doorset 'B'. Thermocouples S84 – S89 were fixed on the right glazed panels of doorset 'B' for mean and maximum temperatures of the unexposed surface of right glazed panels of doorset 'B'.

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 specimens was measured by laser distance meters and recorded. The radiation of the specimens was measured and recorded.

10 TEST DATA AND INFORMATION

The ambient temperature of the test area during the test was 20 °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 doorset 'A' excluding panels (I_1) are shown graphically in Figure 6.

The mean and maximum temperatures of the unexposed surface of transom panel (I_1) of doorset 'A' are shown graphically in Figure 7.

The mean and maximum temperatures of the unexposed surface of glazed panel of doorset 'A' are shown graphically in Figure 8.

The mean and maximum temperatures of the unexposed surface of doorset 'B' excluding panels (I_1) are shown graphically in Figure 9.

The mean and maximum temperatures of the unexposed surface of doorset 'B' excluding panels (I_2) are shown graphically in Figure 10.

The mean and maximum temperatures of the unexposed surface of transom panel (I_1) of doorset 'B' are shown graphically in Figure 11.

The mean and maximum temperatures of the unexposed surface of left glazed panel of doorset 'B' are shown graphically in Figure 12.

The mean and maximum temperatures of the unexposed surface of right glazed panels of doorset 'B' are shown graphically in Figure 13.

The furnace pressure is shown graphically in Figure 14.

The radiation is shown graphically in Figure 15.

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 specimens obtained are summarized in Tables 3 - 7.

The test was discontinued after a heating period of 72 minutes.

11 RESULTS

When tested in accordance with BS EN 1634-1: 2014, the requirements of the standard were satisfied for the following periods:

Doorset 'A'

Integrity:	Cotton Pad	72 Minutes (No failure)
	Gap Gauge	72 Minutes (No failure)
	Sustained Flaming	72 Minutes (No failure)
Insulation (I₁ doorset excluding the panels):		72 Minutes
Insulation (I₁ transom panel):		72 Minutes
Insulation (Glazed panel):		55 Minutes

Doorset 'B'

Integrity:	Cotton Pad	72 Minutes (No failure)
	Gap Gauge	72 Minutes (No failure)
	Sustained Flaming	72 Minutes (No failure)
Insulation (I₁ doorset excluding the panels):		38 Minutes
Insulation (I₂ doorset excluding the panels):		72 Minutes
Insulation (I₁ transom panel):		72 Minutes
Insulation (Left glazed panel):		61 Minutes
Insulation (Right glazed panels):		53 Minutes

Doorset 'A'

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 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 123 °C measured by thermocouple S10 after a heating period of 72 minutes.

Transom panel (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 91 °C measured by thermocouple S23 after a heating period of 72 minutes.

Glazed panel:

The 140 °C rise of the mean temperature of the unexposed surface of specimen reached after a heating period of 59 minutes. The 180 °C rise of the maximum temperature of the unexposed surface of specimen reached and measured by thermocouple S32 after a heating period of 55 minutes. The maximum temperature rise was 402 °C measured by thermocouple S32 after a heating period of 72 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.

No failure was observed regarding to the criteria of cotton pad, gap gauge and sustained flaming during the test.

The specimen met the integrity requirements after a heating period of 72 minutes.

Doorset 'B'

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 (except 360 °C for door frame and mullion in Insulation(I₂)). Insulation failure also occurs simultaneously with integrity failure.

Doorset excluding the 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 reached and measured by thermocouple S90 after a heating period of 38 minutes. The maximum temperature rise was 475 °C measured by thermocouple S90 after a heating period of 72 minutes.

Doorset excluding the panels (I₂):

The 140 °C rise of the mean temperature of the unexposed surface of specimen did not reach during the test. The 180 °C and 360 °C rises of the maximum temperature of the unexposed surface of specimen did not reach during the test. The maximum temperature rise was 175 °C measured by thermocouple S37 after a heating period of 72 minutes.

Transom panel (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 120 °C measured by thermocouple S70 after a heating period of 72 minutes.

Left 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 the roving thermocouple after a heating period of 61 minutes. The maximum temperature rise was 193 °C measured by the roving thermocouple after a heating period of 72 minutes.

Right glazed panels:

The 140 °C rise of the mean temperature of the unexposed surface of specimen reached after a heating period of 55 minutes. The 180 °C rise of the maximum temperature of the unexposed surface of specimen reached and measured by the roving thermocouple after a heating period of 53 minutes. The maximum temperature rise was 540 °C measured by the thermocouple S86 after a heating period of 71 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.

No failure was observed regarding to the criteria of cotton pad, gap gauge and sustained flaming during the test.

The specimen met the integrity requirements after a heating period of 72 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

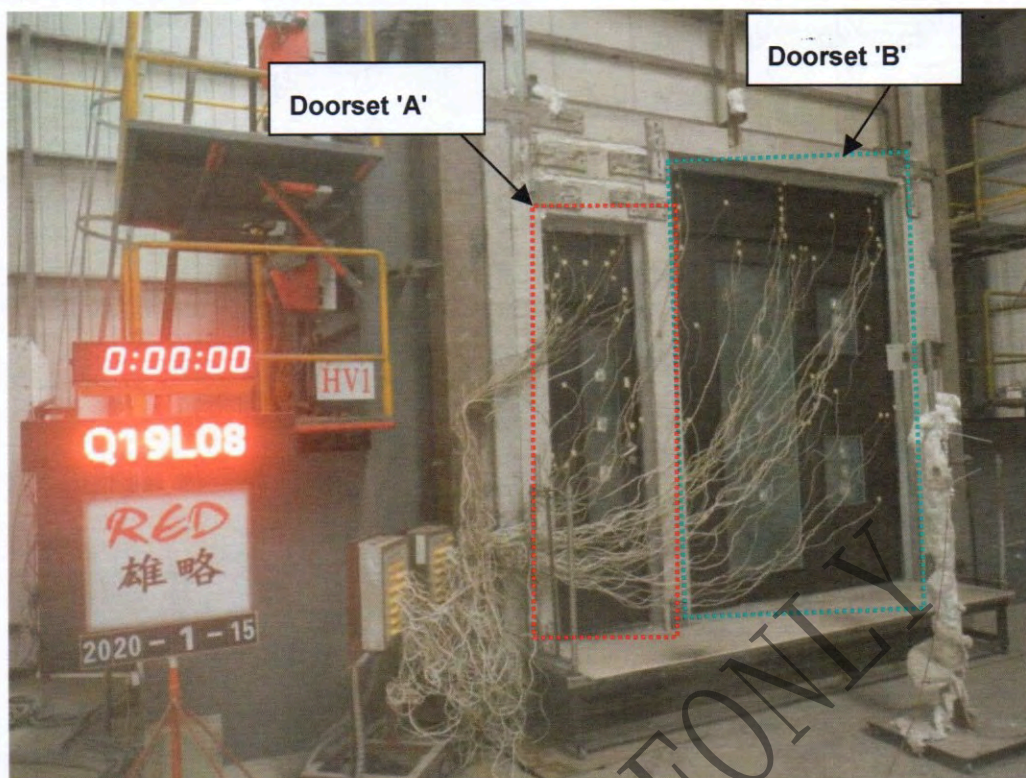


Photo 1: The unexposed face of the specimen before the test.

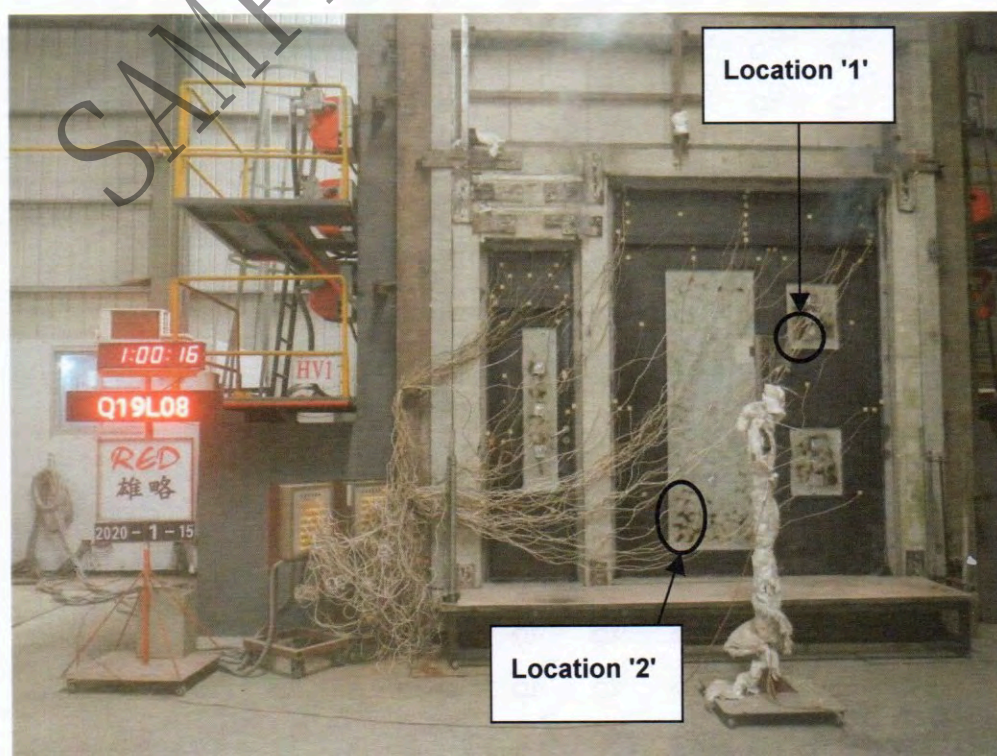


Photo 2: The unexposed face of the specimen after a heating period of 60 minutes.



Photo 3: The unexposed face of the specimen after the test.

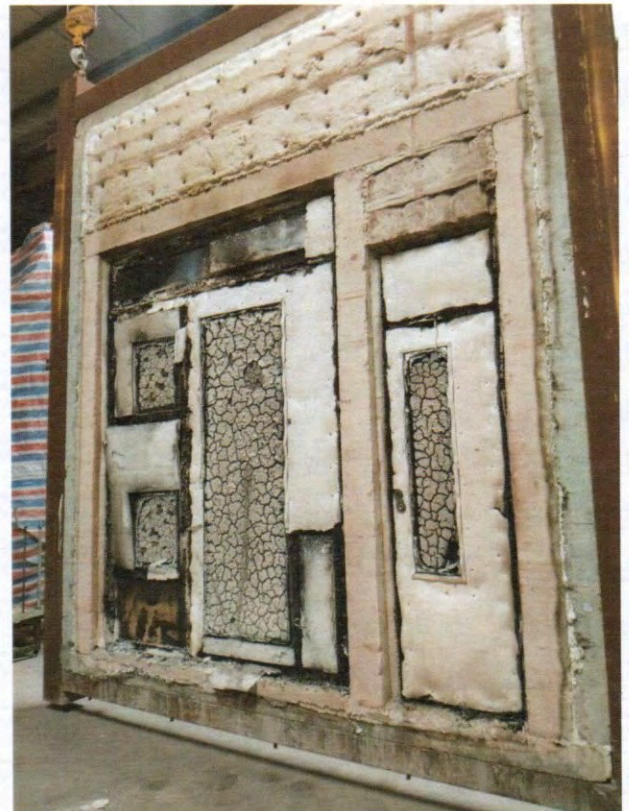


Photo 4: The exposed face of the specimen after the test.

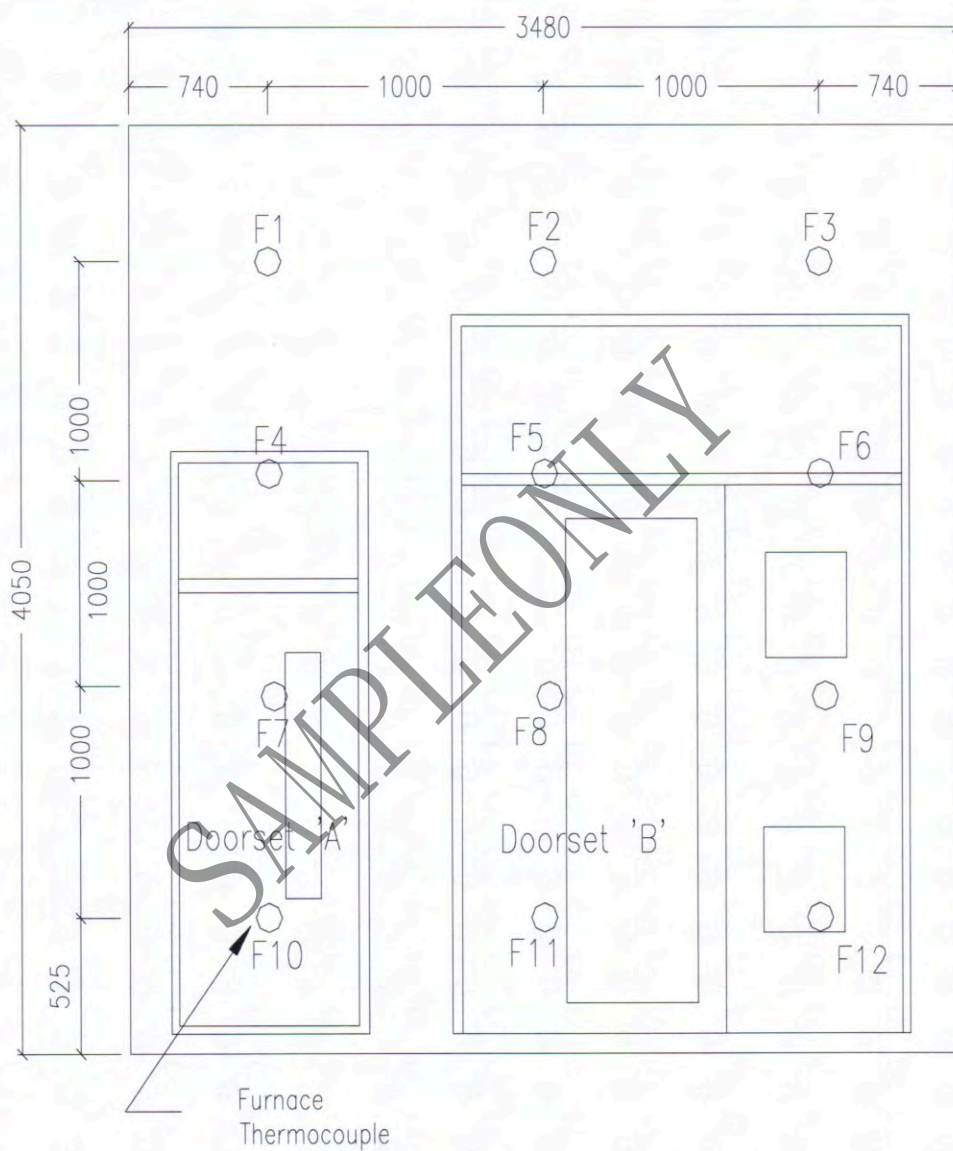


Figure 1 – Locations and reference numbers of furnace thermocouples.
(This figure is not to scale and all dimensions are in millimetres.)

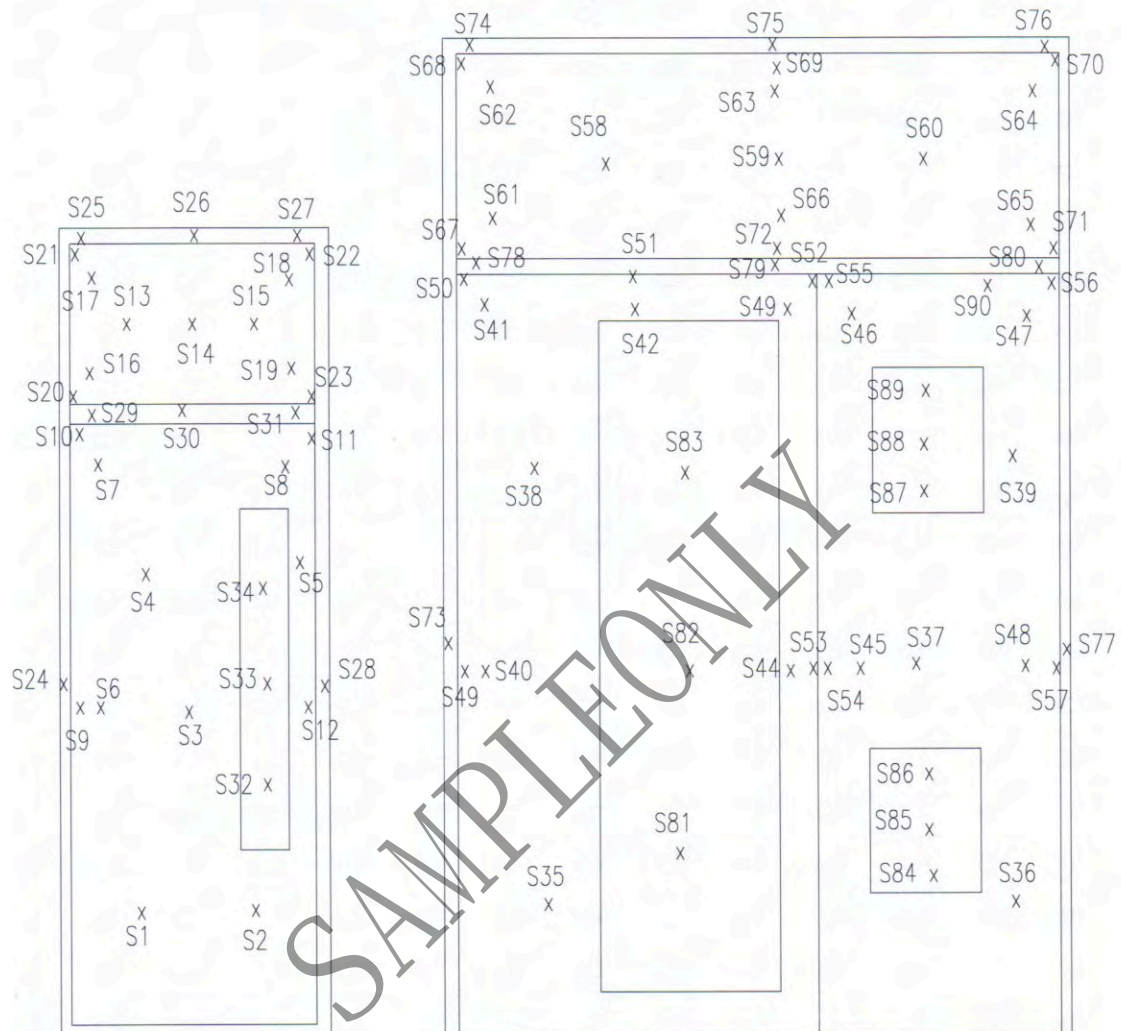


Figure 2 – Locations and reference number of thermocouples to monitor the temperature of unexposed surface of the specimen (This figure is not to scale).

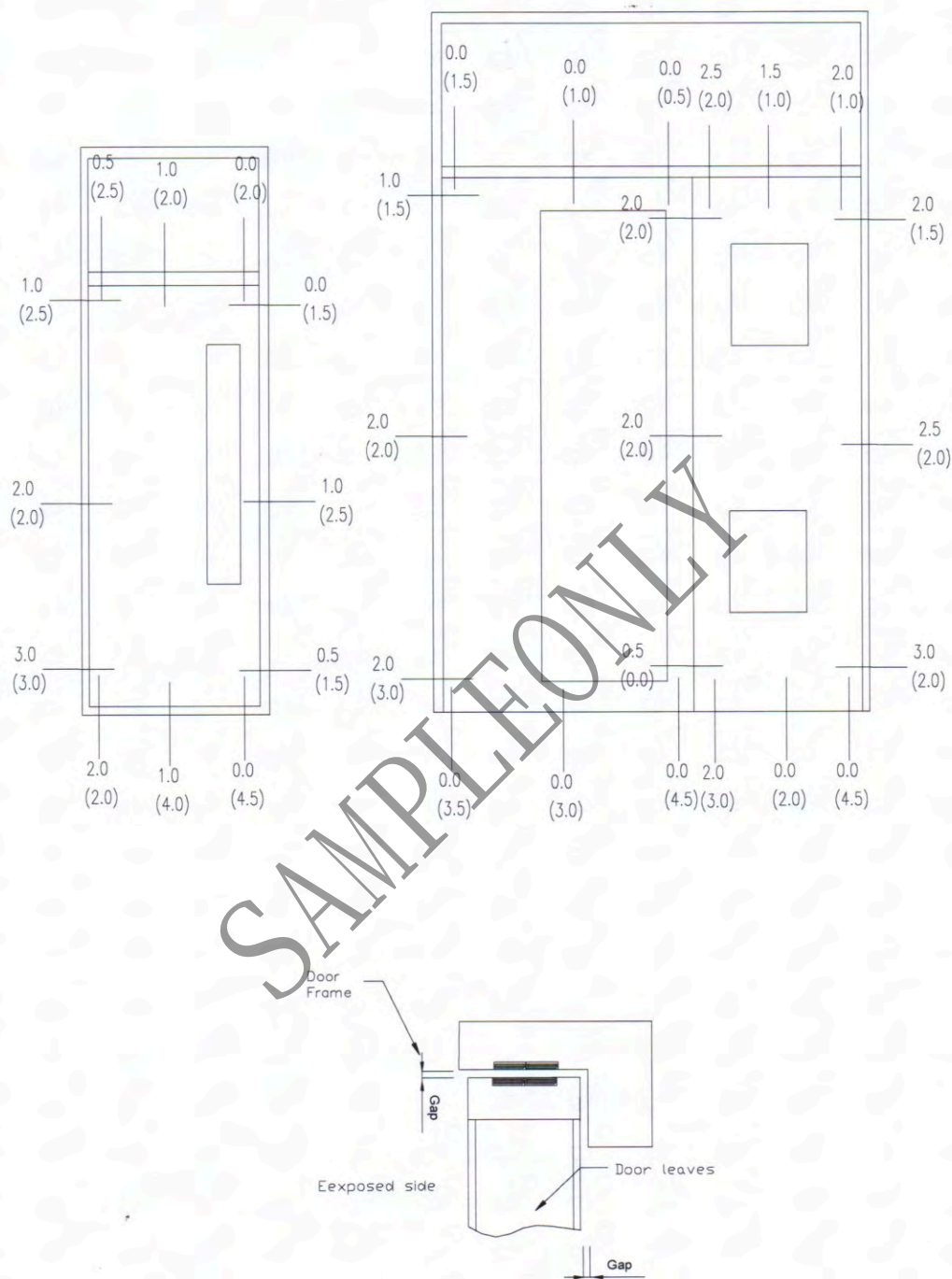


Figure 3 – Door gaps in mm, measured from unexposed face.

(Measurements from exposed face are in brackets)

(This figure is not to scale.)

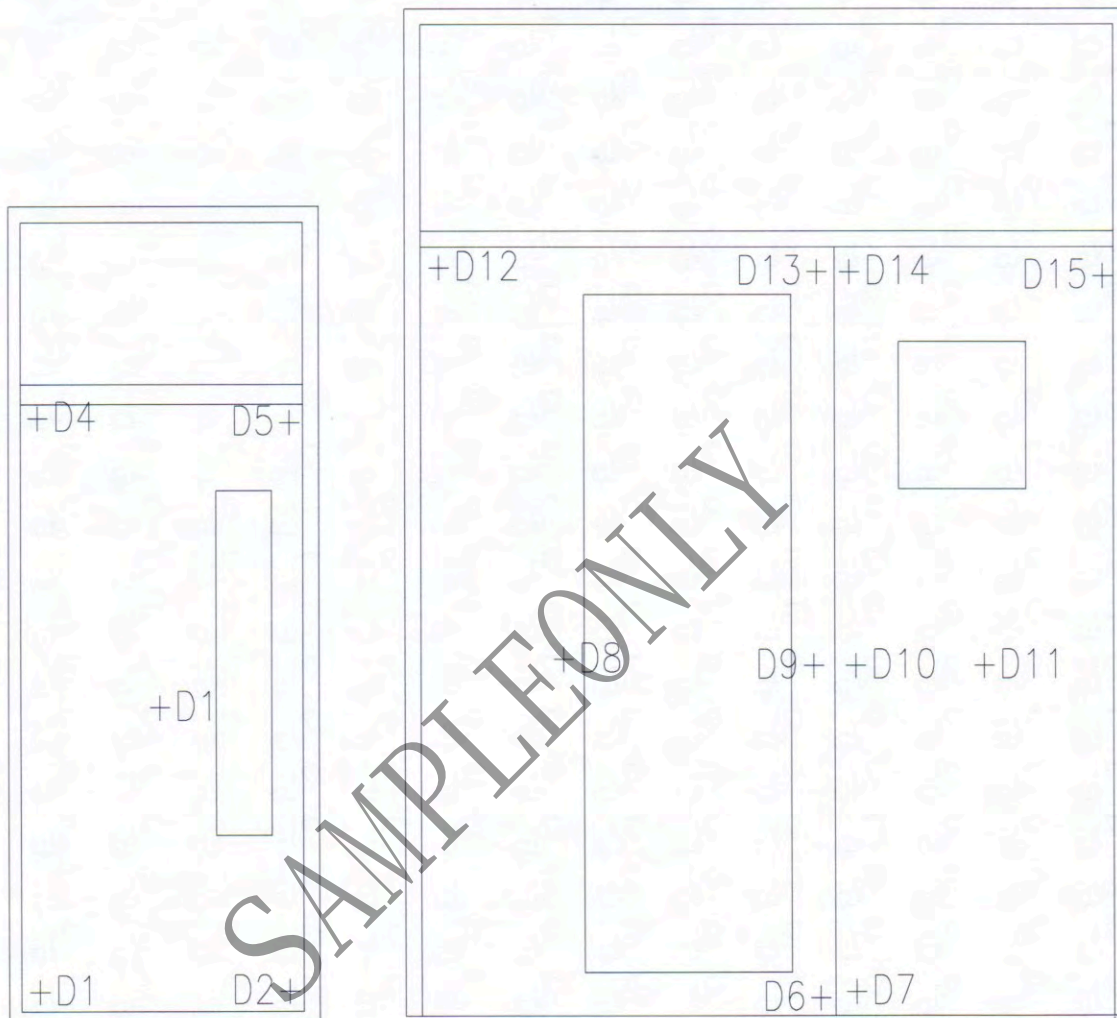


Figure 4 – Locations and reference numbers of displacement measurement.
(This figure is not to scale.)

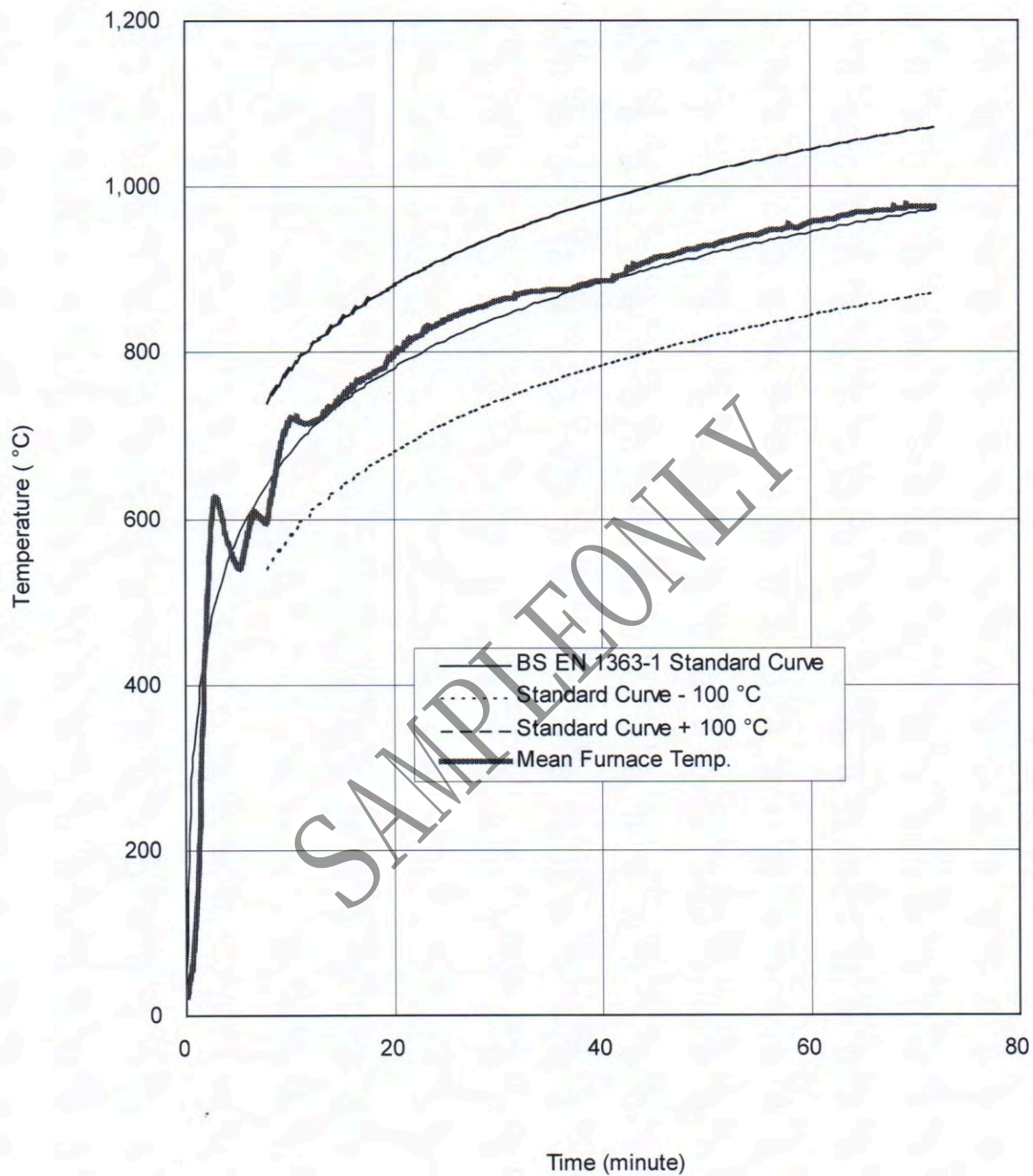


Figure 5 – Mean furnace temperature.

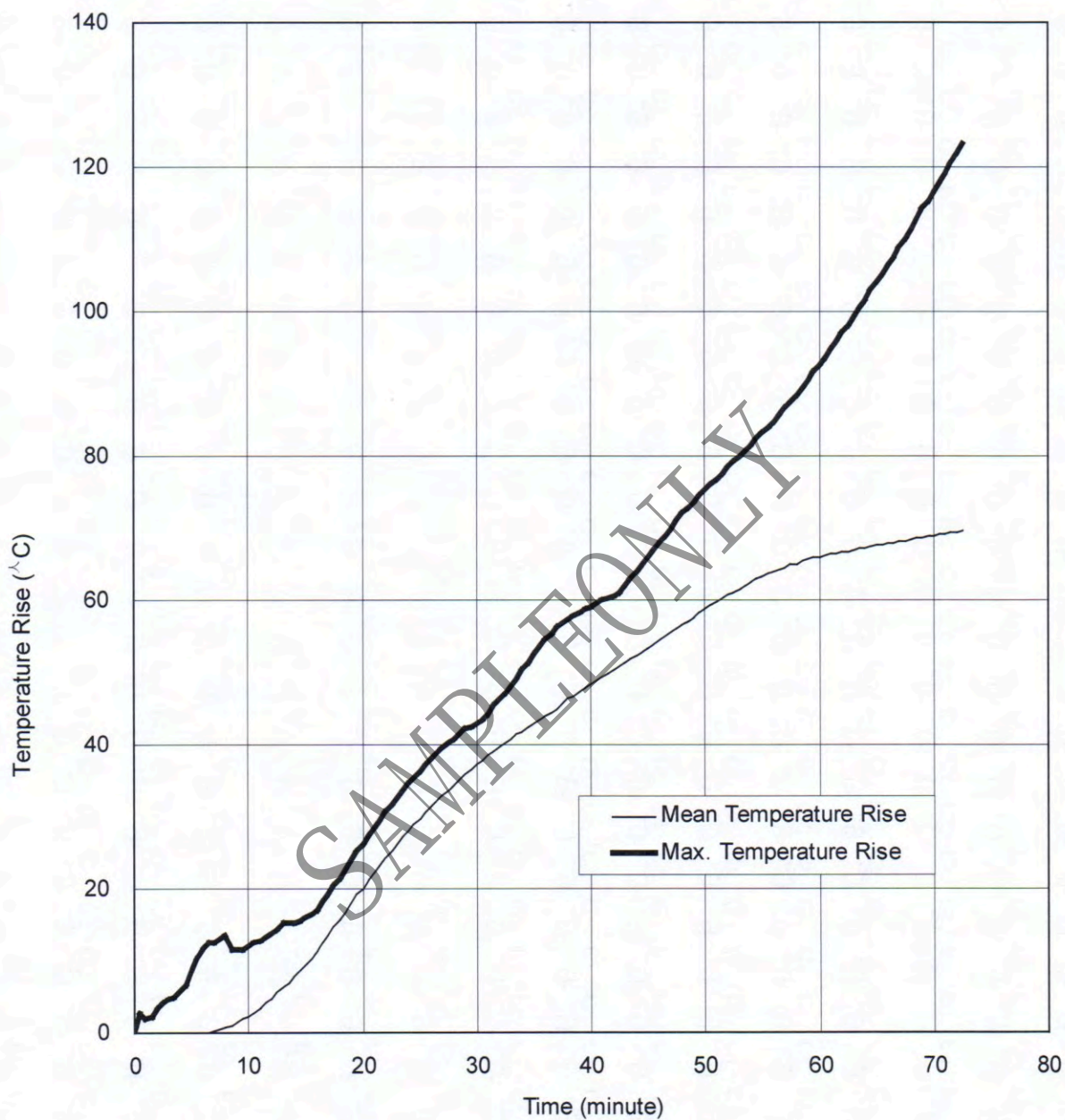


Figure 6 – Temperature rise of unexposed surface of doorset 'A' excluding the panels (I₁).

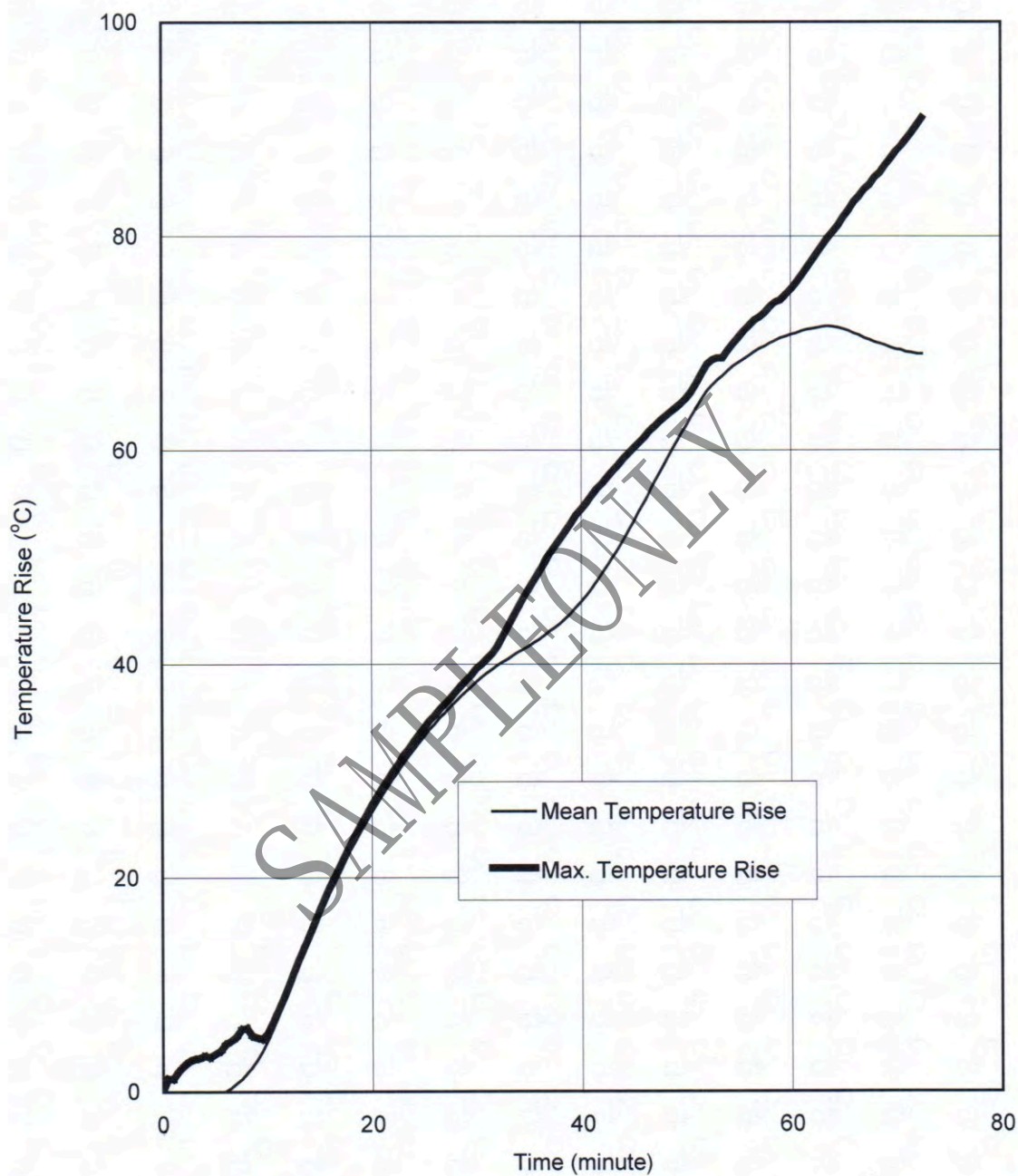


Figure 7 – Temperature rise of unexposed surface of transom panel (I₁) of doorset 'A'.

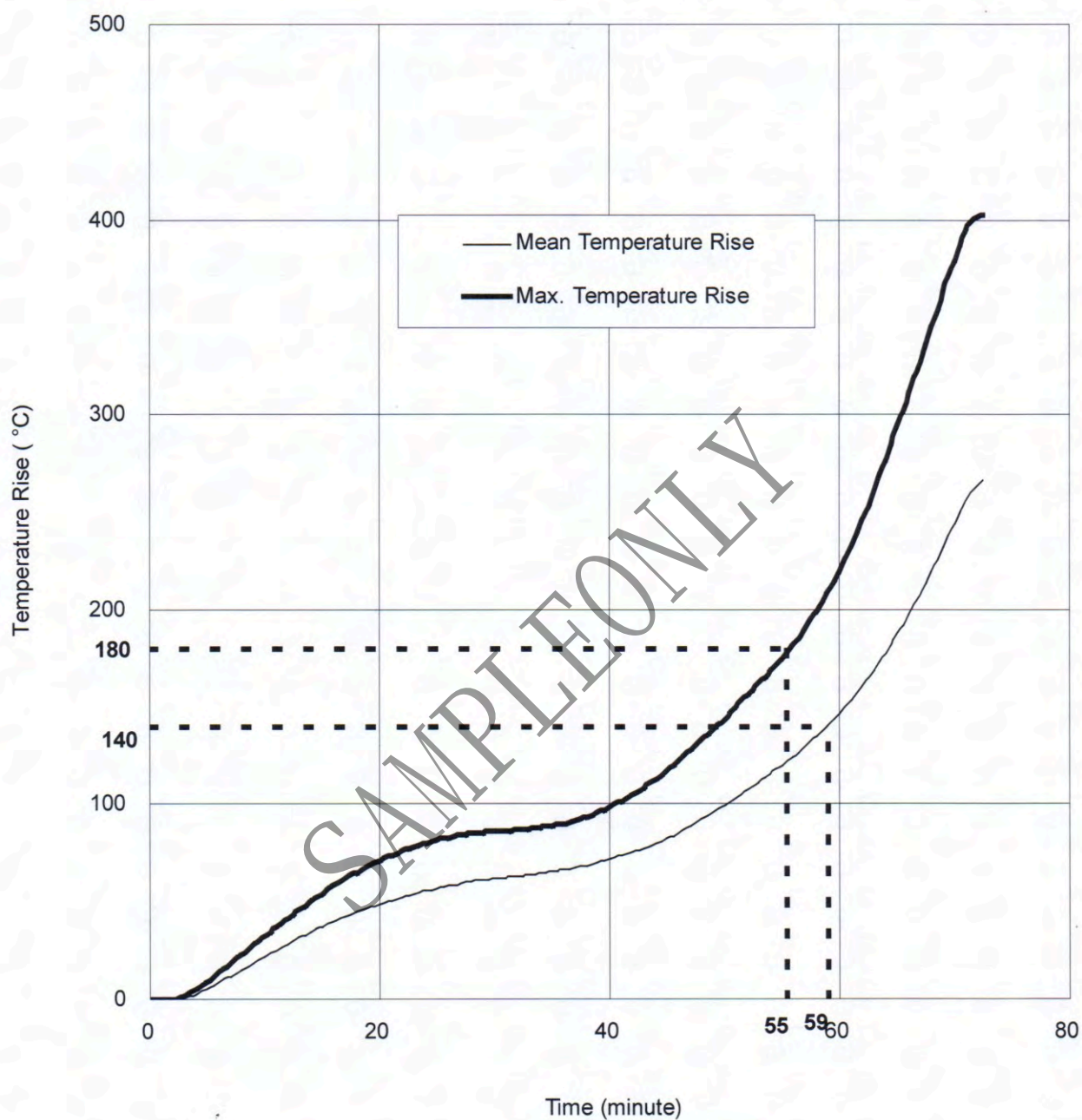


Figure 8 – Temperature rise of unexposed surface of glazed panel of doorset 'A'.

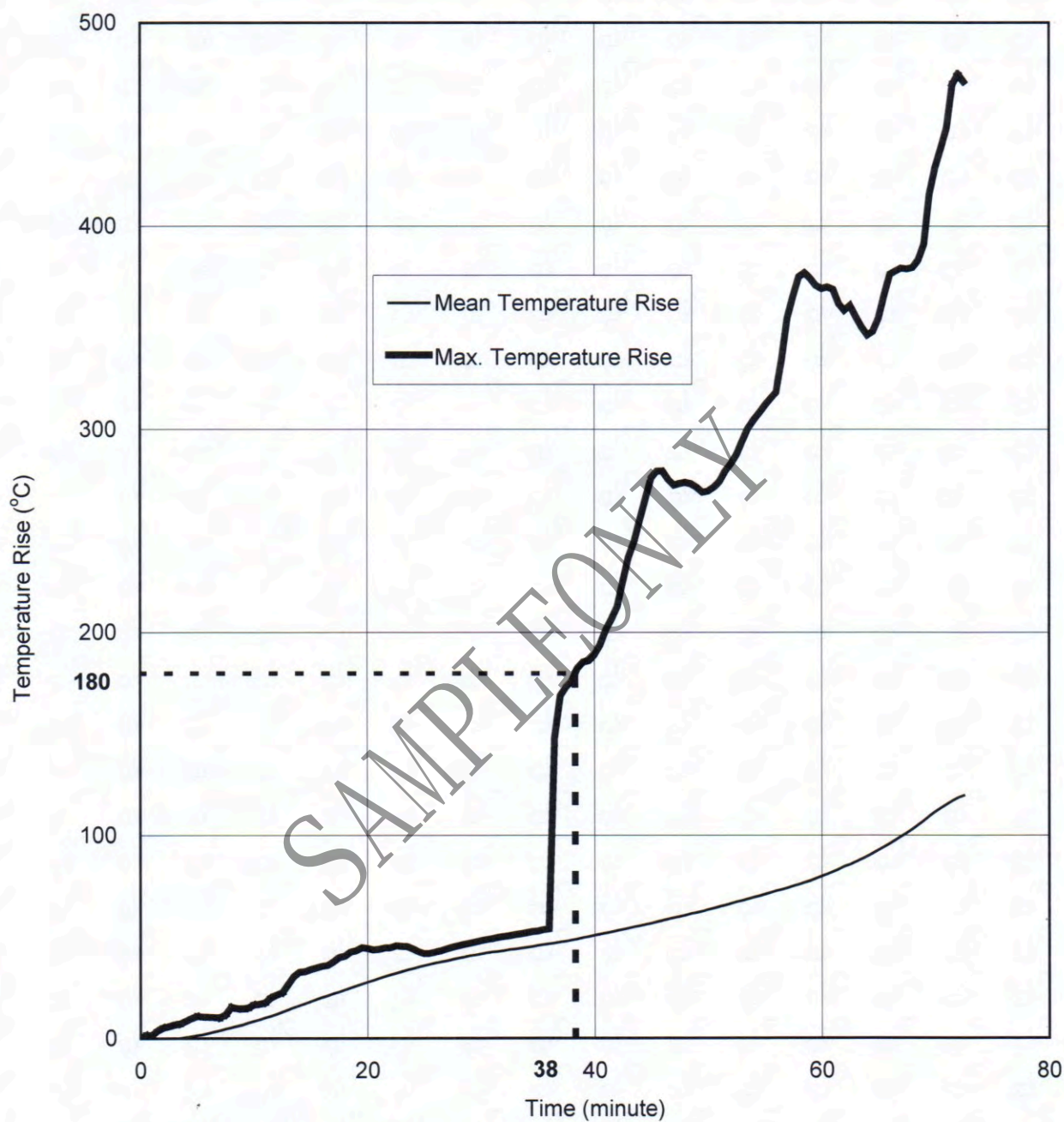


Figure 9 – Temperature rise of unexposed surface of doorset 'B' excluding the panels (I₁).

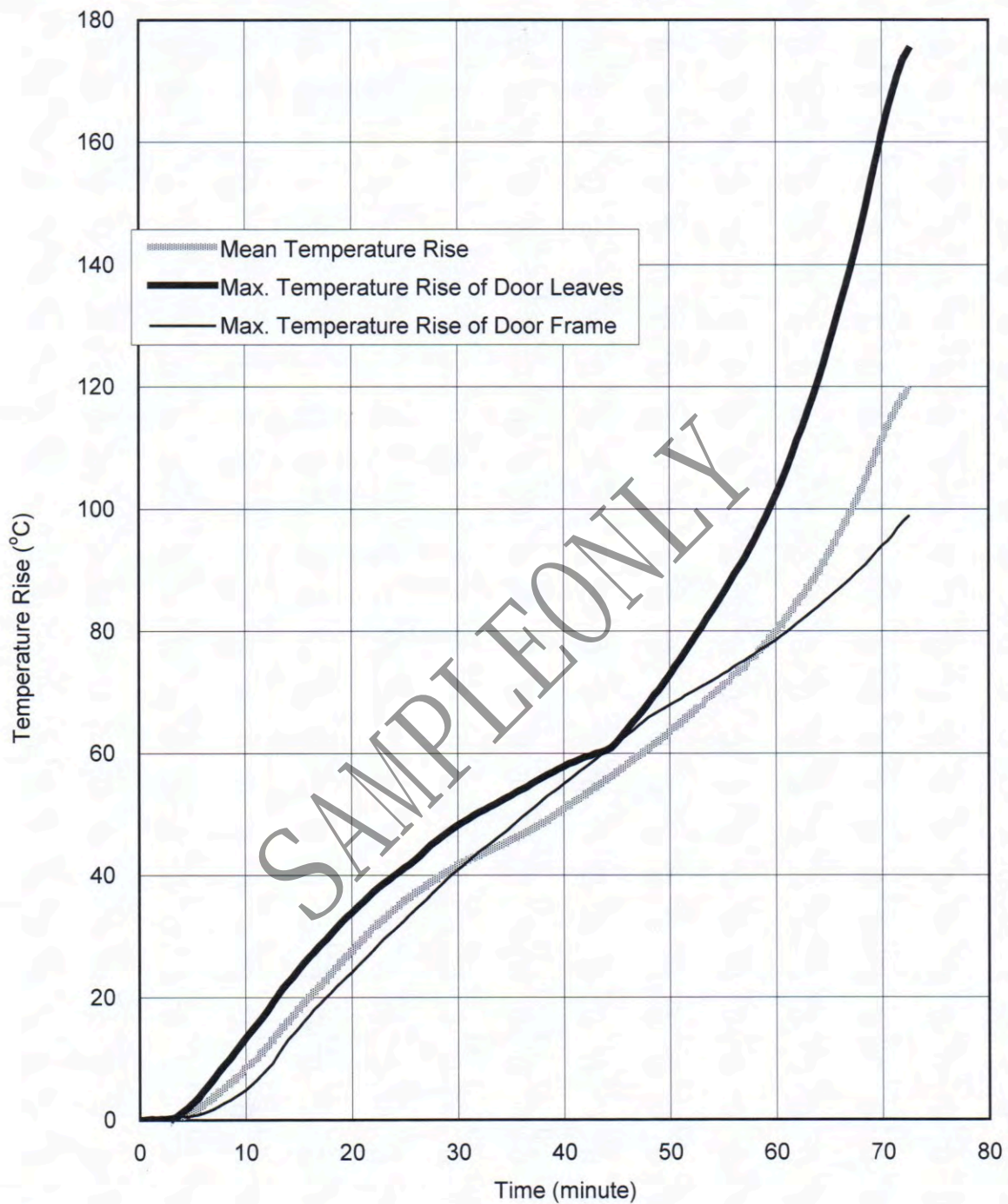


Figure 10 – Temperature rise of unexposed surface of doorset 'B' excluding the panels (I₂).

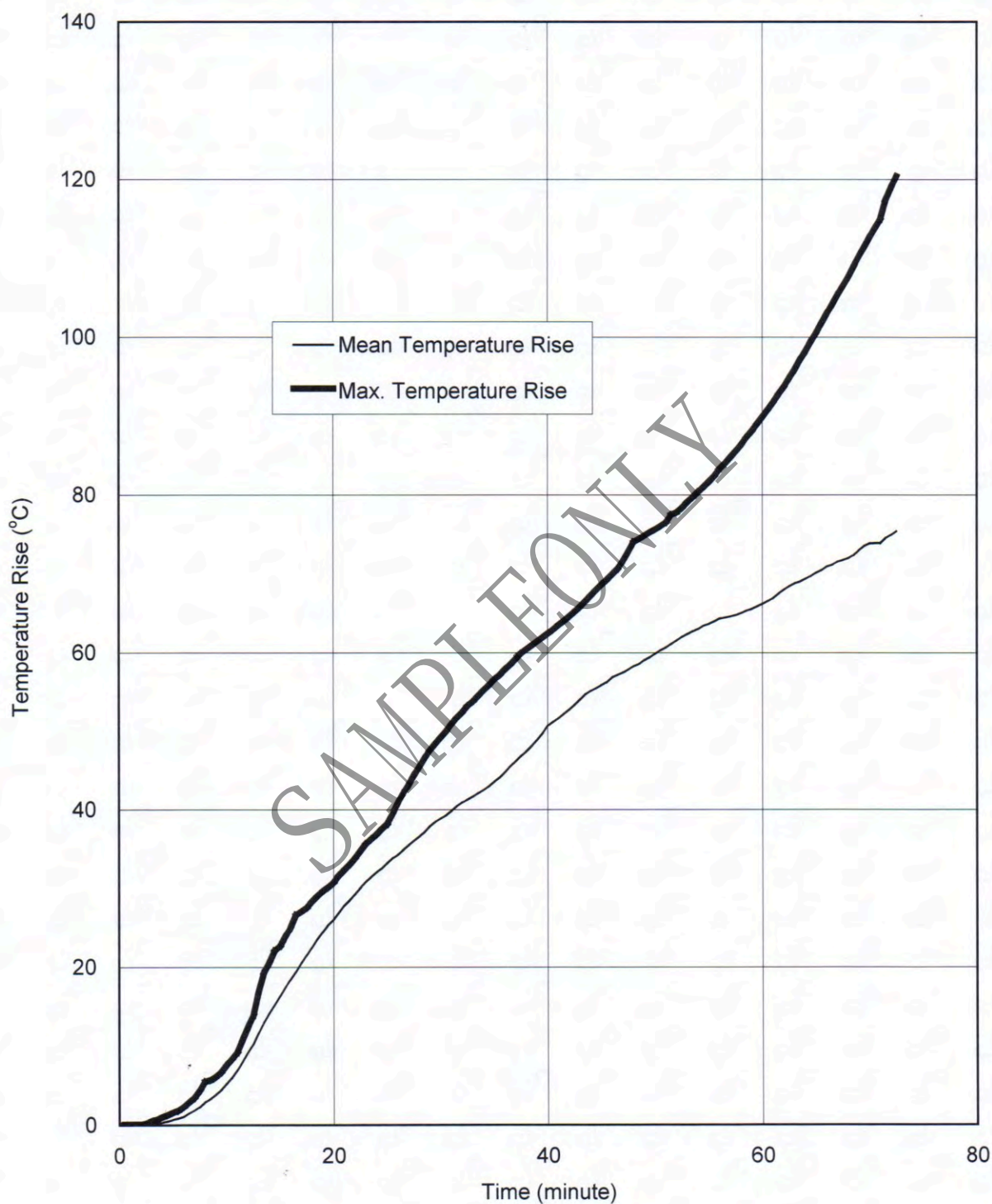


Figure 11 – Temperature rise of unexposed surface of transom panel (I₁) of doorset 'B'.

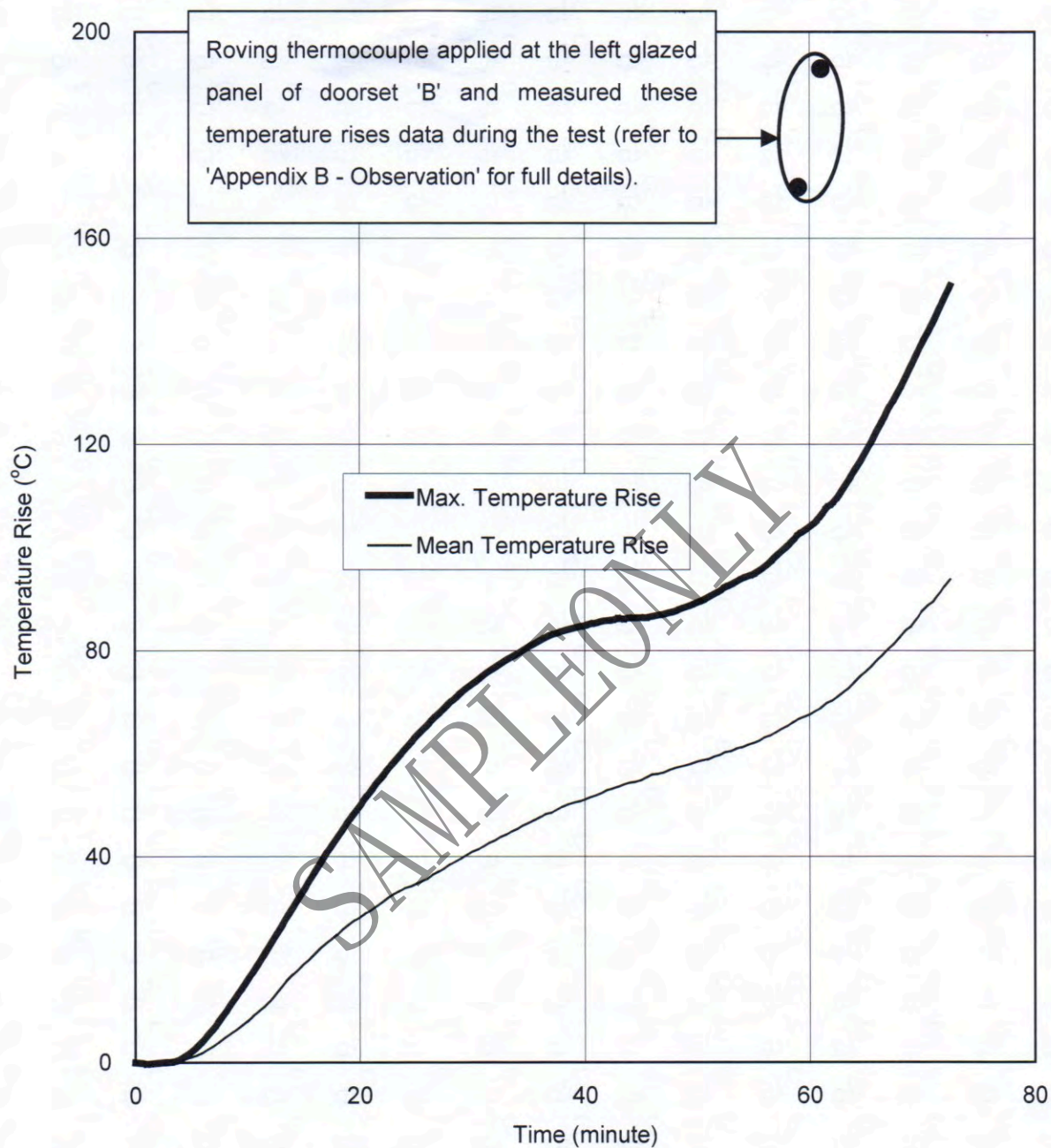


Figure 12 – Temperature rise of unexposed surface of left glazed panel of doorset 'B'.

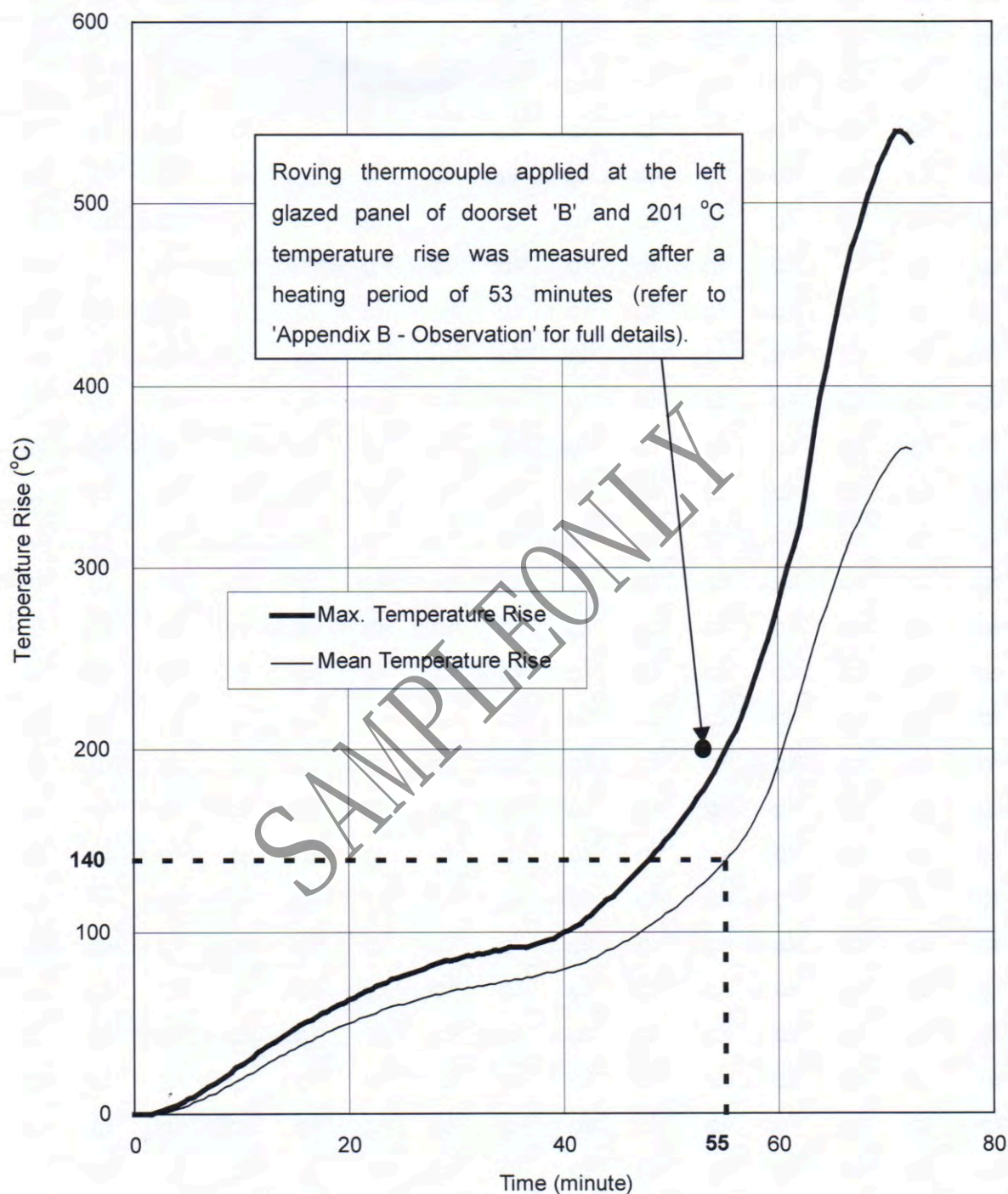


Figure 13 – Temperature rise of unexposed surface of right glazed panels of doorset 'B'.

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.

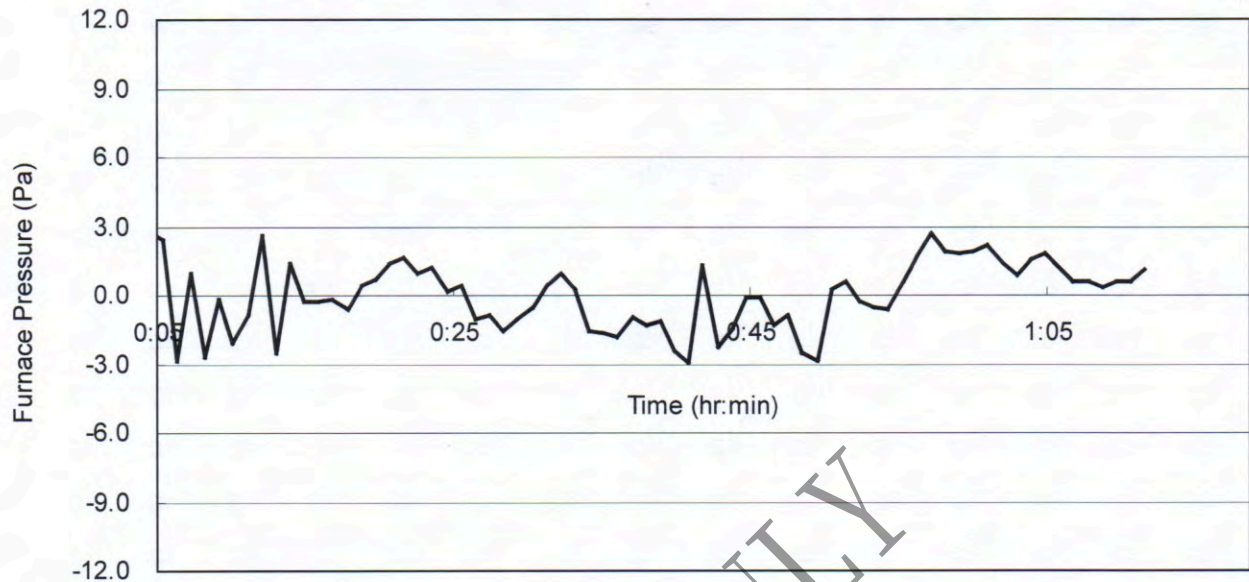


Figure 14 – Furnace pressure.

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

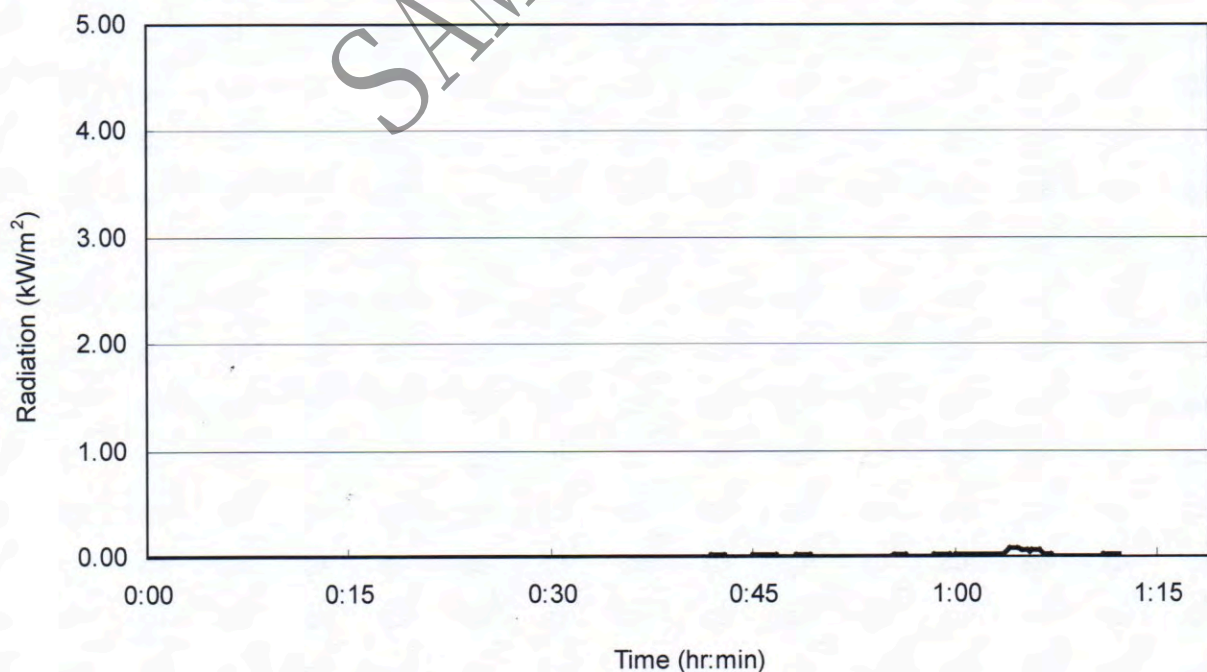


Figure 15 – Radiation.

APPENDIX B – OBSERVATION

Doorset 'A'

Time (min.sec)	Exposed (E) or Unexposed (U)	Observation
00.00	-	Test started.
01.06	U	Smoke started releasing from the specimen.
02.00	E	A glass layer of glazed panel broke and fell into the furnace.
06.30	U	The glazed panel turned grey.
30.00	U	The specimen satisfied the integrity and insulation requirements performance.
42.00	U	White substance was observed at the perimeter of glazed panel.
60.00	U	The specimen satisfied the integrity and insulation requirements performance.
64.55	U	Cotton pad test applied at the glazed panel and the test passed.
65.00	U	The glazed panel turned dark and white substance was observed on it.
72.18	-	Test terminated as requested by test sponsor.

Doorset 'B'

Time (min.sec)	Exposed (E) or Unexposed (U)	Observation
00.00	-	Test started.
01.06	U	Smoke started releasing from the specimen.
02.00	E	A glass layer of all glazed panels broke and fell into the furnace.
03.00	U	Right glazed panel turned grey.
06.30	U	All glazed panels turned grey.
10.25	U	Interlayer of top right glazed panel detached.
10.47	U	Smoke released from concealed hinges positions.
16.35	E	Interlayer of bottom right glazed panel detached.
30.00	U	The specimen satisfied the integrity and insulation requirements performance.
32.00	U	Smoke released from concealed closer positions.
53.48	U	Roving thermocouple applied at top right glazed panel and 223 °C was measured (refer to location '1' in photo '3').
59.58	U	Roving thermocouple applied at bottom left corner of left glazed panel and 192 °C was measured (refer to location '2' in photo '3').
61.40	U	Roving thermocouple applied at bottom left corner of left glazed panel and 192 °C was measured (refer to location '2' in photo '3').
63.46	U	Cotton pad test applied at top right corner of bottom glazed panel and the test passed.
65.00	U	All glazed panels turned dark and white substance was observed on them.
70.42	U	Cotton pad test applied at bottom right glazed panel and the test passed.
71.17	U	Cotton pad test applied at and the test passed.
72.18	-	Test 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.

Location \ Time (mins)					
	0	15	30	45	60
D1	0	3	5	9	--
D2	0	5	6	8	--
D3	0	1	11	12	14
D4	0	8	7	3	13
D5	0	8	-16	17	19
D6	0	2	1	-2	--
D7	0	0	-2	-2	--
D8	0	8	11	8	0
D9	0	-1	-6	-24	-20
D10	0	-11	-11	-14	-23
D11	0	3	6	2	-10
D12	0	6	11	15	--
D13	0	3	-2	3	5
D14	0	0	2	1	8
D15	0	3	7	13	15

(All dimensions are measured in millimetres)

Positive deflection indicates movement towards the furnace and negative deflection indicates movement away from the furnace (see also Figure 4 for the locations).

The maximum deflection of doorset 'A' occurred at location D5 was 19 mm moving towards the furnace after a heating period of 60 minutes.

The maximum deflection of doorset 'B' occurred at location D9 was 29 mm moving away from the furnace after a heating period of 60 minutes.

Table 2- Mean furnace temperature

Time (minute)	BS EN 1363-1 Standard Curve (°C)	Mean Furnace Temp. (°C)
0	20	23
5	576	543
10	678	720
15	739	743
20	781	800
25	815	839
30	842	864
35	865	877
40	885	887
45	902	914
50	918	931
55	932	945
60	945	957
65	957	970
70	968	978
72	973	978

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 72 minutes.

Table 3 - Time and related temperature rise measured by thermocouples S1 – S17 (Doorset 'A').

Time (min)	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
5	0	0	2	1	5	0	1	9	0	12	0	0	0	0	0
10	3	4	0	4	1	3	4	12	3	7	4	5	5	4	4
15	12	15	4	15	10	12	10	16	9	6	16	17	16	15	14
20	23	26	17	26	22	24	13	21	17	2	26	27	25	24	24
25	32	35	27	36	32	34	17	28	30	4	33	34	32	31	33
30	39	42	34	43	38	42	21	35	41	12	38	40	37	37	39
35	42	48	40	47	45	53	26	44	50	21	41	43	41	41	43
40	45	54	45	51	51	59	33	55	57	31	44	48	46	48	49
45	49	56	50	55	55	63	40	66	64	39	51	55	54	56	56
50	56	61	56	61	59	65	47	75	70	47	59	65	63	62	61
55	61	66	61	66	59	66	52	83	76	54	65	69	71	66	64
60	64	70	64	69	59	67	56	93	81	58	67	71	74	68	66
65	66	72	66	71	60	69	60	104	87	62	68	71	75	68	67
70	66	72	70	72	62	74	67	117	94	65	66	70	72	67	68
72	66	72	72	72	64	77	72	123	99	67	65	70	72	68	69

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 72 minutes.

Table 4 - Time and related temperature rise measured by thermocouples S18 – S34 (Doorset 'A').

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	0	0	1	1	1	0	1	1	0	0	0	4	2	3	9	1	6
10	4	5	3	3	1	2	2	2	0	0	0	5	1	1	33	6	27
15	15	16	8	9	7	8	5	3	2	2	1	4	2	2	54	11	47
20	25	25	14	17	17	18	4	8	5	3	2	3	4	5	71	15	61
25	32	32	23	27	26	28	5	14	10	6	4	3	7	8	82	18	71
30	38	38	33	36	34	38	6	25	15	10	6	4	9	11	86	21	79
35	43	43	42	44	44	47	8	31	20	14	10	6	11	13	89	24	83
40	48	49	51	52	52	55	12	34	24	18	13	8	14	16	99	28	89
45	57	57	58	58	57	60	15	38	27	21	17	11	16	18	117	33	97
50	64	62	63	64	60	65	18	40	30	25	20	13	19	19	144	40	113
55	68	66	68	69	64	70	21	43	32	29	24	16	22	22	175	48	137
60	70	68	73	72	69	75	23	48	35	32	26	19	26	25	220	58	162
65	71	69	79	78	77	82	26	52	37	43	29	21	30	27	294	74	194
70	71	69	85	86	84	88	28	52	39	56	33	23	35	31	380	93	261
72	72	70	89	89	87	91	28	51	40	43	34	24	38	33	402	96	302

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

The test was terminated as requested by the test sponsor after a heating period of 72 minutes.

Table 5 - Time and related temperature rise measured by thermocouples S35 – S53 (Doorset 'B').

Time (min)	S35	S36	S37	S38	S39	S40	S41	S42	S43	S44	S45	S46	S47	S48	S49	S50	S51	S52	S53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	3	0	3	1	2	10	1	1	1	0	1	0	0	1	1	11	1	3	2
10	12	3	13	3	11	10	5	5	5	3	3	5	4	2	4	13	5	7	6
15	20	13	25	12	21	4	14	17	14	8	12	17	14	10	12	18	14	19	14
20	26	25	34	22	31	6	24	29	24	17	22	29	24	19	23	21	23	30	23
25	32	37	41	32	38	16	33	41	33	28	31	39	34	29	32	27	32	38	32
30	35	44	46	40	44	26	39	48	40	38	39	46	42	37	40	34	40	39	39
35	38	49	49	45	48	32	44	53	45	47	45	52	48	43	46	43	46	44	45
40	42	53	54	52	53	36	48	58	50	54	50	57	53	49	52	53	52	48	51
45	49	58	62	57	59	39	54	61	55	58	54	60	57	53	56	61	57	52	56
50	58	62	73	57	67	42	60	63	60	61	59	61	61	57	60	70	61	58	61
55	70	64	86	59	77	44	67	66	66	64	64	62	65	59	63	77	65	64	66
60	85	65	102	59	89	45	74	69	73	66	69	63	69	60	67	80	68	68	69
65	107	66	127	60	105	46	85	71	82	69	76	65	75	60	71	84	72	74	73
70	137	67	162	61	130	47	101	74	96	73	87	70	83	61	78	92	79	81	79
72	149	69	175	62	142	48	107	76	102	75	92	73	87	62	82	92	81	87	82

Notes: Locations of thermocouples S35 – S53 are shown in Figure 2.

The test was terminated as requested by the test sponsor after a heating period of 72 minutes.

Table 6 - Time and related temperature rise measured by thermocouples S54 – S71 (Doorset 'B').

Time (min)	S54	S55	S56	S57	S58	S59	S60	S61	S62	S63	S64	S65	S66	S67	S68	S69	S70	S71
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	3	2	2	0	2	0	1	0	1	0	1	0	1	1	1	1	1
10	3	6	17	7	5	7	4	8	5	6	6	6	2	5	5	5	7	5
15	7	14	34	17	18	18	13	19	17	17	23	18	6	17	14	16	21	15
20	14	22	44	26	29	27	22	29	28	27	30	27	12	25	25	24	31	24
25	22	31	42	33	37	33	30	34	36	34	36	34	20	32	38	32	38	32
30	31	37	42	38	43	38	35	39	42	39	42	39	28	38	49	39	47	40
35	40	44	37	43	48	43	40	42	48	44	49	44	36	44	57	46	55	47
40	49	51	45	49	54	50	48	49	54	51	56	51	42	51	62	52	62	54
45	57	57	47	54	61	55	51	54	59	56	61	56	50	56	69	58	68	60
50	64	62	56	60	64	61	55	60	60	60	63	60	57	60	75	62	76	65
55	70	68	73	68	65	68	58	66	61	64	63	63	62	63	82	66	81	70
60	75	71	84	72	67	73	58	71	62	67	65	66	67	66	90	70	88	75
65	79	75	100	79	69	79	62	77	63	72	69	70	71	70	101	75	97	81
70	81	82	116	86	70	86	66	84	66	76	75	76	76	75	113	82	112	89
72	83	84	126	91	70	89	67	88	68	79	79	78	78	78	118	85	120	93

Notes: Locations of thermocouples S54 – S71 are shown in Figure 2.

The test was terminated as requested by the test sponsor after a heating period of 72 minutes.

Table 7 - Time and related temperature rise measured by thermocouples S72 – S90 (Doorset 'B').

Time (min)	S72	S73	S74	S75	S76	S77	S78	S79	S80	S81	S82	S83	S84	S85	S86	S87	S88	S89	S90
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	1	1	1	0	0	2	1	1	0	2	1	8	2	6	3	7	4	0
10	3	5	0	4	4	3	1	2	6	3	16	5	27	10	23	14	25	17	0
15	8	15	1	12	15	11	1	9	17	11	34	13	47	22	42	28	45	33	0
20	15	24	2	20	15	17	0	13	24	15	50	20	62	31	57	39	62	45	0
25	23	33	5	27	15	23	1	17	19	17	63	23	76	36	72	48	74	55	0
30	31	41	11	35	24	30	3	24	14	22	74	28	85	41	82	55	80	62	0
35	40	48	21	43	31	38	5	31	13	27	81	32	91	46	88	61	85	67	0
40	49	55	28	50	37	45	7	37	14	32	85	37	99	51	93	66	93	73	189
45	60	62	43	58	39	54	9	44	17	37	86	41	122	58	101	74	111	85	276
50	70	68	52	65	41	60	11	50	19	41	89	45	154	66	124	87	138	102	270
55	76	73	45	69	44	63	14	51	22	44	95	48	198	76	156	103	171	125	312
60	83	79	49	74	42	67	16	54	26	47	104	52	280	94	240	136	230	172	369
65	88	85	49	79	44	71	18	58	35	51	119	59	387	118	425	193	347	255	355
70	93	94	55	87	46	77	20	63	44	56	140	67	467	140	528	233	443	313	429
72	97	99	57	92	49	81	21	66	47	59	151	71	481	146	534	241	468	323	471

Notes: Locations of thermocouples S72 – S90 are shown in Figure 2.

The test was terminated as requested by the test sponsor after a heating period of 72 minutes.

APPENDIX D - INFORMATION FROM TEST SPONSOR

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

Doorset 'A'

Item	Description
1	Frame (4-sided)
Material	: Hardwood.
Overall sizes	: 700 mm wide x 2,500 mm high.*
Section sizes	: 45 mm by 90 mm thick.*
Rebate	: 20 mm.*
Jambs to head jointing method	: By tongue and groove with screws and L-angles fixed.
Frame to concrete lining fixing method	: Door frame to be fixed by M6 x 68 mm long anchor bolts distribute evenly on each jamb of door frame at spacing 975 mm c/c.
Gap insulation between door frame and concrete testing rig	: By cement sand grouting.#
2	Door Leaf & Transom Panel
Door leaf sizes	: 669 mm wide x 2,013 mm high.*
Transom panel sizes	: 669 mm by 400 mm high.*
Thickness	: 48 mm.*
Construction	: 34 mm thick perlite core and sandwiched by a layer of 5 mm thick fire rated board on both sides with 2 mm thick plywood facing.
Fixing method of transom panel	: M6 screws at 200 mm c/c and 150 mm c/c spacing horizontally and vertically respectively.
Lipping	: 10 mm thick hardwood.

Notes: * Verified on site by RED.

As shown on the test construction.

Information from Test Sponsor (Con't)

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

Doorset 'A'

Item	Description
3 Core	
Material	: Pearlite.
Density	: 250 - 360 kg/m ³ .
Thickness	: 34 mm.*
Fixing method	: By adhesive.
4 Fire Rated Board	
Material	: Magnesium oxide board.
Density	: 800 - 1,000 kg/m ³ .
Thickness	: 5 mm on both sides of core and stiles and rails.
Fixing method	: By adhesive.
5 Plywood Facing	
Material	: Plywood.
Density	: 500 kg/m ³ .
Thickness	: 2 mm thick on both sides of core;
Fixing method	: By adhesive.
6 Stiles and Rails	
Material	: Hardwood.
Density	: 500 - 600 kg/m ³ .
Sizes	: 80 mm wide by 34 mm thick.*
Fixing method	: By adhesive and nails.
7 Glazing Bead	
Material	: Hardwood.
Sizes	: 25 mm wide by 13 mm thick.*
Fixing method	: Nails.

* and # refer to page 38

Information from Test Sponsor (Con't)

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

Doorset 'A'

Item	Description
8 Glazed Panel	
Brand	: Pyrotech.
Thickness	: 25 mm.*
Composition	: 5 mm thick tempered glass + 15 mm interlayer + 5 mm thick tempered glass.
Aperture Sizes	: 310 mm wide by 1,260 mm high.*
Vision Sizes	: 260 mm wide by 1,200 mm high.*
Fixing method	: 95 mm away from hinging edge and 130 mm from top edge.#
9a Intumescent Fire Seal - 20 mm wide by 4 mm thick	
Brand	: UA.
Applied locations	: 1 no. of seal applied at four sides of door frame, top and bottom of mullion.#
9b Intumescent Fire and Smoke Seal - 20 mm wide by 4 mm thick	
Brand	: UA.
Applied locations	: 1 no. of seal applied at all edges of transom panel and door leaf.#
10 Spring Hinges	
Brand & Model	: GUTE, Winco US400.#
Material	: Stainless Steel.
Overall sizes	: 102 mm x 102 mm x 3 mm thick.*
Number used	: 4 nos. of hinges (each) used at door leaf and 200 mm away from edges.#
Fixing method	: By screws with intumescent pad and ceramic wool protected.
11 Lockset	
Brand & Model	: Gamma, DC8200-A01.#
Materials	: Stainless steel
Sizes	: 238 mm long x 80 mm wide x 22 mm thick.*
Applied location	: Right door leaf.#
Status	: Unlatched and unlocked.#

* and # refer to page 38

Information from Test Sponsor (Con't)

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

Doorset 'B'

Item	Description
1 Frame	
Material	: Hardwood.
Overall sizes	: 2,100 mm wide x 2,950 mm high.*
Section sizes	: 45 mm by 90 mm thick.*
Rebate	: 20 mm.*
Jambs to head jointing method	: By tongue and groove with screws and L-angles fixed.
Frame to concrete lining fixing method	: Door frame to be fixed by M6 x 68 mm long anchor bolts distribute evenly on each jamb of door frame at spacing 975 mm c/c.
Gap insulation between door frame and concrete testing rig	: By cement sand grouting #
2 Door Leaves & Transom Panel	
Each door leaf sizes	: Left door leaf: 1,200 mm wide x 2,506 mm high.* Right door leaf: 840 mm wide x 2,506 mm high.*
Transom panel sizes	: 2,150 mm by 400 mm high.*
Thickness	: 48 mm.*
Mullion	: 65 mm wide by 90 mm thick with 20 mm rebate.*
Construction	: 34 mm thick perlite core and sandwiched by a layer of 5 mm thick fire rated board on both sides with 2 mm thick plywood facing.
Fixing method of transom panel	: M6 screws at 200 mm c/c and 150 mm c/c spacing horizontally and vertically respectively.
Lipping	: 10 mm thick hardwood.

Notes: * Verified on site by RED.

As shown on the test construction.

Information from Test Sponsor (Con't)

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

Doorset 'B'

Item	Description
3 Core	
Material	: Pearlite.
Density	: 250 - 360 kg/m ³ .
Thickness	: 34 mm.*
Fixing method	: By adhesive.
4 Fire Rated Board	
Material	: Magnesium oxide board.
Density	: 800 - 1,000 kg/m ³ .
Thickness	: 5 mm on both sides of core and stiles and rails.
Fixing method	: By adhesive.
5 Plywood Facing	
Material	: Plywood.
Density	: 500 kg/m ³ .
Thickness	: 2 mm thick on both sides of core;
Fixing method	: By adhesive.
6 Stiles and Rails	
Material	: Hardwood.
Density	: 500 - 600 kg/m ³ .
Sizes	: 80 mm wide by 34 mm thick.*
Fixing method	: By adhesive and nails.
7 Glazing Bead	
Material	: Hardwood.
Sizes	: 25 mm wide by 13 mm thick.*
Fixing method	: Nails.

* and # refer to page 41

Information from Test Sponsor (Con't)

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

Doorset 'B'

Item	Description
8a Left Glazed Panel	
Brand	: Pyrotech.
Thickness	: 25 mm.*
Composition	: 5 mm thick tempered glass + 15 mm interlayer + 5 mm thick tempered glass.
Aperture Sizes	: 730 mm wide by 2,160 mm high.*
Vision Sizes	: 680 mm wide by 2,110 mm high.*
Fixing method	: 95 mm from meeting edge and 180 mm from top edge.#
8b Right Glazed Panels	
Brand	: Pyrotech.
Thickness	: 25 mm.*
Composition	: 5 mm thick tempered glass + 15 mm interlayer + 5 mm thick tempered glass.
Aperture Sizes	: 460 mm wide by 560 mm high.*
Vision Sizes	: 410 mm wide by 510 mm high.*
Fixing method	: 92 mm from meeting edge and 300 mm from top edge.#
9a Intumescent Fire Seal - 20 mm wide by 4 mm thick	
Brand	: UA.
Applied locations	: 1 no. of seal applied at each jamb and head of door frame, top and bottom of mullion and meeting edge of right door leaf.#
9b Intumescent Fire and Smoke Seal - 20 mm wide by 4 mm thick	
Brand	: UA.
Applied locations	: 1 no. of seal applied at all edges of transom panel, both vertical edges of left door leaves and hinging edge of right door leaf.#

* and # refer to page 41

Information from Test Sponsor (Con't)

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

Doorset 'B'

Item	Description
10 Surface Mounted Overhead Door Closer	
Brand	: Ryobi 9903.
Fixing method	: Exposed side of left door leaf.#
11 Flush Bolts	
Brand	: UA.
Materials	: Stainless steel.
Sizes	: 22 mm deep by 25 mm wide by 200 mm long.
Fixing method	: Top and bottom of right door leaf.#
Status	: Unbolted.#
12 Butt Hinges	
Brand & Model	: Samco, Dorma 3904, Yale, WUYINGHAO.#
Material	: Stainless Steel.
Overall sizes	: 102 mm x 102 mm x 3 mm thick.*
Number used	: 4 nos. of hinges (each) used at left door leaf and 200 mm away from edges.#
Fixing method	: By screws.
13 Lockset	
Brand & Model	: Gamma, DC8200-A01.#
Materials	: Stainless steel
Sizes	: 240 mm long x 88 mm wide x 24 mm thick.*
Applied location	: Right door leaf.#
Status	: Unlatched and unlocked.#
14 Bottom Drop Seal	
Brand	: 1) Baimi A01; 2) BaimiA08.
Sizes	: 1) 30 mm high by 14 mm wide; 2) 32 mm high by 15 mm wide.
Applied location	: Bottom edge of both door leaves.#

* and # refer to page 41

Information from Test Sponsor (Con't)

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

Doorset 'B'

Item	Description
15 Concealed Hinges	
Brand & Model	: SOSS, YALE, UA & Dorma.
Material	: Stainless Steel.
Overall sizes	: 118 mm by 45 mm by 28 mm.*
Number used	: 4 nos. of hinges (each) used at right door leaf and 200 mm away from edges.#
Fixing method	: By screws.
16 Concealed Overhead Door Closer	
Brand & Model	: Dorma, ITS96.#
Material	: Zinc alloy.
Body sizes	: 40 mm wide by 291 mm long by 45 mm deep.
Arm sizes	: 40 mm wide by 460 mm long by 28 mm deep.
Fixing method	: By screws.#
17 Electric bolt	
Brand	: Yale(YDB-100 Electric Drop Bolt Locks).
Materials	: Stainless steel.
Fixing method	: Bottom edge of transom panel and top edge of left door leaf.
Status	: Unbolted without electricity connected.#

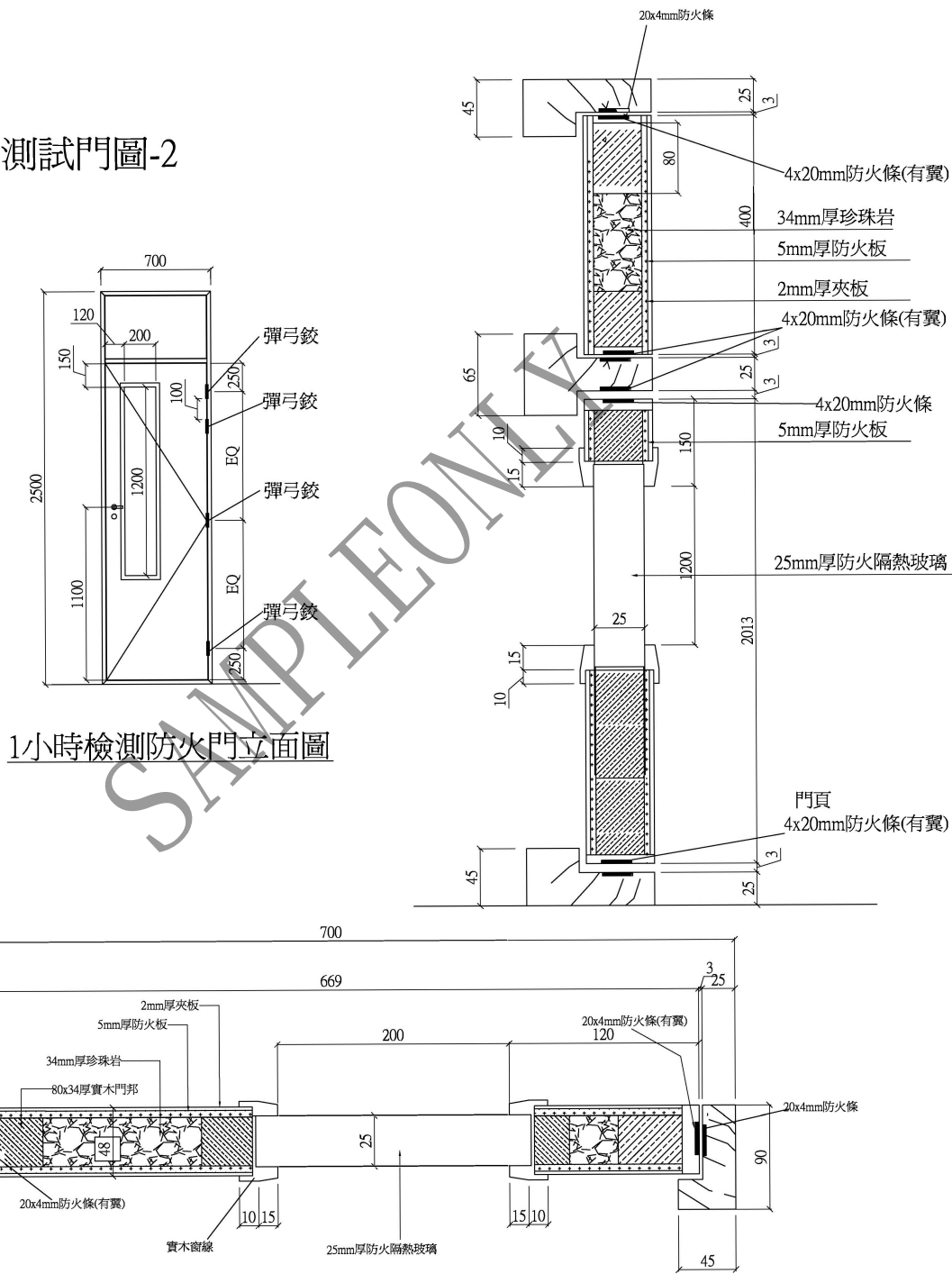
* and # refer to page 41

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'.)

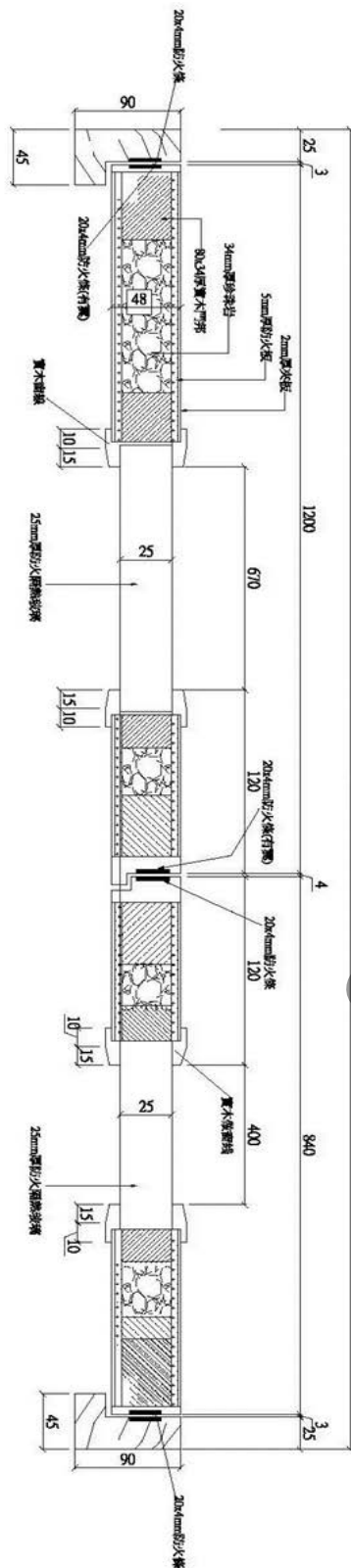
Doorset 'A'

歐標1小時測試門圖-2

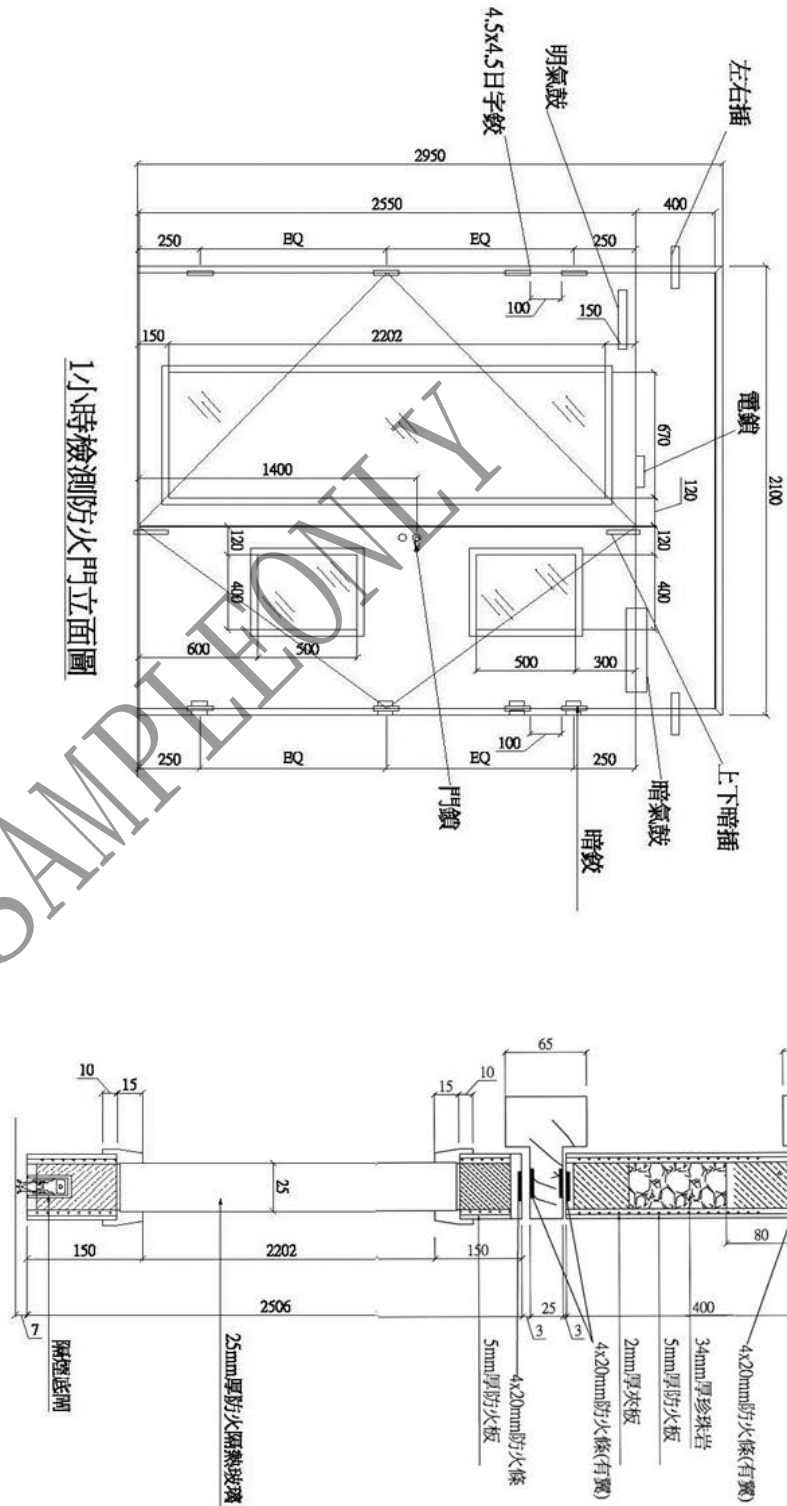


Doorset 'B'

歐標1小時測試門圖-2



1小時檢測防火門立面圖



- End of report -

SMOKE CONTROL TEST IN ACCORDANCE WITH BS EN 1634-3: 2004

On Single-acting, Single-leaf, Composite Timber Doorset

Test Report No.: R20L42-1A

Sample Identification: Q20K32-1

Issue Date: 7 June, 2021

SAMPLE ONLY

Test Sponsor

HK Pro-Tech Fire Prevention Building Materials Limited

Unit B, 22nd Floor, Johnson Centre, 13 Hau Fook Street,
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APPROVED SIGNATORY:




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1 SUMMARY

Smoke control test conducted in accordance with BS EN 1634-3: 2004 on single-acting, single-leaf, composite timber doorset with transom panel

A specimen of single-acting, single-leaf, composite timber doorset had been subjected to the tests in accordance with BS EN 1634-3: 2004, in order to determine the smoke leakage (S_a and S_m) from one side to the other under the ambient and medium temperature at pressure differences of 10 Pa, 25 Pa and 50 Pa. As requested by the test sponsor, the specimens were mounted within concrete lined specimen holders and the fixing details were as shown in the test sponsor's drawings (see the appendix). The doorset was installed such that the door leaf was swung away from the test chamber, therefore only the leakage rate from the closing face of the doorset was measured.

One doorset had been submitted by the test sponsor had the overall dimensions of 700 mm wide by 2,500 mm high by 90 mm frame thickness with four-sided frame. It incorporated of door leaf with sizes of 669 mm wide by 2,013 mm high by 48 mm thick. Above the door leaf was a transom panel with 400 mm high. The door leaf was incorporated with a single vision panel with vision sizes of 200 mm wide by 1,200 mm high. The vision panel was fitted with 'Pyrotech' 25 mm thick insulated glass.

The door leaf was composed of 34 mm thick perlite core sandwiched by a layer of 5 mm thick fire rated boards and 2 mm thick plywood on both sides. The stiles and rails were 80 mm wide by 42 mm thick hardwood. The door leaf was hung to the door frame by four (4) nos. hinges. The leaf was fitted with the "Dorma ITS 96" Concealed door closer and a mortise lockset. The transom panel was fitted with to the frame via the surface-mounted padbolt at both vertical edges. The Doorset was installed such that the closing face, i.e. the door leaves swing towards the door frame stopper) towards the test chamber. The doorset was unlocked and unlatched during the test.

The doorsets were fitted with smoke control seals as follows:

Door Frame

- i) UP "1212", 12 mm by 12 mm compression corner seal. One no. of seal fitted at the corner of the door frame rebate at all four sides. The seal was fitted full height and full width without interruption (See photos 7 & 8).

Transom Panel

- ii) UA, 20 mm wide by 4 mm thick intumescent body with two 4 mm high fins each at the long edge of the intumescent seal boy. One no. of seal was fitted full height and full width at the perimeter of the transom panel (See photo 4).

Door Leaf

- iii) UA, 20 mm wide by 4 mm thick intumescent body with two 4 mm high fins each at the long edge of the intumescent seal boy. One no. of seal was fitted full height at all the top and vertical edges of the door leaf. The seal was fully interrupted at all the hinges and forend plate position (See photos 5 and 6).
- iv) UA 13514, automatic drop seal of size 35 mm high by 14 mm wide. The seal was fitted at the bottom edge of the door leaf, full width without interruption (See photo 7).

The smoke leakage rates of the doorsets were summarized as below:

Test	Temp	Leakage rate Q_{spec} (m ³ /h) at pressure difference of			S_m Criterion (m ³ /h)	Linear leakage rate Q_l (m ³ /h/m) at pressure difference of		S_a Criterion (m ³ /h/m)
		10 Pa	25 Pa	50 Pa		10 Pa	25 Pa	
1	Ambient	0.10	0.20	0.29	< 20	0.02	0.04	< 3.0
2	Medium	0.48	0.47	1.05	< 20	N/A	N/A	N/A

The performance criteria of the smoke leakage rate (S_a) and (S_m) as mentioned in the BS EN 1634-3: 2004 shall be referenced to BS EN 13501-2: 2007 + A1: 2009 where

Smoke leakage (S_m) – when the maximum leakage rate measured at both ambient temperature and 200°C and up to a pressure of 50 Pa does not exceed 20 m³/h for a single-leaf doorset;

Smoke leakage (S_a) – when the maximum leakage rate measured at ambient temperature, and at a pressure of up to 25 Pa only, does not exceed 3 m³/h per meter length of gap between the fixed and movable components of the doorset, excluding leakage at the threshold.

According to the performance criteria as given in BS EN 13501-2: 2007 + A1: 2009, it can be concluded that the tested single-leaf doorset **satisfied both the S_a and S_m** requirements.

2 INTRODUCTION

The specimens were tested in accordance with BS EN 1634-3: 2004, 'Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware – Smoke control test for door and shutter assemblies'. Both ambient and medium temperature leakage rates were considered in the tests.

The specimens were submitted by the test sponsor, and was mounted and constructed by the test sponsor. The test was led by Ms. Ivy Zou of Research Engineering Development Façade Consultants Limited (RED).

3 INFORMATION

3.1. Testing laboratory

Research Engineering Development Façade Consultants Limited (RED)
No. 111, Jiaoxin Road, Lanhe Town, Nansha District, Guangzhou, China

3.2. Test date

10th December, 2020

3.3. Equipment

A test chamber with an open front of size 3 m by 3 m to mount the test construction and provide a sealed enclosure to generate the necessary heating and pressure condition.

Nine (9) thermocouples to monitor the temperature of the test chamber, which were kept at 100 mm from the face of the specimen (see Figure 1).

A flowmeter to measure the volume flow rate supplied to the apparatus to compensate for the total leakage.

A micro-manometer provided to monitor the furnace pressure.

Displacement transducers provided to measure the deflection of the doorset.

3.4. Test environment

The temperature around the test area during the test was in the range of 21°C – 22 °C.

The chamber was controlled so that the mean test chamber temperature at medium temperature test complied with the requirement of Clause 10.2.2.2 of BS EN 1634-3: 2004. The temperatures recorded are shown graphically in Figure 4.

Summaries of the observations made on the general behaviour of the specimens are given in the appendix of this report.

4 CONDITIONING

The specimen's storage, construction, and test preparation took place in the test laboratory over a total, combined time of 11 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 17 °C to 26 °C and 56 % to 80 % respectively.

Mechanical conditioning as required in clause 8.2 of BS EN 1634-3 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.

5 TEST SPECIMEN

5.1. Selection of specimen

The specimens were submitted to the test location by the test sponsor. RED did not involve in the selection of the specimens.

5.2. Verification of specimen

The specifications of the door assembly provided by the test sponsor were as shown in Appendix D of this report. Items that had been verified by RED were clearly identified.

5.3. Supporting construction

The supporting constructions were concrete lined system of 300 mm thick with a structural opening of 1,500 mm wide by 2,900 mm high.

5.4. Specimen construction

One doorset had been submitted by the test sponsor had the overall dimensions of 700 mm wide by 2,500 mm high by 90 mm frame thickness with four-sided frame. It incorporated of door leaf with sizes of 669 mm wide by 2,013 mm high by 48 mm thick. Above the door leaf was a transom panel with 400 mm high. The door leaf was incorporated with a single vision panel with vision sizes of 200 mm wide by 1,200 mm high. The vision panel was fitted with 'Pyrotech' 25 mm thick insulated glass. The door leaf was composed of 34 mm thick perlite core sandwiched by a layer of 5 mm thick fire rated boards and 2 mm thick plywood on both sides. The stiles and rails were 80 mm wide by 42 mm thick hardwood. The door leaf was hung to the door frame by four (4) nos. hinges. The leaf was fitted with the "Dorma ITS 96" Concealed door closer and a mortise lockset. The transom panel was fitted with to the frame via the surface-mounted padbolt at both vertical edges. The Doorset was installed such that the closing face, i.e. the door leaves swing towards the door frame stopper) towards the test chamber. The doorset was unlocked and unlatched during the test.

The doorsets were fitted with smoke control seals as follows:

Door Frame

- i) UP "1212", 12 mm by 12 mm compression corner seal. One no. of seal fitted at the corner of the door frame rebate at all four sides. The seal was fitted full height and full width without interruption (See photos 7 & 8).

Transom Panel

- ii) UA, 20 mm wide by 4 mm thick intumescent body with two 4 mm high fins each at the long edge of the intumescent seal boy. One no. of seal was fitted full height and full width at the perimeter of the transom panel (See photo 4).

Door Leaf

- iii) UA, 20 mm wide by 4 mm thick intumescent body with two 4 mm high fins each at the long edge of the intumescent seal boy. One no. of seal was fitted full height at all the top and vertical edges of the door leaf. The seal was fully interrupted at all the hinges and forend plate position (See photos 5 and 6).
- iv) UA 13514, automatic drop seal of size 35 mm high by 14 mm wide. The seal was fitted at the bottom edge of the door leaf, full width without interruption (See photo 7).

6 TEST PROCEDURE

The tests were conducted in accordance with the procedures specified in Section 10 of BS EN 1634-3: 2004.

6.1. Pre-test procedure

The doorsets were opened to an angle of at least 30° and closed 10 times to ensure the assembly operates normally prior to the test.

The retention forces of the doorsets were measured in accordance with Clause 10.1.2 of BS EN 1634-3: 2004 as shown in the table below.

Doorset	Door Leaf (Door Closer)	
	Arm distance	Retention force
1	650 mm	150 N

The lengths of gap and the clearance between the fixed and moving components of the doorset were measured as shown in appendix A, Figures 3 of this report.

The leakage rate through the apparatus together with the associated/supporting construction at 50 Pa and ambient temperature was measured to be lower than 10 m³/hr.

6.2. Air Leakage test

The ambient temperature of the test area during the test was measured. The furnace was monitored by nine (9) thermocouples so that the mean test chamber temperature complied with the requirements of Clause 10.2.2.2 of BS EN 1634-3: 2004.

6.3. Sequence of test

The tests were carried out in the following sequence:

- i) Doorset was mounted with one of the face towards the test chamber;
- ii) Determine the leakage rate through the test chamber and any support or associated construction at ambient temperature;
- iii) Determine the total leakage rate at ambient temperature;
- iv) Determine the total leakage rate at medium temperature; and
- v) Determine the leakage rate through the apparatus and any supporting or associated construction at medium temperature;

6.4. Test conditions

The temperature in the test chamber was controlled to be lower than 30 °C before the start of the test. The leakage rates through the test chamber and any supporting or associated construction and the total leakage rate at ambient temperature at pressure differences of 10 Pa, 25 Pa and 50 Pa were measured. The leakage rates were measured while the pressure difference was maintained for 2 minutes.

The temperature of the test chamber was raised to medium temperature (200°C) in 30 ± 5 minutes at neutral pressure as stated in Clause 10.2.2.2 of BS EN 1634-3: 2004.

The leakage rates through the test chamber and any supporting or associated construction and the total leakage rate at medium temperature at pressures differences of 10 Pa, 25 Pa and 50 Pa were measured. The leakage rates were measured while the pressure difference was maintained for 2 minutes.

7 RESULTS

When tested in accordance with BS EN 1634-3: 2004, the measured leakage rates and the calculated linear leakage rates were summarized below. There was no failure of any components observed during the test. The observations during and after the test were summarized in Appendix B. The deflections of the doorsets were summarized in Table 2 of Appendix C.

Door type: Single-acting, single-leaf, composite timber doorset
Door opening size: 669 mm (wide) by 2,013 mm (high)
Side A: Closing Side
Side B: Opening Side

Test	Temp	Leakage rate Q_{spec} (m ³ /h) at pressure difference of			S_m Criterion (m ³ /h)	Linear leakage rate Q_l (m ³ /h/m) at pressure difference of		S_a Criterion (m ³ /h/m)
		10 Pa	25 Pa	50 Pa		10 Pa	25 Pa	
1	Ambient	0.10	0.20	0.29	< 20	0.02	0.04	< 3.0
2	Medium	0.48	0.47	1.05	< 20	N/A	N/A	N/A

The performance criteria of the smoke leakage rate (S_a) and (S_m) as mentioned in the BS EN 1634-3: 2004 shall be referenced to BS EN 13501-2: 2007 + A1: 2009 where

- (a) Smoke leakage (S_m) – when the maximum leakage rate measured at both ambient temperature and 200°C and up to a pressure of 50 Pa does not exceed 20 m³/h for a single-leaf doorset;
- (b) Smoke leakage (S_a) – when the maximum leakage rate measured at ambient temperature, and at a pressure of up to 25 Pa only, does not exceed 3 m³/h per meter length of gap between the fixed and movable components of the doorset, excluding leakage at the threshold.

According to the performance criteria as given in BS EN 13501-2: 2007 + A1: 2009, it can be concluded that the tested single-leaf doorset satisfied both the S_a and S_m requirements.

8 POST-TEST OBSERVATION

The doorset was able to open manually after the test. All the smoke seals remained intact in position without deterioration.

9 LIMITATIONS

This report details the method of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in BS EN 1634-3: 2004. Any significant deviations with respect to size, construction details, loads, stresses, edges or end conditions other than those allowed under the field of application in the relevant test method is not covered by this report.

SAMPLEONLY

APPENDIX A – PHOTOS AND TEST RECORD



Photo 1: Exposed face of Doorset before the test.



Photo 2: Exposed face of Doorset after the test.



Photo 3: Unexposed face of Doorset during the test

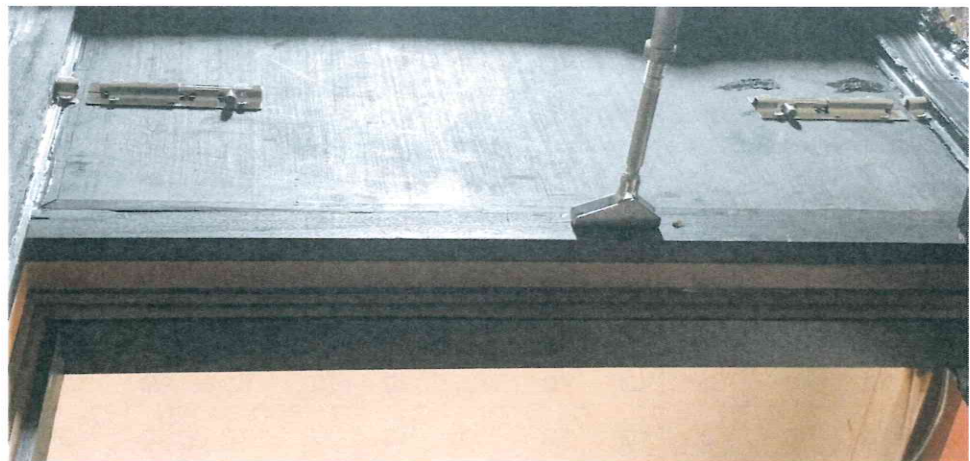


Photo 4: Fire seal & smoke seal arrangements at the head of door frame



Photo 5: Fire seal & smoke seal arrangements at the bottom edge of door frame



Photo 6: Fire and smoke seal at the vertical jamb of door frame



Photo 7: Fire and smoke seal at the top edge of the door leaf

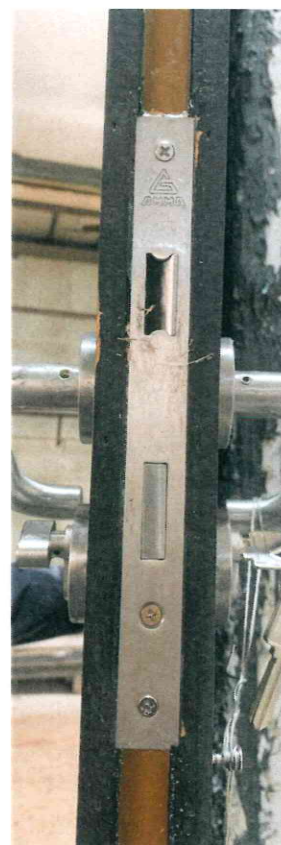


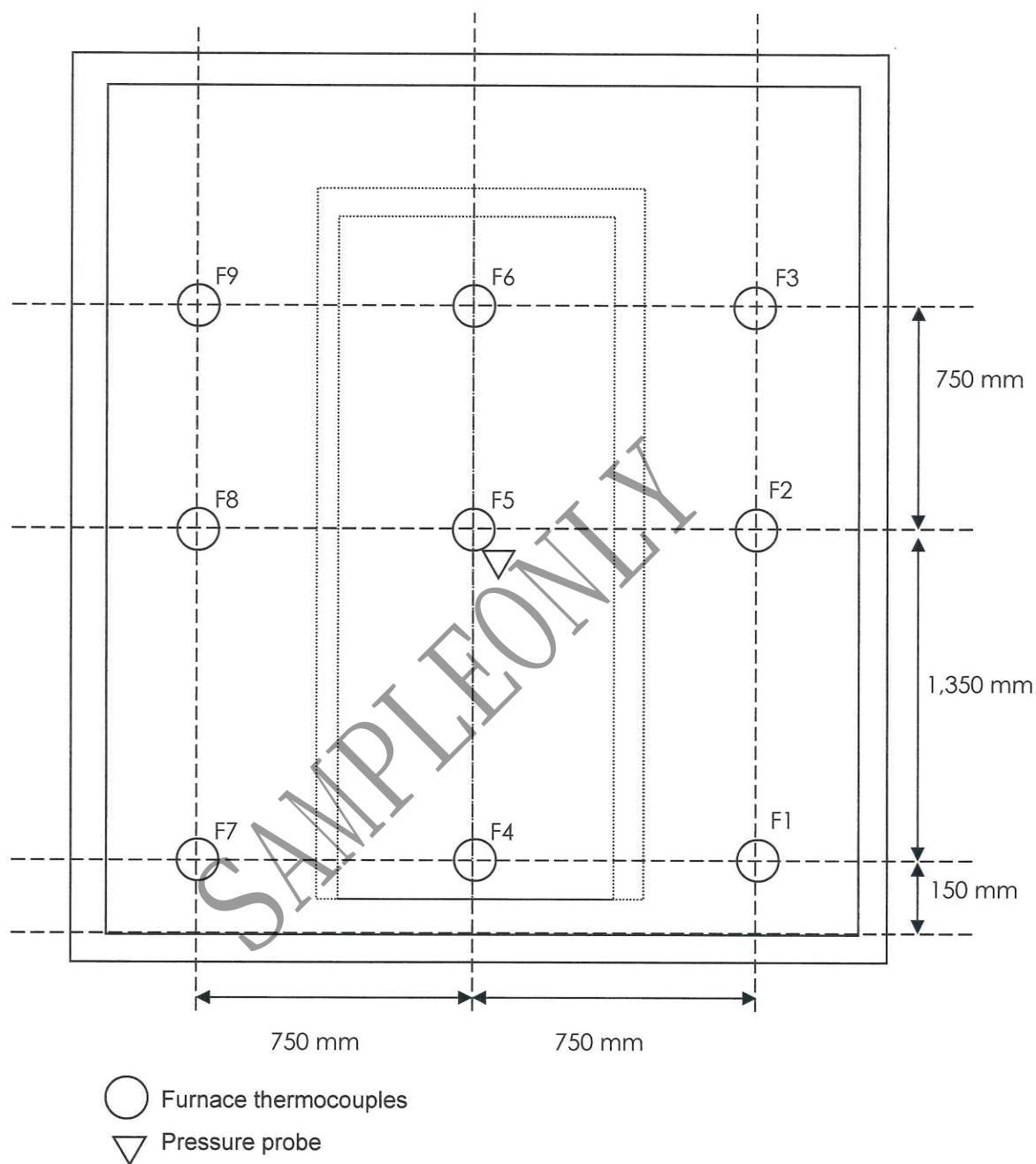
Photo 8: Interruption of the fire and smoke seal at the forend plate



Photo 9: Interruption of the fire and smoke seal at the hinges position

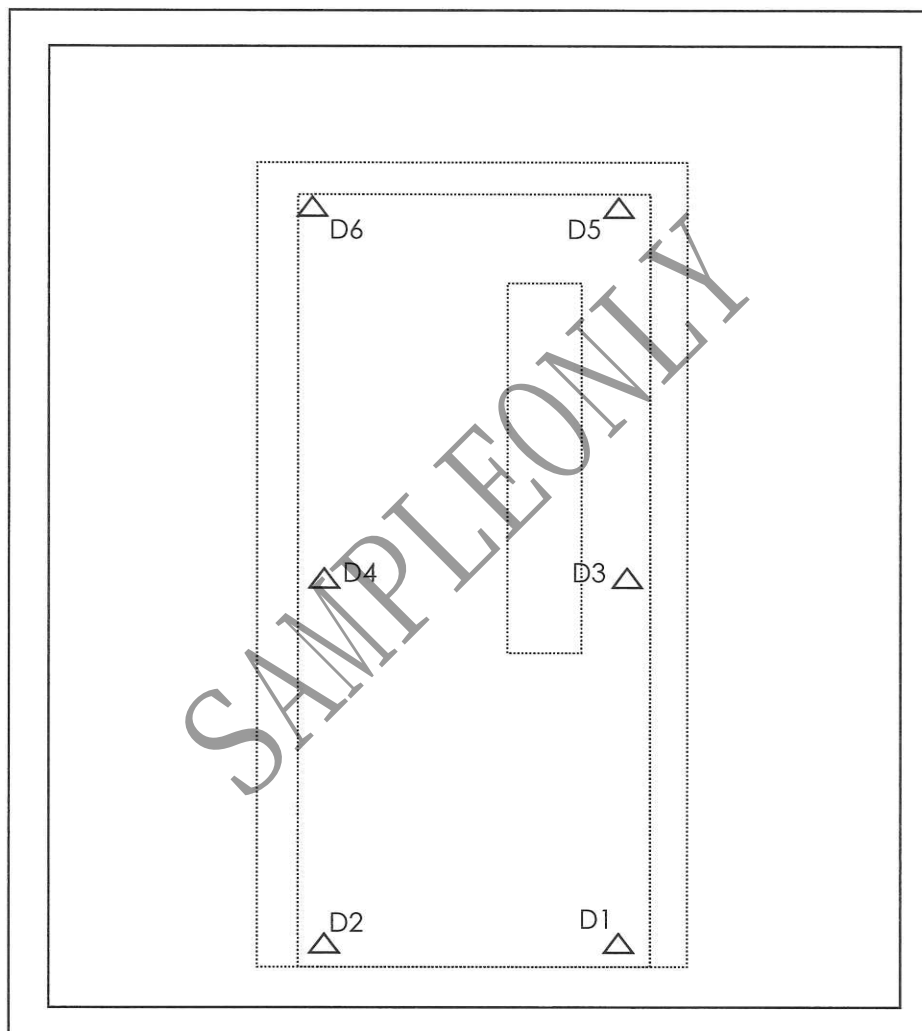


Photo 10: The automatic drop seal at the bottom edge of door leaf



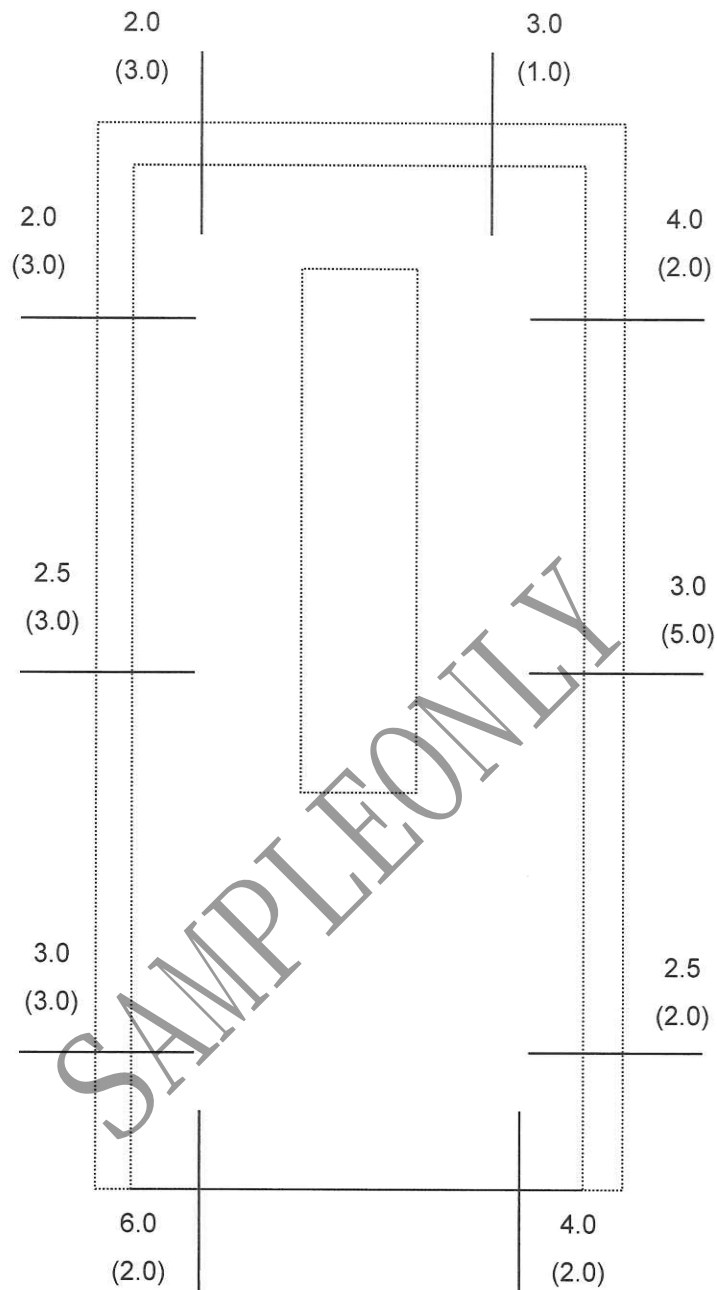
(The illustration not to scale)

Figure 1 – Locations and reference numbers of furnace thermocouples.



(The illustration not to scale)

Figure 2 – Locations and reference numbers of displacement measurement.



(The illustration not to scale)

Length of clearance		Jamb edges (mm)		Top edge (mm)	Bottom edge (mm)	Total (excluding the bottom edge) (mm)
Doorset	Side A	2,020	2,020	648	647	4,688
	Side B	1,985	1,985	608	610	4,578

Figure 3 – Doorset clearance gap in mm, measured from opening face.

(Measurements from closing face are in brackets)

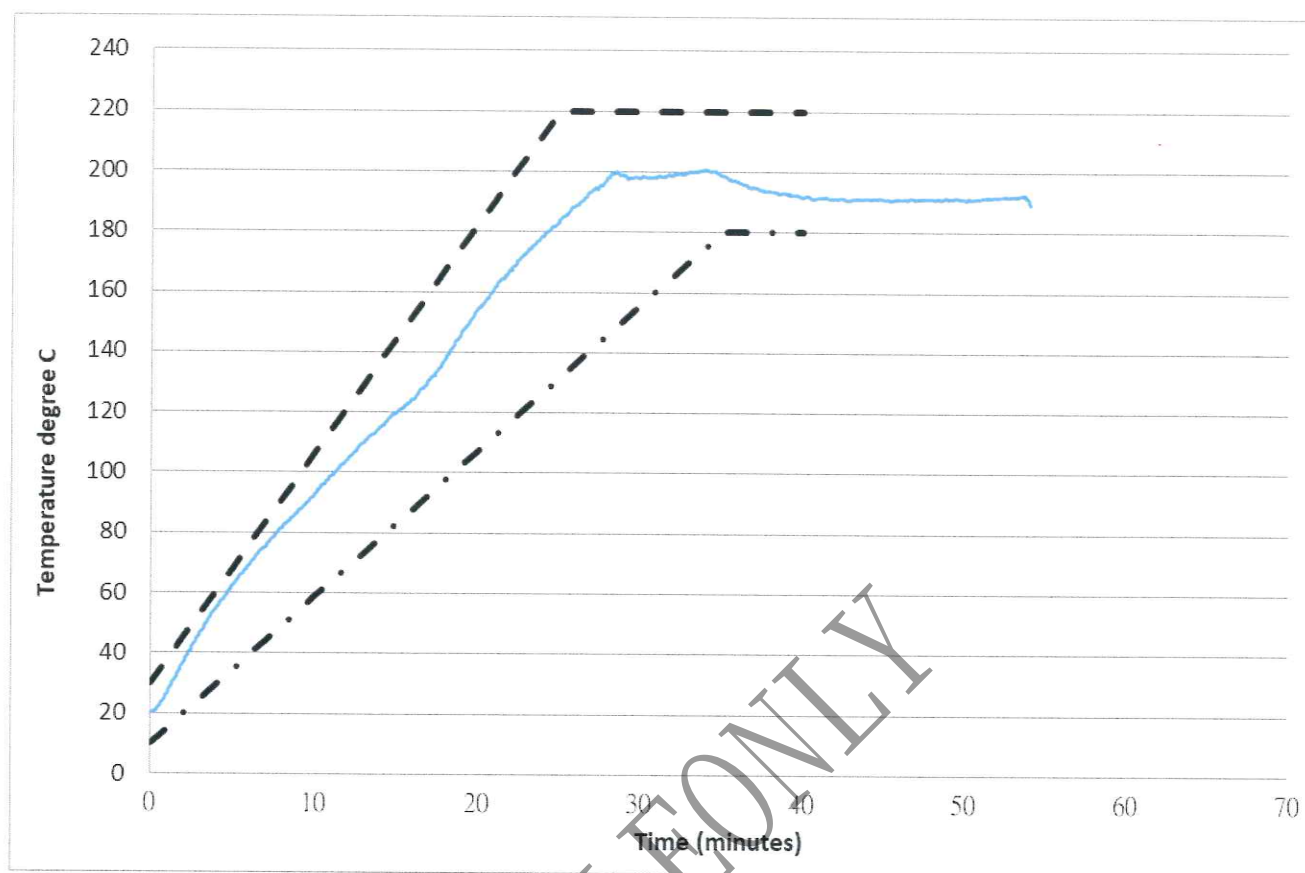


Figure 4 – Test chamber temperature of Doorset (Medium Test)

Medium Temperature Test of Doorset									
Time (mins)	Temperature (°C)								
	F1	F2	F3	F4	F5	F6	F7	F8	F9
0	20	20	20	20	20	21	21	21	21
5	60	61	72	57	63	64	58	65	63
10	89	91	104	86	93	95	86	96	95
15	113	119	134	112	122	124	111	123	122
20	144	154	173	143	155	158	144	161	159
25	172	185	205	170	184	188	171	192	190
30	184	200	215	186	202	203	184	206	206
35	188	202	212	188	202	205	184	205	205
40	181	195	203	184	197	198	177	196	197
45	181	194	202	183	195	197	177	195	195
50	179	195	203	184	196	197	177	195	195
54	177	194	204	177	191	196	178	194	195

Figure 5 – Temperature measured by individual thermocouples

APPENDIX B – OBSERVATION

Table 1 - Ambient and Medium Temperature Test, Doorset 1, Side B

Time (min.sec)	Observation
Ambient Temperature Test	
00.00	All the door gaps were sealed with pressure sensitive tapes.
00.01	Measurement of leakage rates through apparatus and supporting construction started.
06.30	Measurement of leakage rates through apparatus and supporting construction ended and removed the pressure sensitive tapes.
12.40	Measurement of total leakage rates started.
19.00	Ambient temperature test ended
Medium Temperature Test	
00.00	Setup of displacement transducer completed and heat up of the test chamber cavity started.
29.50	The mean temperature of the test chamber reached 200 °C, no further significant change on the specimen was observed.
29.60	Measurement of total leakage rates started.
38.30	Measurement of total leakage rates ended
38.40	The door gaps were sealed with pressure sensitive tapes.
46.20	Measurement of leakages rate through apparatus and supporting construction started.
54.00	Test ended.
Post-test observation	
1. The doorset was able to open manually after the test. 2. All smoke seals remained in position without deterioration.	

APPENDIX C – DATA RECORDED DURING THE TEST

Table 2 - Deflections of the specimen after the measurement of Q_{total} during the medium temperature test, as viewed from the unexposed face.

Location	Deflection	
	Ambient	Medium
D1	0	0
D2	0	1
D3	0	1
D4	0	-1
D5	1	0
D6	0	0

Positive deflections indicate movement away the test chamber (see also Figure 2 for the locations).

APPENDIX D – PRODUCT 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 Overall size : Nominal 700 mm wide by 2,500 mm high Material : Hardwood Section size : 45 mm by 90 mm thick* and 65 by 90 for transom* Rebate : 20 mm* Jambs to head jointing method : By tongue and groove with screws Gap insulation between door frame and sub frame : Cement sand grouting with fire rated sealant# Fixing Method : By M6 x 68 mm long anchor bolts distribute evenly on each jamb at spacing 975 mm c/c*
2	Door Leaves & Transom Panel Overall thickness : Nominal 48 mm* Overall sizes : Door leaf: 669 mm wide by 2,013 mm high* Transom Panel: 669 mm wide by 400 mm high* Rebate depth : 20 mm wide by 13 mm deep* Overall construction : 34 mm thick perlite core and sandwiched by a layer of 5 mm thick fire rated board on both sides with 2 mm thick plywood facing* Fixing method of transom panel : M6 screws at 200 mm c/c and 150 mm c/c spacing horizontally and vertically respectively. With surface mounted bolts on mid-height of left and right vertical edges. Lipping : 10 mm thick hardwood*
2a	Door Leaf Core Material : Perlite # Thickness : 34 mm* Density : 250 – 360 kg/m³ Fixing method : By Adhesive

Notes: * Verified on site by RED. # As shown on the test construction.

2b	Door Leaf Sub-facing (Fire Rated Board) Brand : Gemtree Material : Magnesium Oxide board Density : 800 – 1,000 kg/m ³ Thickness : 5 mm* Fixing method : By adhesive Applied location : On both sides of door leaf core
2c	Door Leaf Facings Material : Plywood Density : 500 kg/m ³ Thickness : 2 mm* Fixing method : By adhesive
2d	Door Leaf Stiles/ Rails Material : Hardwood Density : 500 – 600 kg/m ³ Sizes of stiles and rails : 80 mm wide by 34 mm thick* Fixing method : By adhesive
2e	Door Leaf Lippings Material : Hardwood Density : 500 – 600 kg/m ³ Thickness : 10 mm* Fixing method : By glue and nails
3a	Glazed Panel Brand : Pyrotech Thickness : 25 mm* Composition : 5 mm thick glass + 15 mm thick interlayer gel + 5 mm thick glass* Aperture size : 250 mm wide by 1,250 mm high Vision size : 190 mm wide by 1,190 mm high on active leaf* Fixing Method : Sandwiched by glazing tape and fire rated boards beadings

* and # refer to page 22

3b	Glazing Bead Material : Hardwood Density : 500 - 600 kg/m ³ Section sizes : 25 mm wide by 13 mm thick* Fixing method : Nails
4a	Intumescent fire and smoke seals Brand : UA Overall size(s) : 20 mm wide by 4 mm thick intumescent body with 4 mm high fins on each side of the body* Applied location : One no. of seal applied at all edges of transom panel, top edge and both vertical edges of both door leaves#
4b	Smoke seals Brand : UP Model : 1212 Overall size(s) : 12 mm by 12 mm* Applied location : One no. of seal applied at corner of the door frame#
4c	Automatic Bottom Drop Seal Brand : 百密 (Baimi) Reference : A01 Overall size(s) : 30 mm high by 14 mm wide* Applied location : One no. of seal at the bottom edge of door leaf
5	Butt Hinges Brand : Samco, Dorma 3904, Yale, WuYingHao Material : Stainless steel Overall size : 102 mm x 102 mm x 3 mm thick* Number used : 4 nos.* The top and bottom hinges were 200 mm from the respective edges Fixing method : By Screws

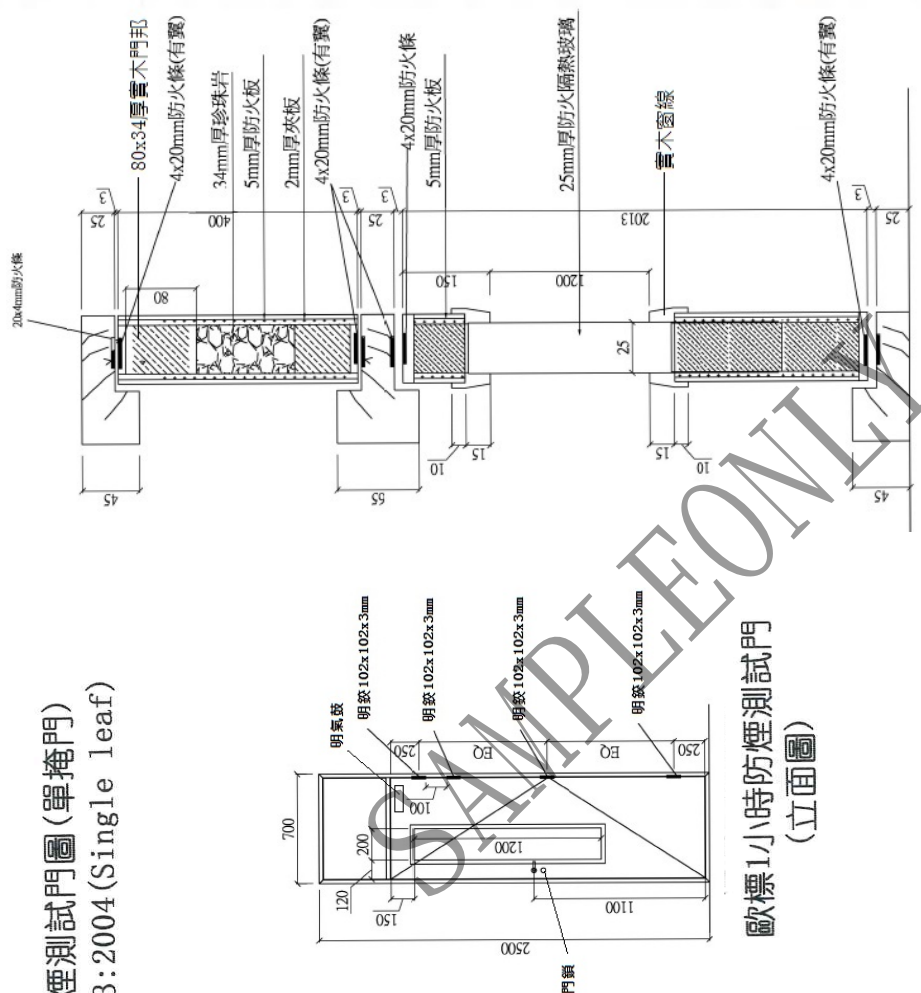
* and # refer to page 22

6	Lockset Brand : Gamma, DC8200-A01.# Model : Stainless steel Material : 240 mm long x 88 mm wide x 24 mm thick.* Overall size : Lock case: 23.2 mm wide by 166 mm high by 88 mm deep* Forend plate: 23.2 mm wide by 240 mm high by 3 mm thick* Striking plate: 23.2 mm wide by 240 mm high by 3 mm deep* Conditions : Unlatched and unlocked.#
7	Surface Mounted Overhead Door Closer Brand : Ryobi# Model : 9903 Body sizes : Body sizes: 40 mm wide by 180 mm long by 60 mm high* Material : Aluminium alloy Applied location : At the head of door leaf
8	Surface Mounted Padbolt Brand : UA Overall sizes : 35 mm wide by 15 mm thick by 200 mm high Material : Stainless Steel. Fixing : At the mid-height of the vertical edges of the transom panel

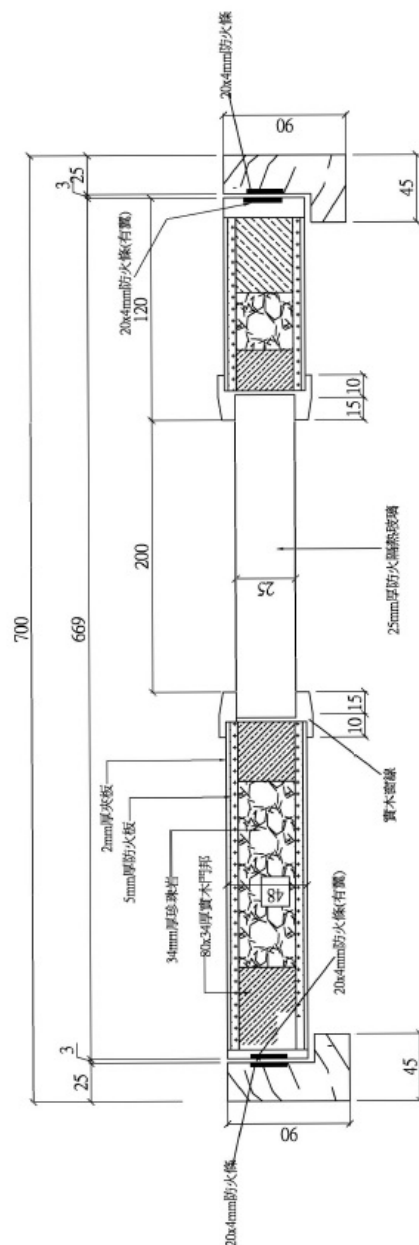
* and # refer to page 22

DRAWING FROM TEST SPONSOR

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



歐標1小時防煙測試門
(立面圖)



- End of report -

SMOKE CONTROL TEST IN ACCORDANCE WITH BS EN 1634-3: 2004

On Single-acting, Double-leaf, Composite Timber Doorset with Transom Panel

Test Report No.: R20L42-2A

Sample Identification: Q20K32-2

Issue Date: 7 June, 2021

SAMPLE ONLY

Test Sponsor

HK Pro-Tech Fire Prevention Building Materials Limited

Unit B, 22nd Floor, Johnson Centre, 13 Hau Fook Street,
Tsim Sha Tsui, Kowloon, Hong Kong

APPROVED SIGNATORY: _____




Ir. Dr. YUEN Sai-wing, MHKIE (FIRE)

Hong Kong Accreditation Service (HKAS) has accredited Research Engineering Development Façade Consultants Limited (HOKLAS 091- TEST) under Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accreditation laboratories. The results shown in this test report were determined by this laboratory in accordance with its terms of accreditation. This report may not be reproduced except in full.

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1 SUMMARY

Smoke control test conducted in accordance with BS EN 1634-3: 2004 on single-acting, double-leaf, composite timber doorset with transom panel

Two identical specimens of single-acting, double-leaf, composite timber doorset with transom panel had been subjected to the tests in accordance with BS EN 1634-3: 2004, in order to determine the smoke leakage (S_a and S_m) from one side to the other under the ambient and medium temperature at pressure differences of 10 Pa, 25 Pa and 50 Pa. As requested by the test sponsor, the specimens were mounted within concrete lined specimen holders and the fixing details were as shown in the test sponsor's drawings (see the appendix). The leakage rates from both sides of the doorsets were assessed for full evaluation.

Two identical specimens, referenced as Doorset '1' and Doorset '2', had been submitted by the test sponsor. Each doorset had overall dimensions of 2,100 mm wide by 2,850 mm high by 90 mm frame thickness. It was incorporated with two unequal-width door leaves. The sizes of the door leaves were nominal 1,200 mm + 840 mm wide by 2,506 mm high by 48 mm thick with rebated meeting edge. The wider leaf being the active leaf. Above the door leaves was a 278 mm high transom panel. The doorset was fitted with the two vision panels in the active door leaf with each were 392 mm wide by 493 mm high, while the one single vision panel in the passive door leaf with sizes of 671 mm wide by 2,105 mm high. The vision panels were fitted with "Pyrotech" 25 mm thick insulated glass. The door leaf was composed of 34 mm thick perlite core sandwiched by a layer of 5 mm thick fire rated boards and 2 mm thick plywood on both sides. The stiles and rails were 80 mm wide by 34 mm thick hardwood.

Each door leaf was hung to the door frame by four (4) nos. of "KW" concealed hinges. The active door leaf was fitted with the "Dorma" ITS 96 concealed door closer while the passive leaf was fitted with the surface-mounted door closer. The bottom edge of the transom panel was fitted with a electronic drop bolt. A "Gamma" electronic drop bolt was incorporated at the door frame.

Doorset '1' was installed such that the Side B (closing face, i.e. the door leaves swing towards the door frame stopper) towards the test chamber while Doorset '2' was installed such that the Side A (opening face, i.e. the door leaves swing away from the door frame stopper) towards the test chamber. The doorsets were unlocked, unlatched and unbolted during the test.

The doorsets were fitted with smoke control seals as follows:

Door Frame

- i) Lorient "LAS 1212", 12 mm by 12 mm compression corner seal. One no. of seal fitted at the corner of the door frame rebate at all four sides. The seal was fitted full height and full width without interruption (See photos 7 & 8).

Transom Panel

- ii) UA, 20 mm wide by 4 mm thick intumescent body with two 4 mm high fins each at the long edge of the intumescent seal boy. One no. of seal was fitted full height and full width at the perimeter of the

transom panel. (See photo 6).

Door Leaves

- iii) UA, 20 mm wide by 4 mm thick intumescent body with two 4 mm high fins each at the long edge of the intumescent seal boy. One no. of seal was fitted full height at all the vertical leaf edges, except the meeting edge of passive leaf and full width at the top edge of the door leaves. The seal was partially interrupted at all the concealed hinges, flush bolts, bottom drop seal, forend plate and striking plate with the fin at one side cut (See photos 8 and 9). The seal was fully interrupted at the concealed closer (See photos 8, 9 and 10).
- iv) UA, 10 mm wide by 4 mm thick intumescent body with two 4mm mm high fins each at the long edge of the intumescent seal boy. One no. of seal was fitted full width without interruption at the top edge of the door leaf aside the concealed door closer (See photo 8).
- v) 百密(BAIMI)A11, automatic drop seal of size 38 mm high by 20 mm wide. The seal was fitted at the bottom edges of the door leaves, full width without interruption (See photo 11).

The smoke leakage rates of the doorsets were summarized as below:

Test	Face exposed to pressure	Temp	Leakage rate Q_{spec} (m ³ /h) at pressure difference of			S_m Criterion (m ³ /h)	Linear leakage rate Q_l (m ³ /h/m) at pressure difference of		S_a Criterion (m ³ /h/m)
			10 Pa	25 Pa	50 Pa		10 Pa	25 Pa	
1	Closing face	Ambient	5.41	10.74	19.02	< 30	0.57	1.13	< 3.0
2	Closing face	Medium	2.08	2.75	2.75	< 30	N/A	N/A	N/A
3	Opening face	Ambient	6.26	12.27	17.98	< 30	0.65	1.28	< 3.0
4	Opening face	Medium	3.90	3.92	4.26	< 30	N/A	N/A	N/A

The performance criteria of the smoke leakage rate (S_a) and (S_m) as mentioned in the BS EN 1634-3: 2004 shall be referenced to BS EN 13501-2: 2007 + A1: 2009 where

Smoke leakage (S_m) – when the maximum leakage rate measured at both ambient temperature and 200°C and up to a pressure of 50 Pa does not exceed 30 m³/h for a double-leaf doorset;

Smoke leakage (S_a) – when the maximum leakage rate measured at ambient temperature, and at a pressure of up to 25 Pa only, does not exceed 3 m³/h per meter length of gap between the fixed and movable components of the doorset, excluding leakage at the threshold.

According to the performance criteria as given in BS EN 13501-2: 2007 + A1: 2009, it can be concluded that the tested double-leaf doorset **satisfied both the S_a and S_m** requirements.

2 INTRODUCTION

The specimens were tested in accordance with BS EN 1634-3: 2004, 'Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware – Smoke control test for door and shutter assemblies'. Both ambient and medium temperature leakage rates were considered in the tests.

The specimens were submitted by the test sponsor, and was mounted and constructed by the test sponsor. The test was led by Ms. Ivy Zou of Research Engineering Development Façade Consultants Limited (RED), and witness by Mr. Cheung, the representative of the test sponsor.

3 INFORMATION

3.1. Testing laboratory

Research Engineering Development Façade Consultants Limited (RED)
No. 111, Jiaoxin Road, Lanhe Town, Nansha District, Guangzhou, China

3.2. Test date

10th and 11th December, 2020

3.3. Equipment

A test chamber with an open front of size 3 m by 3 m to mount the test construction and provide a sealed enclosure to generate the necessary heating and pressure condition.

Nine (9) thermocouples to monitor the temperature of the test chamber, which were kept at 100 mm from the face of the specimen (see Figure 1).

A flowmeter to measure the volume flow rate supplied to the apparatus to compensate for the total leakage.

A micro-manometer provided to monitor the furnace pressure.

Displacement transducers provided to measure the deflection of the doorset.

3.4. Test environment

The temperature around the test area during the test was in the range of 23.0 °C – 25.0 °C.

The chamber was controlled so that the mean test chamber temperature at medium temperature test complied with the requirement of Clause 10.2.2.2 of BS EN 1634-3: 2004. The temperatures recorded are shown graphically in Figures 5 and 6.

Summaries of the observations made on the general behaviour of the specimens are given in the appendix of this report.

4 CONDITIONING

The specimen's storage, construction, and test preparation took place in the test laboratory over a total, combined time of 7 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 17.0 °C to 26 °C and 56 % to 80 % respectively.

Mechanical conditioning as required in clause 8.2 of BS EN 1634-3 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.

5 TEST SPECIMEN

5.1. Selection of specimen

The specimens were submitted to the test location by the test sponsor. RED did not involve in the selection of the specimens.

5.2. Verification of specimen

The specifications of the door assembly provided by the test sponsor were as shown in Appendix D of this report. Items that had been verified by RED were clearly identified.

5.3. Supporting construction

The supporting constructions were concrete lined system of 300 mm thick with a structural opening of 2,200 mm wide by 2,900 mm high.

5.4. Specimen construction

Two identical specimens, referenced as Doorset '1' and Doorset '2', had been submitted by the test sponsor. Each doorset had overall dimensions of 2,100 mm wide by 2,850 mm high by 90 mm frame thickness. It was incorporated with two unequal-width door leaves. The sizes of the door leaves were nominal 1,200 mm + 840 mm wide by 2,506 mm high by 48 mm thick with rebated meeting edge. The wider leaf being the active leaf. Above the door leaves was a 278 mm high transom panel. The doorset was fitted with the two vision panels in the active door leaf with each were 392 mm wide by 493 mm high, while the one single vision panel in the passive door leaf with sizes of 671 mm wide by 2,105 mm high. The vision panels were fitted with "Pyrotech" 25 mm thick insulated glass. The door leaf was composed of 34 mm thick perlite core sandwiched by a layer of 5 mm thick fire rated boards and 2 mm thick plywood on both sides. The stiles and rails were 80 mm wide by 34 mm thick hardwood.

Each door leaf was hung to the door frame by four (4) nos. of "KW" concealed hinges. The active

door leaf was fitted with the "Dorma" ITS 96 concealed door closer while the passive leaf was fitted with the surface-mounted door closer. The bottom edge of the transom panel was fitted with a electronic drop bolt. A "Gamma" electronic drop bolt was incorporated at the door frame.

Doorset '1' was installed such that the Side B (closing face, i.e. the door leaves swing towards the door frame stopper) towards the test chamber while Doorset '2' was installed such that the Side A (opening face, i.e. the door leaves swing away from the door frame stopper) towards the test chamber. The doorsets were unlocked, unlatched and unbolted during the test.

The doorsets were fitted with smoke control seals as follows:

Door Frame

- i) Lorient "LAS 1212", 12 mm by 12 mm compression corner seal. One no. of seal fitted at the corner of the door frame rebate at all four sides. The seal was fitted full height and full width without interruption (See photos 7 & 8).

Transom Panel

- ii) UA, 20 mm wide by 4 mm thick intumescent body with two 4 mm high fins each at the long edge of the intumescent seal boy. One no. of seal was fitted full height and full width at the perimeter of the transom panel. (See photo 6).

Door Leaves

- iii) UA, 20 mm wide by 4 mm thick intumescent body with two 4 mm high fins each at the long edge of the intumescent seal boy. One no. of seal was fitted full height at all the vertical leaf edges, except the meeting edge of passive leaf and full width at the top edge of the door leaves. The seal was partially interrupted at all the concealed hinges, flush bolts, bottom drop seal, forend plate and striking plate with the fin at one side cut (See photos 8 and 9). The seal was fully interrupted at the concealed closer (See photos 8, 9 and 10).
- iv) UA, 10 mm wide by 4 mm thick intumescent body with two 4mm mm high fins each at the long edge of the intumescent seal boy. One no. of seal was fitted full width without interruption at the top edge of the door leaf aside the concealed door closer (See photo 8).
- v) 百密(BAIMI)A11, automatic drop seal of size 38 mm high by 20 mm wide. The seal was fitted at the bottom edges of the door leaves, full width without interruption (See photo 11).

6 TEST PROCEDURE

The tests were conducted in accordance with the procedures specified in Section 10 of BS EN 1634-3: 2004.

6.1. Pre-test procedure

The doorsets were opened to an angle of at least 30° and closed 10 times to ensure the assembly operates normally prior to the test.

The retention forces of the doorsets were measured in accordance with Clause 10.1.2 of BS EN 1634-3: 2004 as shown in the table below.

Doorset	Active Leaf (Door Closer)		Passive Leaf (Door Closer)	
	Arm distance	Retention force	Arm distance	Retention force
1	1,100 mm	156 N	750 mm	79 N
2	1,100 mm	159 N	750 mm	84 N

The lengths of gap and the clearance between the fixed and moving components of the doorset were measured as shown in appendix A, Figures 3 and 4 of this report.

The leakage rate through the apparatus together with the associated/supporting construction at 50 Pa and ambient temperature was measured to be lower than 10 m³/hr.

6.2. Air Leakage test

The ambient temperature of the test area during the test was measured. The furnace was monitored by nine (9) thermocouples so that the mean test chamber temperature complied with the requirements of Clause 10.2.2.2 of BS EN 1634-3: 2004.

6.3. Sequence of test

The tests were carried out in the following sequence:

- Doorset '1' was mounted with one of the face towards the test chamber;
- Determine the leakage rate through the test chamber and any support or associated construction at ambient temperature;
- Determine the total leakage rate at ambient temperature;
- Determine the total leakage rate at medium temperature;
- Determine the leakage rate through the apparatus and any supporting or associated construction at medium temperature; and
- Repeat the steps (ii) to (v) on Doorset '2' while the doorset was mounted with the opening face towards the test chamber.

6.4. Test conditions

The temperature in the test chamber was controlled to be lower than 30 °C before the start of the test. The leakage rates through the test chamber and any supporting or associated construction and the total leakage rate at ambient temperature at pressure differences of 10 Pa, 25 Pa and 50 Pa were measured. The leakage rates were measured while the pressure difference was maintained for 2 minutes.

The temperature of the test chamber was raised to medium temperature (200 °C) in 30 ± 5 minutes at neutral pressure as stated in Clause 10.2.2.2 of BS EN 1634-3: 2004.

The leakage rates through the test chamber and any supporting or associated construction and the total leakage rate at medium temperature at pressures differences of 10 Pa, 25 Pa and 50 Pa were measured. The leakage rates were measured while the pressure difference was maintained for 2 minutes.

SAMPLE ONLY

7 RESULTS

When tested in accordance with BS EN 1634-3: 2004, the measured leakage rates and the calculated linear leakage rates were summarized below. There was no failure of any components observed during the test. The observations during and after the test were summarized in Appendix B. The deflections of the doorsets were summarized in Table 3 of Appendix C.

Door type: Single-acting, double-leaf, composite timber doorset

Door opening size: 2,040 mm (wide) by 2,506 mm (high)

Side A: Opening Side

Side B: Closing Side

Test	Face exposed to pressure	Temp	Leakage rate Q_{spec} (m ³ /h) at pressure difference of			S_m Criterion (m ³ /h)	Linear leakage rate Q_l (m ³ /h/m) at pressure difference of		S_a Criterion (m ³ /h/m)
			10 Pa	25 Pa	50 Pa		10 Pa	25 Pa	
1	Closing face	Ambient	5.41	10.74	19.02	< 30	0.57	1.13	< 3.0
2	Closing face	Medium	2.08	2.75	2.75	< 30	N/A	N/A	N/A
3	Opening face	Ambient	6.26	12.27	17.98	< 30	0.65	1.28	< 3.0
4	Opening face	Medium	3.90	3.92	4.26	< 30	N/A	N/A	N/A

The performance criteria of the smoke leakage rate (S_a) and (S_m) as mentioned in the BS EN 1634-3: 2004 shall be referenced to BS EN 13501-2: 2007 + A1: 2009 where

- (a) Smoke leakage (S_m) – when the maximum leakage rate measured at both ambient temperature and 200°C and up to a pressure of 50 Pa does not exceed 30 m³/h for a double-leaf doorset;
- (b) Smoke leakage (S_a) – when the maximum leakage rate measured at ambient temperature, and at a pressure of up to 25 Pa only, does not exceed 3 m³/h per meter length of gap between the fixed and movable components of the doorset, excluding leakage at the threshold.

According to the performance criteria as given in BS EN 13501-2: 2007 + A1: 2009, it can be concluded that the tested double-leaf doorset satisfied both the S_a and S_m requirements.

8 POST-TEST OBSERVATION

Both doorsets were able to open manually after the test. All the smoke seals remained intact in position without deterioration.

9 LIMITATIONS

This report details the method of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in BS EN 1634-3: 2004. Any significant deviations with respect to size, construction details, loads, stresses, edges or end conditions other than those allowed under the field of application in the relevant test method is not covered by this report.

SAMPLE ONLY

APPENDIX A – PHOTOS AND TEST RECORD



Photo 1: Exposed face of Doorset '1' before the test.



Photo 2: Exposed face of Doorset '1' after the test.



Photo 3: Exposed Face of Doorset '2' before the test

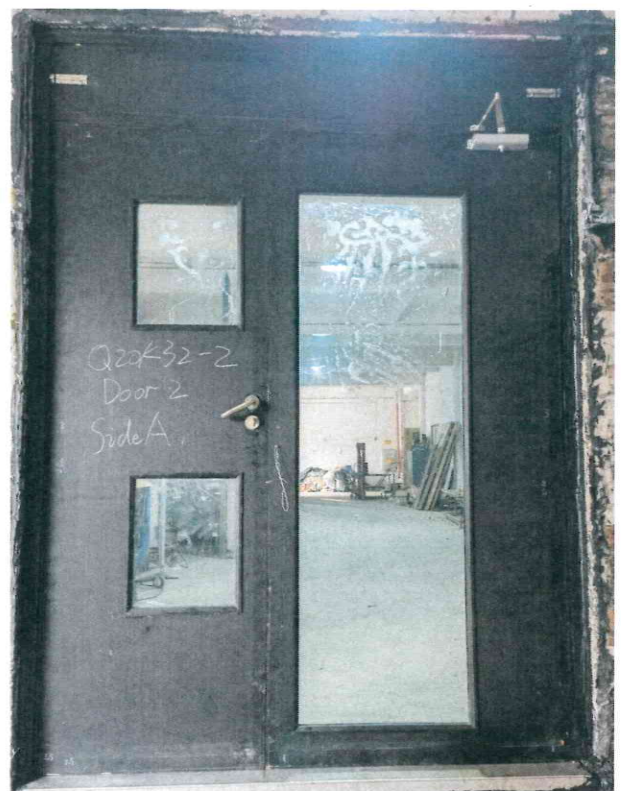


Photo 4: Exposed Face of Doorset '2' after the test.



Photo 5: Unexposed face of Doorset '1' during the test



Photo 6: Unexposed face of Doorset '2' during the test



Photo 7: Fire and smoke seal arrangement on the head of the door frame



Photo 8: Fire and smoke seal arrangement at the top edge of door leaf.

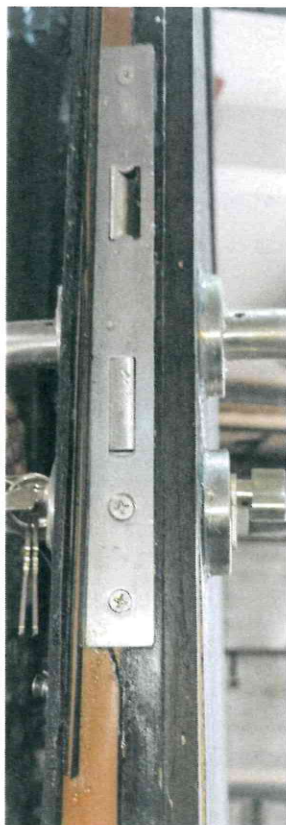


Photo 9: The fire and smoke seal at the meeting edge of the active door leaves

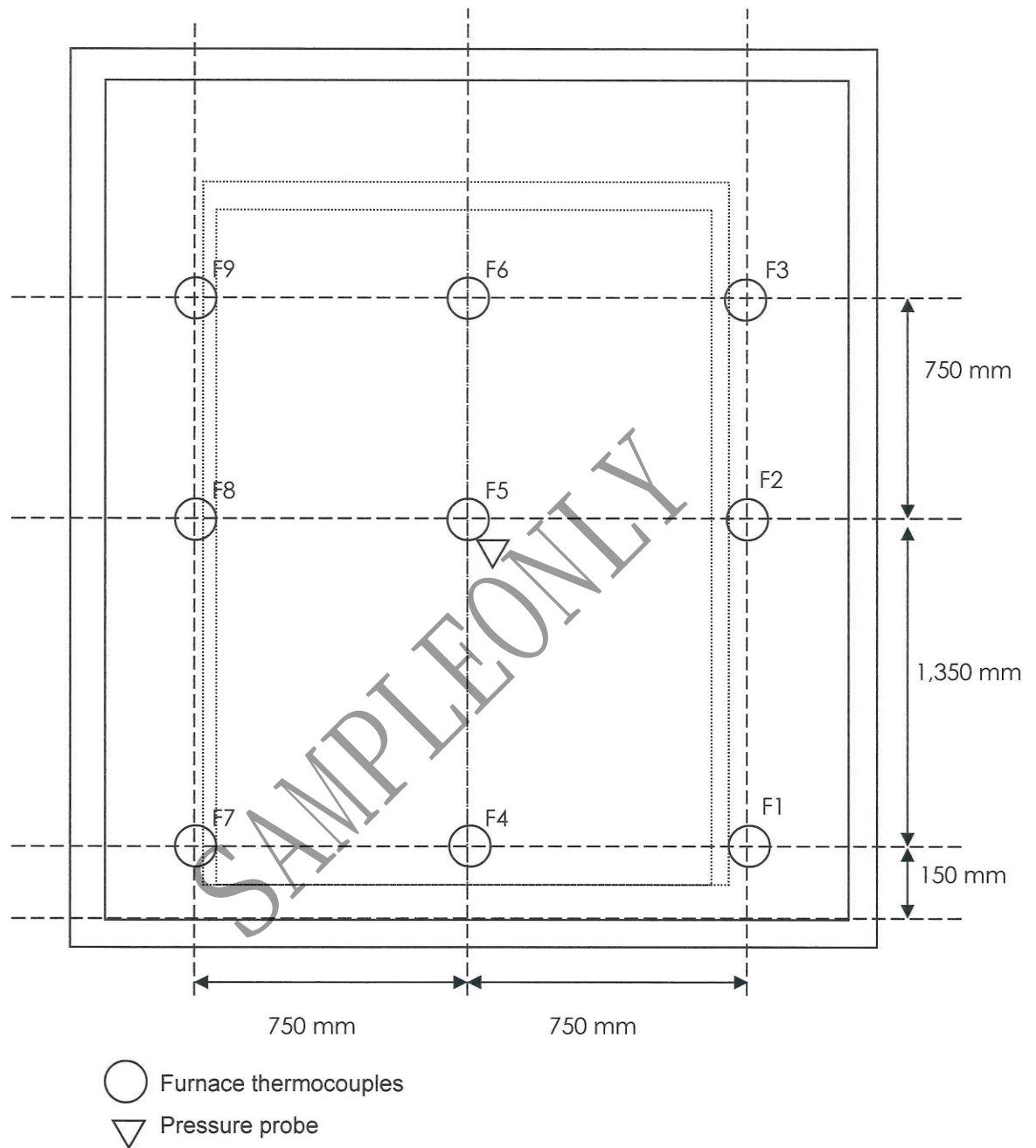


Photo 10: No smoke seal at the meeting edge of the PASSIVE door leaves



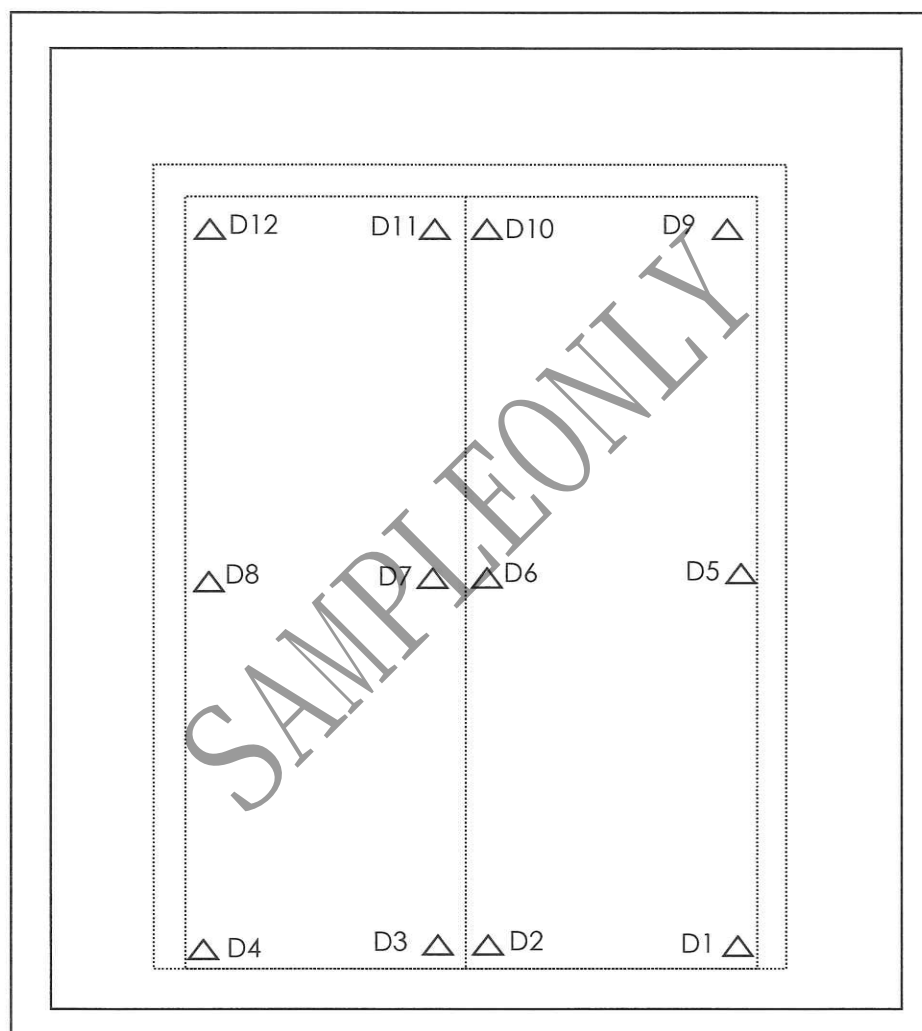
Photo 11: The automatic drop seal at the bottom edge of leaf.

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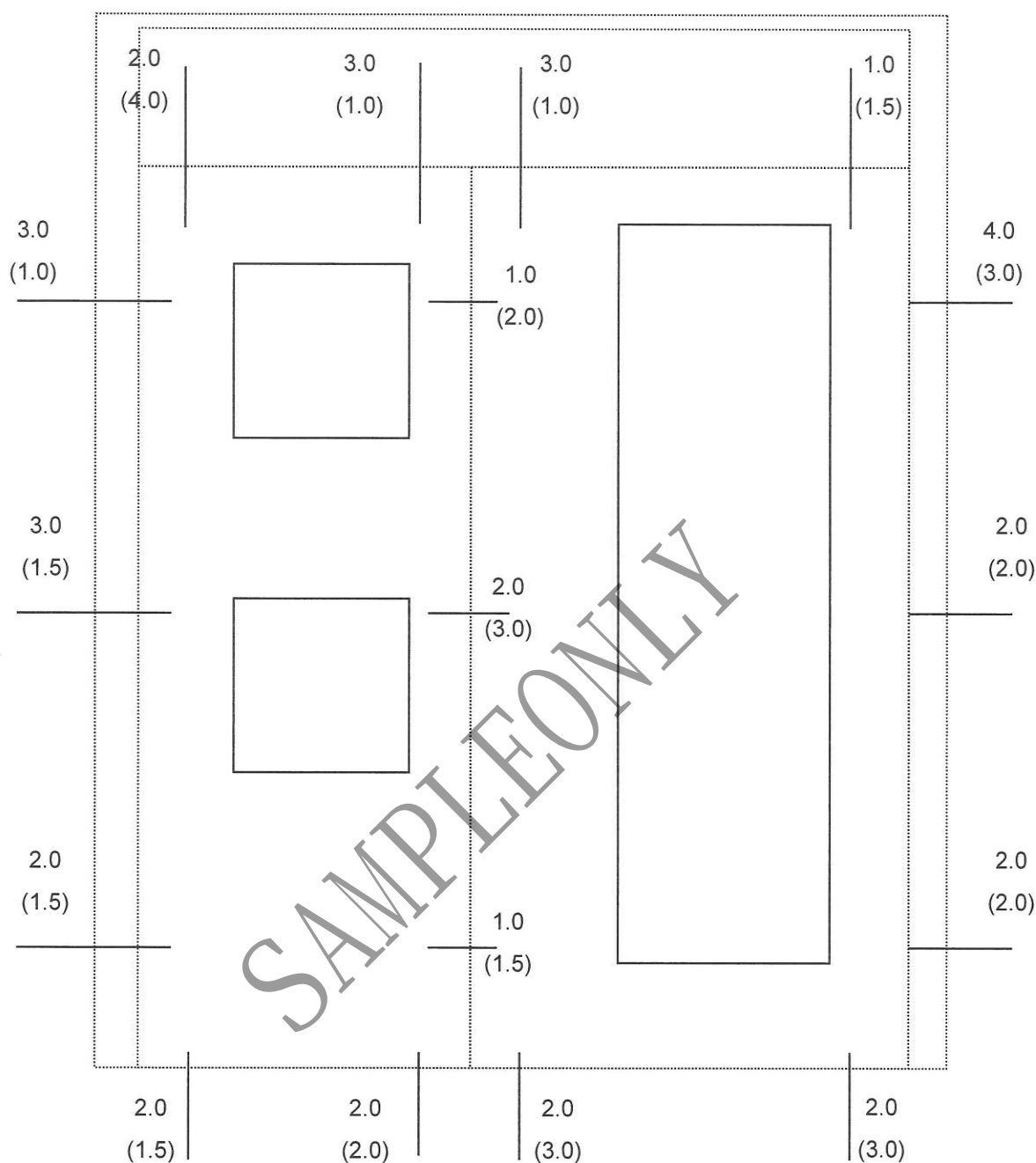
(The illustration not to scale)

Figure 1 – Locations and reference numbers of furnace thermocouples.



(The illustration not to scale)

Figure 2 – Locations and reference numbers of displacement measurement.

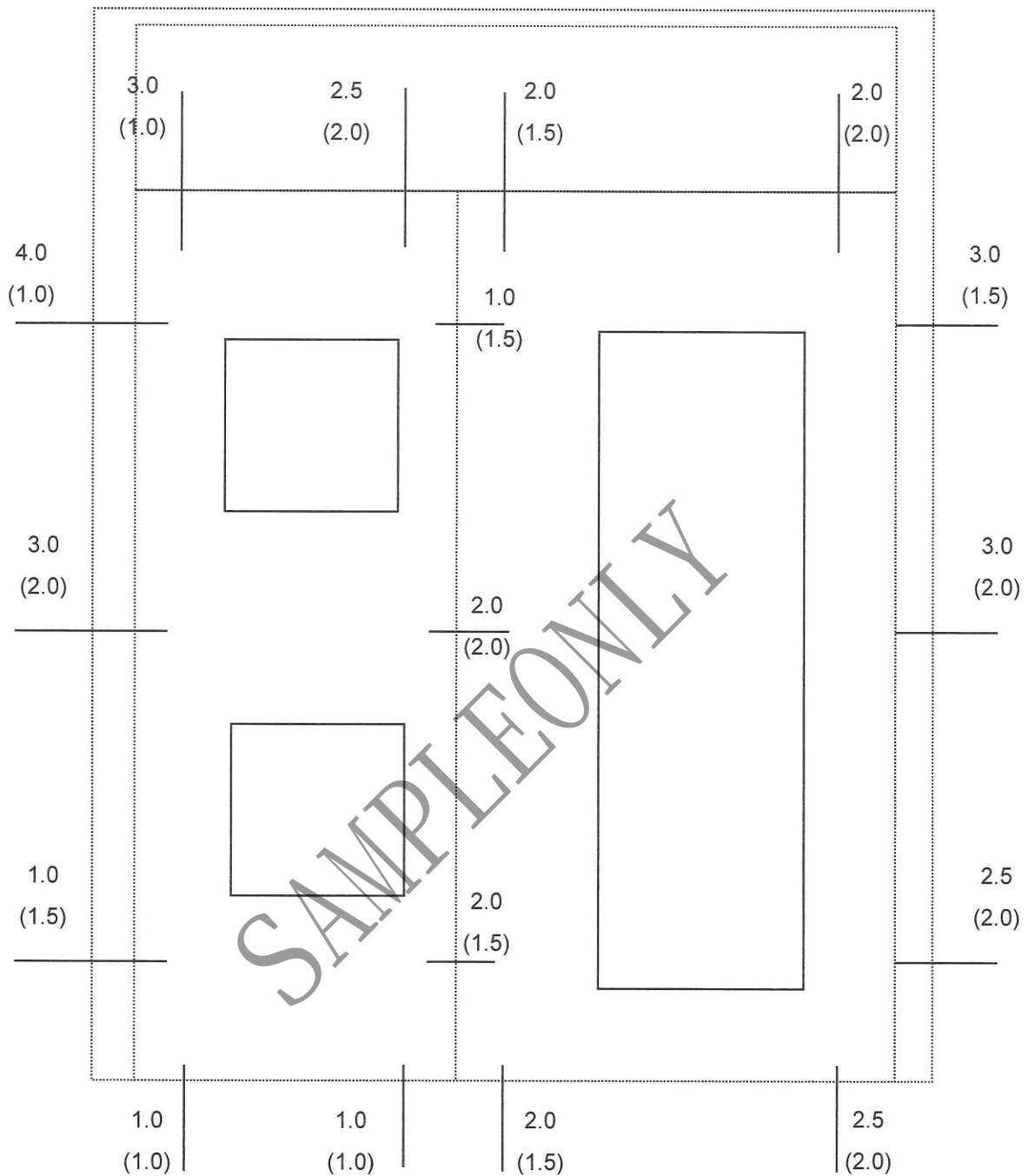


(The illustration not to scale)

Length of clearance		Jamb edges (mm)		Meeting edge (mm)	Top edge (mm)	Bottom edge (mm)	Total (excluding the bottom edge) (mm)
Doorset '1'	Side A	2,510	2,510	2,510	2,045	2,045	9,575
	Side B	2,495	2,495	2,495	2,009	2,009	9,494

Figure 3 – Doorset '1' clearance gap in mm, measured from opening face.

(Measurements from closing face are in brackets)



(The illustration not to scale)

Length of clearance		Jamb edges (mm)		Meeting edge (mm)	Top edge (mm)	Bottom edge (mm)	Total (excluding the bottom edge) (mm)
Doorset '2'	Side A	2,510	2,510	2,510	2,047	2,047	9,577
	Side B	2,497	2,498	2,496	2,010	2,009	9,501

Figure 4 – Doorset '2' clearance gap in mm, measured from opening face.

(Measurements from closing face are in brackets)

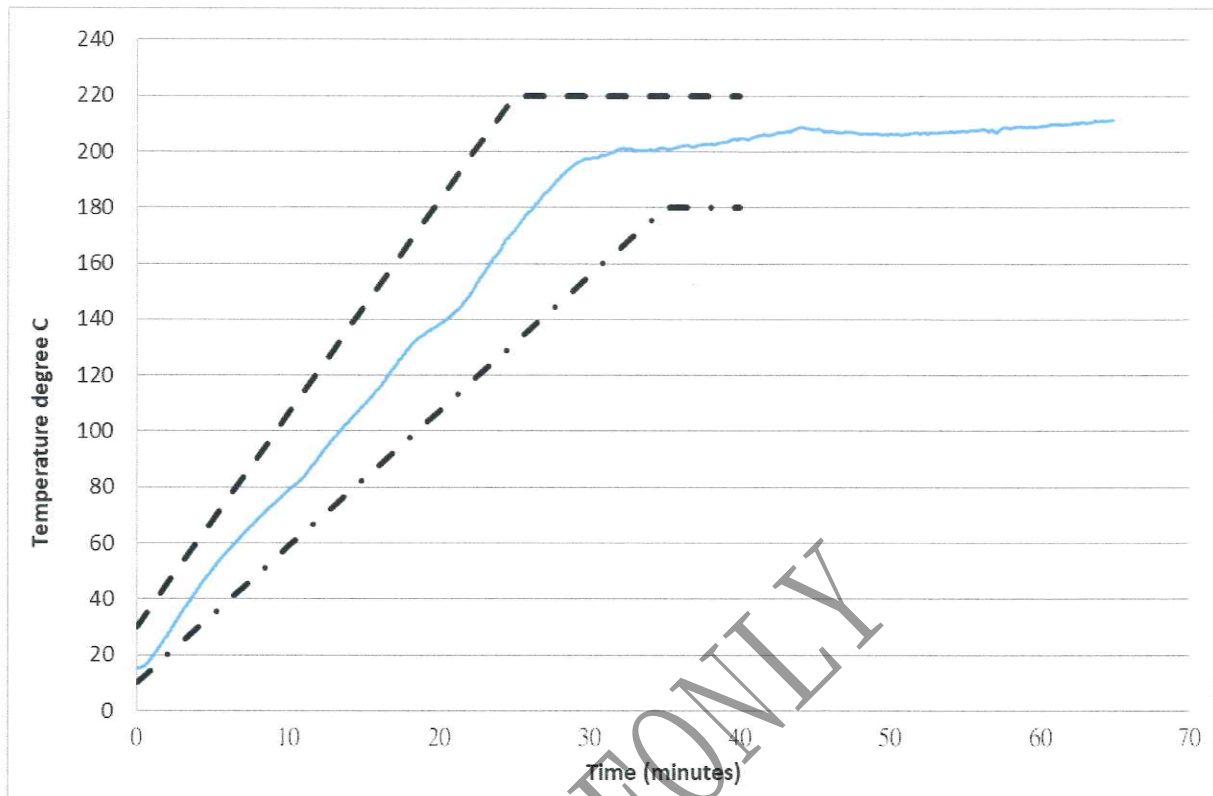


Figure 5 – Test chamber temperature of Doorset '1' (Medium Test)

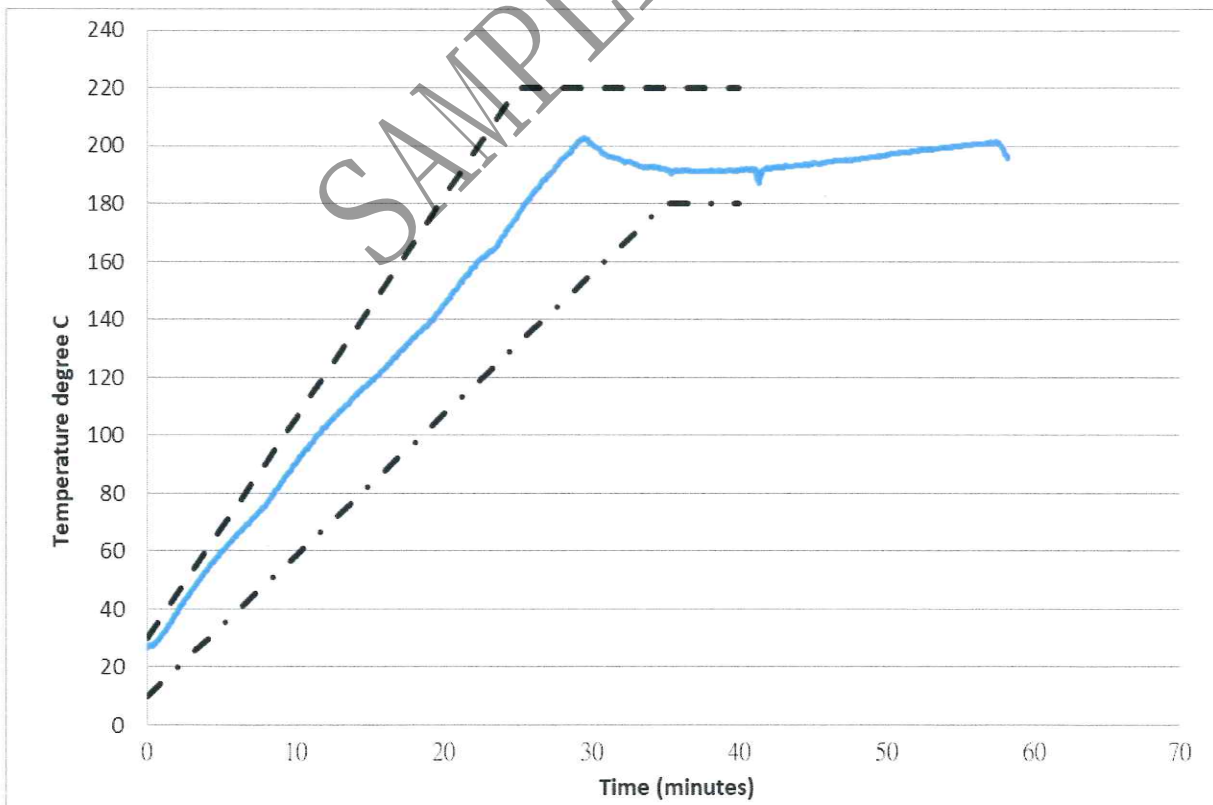


Figure 6 – Test chamber temperature of Doorset '2' (Medium Test)

Medium Temperature Test of Doorset '1'									
Time (mins)	Temperature (°C)								
	F1	F2	F3	F4	F5	F6	F7	F8	F9
0	15	15	15	15	16	16	15	16	16
5	49	51	53	47	49	50	49	49	48
10	76	79	83	74	78	78	76	77	76
15	104	108	112	102	108	108	104	107	106
20	131	138	143	131	138	139	132	136	137
25	159	168	173	159	168	170	163	168	169
30	186	198	204	187	198	198	190	200	201
35	182	205	209	191	205	207	193	204	207
40	184	209	212	196	209	208	195	207	209
45	191	213	216	201	213	214	200	211	213
50	192	211	214	200	212	212	198	209	211
55	194	211	214	200	212	212	198	209	211
58	196	212	214	202	213	214	199	210	212
Medium Temperature Test of Doorset '2'									
Time (mins)	Temperature (°C)								
	F1	F2	F3	F4	F5	F6	F7	F8	F9
0	25	27	28	26	27	28	26	27	28
5	57	60	63	52	59	59	57	59	58
10	86	89	93	81	90	90	87	89	88
15	112	117	122	107	119	119	114	117	117
20	135	140	146	131	143	144	137	143	143
25	163	169	177	159	173	175	166	175	176
30	192	200	209	188	206	208	195	206	208
35	181	193	198	184	197	200	187	198	199
40	181	192	198	183	196	198	185	195	197
45	182	194	199	185	197	200	185	196	198
50	185	196	202	186	200	203	190	200	201
55	187	200	205	190	203	206	194	203	204
60	178	201	209	183	200	207	189	204	204
62	159	188	195	169	188	195	168	190	194

Figure 7 – Temperature measured by individual thermocouples

APPENDIX B – OBSERVATION

Table 1 - Ambient and Medium Temperature Test, Doorset 1, Side B

Time (min.sec)	Observation
Ambient Temperature Test	
00.00	All the door gaps were sealed with pressure sensitive tapes.
00.01	Measurement of leakage rates through apparatus and supporting construction started.
06.30	Measurement of leakage rates through apparatus and supporting construction ended.
06.31	Removed the tape of door and start measure the leakage rate.
10.30	Measurement of the leakage rate from door and apparatus started
17.30	Ambient temperature test ended
Medium Temperature Test	
00.00	Setup of displacement transducer completed and heat up of the test chamber cavity started.
30.00	The mean temperature of the test chamber reached 200 °C, no further significant change on the specimen was observed.
30.10	Measurement of total leakage rates started.
37.40	Measurement of total leakage rates ended
37.50	The door gaps were sealed with pressure sensitive tapes.
42.30	Measurement of leakages rate through apparatus and supporting construction started.
50.40	Test ended.
Post-test observation	
1. The doorset was able to open manually after the test. 2. All smoke seals remained in position without deterioration.	

Table 2 - Ambient and Medium Temperature Test, Doorset 2, Side A

Time (min.sec)	Observation
Ambient Temperature Test	
00.00	All the door gaps were sealed with pressure sensitive tapes.
00.01	Measurement of leakage rates through apparatus and supporting construction started.
08.10	Measurement of leakage rates through apparatus and supporting construction ended.
08.20	Removed the tape of door and start measure the leakage rate.
11.40	Measurement of the leakage rate from door and apparatus started
19.20	Ambient temperature test ended
Medium Temperature Test	
00.00	Setup of displacement transducer completed and heat up of the test chamber cavity started.
30.00	The mean temperature of the test chamber reached 200 °C, no further significant change on the specimen was observed.
30.10	Measurement of total leakage rates started.
38.20	Measurement of total leakage rates ended
38.30	The door gaps were sealed with pressure sensitive tapes.
44.20	Measurement of leakages rate through apparatus and supporting construction started.
52.00	Test ended.
Post-test observation	
1. The doorset was able to open manually after the test. 2. All smoke seals remained in position without deterioration.	

APPENDIX C – DATA RECORDED DURING THE TEST

Table 3 - Deflections of the specimen after the measurement of Q_{total} during the medium temperature test, as viewed from the unexposed face.

Doorset Location	Doorset 1		Doorset 2	
	Ambient	Medium	Ambient	Medium
D1	0	-1	0	1
D2	5	15	-3	2
D3	5	15	-3	1
D4	-2	1	0	-1
D5	0	0	-1	-1
D6	5	13	-2	0
D7	5	13	-3	0
D8	0	0	-1	0
D9	1	1	0	0
D10	2	14	0	1
D11	0	8	0	1
D12	0	0	0	-1

Positive deflections indicate movement away the test chamber (see also Figure 2 for the locations).

APPENDIX D – PRODUCT 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 Overall size : Nominal 2,100 mm wide by 2,850 mm high Material : Hardwood, fire rated board and plywood Section size : 45 mm by 90 mm thick* 65 mm by 90 mm thick for transom* Rebate : 20 mm* Jambs to head jointing method : By tongue and groove with screws Gap insulation between door frame and sub frame : Cement sand grouting with fire rated sealant# Fixing Method : By M6 x 68 mm long anchor bolts distribute evenly on each jamb at spacing 975 mm c/c*
2	Door Leaves & Transom Panel Overall thickness : Nominal 48 mm* Overall sizes : Active leaf: 840 mm wide by 2,506 mm high* Passive leaf: 1,200 mm wide by 2,500 mm high* Transom Panel: 2,040 mm wide by 278 mm high* Overall construction : 34 mm thick perlite core and sandwiched by a layer of 5 mm thick fire rated board on both sides with 2 mm thick plywood facing* Fixing method of transom panel : M6 screws at 200 mm c/c and 150 mm c/c spacing horizontally and vertically respectively. With surface mounted bolts on mid-height of left and right vertical edges. Lipping : 10 mm thick hardwood*
2a	Door Leaf Core Material : Perlite# Thickness : 34 mm* Density : 250 – 360 kg/m³ Fixing method : By Adhesive

Notes: * Verified on site by RED. # As shown on the test construction.

2b	Door Leaf Sub-facing (Fire Rated Board) Brand : Gemtree Material : Magnesium Oxide board Density : 800 – 1,000 kg/m ³ Thickness : 5 mm* Fixing method : By adhesive Applied location : On both sides of door leaf core
2c	Door Leaf Facings Material : Plywood Density : 500 kg/m ³ Thickness : 2 mm* Fixing method : By adhesive
2d	Door Leaf Stiles/ Rails Material : Hardwood Density : 500 - 550 kg/m ³ Sizes of stiles and rails : 80 mm wide by 42 mm thick* Fixing method : By adhesive
2e	Door Leaf Lippings Material : Hardwood Density : 500-550 kg/m ³ Thickness : 10 mm* Fixing method : By glue and nails
3a	Glazed Panel Brand : Pyrotech Thickness : 25 mm* Composition : 5 mm thick glass + 15 mm thick interlayer gel + 5 mm thick glass* Aperture size : Glazed panels at active leaf: 452 mm wide by 553 mm high.* Glazed panels at passive leaf: 732 mm wide by 2,163 mm high.* Vision size : Glazed panels at active leaf: 392 mm wide by 493 mm high.* Glazed panels at passive leaf: 672 mm wide by 2,103 mm high.* Fixing Method : Sandwiched in position by beadings

* and # refer to page 27

3b	Glazing Bead Material : Hardwood Density : 500 - 550 kg/m ³ Section sizes : 25 mm wide by 13 mm thick* Fixing method : Nails
4a	Intumescent fire and smoke seals Brand : UA Overall size(s) : 20 mm wide by 4 mm thick intumescent body with 4 mm high fins on each side of the body* Applied location : (i) One no. of seal applied at all edges of transom panel, vertical edges of both door leaves, except the meeting edge of passive leaf# (ii) One no. of seal applied at the top edge of door leaf#
4b	Intumescent fire and smoke seals Brand : UA Overall size(s) : 10 mm wide by 4 mm thick intumescent body with 4 mm high fins on each side of the body* Applied location : One no. of seal applied at the top edge of the door leaf that fitted with concealed door closer
4c	Smoke seals Brand : UP Model : 1212 Overall size(s) : 12 mm by 12 mm* Applied location : One no. of seal applied at corner of the door frame and the frame for the transom panel#
4d	Automatic drop seal Brand : 百密 (Baimi) Reference : A01 Overall size(s) : 30 mm high by 14 mm wide* Applied location : One no. of seal at the bottom edge of door leaf
5	Intumescent Seal Brand : UA Overall size(s) : 20 mm wide by 4 mm thick* Applied location : (a) One no. of seal at the door frame head and reveals. (b) One no. of seal at the meeting edge of passive leaf

* and # refer to page 27

6	Flush Bolts Brand : UA Material : Stainless steel Overall size : 22 mm deep by 25 mm wide by 200 mm long*
7	Concealed Hinges Brand : KW Material : Stainless Steel. Overall size : 118 mm x 45 mm x 28 mm thick.* Number used : 4 nos. of hinges (each) 4 nos.* The top and bottom hinges were 250 mm from the respective edges Fixing method : By screws.
8	Lockset Brand : Gamma, DC8200-A01.# Material : Stainless steel Overall size : 240 mm long x 88 mm wide x 24 mm thick.* Lock case: 23.2 mm wide by 166 mm high by 88 mm deep* Forend plate: 23.2 mm wide by 240 mm high by 3 mm thick* Striking plate: 23.2 mm wide by 240 mm high by 3 mm deep* Fixing location : Right door leaf.# Conditions : Unlatched and unlocked.#
9	Surface Mounted Door Closer Brand : Ryobi Model : 9903 Body sizes : 178 mm wide by 65 mm high by 41 mm thick* Material : Stainless steel Applied location : At the head of both door leaves
10	Concealed Door Closer Brand : Dorma Model : ITS 96 Overall sizes : Body: 40 mm wide by 291 mm long by 45 mm deep* Top Track: 40 mm wide by 460 mm long by 28 mm high* Material : Zinc alloy Applied location : At the head of both door leaves

* and # refer to page 27

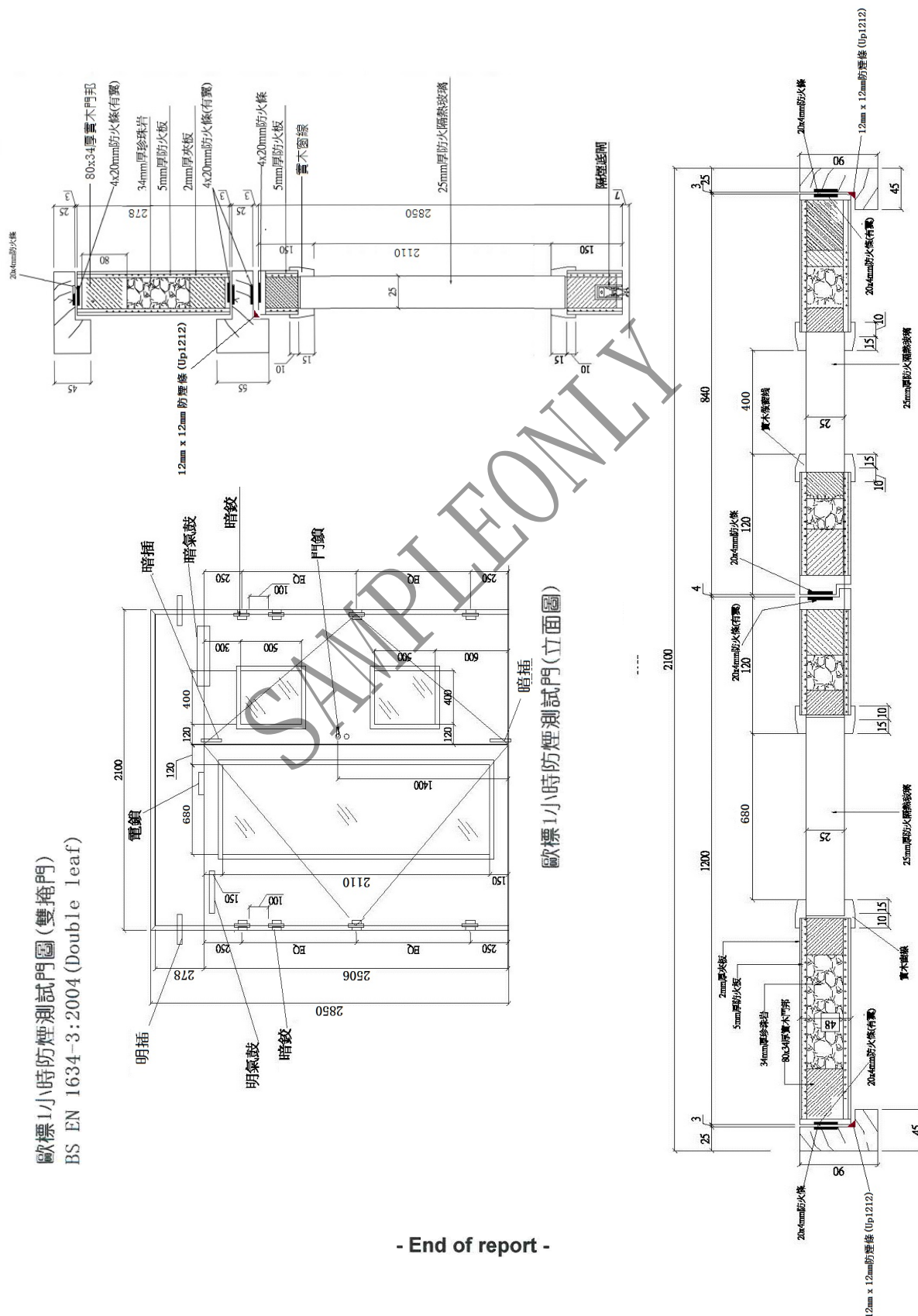
11	Surface Mounted Padbolt
Brand	: UA
Overall sizes	: 35 mm wide by 15 mm thick by 200 mm high
Material	: Stainless Steel.
Fixing	: At the mid-height of the vertical edges of the transom panel

* and # refer to page 27

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DRAWING FROM TEST SPONSOR

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



- End of report -

ASSESSMENT REPORT

Fire Resistance Performance of Insulated Composite Timber Doorsets

Test Report No.: R20H31-1A_Issue 1

Issue Date: 11 August 2021

Date of Review: 5 November 2022

SAMPLE ONLY

Report Sponsor

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REVISION HISTORY

Issue date (DD/MM/YYYY)	Issue number	Remark
06/11/2020	0	Initial version
11/08/2021	1	Addition of RED test report no. R21D09-1A for addition scopes of double-swing configuration, door frame rebate and louver on the composite timber doorsets with respect to BS EN 1634-1: 2014 or BS 476: Part 22: 1987, depending on designs

FIRE RESISTANCE PERFORMANCE OF INSULATED COMPOSITE TIMBER DOORSETS

1 INTRODUCTION

This assessment report presents an appraisal of the insulated composite timber doorsets with the construction details reference to those tested and described in R19M24-1A issued by Research Engineering Development Façade Consultants Limited (RED). This assessment report is prepared for HK Pro-Tech Fire Prevention Building Materials Ltd. of Unit B, 22nd Floor, Johnson Centre, 13 Hau Fook Street, Tsim Sha Tsui, Kowloon, Hong Kong.

The proposed insulated composite timber doorsets are required to provide a fire resistance performance of 60 minutes integrity and insulation with respect to BS EN 1634-1: 2014 or BS 476: Part 22: 1987, depending on designs.

2 ASSUMPTIONS

The proposed doorsets are assumed to be installed in a similar manner to that of the previously tested system by competent installers. It is assumed that the modified doorsets will be constructed in a similar manner from materials and components of the same manufacture and equivalent quality as tested with supporting test evidence or otherwise appraised by RED.

Further assumptions relating to specific modifications will be stated in the report. It is also assumed that the supporting structures to which the perimeter of the doorsets will be fixed are capable of supporting the proposed structure effectively. Assuming that the issue of the original test report is valid, the current fire testing standard or testing experience has not been changed and the procedures adopted for the original report have been re-examined and reviewed that there have been no changes to the specification of the construction considered in the original report.

If contradictory data or any related evidence becomes available to RED, the assessment will be unconditionally withdrawn and the sponsor will be notified. This report is based on the given information, in which is declared by report sponsor that no contradictory data has become available.

3 SUPPORTING DATA

3.1 Summary of test evidence

Report nos.	Sections	Description
Primary Test Evidence		
R19M24-1A	4.1 - 4.3	Supporting test evidence for general construction of insulated composite timber doorsets which require 60 minutes integrity and insulation with respect to BS EN 1634-1: 2014 or BS 476: Part 22: 1987, depending on designs
Secondary Test Evidences		
R21D09-1A	4.1 - 4.3	Supporting test evidence for general construction of insulated composite timber doorsets which require 60 minutes integrity and insulation with respect to BS EN 1634-1: 2014 or BS 476: Part 22: 1987, depending on designs
R16G02-1C	4.1 & 4.2	Supporting test evidence for the use of nominal 25 mm thick 'Pyrotech' insulated glass for the insulated composite timber doorsets which require 60 minutes integrity and insulation with respect to BS EN 1634-1: 2014 or BS 476: Part 22: 1987, depending on designs
R12G18-3	4.1 & 4.2	Supporting test evidence for the use of nominal 25 mm thick 'Master' insulated glass for the insulated composite timber doorsets which require 60 minutes integrity and insulation with respect to BS EN 1634-1: 2014 or BS 476: Part 22: 1987, depending on designs
R19J11-1A	4.1 & 4.2	Supporting test evidence for the use of spray paint for the insulated composite timber doorsets which require 60 minutes integrity and insulation with respect to BS EN 1634-1: 2014 or BS 476: Part 22: 1987, depending on designs

(To be continued)

Report nos.	Sections	Description
R13J13-1	4.1 & 4.2	Supporting test evidence for the use of smoke seal for the insulated composite timber doorsets which require 60 minutes integrity and insulation with respect to BS EN 1634-1: 2014 or BS 476: Part 22: 1987, depending on designs
R14H03-1	4.1 & 4.2	Supporting test evidence for the use of locksets for the insulated composite timber doorsets which require 60 minutes integrity and insulation with respect to BS EN 1634-1: 2014 or BS 476: Part 22: 1987, depending on designs

SAMPLEONLY

3.2 Primary Test Evidence

3.2.1 RED Test Report No. R19M24-1A

A fire resistance test in accordance with BS EN 1634-1: 2014 on two nos. of specimens of insulated, single-acting composite timber doorsets with transom panels, namely doorsets 'A' and 'B', was performed at the RED laboratory on 15 January 2020. The test sponsor was HK Pro-Tech Fire Prevention Building Materials Ltd. As requested by the test sponsor, the specimens were mounted within concrete lined specimen holder such that the specimens were swinging towards the furnace. The specimens were asymmetrical and only one side of the specimens was tested as per test sponsor's request.

Doorset 'A' had overall dimensions of 700 mm wide by 2,500 mm high. It was comprised of a composite 4-sided timber door frame, single-acting, single door leaf and transom panel. The door leaf and transom panel were constructed with 34 mm thick perlite core and sandwiched by a layer of 5 mm thick fire rated board on both sides with 2 mm thick plywood facing. The door leaf was with sizes of 669 mm by 2,103 mm high by 48 mm thick and hung to the door frame by 4 nos. of stainless steel spring hinges with sizes 102 mm by 102 mm by 3 mm thick. The transom panel was with sizes 675 mm wide by 400 mm high by 48 mm thick and hold to the door frame screws fixing. A 25 mm thick 'Pyrotech' glazed panel with vision sizes of 260 mm wide by 1,210 mm high was incorporated with door leaf.

One (1) no. of 'UA' fire seal with sizes of 20 mm wide by 4 mm thick was installed at four sides of door frame, top and bottom of mullion. One (1) no. of 'UA' fire and smoke seal with sizes of 20 mm wide by 4 mm thick was installed at all edges of transom panel and door leaf. A 'GAMMA' mortise lockset was installed at the door leaf. The doorset was unlatched and unlocked during the test.

Doorset 'B' had overall dimensions of 2,250 mm wide by 2,950 mm high. It was comprised of a composite timber door frame, single-acting, unequal double door leaves and transom panel. Both door leaves and transom panel were constructed with 34 mm thick perlite core and sandwiched by a layer of 5 mm thick fire rated board on both sides with 2 mm thick plywood facing. An unequal rebate with sizes of 15 mm wide by 10 mm deep was incorporated at the meeting edge of door leaves. Left door leaf was with sizes of 1,200 mm by 2,506 mm high by 48 mm thick and hung to the door frame by 4 nos. of stainless steel butt hinges with sizes 102 mm by 102 mm by 3 mm thick. Right door leaf was with sizes of 840 mm wide by 2,506 mm high by 48 mm thick and hung to the door frame by 4 nos. of concealed hinges with sizes of 115 mm long by 45 mm deep by 28 mm wide. The transom panel was with sizes 2,050 mm wide by 400 mm high by 48 mm thick and hold to the door frame screws fixing. A 25 mm thick 'Pyrotech' glazed panel with vision sizes of 680 mm wide by 2,110 mm high was incorporated with left door leaf. Two nos. of nominal 25 mm thick 'Pyrotech' glazed panels with vision sizes of 410 mm wide by 510 mm high was incorporated with right door leaf.

One (1) no. of 'UA' fire seal with sizes of 20 mm wide by 4 mm thick was installed at each jamb and head of door frame, top and bottom of mullion and meeting edge of right door leaf. One (1) no. of 'UA' fire and smoke seal with sizes of 20 mm wide by 4 mm thick was installed at all edges of transom panel, both

vertical edges of left door leaves and hinging edge of right door leaf. A bottom drop seal was installed at bottom edge of both door leaves.

A surface mounted overhead door closer was installed at exposed side of left door leaf. A 'DORMA' concealed door closer was installed at right door leaf. A 'Yale' electric lockset was installed at the mullion, above left door leaf. A 'GAMMA' mortise lockset was installed at right door leaf. A flush bolt was installed at the top and bottom of meeting edge of right door leaf. The doorset was unbolted, unlatched and unlocked during the test.

The specimen satisfied the performance requirements specified in BS EN 1634-1: 2014 for the following periods and the test was discontinued after a heating period of 72 minutes (see R19M24-1A for details).

Doorset 'A'

Integrity:	Cotton Pad	72 Minutes (No failure)
	Gap Gauge	72 Minutes (No failure)
	Sustained Flaming	72 Minutes (No failure)
Insulation (I₁ doorset excluding the panels):		72 Minutes
Insulation (I₁ transom panel):		72 Minutes
Insulation (Glazed panel):		55 Minutes

Doorset 'B'

Integrity:	Cotton Pad	72 Minutes (No failure)
	Gap Gauge	72 Minutes (No failure)
	Sustained Flaming	72 Minutes (No failure)
Insulation (I₁ doorset excluding the panels):		38 Minutes
Insulation (I₂ doorset excluding the panels):		72 Minutes
Insulation (I₁ transom panel):		72 Minutes
Insulation (Left glazed panel):		61 Minutes
Insulation (Right glazed panels):		53 Minutes

3.2 Secondary Test Evidences

3.2.1 RED Test Report No. R21D09-1A^

A fire resistance test in accordance with BS EN 1634-1: 2014 + A1: 2018 on two (2) nos. of specimens of insulated composite timber doorsets, namely doorsets 'A' and 'B', was performed at the RED laboratory on 26th April 2021. The test sponsor was HK Pro-Tech Fire Prevention Building Material Limited. As requested by the test sponsor, the specimens were mounted within concrete lined specimen holder such that doorset 'A' was swinging towards the furnace and doorset 'B' was swing towards and away from the

furnace. The specimens were asymmetrical and only one side of the specimens was tested as per test sponsor's request.

Doorset 'A' had overall dimensions of 1,000 mm wide by 2,400 mm high. It was comprised of a timber door frame, single-acting, unequal double door leaves and 2 nos. of louvers. Both door leaves were constructed with 40 mm thick hardwood core and sandwiched by a layer of 5 mm thick plywood facing on both sides. Left door leaf was with sizes of 175 mm by 2,362 mm high by 50 mm thick and hung to the door frame by 4 nos. of stainless steel spring hinges with sizes 102 mm by 102 mm by 3 mm thick. Right door leaf was with sizes 762 mm wide by 2,362 mm high by 50 mm thick and hung to the door frame by 4 nos. of concealed hinges. An equal rebate with sizes of 14 mm wide by 25 mm deep was incorporated with the meeting edge of door leaves. Two nos. of double-layers of louvers (louvers 'A' & 'B') with sizes of 440 mm wide by 440 mm high by 67 mm thick were incorporated with right door leaf.

One (1) no. of 'LiWang' fire seal with sizes of 20 mm wide by 4 mm thick was installed at each jamb and head of door frame. One (1) no. of 'LiWang' fire seal with sizes of 10 mm wide by 4 mm thick was installed at meeting edge of both door leaves. A 'Dorma T6100' mortise lockset was installed at the doorset. A flush bolt was installed at top and bottom of left door leaf. A concealed door closer was installed at right door leaf. The doorset was unbolted, unlatched and unlocked during the test.

Doorset 'B' had overall dimensions of 1,740 mm wide by 2,950 mm high. It was comprised of a timber door frame, double-acting, unequal double door leaves and transom panel. Both door leaves and transom panel were constructed with 34 mm thick pearlite core and sandwiched by a layer of 5 mm thick fire rated board with 2 mm thick plywood facing on both sides. An unequal rebate with sizes of 13 mm wide by 10 mm deep was incorporated at the meeting edge of door leaves. Left door leaf was with sizes of 1,104 mm by 2,506 mm high by 48 mm thick and right door leaf was with sizes of 546 mm wide by 2,506 mm high. Both door leaves were held by floor spring. The transom panel was with sizes 1,660 mm wide by 378 mm high by 48 mm thick and held to the door frame screws fixing. A 25 mm thick 'Protech' glazed panel (pane 'A') with vision sizes of 300 mm wide by 1,800 mm high was incorporated with left door leaf. Two nos. of nominal 25 mm thick 'Protech' glazed panels (panes 'B' & 'C') with vision sizes of 300 mm wide by 400 mm high was incorporated with right door leaf.

One (1) no. of 'Fan Qiu' fire seal with sizes of 20 mm wide by 4 mm thick was installed at each jamb and head of door frame, top of mullion and meeting edge of left door leaf. One (1) no. of 'Fan Qiu' fire and smoke seal with sizes of 20 mm wide by 4 mm thick was installed at top and bottom edges of both door leaves, both vertical edges of right door leaf, hinging edge of left door leaf and perimeter of transom panel. A 'Yale' electric lockset was installed at the mullion, above left door leaf. A mortise lockset was installed at right door leaf. A flush bolt was installed at the top and bottom of meeting edge of right door leaf. A surface mounted handle was installed at both sides of both door leaves. Two nos. of surface mounted bolts were installed at exposed side of transom panel. A surface mounted latch was installed at exposed side of doorset. The doorset was unbolted, unlatched and unlocked during the test.

The specimen satisfied the performance requirements specified in BS EN 1634-1: 2014 + A1: 2018 for the following periods and the test was discontinued after a heating period of 73 minutes. (see R21D09-1A for details).

Doorset 'A'

Integrity:	Cotton Pad	73 Minutes (No failure)
	Gap Gauge	73 Minutes (No failure)
	Sustained Flaming	73 Minutes (No failure)
Insulation (I₁ doorset excluding the louvers):		73 Minutes
Insulation (louvers):		73 Minutes

Doorset 'B'

Integrity:	Cotton Pad	73 Minutes (No failure)
	Gap Gauge	73 Minutes (No failure)
	Sustained Flaming	73 Minutes (No failure)
Insulation (I₁ doorset excluding the panels):		73 Minutes
Insulation (I₁ transom panel):		73 Minutes
Insulation (Left glazed panel):		73 Minutes
Insulation (Right glazed panels):		73 Minutes

^Note: the specimen was tested with respect to BS EN 1634-1: 2014 + A1: 2018; we have reviewed this data against the current test procedures as per BS EN 1634-1: 2014 and found it suitable for this assessment.

3.2.2 RED Test Report No. R16G02-1C[#]

A fire resistance test in accordance with BS EN 1634-1: 2008 on fully insulated single-acting, unequal double-leaf composite timber doorset was performed at the RED laboratory on 27 July 2016. The test sponsor was HK Pro-Tech Fire Prevention Building Material Limited. 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 towards the heating conditions. The specimen was asymmetrical and only one side of the specimen was tested, in which the fire side was determined by the test sponsor.

The specimen had overall dimensions of 2,100 mm wide by 2,405 mm high. It was comprised of a timber door frame and unequal door leaves. Both door leaves were constructed with nominal 35 mm thick perlite door core with mesh wire, sandwiched by nominal 4.5 mm thick fire rated board with 3 mm thick plywood facing on both sides. An unequal rebate of 12 mm wide by 28 mm thick was incorporated in the meeting edge of door leaves. Left door leaf was with sizes of 930 mm wide by 2,360 mm high by 50 mm thick and

was hung to the door frame by 4 nos. of butt hinges with sizes of 102 mm by 102 mm by 3 mm thick. Right door leaf was with sizes of 1,100 mm wide by 2,360 mm high by 50 mm thick and was hung to the door frame by 4 nos. of 'MARCO POLO' concealed hinges. The left door leaf was incorporated with one number of 25 mm thick 'Pyrotech' glazed panel with vision sizes of 200 mm wide by 1,200 mm high. The right door leaf was incorporated with one number of 25 mm thick 'Pyrotech' glazed panel with vision sizes of 400 mm wide by 400 mm high.

1 no. of 'SG Seals' perimeter smoke seal with sizes of 12 mm by 12 mm and 2 nos. of 'SG Seals' fire seals with sizes of 30 mm wide by 4 mm thick were installed at each jamb and head of door frame. 1 no. of 'SG Seals' fire seal with sizes of 15 mm wide by 4 mm thick and 1 no. of 'SG Seals' fire and smoke seal with sizes of 10 mm wide by 4 mm thick were installed at the meeting edge of both door leaves. 1 no. of 'SG Seals' fire seal with sizes of 10 mm wide by 4 mm thick and 1 no. of 'SG Seals' fire and smoke seal with sizes of 20 mm wide by 4 mm thick were installed at top edge of both door leaves. 1 no. of 'SG Seals' fire and smoke seal with sizes of 20 mm wide by 4 mm thick was installed at hinging edge of both door leaves. 1 no. of 'Reddiplex' automatic bottom drop seal with sizes of 34 mm high by 14 mm thick was installed at the bottom edge of each door leaf.

A 'DORMA' concealed door closer was installed at the right door leaf. A 'RYOBI' surface mounted door closer was installed at exposed side of left door leaf. A lockset was installed on the right door leaf and the doorset was unlocked and unlatched during the test.

The specimen satisfied the performance requirements specified in BS EN 1634-1: 2008 for the following periods and the test was discontinued after a heating period of 68 minutes (see R16G02-1C for details).

Integrity:	Cotton Pad	68 Minutes (No failure)
	Gap Gauge	68 Minutes (No failure)
	Sustained Flaming	64 Minutes
Insulation (I₁ excluding glazed panels):		63 Minutes
Insulation (I₂ excluding glazed panels):		64 Minutes^Ω
Insulation (left glazed panel):		64 Minutes^Ω
Insulation (right glazed panel):		64 Minutes^Ω

^ΩNote: 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 the test report.

[#]Note: The test date is more than five years old and the specimen was tested with respect to BS EN 1634-1: 2008; we have reviewed this data against the current test procedures as per BS EN 1634-1: 2014 and found it suitable for this assessment.

3.2.3 RED Test Report No. R12G18-3#

A fire resistance test in accordance with BS EN 1634-1: 2008 on 2 nos. of specimens of insulated, single-acting, composite timber doorsets, namely doorsets 'A' and 'B', was performed at the RED laboratory on 11 September 2013. The test sponsor was United-Pilot Firerated Door Company who had permitted the use of this data. As requested by the test sponsor, the specimens were mounted within concrete lined specimen holder by test sponsor such that both door leaves could swing towards the heating conditions. The specimens were asymmetrical and only one side of the specimens were tested as per test sponsor's request, which was considered to be more critical. In this assessment, only doorset 'A' will be considered.

Doorset 'A' had overall dimensions of 820 mm wide by 2,137 mm high. It was comprised of a timber door frame and a door leaf constructed with nominal 38 mm thick softwood sandwiched by nominal 3 mm thick magnesium oxide boards on both sides, with nominal 3 mm thick facings. The door leaf was with sizes of 756 mm wide by 2,100 mm high by 50 mm thick and was hung to the door frame by 3 nos. of 'UA' stainless steel butt hinges with sizes of 102 mm by 102 mm by 3 mm thick. The door leaf was incorporated with a 25 mm thick 'Master' glazed panel with vision sizes of 200 mm wide by 1,735 mm high. 1 no. of 'Lorient' fire seal with sizes of 30 mm wide by 4 mm thick and 1 no. of 'UP' smoke seal with sizes of 12 mm wide by 12 mm thick were installed at jambs and head of door frame. 1 no. of 'UP' drop seal with sizes of 14 mm wide by 35 mm deep was installed at the bottom edge of door leaf. A surface mounted overhead door closer and a handle were installed at the exposed side of door leaf.

The specimens satisfied the performance requirements specified in BS EN 1634-1: 2008 for the following periods and the test was discontinued after a heating period of 87 minutes (see R12G18-3 for details).

Doorset 'A'

Integrity:	Cotton Pad	87 Minutes (No failure)
	Gap Gauge	87 Minutes (No failure)
	Sustained Flaming	87 Minutes (No failure)
Insulation (I₁ excluding glazed panel):		64 Minutes
Insulation (glazed panel)		87 Minutes

#see note on page 10

3.2.4 RED Test Report No. R19J11-1A*

A fire resistance test in accordance with BS EN 1634-1: 2008 on insulated, single-acting, unequal double-leaf composite timber doorset with transom panel was performed at the RED laboratory on 30 September 2019. The test sponsor was HK Pro-Tech Fire Prevention Building Materials Ltd. As requested by the test sponsor, the specimen was mounted within concrete lined specimen holder such

that the specimen was swinging towards the furnace. The specimen was asymmetrical and only one side of the specimen was tested as per test sponsor's request.

The specimen had overall dimensions of 2,250 mm wide by 2,950 mm high. It was comprised of a composite timber door frame, single-acting, flush-type, unequal double door leaves and transom panel. An unequal rebate with sizes of 25 mm wide by 13 mm deep was incorporated between door frame, and door leaves and transom panel. Both door leaves and transom panel were constructed with 42 mm thick pearlite core and sandwiched by a layer of 6 mm thick fire rated board on both sides with 3 mm thick plywood facing. An unequal rebate with sizes of 22 mm wide by 13 mm deep was incorporated at the meeting edge of door leaves and sizes of 25 mm wide by 13 mm deep at meeting edge between transom panels and both door leaves. Left door leaf was with sizes of 1,200 mm by 2,550 mm high by 60 mm thick and hung to the door frame by 4 nos. of stainless steel butt hinges with sizes 114 mm by 100 mm by 3 mm thick. Right door leaf was with sizes of 970 mm wide by 2,550 mm high by 60 mm thick and hung to the door frame by 4 nos. of concealed hinges with sizes of 115 mm long by 45 mm deep by 28 mm wide. The transom panel was with sizes 2,174 mm wide by 400 mm high by 60 mm thick and hold to the door frame by 2 nos. of surface mounted bolts at unexposed side. A nominal 41 mm thick 'Master' glazed panel with vision sizes of 670 mm wide by 2,202 mm high was incorporated with left door leaf. Two (2) nos. of nominal 41 mm thick 'Master' glazed panels with vision sizes of 400 mm wide by 500 mm high were incorporated with right door leaf.

One (1) no. of 'UA' fire seal with sizes of 30 mm wide by 4 mm thick was installed at each jamb and head of door frame and top edge of both door leaves. One (1) no. of 'UA' fire and smoke seal with sizes of 30 mm wide by 4 mm thick was installed at all edges of transom panel, both vertical edges of both door leaves. A bottom drop seal was installed at bottom edge of both door leaves.

A surface mounted overhead door closer was installed at exposed side of left door leaf. A 'DORMA' concealed door closer was installed at right door leaf. A 'Gamma' electric lockset was installed at bottom of transom panel, above left door leaf. A 'GAMMA' mortise lockset was installed at right door leaf. A flush bolt was installed at the top and bottom of meeting edge of right door leaf. Two nos. of surface mounted bolts were installed at unexposed side of transom panel. An electric lockcase was installed at both sides of right door leaf. A surface mounted handle was mounted at both sides of right door leaf. The doorset was unbolted, unlatched and unlocked during the test.

The specimen satisfied the performance requirements specified in BS EN 1634-1: 2008 for the following periods and the test was discontinued after a heating period of 132 minutes (see R19J11-1A for details).

Integrity:	Cotton Pad	132 Minutes (No failure)
	Gap Gauge	132 Minutes (No failure)
	Sustained Flaming	132 Minutes (No failure)
Insulation (I₁ doorset excluding the panels):		132 Minutes
Insulation (I₁ transom panel):		132 Minutes

Insulation (Left glazed panel):

112 Minutes

Insulation ((Right glazed panels):

132 Minutes

**Note: The specimen was tested with respect to BS EN 1634-1: 2008; we have reviewed this data against the current test procedures as per BS EN 1634-1: 2014 and found it suitable for this assessment*

3.2.5 RED Test Report No. R13J13-1#

A fire resistance test in accordance with BS EN 1634-1: 2008 on two nos. of specimens of insulated, single-acting, composite timber doorsets with steel frames, namely doorsets 'A' and 'B', was performed at the RED laboratory on 23 October 2013. The test sponsor was United-Pilot Firerated Door Company who had permitted the use of this data. As requested by the test sponsor, the specimens were mounted within concrete lined specimen holder by test sponsor such that both door leaves could swing away from the heating conditions. The specimens were asymmetrical and only one side of the specimens were tested as per test sponsor's request, which was considered to be more critical.

Doorset 'A' had overall dimensions of 1,588 mm wide by 2,295 mm high. The specimen was comprised of a G.M.S. door frame with a single-acting, unequal double-leaf timber doorset which constructed by 50 mm thick millboard door core, sandwiched by 6 mm thick fire rated boards and 4 mm thick plywood facings on both sides. The left door leaf was with sizes of 1,000 mm wide by 2,250 mm high by 70 mm thick and the right door leaf was with sizes of 500 mm wide by 2,250 mm high by 70 mm thick. Each door leaf was hung to the door frame by 4 nos. of 'Pilot' stainless steel butt hinges with sizes of 114 mm by 114 mm by 3 mm thick. A 'UP1212' smoke seal with sizes of 12 mm by 12 mm was installed at each jamb and head of door frame. A 'Lorient LP4004' intumescent seal with sizes of 40 mm wide by 4 mm thick was installed at the vertical and top edges of both door leaves. A 'UP3514' concealed bottom drop seal with sizes of 35 mm high by 14 mm thick was installed at the bottom edge of each door leaf. A 'RYOBI' surface mounted overhead door closer was installed at the unexposed side of the left door leaf and a 'DORMA' surface mounted overhead door closer was installed at the exposed side of the right door leaf. A 'GAMMA' lockset was installed at the left door leaf and 'HMR' surface mounted door bolt was installed at the exposed side of the top and bottom of right door leaf. The doorset was latched but unbolted during the test.

Doorset 'B' had overall dimensions of 682 mm wide by 2,295 mm high. The specimen was comprised of a stainless steel door frame and a single-acting, single-leaf timber doorset which constructed by 50 mm thick millboard door core, sandwiched by 6 mm thick fire rated boards and 4 mm thick plywood facings on both sides. The door leaf was with sizes of 600 mm wide by 2,250 mm high by 70 mm thick and hung to the door frame by 4 nos. of 'Pilot' stainless steel butt hinges with sizes of 114 mm by 114 mm by 3 mm thick. The door leaf was incorporated with a nominal 40 mm thick 'Master' insulated glass panel with vision sizes of 155 mm wide by 755 mm high. A 'Lorient LP4004' intumescent seal with sizes of 40 mm wide by 4 mm thick was installed at the vertical and top edges of the door leaf. A 'COMMY' surface mounted overhead door closer was installed at the unexposed side of door leaf.

The specimen satisfied the performance requirements specified in BS EN 1634-1: 2008 for the following periods and the test was discontinued after a heating period of 145 minutes (see R13J13-1 for details).

Doorset 'A'

Integrity:	Cotton Pad	145 Minutes (No failure)
	Gap Gauge	145 Minutes (No failure)
	Sustained Flaming	145 Minutes (No failure)

Insulation (I₂):	145 Minutes
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Doorset 'B'

Integrity:	Cotton Pad	145 Minutes (No failure)
	Gap Gauge	145 Minutes (No failure)
	Sustained Flaming	145 Minutes (No failure)

Insulation (I₂ excluding glazed panel):	145 Minutes
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Insulation (glazed panel):	141 Minutes
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#see note on page 10

3.2.6 RED Test Report No. R14H03-1#

A fire resistance test in accordance with BS EN 1634-1: 2008 on fully insulated single-acting, equal double-leaf composite timber doorset was performed at the RED laboratory on 20 August 2014. The test sponsor was United-Pilot Firerated Door Company who had permitted the use of this data. 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 away from the heating conditions. The specimen was asymmetrical and only one side of the specimen was tested, in which the fire side was determined by the test sponsor.

The specimen was double leaves configuration and had overall dimensions of 950 mm wide by 1,860 mm high by 100 mm frame thickness. It was comprised of a G.M.S. door frame, with equal door leaves which constructed by 40 mm thick millboard sandwiched by nominal 6 mm thick fire rated board with nominal 4 mm thick plywood facings on both sides. Both door leaves were with sizes of 434 mm wide by 1,815 mm high by nominal 60 mm thick and was hung to the door frame by 3 nos. of Commy' and 'UA' stainless steel butt hinges with sizes of 114 mm by 114 mm by 3 mm thick. A 40 mm thick 'Longdian' glazed panel with vision sizes of 150 mm wide by 1,400 mm high was incorporated in left door leaf. 1 no. of 'Lorient' fire seal with sizes of 40 mm wide by 4 mm thick was installed at vertical and top of both door leaves. A 'HMR' flush

bolt was installed at top and bottom of left door leaf and 'Ezset', 'Gamma 8200' and 'Zone' locksets were installed at right door leaf. A 'Gamma' and 'Zone' surface mounted overhead closers were installed at exposed side of left and right door leaves respectively. The doorset was unbolted, unlocked and unlatched during the test.

The specimen satisfied the performance requirements specified in BS EN 1634-1: 2008 for the following periods and the test was discontinued after a heating period of 132 minutes (see R14H03-1 for details).

Integrity:	Cotton Pad	29 Minutes
	Gap Gauge	27 Minutes
	Sustained Flaming	30 Minutes
Insulation (I₂ excluding glazed panel):		27 Minutes@
Insulation (glazed panel):		27 Minutes@

@Note: Insulation performance is 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 the test report.

#see note on page 10

4 PROPOSAL

4.1 Insulated composite timber doorsets for 60 minutes integrity and insulation (I_2) with respect to BS EN 1634-1: 2014

Proposal

The proposed constructions are insulated composite timber doorsets which are basically similar to those tested and described in R19M24-1A, except that the thickness of nominal 25 mm thick 'Pyrotech' glazed panels are increased to nominal 30 mm thick.

The proposed insulated composite timber doorsets may provide 60 minutes integrity and insulation (I_2) in accordance with BS EN 1634-1: 2014 with the modifications as state below:

- (a) the doorset may be modified to unequal double-leaf, equal double-leaf or single-leaf (see figures 1 to 4);
- (b) the doorset may be fitted with or without transom panels (see figures 1 to 4);
- (c) an additional frame member may be incorporated at the sill to form a four-side frame (see figure 5);
- (d) the doorset may be fitted with or without glazed panels;
- (e) the doorset may be modified to double-acting configuration by fitting with 'Gamma FS-1104' or 'Dorma BTS-T75V' floor springs as tested and described in R21D09-1A;
- (f) the doorset may be installed with 'CF BY304' louvers with maximum sizes of 440 mm wide by 440 mm high by 67 mm thick (double layers) as tested and as tested and described in R21D09-1A;
- (g) a modest variation in the aspect ratio of the door leaf and transom panel is allowed, with increase in area, as shown in Tables 4.1.1 and 4.1.2;
- (h) alternative glazed panels may be incorporated. A modest variation in the aspect ratio of the vision sizes of glazed panels is allowed, with increase in area, as shown in Table 4.1.3. Multiple vision panels and various pane shapes (see figure 6) may be allowed;
- (i) decrease in door leaf dimension may be allowed. The door leaf which is shorter than or equal to 2,000 mm high may be fitted with 3 hinges, while the door leaf which is shorter than or equal to 1,350 mm high may be fitted with 2 hinges, provided that the distance of the top and bottom hinges from the corresponding door leaf edges shall remain the same as that tested;
- (j) the doorset may be incorporated with or without lockset and flush bolts; and it may be bolted or unbolted, latched or unlatched and locked or unlocked;
- (k) the door frame may be with sizes of 23 ~ 25 mm by 90 mm thick by 43 ~ 45 mm, with 14 mm to 20 mm thick rebate;
- (l) the door frame profile may be modified (see figure 7);
- (m) the door frame may be extended maximum 30 mm away from the concrete wall, provided that at least 2 nos. of nominal 9 mm thick fire rated boards are fixed at the back of door frame (see figure 8.1);

- (n) the 18 mm wide plywood sub-frame may be used between door frame and supporting construction (see figure 8.2);
- (o) direction of fire exposure from either side of doorset;
- (p) modification of glazing bead profiles (see figure 9);
- (q) timber astragal of 8 mm thick may be added at the meeting edge (see figure 10);
- (r) unequal rebated or square meeting stiles may be allowed for the proposed double-leaf doorset (see figure 10);
- (s) the door frame, door leaf and transom panel may be clad with maximum 3 mm thick wall paper, plastic laminates, stainless steel, G.M.S., aluminium sheets and maximum 15 mm thick MDF, hardwood, plywood facings, marble facings, wall tiles, glass or mirror (see figure 11);
- (t) the glazed bead may be clad with maximum 3 mm thick plywood, wall paper, hardwood, plastic laminates, glass, mirror, stainless steel, G.M.S. or aluminium sheets;
- (u) the transom panel may be fixed to the door frame by screws or surface mounted bolts at maximum 190 mm spacing (see figures 12 & 13);
- (v) the fitting of the intumescent seal may be interchanged at the frame or at the door leaf, provided that the total wide of intumescent seal at each clearance remain the same as tested;
- (w) the fire & smoke seals may be replaced by fire seals with the same sizes, or vice versa. In addition, the total number of seals may be varied, provided that the intumescent bodies of seals are not less than tested;
- (x) the doorset may be with or without perimeter smoke seals and bottom drop seals;
- (y) the threshold gap clearance may be increased up to 10 mm;
- (z) the surfaces of door frame, door leaf, transom panel and glazed bead may be applied with spray paint or water-based paint;
- (aa) the jambs and head of door frame may be installed with 'UP1212' smoke seals as tested and described in R13J13-1;
- (bb) the gaps between the meeting edges of door leaves; the door frame and door leaves may be maximum 4.5 mm.

Table 4.1.1 – Allowable sizes of each door leaf

Reference Test Report	Integrity (min)	Insulation (doorset excluding the panels) (min)	Tested Sizes			Proposed Sizes		
			Max. Width (mm)	Max. Height (mm)	Max. Area (m ²)	Max. Width (mm)	Max. Height (mm)	Max. Area (m ²)
R19M24-1A Doorset 'A'	72	72	669	2,013	1.35	1,440	3,007	3.61
R19M24-1A Doorset 'B'	72	72	1,200	2,506	3.01			

For the above table, a reduction in width may be required for an increase in height, or vice versa.

Table 4.1.2 – Allowable sizes of transom panel

Reference Test Report	Integrity (min)	Insulation (I ₁) (min)	Tested Sizes			Proposed Sizes		
			Width (mm)	Height (mm)	Area (m ²)	Max. Width (mm)	Max. Height (mm)	Max. Area (m ²)
R19M24-1A (transom panel)	72	72	2,050	378	0.87	2,880	880	2.53
R19M24-1A (door leaf)			2,506	1,200	3.01			

For the above table, a reduction in width may be required for an increase in height, or vice versa.

Table 4.1.3 – Vision sizes of glazed panel

Type of Glass	Reference Test Report	Integrity (min)	Insulation (min)	Tested vision sizes			Proposed vision sizes		
				Max. Width (mm)	Max. Height (mm)	Max. Area (m ²)	Max. Width (mm)	Max. Height (mm)	Max. Area (m ²)
30 mm thick 'Pyrotech' insulated glass*	R19M24-1A	72	72	680	2,110	1.43	680	2,110	1.43
25 mm thick 'Pyrotech' insulated glass	R16G02-1C	68*	68*	400	400	0.16	440	440	0.18
				200	1,200	0.24	220	1,320	0.26
25 mm thick 'Master' insulated glass	R12G18-3	87	87	200	1,735	0.35	600	2,082	0.42
25 mm thick 'Protech' insulated glass	R21D09-1A	73	73	300	1,800	0.54	600	2,070	0.65

*see the following explanations

For the above table, a reduction in width may be required for an increase in height, or vice versa. All other details such as glazing materials, depth of glazing channel and allowance for expansion shall be the same as tested and described in R19M24-1A.

Discussion

From the test evidence of R19M24-1A, the single-acting, single door-leaf composite timber doorset with transom panel (doorset 'A') satisfied 72 minutes integrity, 72 minutes insulation (I₁ doorset excluding the panels), 72 minutes insulation (I₁ transom panel), 55 minutes insulation (glazed panel) criteria in accordance with BS EN 1634-1: 2014.

The single-acting, unequal double-leaf composite timber doorset with transom panel (doorset 'B') as tested and described in R19M24-1A satisfied 72 minutes integrity, 72 minutes insulation (I₂ doorset excluding the panels), 72 minutes insulation (I₁ transom panel), 61 minutes insulation (left glazed panel) and 53 minutes insulation (right glazed panels) criteria in accordance with BS EN 1634-1: 2014.

All the door leaves of composite timber doorsets 'A' and 'B' as tested and described in R19M24-1A were incorporated with nominal 25 mm thick 'Pyrotech' glazed panels. For doorset 'A', insulation failure was observed from the 25 mm thick 'Pyrotech' glazed panel when the maximum temperature rise of 180 °C

was measured on the unexposed surface by fixed thermocouple after a heating period of 55 minutes. For doorset 'B', insulation failure was observed from the 25 mm thick 'Pyrotech' glazed panels on the right door leaf when the maximum temperature rise of 180 °C was measured on the unexposed surface by moving thermocouple after a heating period of 53 minutes. Since all the glazed panels are having the same glass combination, it is concluded that the vision sizes of the 25 mm thick 'Pyrotech' glazed panels cannot be as large as 680 mm wide by 2,110 mm high (left glazed panel of doorset 'B') and the thickness shall be increased to achieve 60 minutes insulation performance.

Based on the assumption that the insulation property of the insulated glazed panel will be linearly proportional to the thickness of interlayer gel of the tested prototype, the required thickness of interlayer gel of the insulated glazed panel to achieve 60 minutes insulation period may be estimated as follows:

The required thickness = (60 minutes / 53 minutes) x 15 mm thick = 17 mm thick.

Therefore, it is reasonable to anticipate that the proposed insulated glazed panels, with nominal 20 mm thick interlayer gel, will achieve an insulation period of at least 60 minutes. In this proposal, the total thickness of the proposed insulated glazed panels will be 30 mm, with glass combination of nominal 20 mm thick interlayer gel sandwiched by nominal 5 mm thick tempered glass on both sides. The increase in thickness of insulated glazed panels will not adversely affect the integrity performance of the tested prototype. All other details such as glazing materials, depth of glazing channel and allowance for expansion shall be the same as tested.

Hence, the proposed insulated composite timber doorsets, incorporated with nominal 30 mm thick 'Pyrotech' glazed panels, are expected to satisfy at least 60 minutes integrity and insulation criteria of BS EN 1634-1: 2014.

- (a) The tested composite timber doorset 'B' was of unequal double-leaf configuration. Since the door leaves are of unequal width, the door leaves will have differential deflection at the meeting edges. Larger door leaves are expected to yield greater differential deflection. This is deemed to be more onerous as the presence of the meeting stiles and the differential deflection occurring at mid-height of the meeting stiles introduced weaknesses in the doorset that will be detrimental to the fire resistance performance. Therefore, the fire resistance performance achieved by an unequal double-leaf doorset is expected to be maintained for an equal double-leaf. As mentioned above, the meeting edge in double-leaf configuration is one of the potential risks that may cause integrity failure. Removal of this feature in single-leaf doorset eliminates this potential risk. Therefore, the single-leaf configuration is expected to be a less onerous situation and the proposal is therefore positively appraised.
- (b) The edge between the transom panel and the door leaves is one of the potential risks that may cause integrity failure. The doorset fitted without transom panel is considered to present a similar or reduced level of risk. Therefore, the proposal of omitting areas of transom panels is positively

appraised. The fire resistance performance achieved by the tested prototype is expected to be maintained.

- (c) The single-leaf composite timber doorset 'A' as tested and described in R19M24-1A was tested with four-side frame. An additional frame member may be incorporated at the sill to form a four-side frame. The additional member provides extra support to door leaf at the sill as similar function as the member at frame head. The extra frame at the sill shall have the intumescent protection replicate the same as the rest of the three side frame. This minor modification is not expected to have adverse effect on the fire resistance performance achieved. Hence, the proposal of incorporating an extra sill member to form a four-side frame is positively appraised.
- (d) The doorset fitted without glazed panel is considered to present a similar or reduced level of risk. Therefore, the proposal of omitting areas of glazed panels is positively appraised. The fire resistance performance achieved by the tested prototype is expected to be maintained.
- (e) It is proposed that the composite timber doorset may be modified to double-acting configuration by fitting with floor springs as tested and described in R21D09-1A. From the test evidence of R21D09-1A, the left and right door leaf of the composite timber doorset 'B' was held to the door frame by 'Gamma FS-1104' floor spring and 'Dorma BTS-T75V' floor spring respectively. The maximum deflection of the double-acting composite timber doorset 'B' was 12 mm only during the test and the composite timber doorset 'B' satisfied 73 minutes integrity and insulation performance. The construction details of the double-acting composite timber doorset 'B' was basically similar to the one tested and described in R19M24-1A. Therefore, the modification of the composite timber doorset to double-acting configuration by fitting the 'Gamma FS-1104' or 'Dorma BTS-T75V' floor springs as tested and described in R21D09-1A is supported by direct test evidence. In this case, the door frame profile shall also be modified without rebate which has been tested and described in R21D09-1A to facilitate the double-acting configuration. The double-acting configuration may be applied to single-leaf, equal and unequal double-leaf composite timber doorset with or without transom panels. The above modifications are not expected to adversely affect the fire resistance performance achieved by the tested prototypes.
- (f) The doorset may be installed with 'CF BY304' louvers with maximum sizes of 440 mm wide by 440 mm high by 67 mm thick (double layers) as tested and described in R21D09-1A. From the test evidence of R21D09-1A, the double-leaf composite timber doorset 'A' was incorporated with 2 nos. of double-layered louvers, each with sizes of 440 mm wide by 440 mm high by 67 mm thick. No failure was observed from the louvers during the test and the composite timber doorset 'A' as tested and described in R21D09-1A satisfied 73 minutes integrity and insulation performance. A

performance overrun of more than 21% was used to justify this proposal. Thus, the incorporation of 'CF BY304' louvers as tested and described in R21D09-1A to the composite timber doorset is not expected to adversely affect the fire resistance performance achieved by the tested prototype. The 'CF BY304' louvers may be decrease in area. The decrease in louver dimensions is generally accepted as a less onerous situation. All the construction and fixing details of the louvers shall be the same as those tested in R21D09-1A.

- (g) A modest variation (as much as 20%) in the aspect ratio of the door leaf, with 20% increase in area, may be allowed as shown in Table 4.1.1. For the transom panel, the proposed sizes may be referenced to those of the door leaf in horizontal orientation. Therefore, the proposed sizes of the transom panel may be as large as 2,880 mm wide by 880 mm high as shown in Table 4.1.2, which is less than the tested door leaf sizes. The vertical edge of the transom panel shall be fixed to the door frame by screws or surface mounted bolts at maximum 190 mm spacing as tested. Regarding to the transom panel and doorset excluding the glazed panels, a performance overrun of 20% was achieved which is used for the justification of this variation. Moreover, there was no sign of potential risk of integrity failure due to deformation on the door leaves and transom panel was observed. In our opinion, the proposed modification in the aspect ratio of the door leaf and transom panel, together with the increase in area, is not expected to affect the fire resistance performance achieved by the tested doorset. A reduction in width is required for an increase in height, or vice versa. All other construction and fixing details of the doorsets shall be the same as those tested.
- (h) As discussed above, the proposed insulated composite timber doorsets, incorporated with nominal 30 mm thick 'Pyrotech' glazed panels, are expected to satisfy at least 60 minutes integrity and insulation criteria of BS EN 1634-1: 2014. Except the insulation failures, the glazed panels retained in positions and remained intact after a heating period of at least 60 minutes. Alternative glazed panels as tested and described in R21D09-1A, R16G02-1C and R12G18-3, which achieved at least 60 minutes fire resistance performance, may be incorporated into the door leaves. From the test evidence of R16G02-1C, the left and right door leaves were incorporated with nominal 25 mm thick 'Pyrotech' glazed panels. Regarding to the glazed panels only, no failure was observed during the test and the glazed panels satisfied 68 minutes fire resistance performance. The nominal 25 mm thick 'Protech' glazed panel as tested and described in R21D09-1A and nominal 25 mm thick 'Master' glazed panel as tested and described in R12G18-3 did not deteriorate the integrity performance of the doorset and at the same time achieved an insulation performance of not less than 60 minutes. While for the glass width, from experience, glass with smaller aspect ratio shall perform better and therefore the width of the nominal 25 mm thick 'Master' and 'Protech' glazed panel is allowed to be increased further up to 600 mm.

A modest variation in the aspect ratio of the vision sizes of glazed panel is allowed, with increase in

area, as shown in Table 4.1.3. Performance overruns achieved by the glazed panels are used to justify these modifications. From our experience, the proposed glazed panels with variation in the aspect ratio and area are not expected to have detrimental effect on the fire resistance performance achieved. A reduction in width may be required for an increase in height, or vice versa. Multiple glass vision panels proposed shall not be closer than 120 mm from the edges of the door leaf and should have at least 120 mm distance between each multiple glass vision panels. Variation of the shape of the vision panel while with the maximum dimension including the area do not exceed the maximum allowed as in Table 4.1.3 is considered acceptable. In our opinion, the variations of multiple glass vision panels and the shape of the variation panels are not expected to affect the fire resistance performance which was achieved. All other details such as glazing materials, depth of glazing channel and allowance for expansion shall be the same as tested and described in R19M24-1A.

- (i) The decrease in door leaf dimensions is generally accepted as a less onerous situation. In case the door leaf decrease in height to less than or equal to 2,000 mm, the door leaf may be hung by 3 nos. of hinges only. For the door leaf shorter than or equal to 1,350 mm high, the door leaf may be fitted with 2 hinges, provided that the distance of the top and bottom hinges from the corresponding door leaf edges shall remain at 200 mm, which is the same as tested. From the test evidence R19M24-1A, the doorset was hung to the door frame by 4 hinges. By maintaining the edge distance and spacing of hinges as tested, the proposed doorsets with 2,000 mm high may be installed with only 3 nos. of hinges while the proposed doorsets with 1,350 mm high may be installed with only 2 nos. of hinges. The above proposal is considered as supported by direct test evidence and is not expect to adversely affect the fire resistance performance achieved by the tested prototype. However, the hinges shall have adequate grading to hold the door leaf.
- (j) The insulated composite timber doorsets as tested and described in R19M24-1A was unbolted, unlatched and unlocked during the test. This is deemed to be more onerous when the doorset incorporated with lockset and flush bolts but was unbolted, unlatched and unlocked during the test. The differential deflection occurred at mid-height of the meeting stiles may introduce weaknesses in the doorset that will be detrimental to the fire resistance performance. In additions, a doorset without lockset and flush bolts is considered to present similar or reduced level of risk of losing integrity performance since no cut out of the door leaf core is required for the installation of lockset and flush bolts. Therefore, the doorset may be incorporated with or without lockset and flush bolts; and it may be bolted or unbolted, latched or unlatched and locked and unlocked.
- (k) From the test evidence of R19M24-1A, the door frame was with overall sizes of 25 mm by 90 mm thick by 45 mm and the rebate depth was 20 mm. It is proposed that the door frame may be with sizes of 23 ~ 25 mm by 90 mm thick by 43 ~ 45 mm, with 14 mm to 20 mm thick rebate. The

proposed door frame with at least 90 mm thick is considered as the critical factor that may affect the fire resistance performance of the tested prototype. The proposed modifications maintain the critical parameter that may affect the fire resistance performance, with the performance overrun achieved, the proposal is positively appraised. The decrease in the width of rebate is supported by the test evidence of R21D09-1A that the double-acting composite timber doorset 'B', for which the door frame was tested without rebate, achieved at least 60 minutes integrity and insulation. Therefore, the proposal of applying 14 mm to 20 mm thick rebate to the door frame is not expected to have any detrimental effect towards the fire resistance performance of the tested prototypes.

- (l) The tested door frame profile under the reference R19M24-1A was L-shaped profile with the section sizes of 25 mm by 90 mm thick by 45 mm and the rebate depth was 20 mm. The frame profile may be changed to L-shaped or T-shaped by extending a rectangular portion of frame from the original tested profile. The dimensions of the original L-shaped profile, the rebate depth and the overall thickness shall remain unchanged or larger than tested. The L-shaped or T-shaped profile may be formed either by planting an additional section of timber or formed by one single timber unit. For door frame profile without rebate to facilitate double-acting configuration, it is supported by direct test evidence from R21D09-1A that the double-acting double-leaf composite timber doorset 'B' achieved at least 60 minutes integrity and insulation. Since the construction details of the composite timber doorsets as tested and described in R19M24-1A and R21D09-1A are basically similar, the modification of door frame without rebate is positively appraised.
- (m) From the test evidence of R19M24-1A, the door frame was L-shaped profile with the section sizes of 25 mm by 90 mm thick by 45 mm. As discussed above, the door frame may be increase in sizes by extending a rectangular portion of frame from the original tested concealed profile. In this case, the door frame may be extended maximum 30 mm away from the concrete wall, provided that at least 2 nos. of nominal 9 mm thick fire rated boards are fixed at the back of door frame so as to avoid direct fire exposure. This proposal is not expected to have any detrimental effect towards the fire resistance performance achieved by the tested prototype.
- (n) The doorset may be with or without sub frame. From the test evidence of R19M24-1A, the jambs of door frame was fixed directly to the concrete lining of test rig by at M6 with 68 mm long anchor bolts at maximum 975 mm spacing. The tested doorsets remained intact after the test and no failure was observed regarding to the fixings of door frame throughout the heating period. In our opinion, the fire resistance performance of the tested prototypes will be remained the same by adding 18 mm wide plywood sub frame between door frame and concrete lining.

- (o) In the test evidence, the composite timber doorsets were installed with the door leaves swung towards the heating conditions, which is considered to be a more critical situation in terms of heat exposure. During the fire test, timber door will deflect and with the leaf centre bow away from the furnace while the door corner of the door leaf will therefore moving towards the furnace away from the frame stopper. This tends to be a more onerous situation that over-deflection at the door leaf corner may cause integrity failure or at least increase the risk of integrity failure. Since the doorsets was tested with the critical side facing the heating condition, it is believed that the doorsets shall achieve at least the same fire resistance performance as if the heating exposure is from another side of the doorset.
- (p) The glazing bead profiles may be changed as illustrated in Figure 9 in the appendix of this report. The proposed glazing bead profiles with height of at least 15 mm thick is considered as the critical factors that may affect the fire resistance performance remains the same as tested. In case the glazing bead is modified to flush with the door leaf surface, the thickness of door leaf shall be increased to at least 54 mm thick. The proposed modifications maintain the critical parameter that may affect the fire resistance performance, with the performance overrun achieved, the proposal is still considered acceptable. All other details such as glazing materials, depth of glazing channel and allowance for expansion shall be the same as tested.
- (q) It is proposed that a 8 mm thick timber astragal may be added at the meeting edge of the doorset. The additional timber astragal on either side of the door leaf is considered as a surface feature of the door leaf and it is expected that this will not contributed to any potential risk of integrity and insulation weakness. The proposal is therefore acceptable.
- (r) From the test evidences R19M24-1A, the composite timber doorset 'B' was incorporated with unequal rebated meeting edge. This is generally accepted to be more critical than the case in which the door leaves with square meeting stile. A variation of the unequal rebated or square meeting stile may be allowed for the proposed double-leaf doorset. The fire resistance performance of the proposed doorset with unequal rebated or square meeting stile is deemed to be maintained, provided that the sizes and numbers of fire seals and fire & smoke seals are the same as tested. All other construction and fixing details of the doorset shall be the same as tested.
- (s) It is proposed that the door frame, door leaf and transom panel of the tested doorset may be clad with maximum 3 mm thick wall paper, plastic laminates, stainless steel, G.M.S., aluminium sheets and maximum 15 mm thick MDF, hardwood, plywood facings, marble facings, wall tiles, glass or mirror. Adhesive shall be used to assist in attaching the claddings to the doorset. The acceptable adhesive we recommended shall be a non-combustible, water-based, ceramic adhesive. From our

experience, when the proposed wall paper, MDF, hardwood, plywood and plastic laminate facings are glued on the top of doorset, the facings on the exposed surfaces will burn out quickly and drop down at the beginning of the fire test. The wall paper and plastic laminates shall achieve Class 1 if tested to BS 476: Part 7. When the proposed facings are glued on the unexposed surfaces of doorset, since the doorset is insulated, the temperature on the surfaces of doorset will not ignite the facings. Hence, it is reasonable to expect that applying wall paper, MDF, hardwood, plywood or plastic laminates to the doorset as facings will not have detrimental effect on the fire resistance performance achieved.

For the use of stainless steel, G.M.S., aluminium sheets, marble facings, wall tiles, glass and mirror, it is expected that differential expansion of these claddings relative to the doorset occurring in the early stages of a standard fire test will result in the failure of the adhesive bond. This allows the independent expansion of cladding from the underlying doorset. The cladding may fall off and consequently the modification is not expected to have any detrimental effect on the fire resistance performance achieved. The existence of insulation breaks minimize the heat transfer by direct conduction from exposed face to unexposed face such that the insulation performance shall be maintained. Hence, it is reasonable to expect that applying the above claddings to the doorset will not have detrimental effect on the fire resistance performance achieved.

- (t) It is proposed that the glazed bead of the tested doorset may be clad with maximum 3 mm thick plywood, wall paper, hardwood, plastic laminates, glass, mirror, stainless steel, G.M.S. or aluminium sheets. Adhesive shall be used to assist in attaching the claddings to the glazed bead. The acceptable adhesive we recommended shall be a non-combustible, water-based, ceramic adhesive. From our experience, when the proposed plywood, wall paper, hardwood, plastic laminates facings are glued on the top of glazed bead, the facings on the exposed surfaces will burn out quickly and drop down at the beginning of the fire test. The wall paper and plastic laminates shall achieve Class 1 if tested to BS 476: Part 7. When the proposed facings are glued on the unexposed surfaces of glazed bead, since the glazed bead is insulated, the temperature on the surfaces of glazed bead will not ignite the facings. Hence, it is reasonable to expect that applying plywood, wall paper, hardwood, plastic laminates facings to the glazed bead as facings will not have detrimental effect on the fire resistance performance achieved.

For the use of glass, mirror, stainless steel, G.M.S. or aluminium sheets, it is expected that differential expansion of these claddings relative to the doorset occurring in the early stages of a standard fire test will result in the failure of the adhesive bond. This allows the independent expansion of cladding from the underlying glazed bead. The cladding may fall off and consequently the modification is not expected to have any detrimental effect on the fire resistance performance achieved. The existence of insulation breaks minimize the heat transfer by direct conduction from exposed face to unexposed face such that the insulation performance shall be maintained. Hence, it

is reasonable to expect that applying the above claddings to the glazed bead will not have detrimental effect on the fire resistance performance achieved.

- (u) From the test evidence of R19M24-1A, each vertical side of the transom panel of doorset 'B' was fixed to the door frame by a surface mounted bolt located at mid-height. It is proposed that the transom panel may be fixed to the door frame by screws or surface mounted bolts, provided that the screws or surface mounted bolts are fixed at maximum 190 mm spacing as tested. This proposal is not expected to adversely affect the fire resistance performance achieved by the tested prototype.
- (v) The use of intumescent seal is to block and seal up the clearance between the door leaf and the door frame such that the passage of hot gases is blocked during the fire test. The intumescent material limit the passage of hot gases at least at the initial stage of the fire test which may significantly delay the timber charring during the tests and the build up of hot spot on the unexposed face. Since the expansion of the intumescent is activated by high temperature, theoretically the intumescent on the door leaf or door frame shall function similarly. However, there is a condition that total width of intumescent seals and the length of interruption shall be remained the same as tested. Also it is suggested that the density of the timber lipping and timber frame for interchanging the intumescent seals shall be at least the same such that timber base to accommodate the intumescent seal shall be similar.
- (w) Both of the fire seals and fire & smoke seals have the same constructions and material used, except that two plastic fins are incorporated in the fire & smoke seals which are actually for smoke control purpose only. Therefore, the proposal of replacing the fire & smoke seals by fire seals, or vice versa, with the same sizes is not expected to have any detrimental effect to the fire resistance performance achieved by the tested prototype. In addition, the total number of seals may be varied, provided that the intumescent bodies of seals are not less than tested. With the total number of intumescent bodies of seals remain unchanged or increased, the fire resistance performance of the tested prototype is expected to be maintained.
- (x) The perimeter smoke seals are actually for smoke control purpose only and do not have contribution to the fire resistance performance of doorsets. Therefore, the proposed doorsets may be with or without perimeter smoke seals. On the other hand, a doorset with bottom drop seal is considered to present similar or increased level of risk of losing integrity performance since part of the door leaf core has been cut off for the installation of bottom drop seal. Hence, the proposed doorsets may be with or without bottom drop seals and the fire resistance performance of the tested prototype is expected to be maintained.

- (y) For the threshold gap clearance, the 6 mm gap gauge will not be applied to assess for the integrity performance, therefore the threshold clearance may be increased larger than 6 mm. It is as required by the test standard that the furnace pressure at the sill level is negative, i.e. the flow of gases at the threshold clearance is from the unexposed side to the exposed side, which is not as onerous as the situation for the clearance at the upper part of the doorset. Consequently increase of the gap clearance at the bottom threshold up to 10 mm is considered acceptable.
- (z) Direct test evidence from R19J11-1A showed that spray paint was applied on the surface of the composite timber doorset and the composite timber doorset satisfied at least 60 minutes fire resistance performance. It is proposed that spray paint or water-based paint may be applied on the surfaces of door frame, door leaf, transom panel and glazed bead, while the paint shall be previously tested with sufficient supporting test evidences. Since the structure of doorset and glazed bead will not be affected when the water-based paint is applied on the surfaces, it is not expected to have any detrimental effect on the fire resistance performance achieved, provided that the doorset and glazed bead are maintained the same as the tested prototype.
- (aa) It is proposed that the jambs and head of door frame may be installed with 'UP1212' smoke seals as tested and described in R13J13-1. From the test evidence of R13J13-1, the door frame of doorset 'A' was installed with 'UP1212' smoke seal with sizes of 12 mm by 12 mm and the doorset 'A' satisfied at least 120 minutes integrity and insulation performance with respect to BS EN 1634-1: 2008. Direct test evidence from R13J13-1 showed that the application of 'UP1212' smoke seal will not adversely affect the fire resistance performance of the doorset. Therefore, the proposal of installing the 'UP1212' smoke seals as tested and described in R13J13-1 to the door frame is positively appraised.
- (bb) It is proposed that the gaps between the meeting edges of door leaves; the door frame and door leaves may be maximum 4.5 mm. From the test evidence of R21D09-1A, the gaps between the meeting edges of door leaves; the door frame and door leaves ranged from nominal 1.5 mm to 5.0 mm. No failure was observed regarding to the door leaves of the composite timber doorsets during the heating period of 60 minutes. Therefore, the application of maximum 4.5 mm gaps between the meeting edges of door leaves; the door frame and door leaves, which is within the tested range, is considered as acceptable. The above proposal is not expected to have any detrimental effect towards the fire resistance performance achieved by the tested prototype, provided that the sizes and numbers of fire seals are the same as tested.

4.2 Insulated composite timber doorsets for 60 minutes integrity and insulation (I₁) with respect to BS EN 1634-1: 2014 or BS 476: Part 22: 1987

Proposal

The proposed constructions are insulated composite timber doorsets which are basically similar to those tested and described in R19M24-1A, except that the concealed door closer is removed and the thickness of nominal 25 mm thick 'Pyrotech' glazed panels are increased to nominal 30 mm thick.

It is proposed that the test evidences R19M24-1A and R21D09-1A for the insulated composite timber doorsets, which were tested in accordance with BS EN 1634-1: 2014 and BS EN 1634-1: 2014 + A1: 2018 respectively, are suitable for the use in the assessment against BS 476: Part 22: 1987.

The proposed insulated composite timber doorsets may provide 60 minutes integrity and insulation (I₁) in accordance with BS EN 1634-1: 2014 or BS 476: Part 22: 1987 with the same modifications as state in Section 4.1, Proposal (a) to (bb).

Discussion

From the test evidence of R19M24-1A, the single-acting, single door-leaf composite timber doorset with transom panel (doorset 'A') satisfied 72 minutes integrity, 72 minutes insulation (I₁ doorset excluding the panels), 72 minutes insulation (I₁ transom panel), 55 minutes insulation (glazed panel) criteria in accordance with BS EN 1634-1: 2014.

The single-acting, unequal double-leaf composite timber doorset with transom panel (doorset 'B') as tested and described in R19M24-1A satisfied 72 minutes integrity, 38 minutes insulation (I₁ doorset excluding the panels), 72 minutes insulation (I₂ doorset excluding the panels), 72 minutes insulation (I₁ transom panel), 61 minutes insulation (left glazed panel) and 53 minutes insulation (right glazed panels) criteria in accordance with BS EN 1634-1: 2014. The insulation (I₁ doorset excluding the panels) failure occurred when the 180 °C rise of maximum temperature of the unexposed surface of specimen reached and measured by thermocouple S90 after a heating period of 38 minutes. The thermocouple S90 was fixed at the top right portion of right door leaf of the composite timber doorset 'B' around the concealed door closer. Regardless the localised insulation failure occurred at the concealed door closer and glazed panels, no other failure was observed from the composite timber doorset 'B' and the proposed composite timber doorset without concealed door closer is expected to satisfy at least 60 minutes insulation (I₁ doorset excluding the panels). Secondary test evidence from R21D09-1A showed that a similar double-leaf composite timber doorset with transom panel (doorset 'B') was tested without concealed door closer and satisfied 73 minutes integrity and insulation (I₁ doorset excluding the panels, transom panel and glazed panels) performance with respect to BS EN 1634-1: 2014 + A1: 2018. The test data from R21D09-1A was tested with respect to BS EN 1634-1: 2014 + A1: 2018, we have reviewed this data against the current test procedures as per BS EN 1634-1: 2014 and found it suitable for this assessment.

The composite timber doorset 'B' as tested and described in R21D09-1A has similar construction details to the composite timber doorset 'B' as tested and described in R19M24-1A. Therefore, the test evidence from R21D09-1A provide confidence that the composite timber doorset 'B' as tested and described in R19M24-1A without concealed door closer may continue to satisfy at least 60 minutes fire resistance performance.

As discussed in Section 4.1, the thickness of 'Pyrotech' glazed panels shall be increased in order to achieve at least 60 minutes insulation performance. Therefore, the proposed insulated composite timber doorsets, without concealed door closer and incorporated with nominal 30 mm thick 'Pyrotech' glazed panels, are expected to satisfy at least 60 minutes integrity and insulation (I₁) criteria of BS EN 1634-1: 2014.

It is proposed that the test evidences R19M24-1A and R21D09-1A for the insulated composite timber doorsets, which were tested in accordance with BS EN 1634-1: 2014 and BS EN 1634-1: 2014 + A1: 2018 respectively, are suitable for the use in the assessment against BS 476: Part 22: 1987. In reviewing these tests, we have considered the design and installation of the specimens, the surrounding construction, the initial furnace temperature, the pressure in the furnace, the changes in the integrity criteria and the behaviour of the fire tests. It is expected that if these fire tests had been conducted in accordance with BS 476: Part 22: 1987, very similar results would have been achieved.

Fire tests to BS EN 1634-1: 2014, BS EN 1634-1: 2014 + A1: 2018 and BS 476: Part 22: 1987 have the same furnace temperature-time curve, i.e., the standard ISO temperature time curve represented by $T = 345 \log_{10}(8t + 1) + 20$, where T is the furnace temperature rise and t is the time of heating conditions. However, a more severe overpressure requirement of 5 Pa required by BS EN 1634-1: 2014 and BS EN 1634-1: 2014 + A1: 2018 was used, which was normally deemed to be more onerous. The passing criteria for the standards of BS EN 1634-1: 2014, BS EN 1634-1: 2014 + A1: 2018 and BS 476: Part 22: 1987 are summarised as follows:

Integrity. Monitor the unexposed face of the specimen for evaluation of integrity. A failure of the test construction to maintain integrity occurs when collapse or sustained flaming on the unexposed face occurs or impermeability is exceeded.

Insulation. Failure occurs when (a) the mean unexposed face temperature increases by more than 140 °C above its initial value; or (b) the temperature recorded at any position on the unexposed face is in excess of 180 °C above its initial value; or (c) when integrity failure occurs.

Having stated these criteria, there is no difference between the tests to BS EN and British standards.

As discussed, the insulated composite timber doorsets as tested and described in R19M24-1A and R21D09-1A, without concealed door closer and incorporated with nominal 30 mm thick 'Pyrotech' glazed panels, are expected to satisfy at least 60 minutes integrity and insulation (I₁) criteria of BS EN 1634-1: 2014. Since the integrity and insulation criteria of BS EN 1634-1: 2014, BS EN 1634-1: 2014 + A1: 2018 and BS 476: Part 22: 1987 are basically the same, we can conservatively conclude that the proposed insulated composite timber doorsets will achieve at least 60 minutes integrity and insulation criteria if

tested to BS 476: Part 22: 1987.

The proposed insulated composite timber doorsets as tested and described in R19M24-1A and R21D09-1A are expected to achieve at least 60 minutes integrity and insulation (I₁) in accordance with BS EN 1634-1: 2014 or BS 476: Part 22: 1987 with the same modifications as state in Section 4.1, Proposal (a) to (bb). The same reasons as discussed in Section 4.1, Discussion (a) to (bb) are also applied to the proposed insulated composite timber doorsets.

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4.3 Use of alternative Ironmongeries (60 minutes FRP)

Proposal

The following discussion relates to specific forms of hardware and provides the essential generic specifications. The acceptability of alternative hardware is based on the following principles:

- i. a like-with-like substitution, in terms of materials and dimensions specifications;
- ii. no limitations are given in this report for entirely surface fixed items which do not detract from the specifications of the tested prototype doorset;
- iii. different forms of hardware that perform the same function as tested items but are considered to present a similar or lesser risk because of:
 - (a) similar or reduced quantities of door frame or leaf material removed for installation;
 - (b) similar or reduced penetration of the door leaves; and
 - (c) similar or reduced overall mass of metal introduced into the leaf edge clearance gap.
- iv. similar or higher melting point of essential components;
- v. the availability of test evidence(s) relating to items of hardware, either from full scale or pilot tests with respect to BS EN 1634-1: 2008;
- vi. whether the tested doorset was latched or unlatched during the test.

Discussion

4.3.1 Surface mounted door closers

Incorporation of any alternative brand of overhead surface mounted door closers of cast aluminium, iron/steel material, with steel arm, linkages, fixings and brackets is deemed to be suitable. The closers shall be entirely surface mounted and shall not introduce any component into the leaf to frame clearance gap. These closers shall have power ratings suited to the weight and sizes of the door leaf.

The prototype tested door closer as described in R19M24-1A was 'Ryobi 9903' surface mounted overhead door closer, which achieved at least 60 minutes fire resistance performance. Therefore, the mounting of alternative brands of overhead surface mounted door closers, with effective supporting test evidences, on either the exposed or unexposed face of the door leaves is not expected to have any detrimental effect on the fire resistance performance achieved.

4.3.2 Concealed door closers (For doorset with I_2 insulation to BS EN 1634-1: 2014)

The installation of 'Dorma, ITS96' concealed door closer as tested and described in R19M24-1A is deemed to be suitable for composite timber doorsets with 60 minutes integrity and insulation (I_2) in accordance with BS EN 1634-1: 2014. The 'Dorma, ITS96' concealed door closer as tested in R19M24-1A had satisfied at least 60 minutes fire resistance performance without failure on the area of closer. Therefore, the mounting of the tested 'Dorma, ITS96' concealed door closers on the door leaves is not expected to have any detrimental effect on the fire resistance performance achieved.

4.3.3 Door hinges

It is proposed to incorporate any alternative brand of stainless steel ball bearing butt hinges or spring hinges with sizes of 102 mm x 102 mm x 3 mm thick. The stainless steel butt hinges and spring hinges may allow 10% variation in sizes. The distance of top and bottom hinges, as measured from the nearest end to the edges of the door leaf, shall not exceed the minimum edge distance of the tested specimen. The grade of the hinges shall be strong enough to hold the door leaf.

From the test evidence of R19M24-1A, the composite timber doorset 'A' was installed with 'GUTE' and 'Winco US400' spring hinges with sizes of 102 mm x 102 mm x 3 mm thick. The prototype tested composite timber doorset 'B' as described in R19M24-1A was installed with 'Samco', 'Dorma 3904', 'Yale' and 'WUYINGHAO' butt hinges with sizes of 102 mm x 102 mm x 3 mm thick. Since there was no integrity failure related to the hinges throughout the heating periods of 60 minutes, the substitution of any alternative brand of butt hinges or spring hinges with sizes mentioned above and of steel material is not expected to have any detrimental effect on the fire resistance performance achieved.

Furthermore, the 'SOSS', 'YALE', 'UA' and 'Dorma' concealed hinges with sizes of 118 mm x 45 mm x 28 mm as tested in R19M24-1A had satisfied at least 60 minutes fire resistance performance without failure on the hinge area. Therefore, the mounting of the tested concealed hinges on the door leaves is not expected to have any detrimental effect on the fire resistance performance achieved.

All hinges shall have power ratings suited to the weight and sizes of the door leaf and they shall not introduce any component into the leaf to frame clearance gap.

4.3.4 Locksets

Incorporation of any alternative brand of cylindrical locksets with maximum casing sizes of 38 mm diameter and mortise locksets with maximum casing sizes of 88 mm by 240 mm by 24 mm (overall thickness) is deemed to be suitable for installation. Locks or latches shall be fitted not higher than 1,100 mm and not lower than 900 mm from the floor level. Lock or latch bolts shall be of materials having a melting point of not less than 850 °C. Locksets incorporating with surface mounted handles, knobs and cover trim are considered of only cosmetic significance and therefore no constraints are considered necessary with respect to colour, finish, material or style.

The prototype tested doorset as described in R19M24-1A was incorporated with a 'Gamma DC8200-A01' mortise lockset. From the test evidence of R14H03-1, the prototype tested doorset was installed with 'Ezset BPLJ1062' latch bolt lock, 'Gamma DC8200' mortise lock and 'Zone 5871ET' latchsets of a cylinder with diameter of 38 mm. In these test evidences, no potential failure around the lockset area was observed. The proposed sizes was based on the maximum size that had been tested and it is believed that for any mortise lock casing size within the proposed size shall not significantly deteriorate the fire resistance performance of the doorset. The use of alternative locksets with maximum casing sizes as mention above and of steel material is considered suitable for incorporation and not expected to affect on the fire resistance performance.

All other details such as intumescent materials and casings for the locksets shall be the same as tested in R19M24-1A to provide 60 minutes fire resistance performance. It is also in consideration that no combustible material shall be incorporated in the construction of the locksets.

4.3.5 Door Viewer

It is possible to incorporate a door viewer onto the door leaf with its insertion not exceeding 18 mm in diameter as it is required for coring through the door leaf. In our opinion, insertion of steel door viewer with which does not exceeding 18 mm in diameter is not expected to have any detrimental effect on the fire resistance performance achieved by the doorset. The door viewer shall be bedded with fire sealant (with at least 60 minutes FRP) and shall be filled up the gap between the door core and door viewer.

4.3.6 Flush bolts

It is possible to incorporate any alternative brand of flush bolts with sizes of 22 mm deep by 25 mm wide by 200 mm long or smaller to the proposed doorsets. From the test evidence of R19M24-1A, the composite timber doorset 'B' was incorporated with 'UA' flush bolts without any failure occurred. The flush bolts which made of steel or stainless steel material is not expected to have any detrimental effect on the fire resistance performance achieved, provided that the fixing of the flush bolts are kept unchanged. Other materials may be allowed to provide effective supporting test evidences. Since the structure of doorsets will not be affected when the flush bolts are incorporated onto the door leaves, the proposal is positively appraised. All the intumescent materials for the flush bolts and sizes and numbers of fire seals used at the meeting edges of door leaves shall be the same as tested evidence provided.

4.3.7 Electric bolts

From the test evidence of R19M24-1A, the composite timber doorset 'B' was installed with 'Yale YDB-100' electric drop bolt lock at the bottom edge of transom panel and top edge of left door leaf. The electric bolt satisfied at least 60 minutes fire resistance performance and hence the incorporation of the electric bolt to the proposed doorsets is not expected to have any detrimental effect on the fire resistance performance achieved. All the intumescent materials for the electric bolts and sizes and numbers of fire seals used at the edges of door leaves shall be the same as tested evidence provided.

4.3.8 Miscellaneous surface mounted hardware

Surface mounted steel pull handles, kick plates, exit device, door selector, door guard chain, bolts, magnetic lock and magnetic door contact are considered to be suitable for screwing onto the door leaf. These hardware are non-combustible, except for magnetic door contact, and do not require coring into the door leaf. With the prototype tested doorset also achieving at least 60 minutes integrity and insulation, therefore the fire resistance performance achieved is expected to be maintained. In cases where the steel pull handles are required to be screwed through the door leaf, the gap between surface of cored

holes and the handle screws shall be filled with intumescent mastic so that any presence of gaps will be sealed to avoid adversely affect the fire resistance performance achieved.

Panic bolt which is entirely surface mounted may be acceptable following the condition as mentioned above.

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5 CONCLUSION

The proposed insulated composite timber doorsets are based on the specimens as tested and described in R19M24-1A and modified as described in section 4.

The proposed insulated composite timber doorsets may provide a fire resistance performance of 60 minutes integrity and insulation (I₂) with respect to BS EN 1634-1: 2014.

6 DECLARATION BY APPLICANT

We, HK Pro-Tech Fire Prevention Building Materials Ltd., confirm that the materials, components or elements of structure, which are the subject of the test report being reviewed, has not to our knowledge been subjected to another test to the standard against which the assessment is being made.

We agree to withdraw this assessment from circulation should the component or element of structure be the subject of another test to the standard against which the assessment is being made.

We are not aware of any information that could affect the conclusions of this assessment.

If we subsequently become aware of any such information we agree to ask the assessing authority to withdraw the assessment.

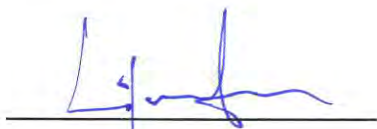
7 VALIDITY

This assessment is based on test data, experience and the information supplied. The assessment will be invalidated if the assessed construction is subsequently tested since actual test data is deemed to take precedence over an expressed opinion. Any changes in the specification of product will invalidate this assessment. This assessment relates only to the specimen assessed and does not by itself infer that the product is approved under any other endorsements, approval or certification scheme. Since the appraisal method is under development, the laboratory reserved the right to supersede this assessment in case the appraisal method had been changed.

This report only relates to the specimen(s) tested and may only be reproduced by the sponsor in full, without comment, abridgement and modifications.

8 SIGNATORIES

Assessment by:



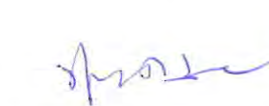
Dr. SZE Lip-kit

Authorized Signature

Research Engineering Development

Façade Consultants Limited

Reviewed by:



Ir Dr. YUEN Sai-wing, MHKIE (Fire)

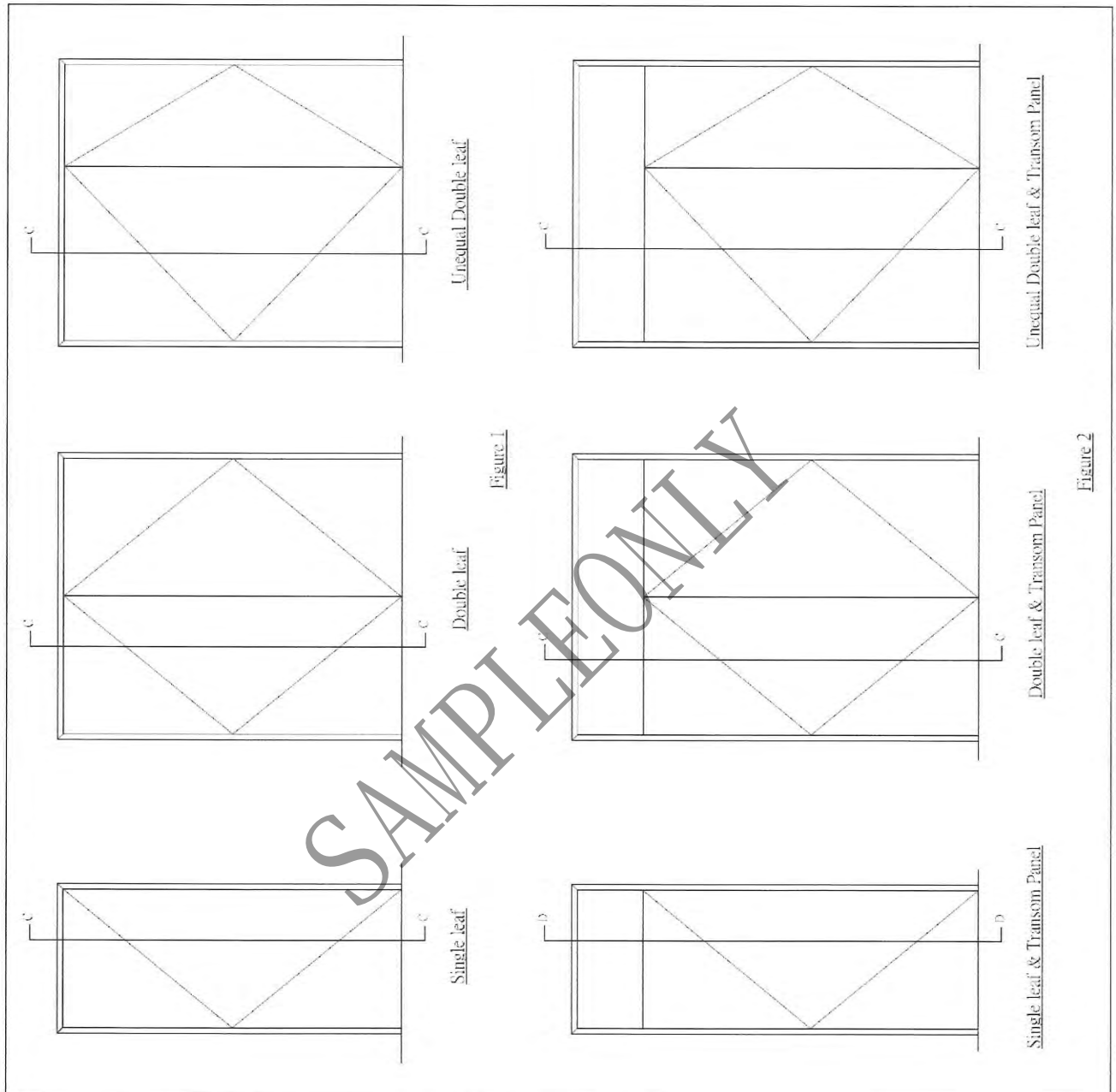
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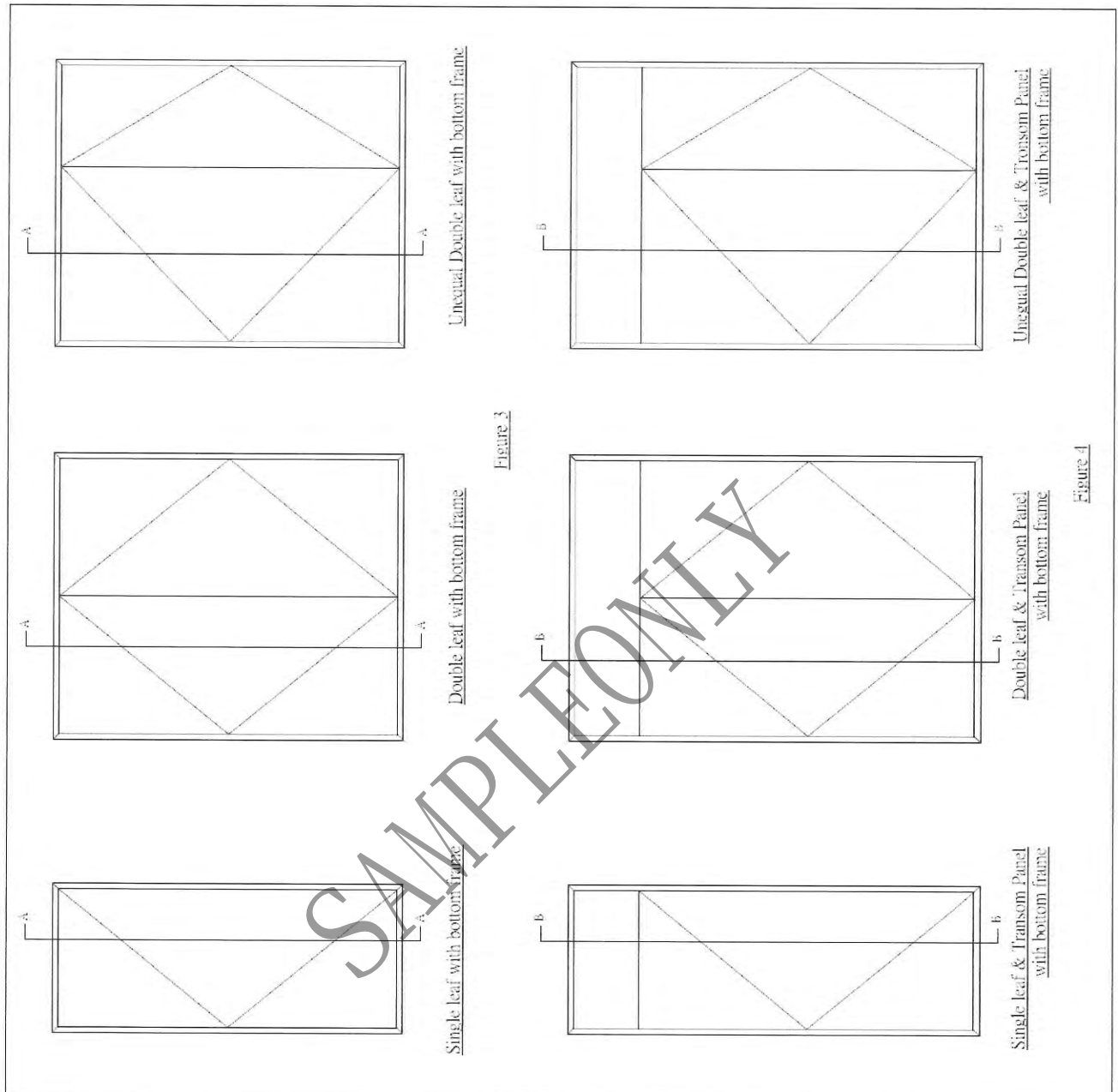
Research Engineering Development

Façade Consultants Limited



APPENDIX – DRAWINGS PROVIDED BY THE APPLICANT





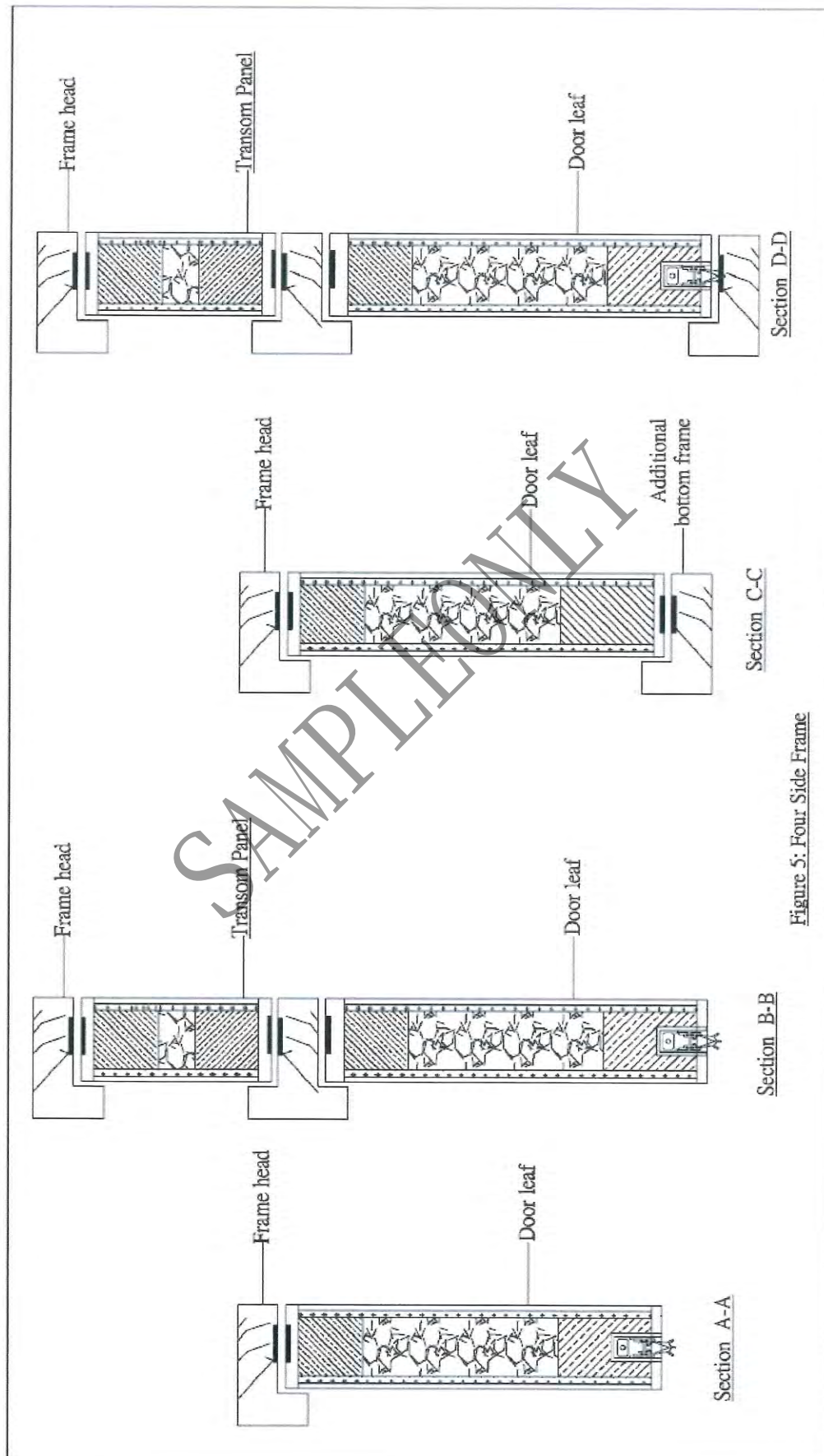


Figure 5: Four Side Frame

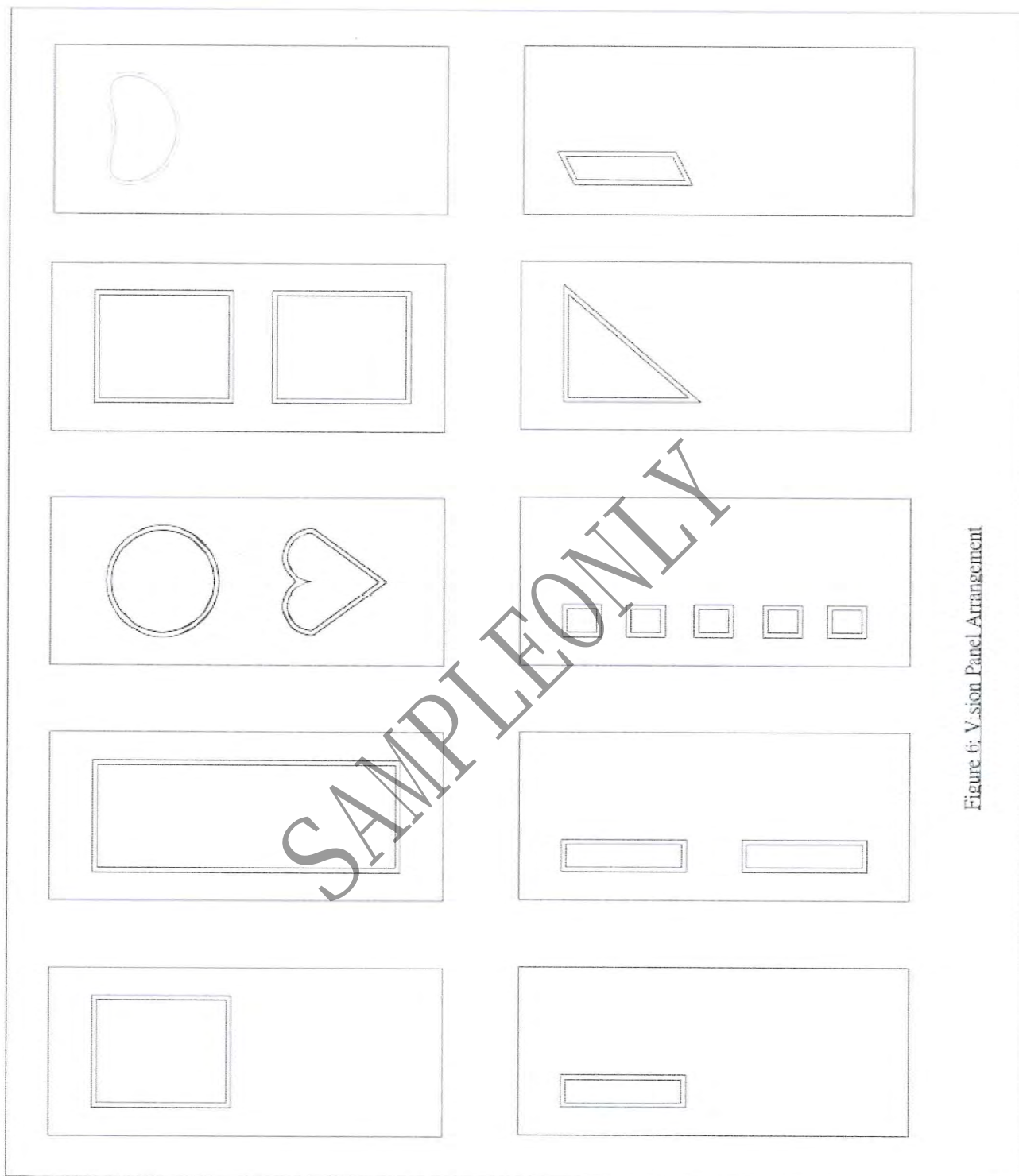


Figure 6: Vision Panel Arrangement

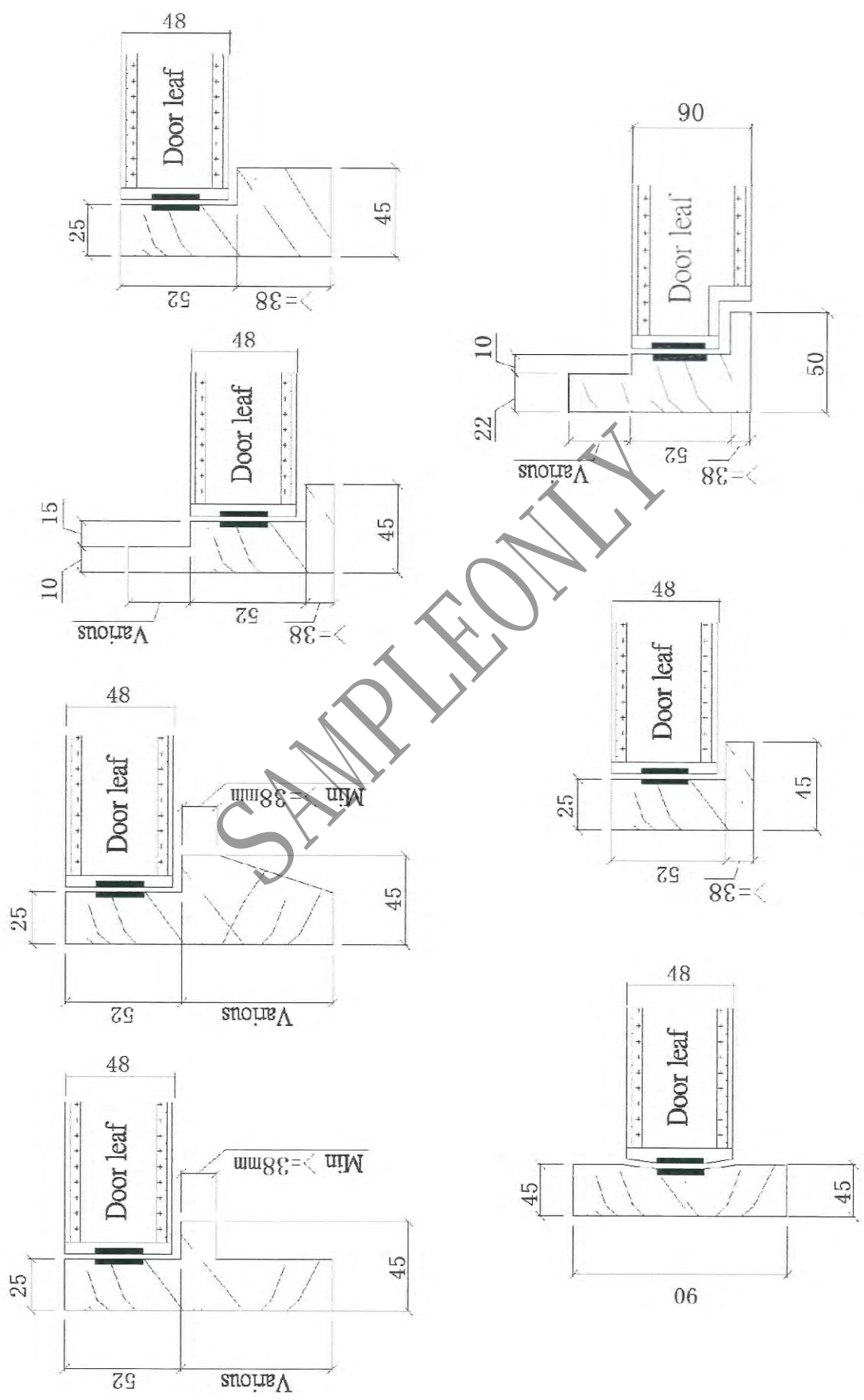


Figure 7: Modified Door Frame Profile

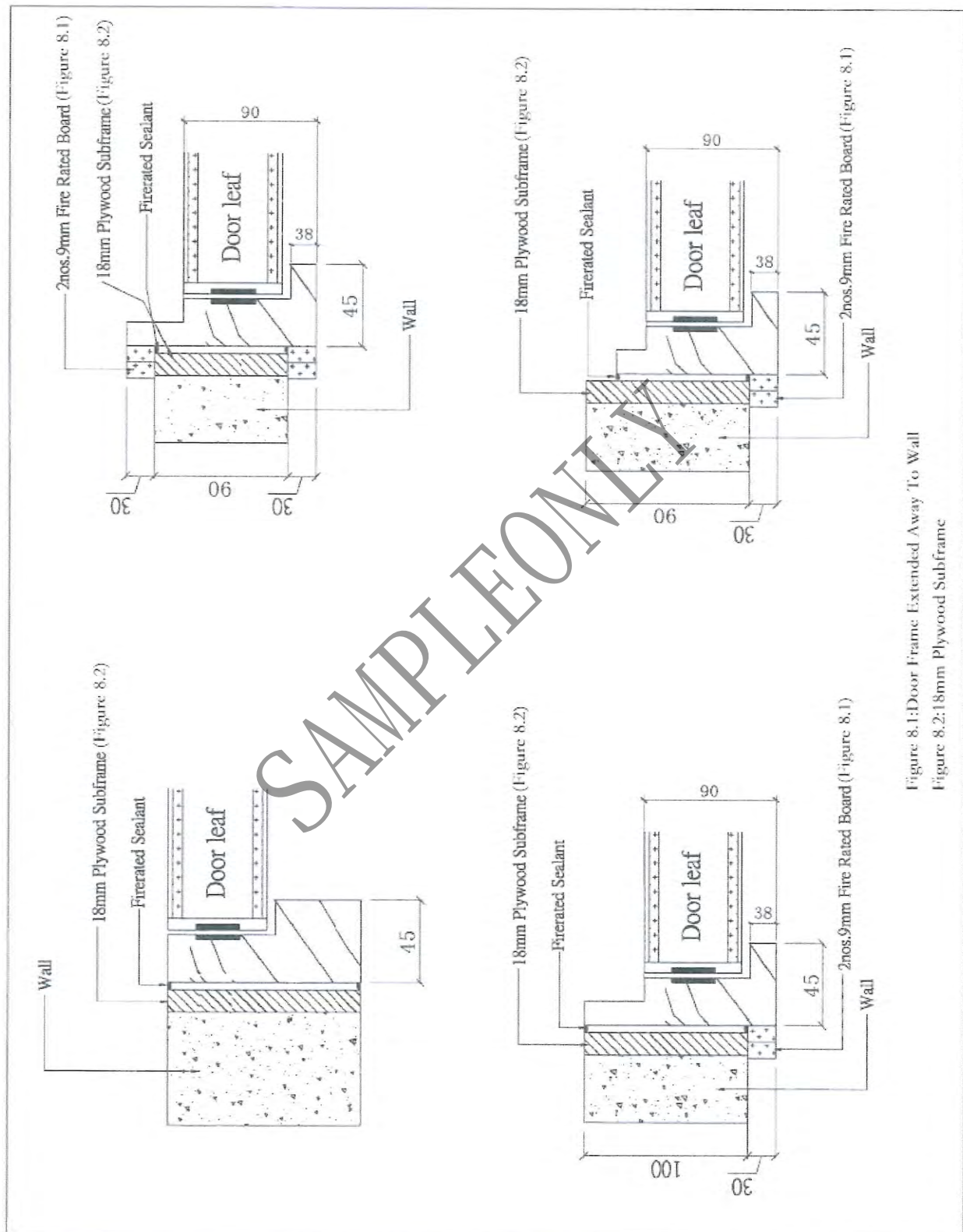


Figure 8.1: Door Frame Extended Away To Wall

Figure 8.2: 18mm Plywood Subframe

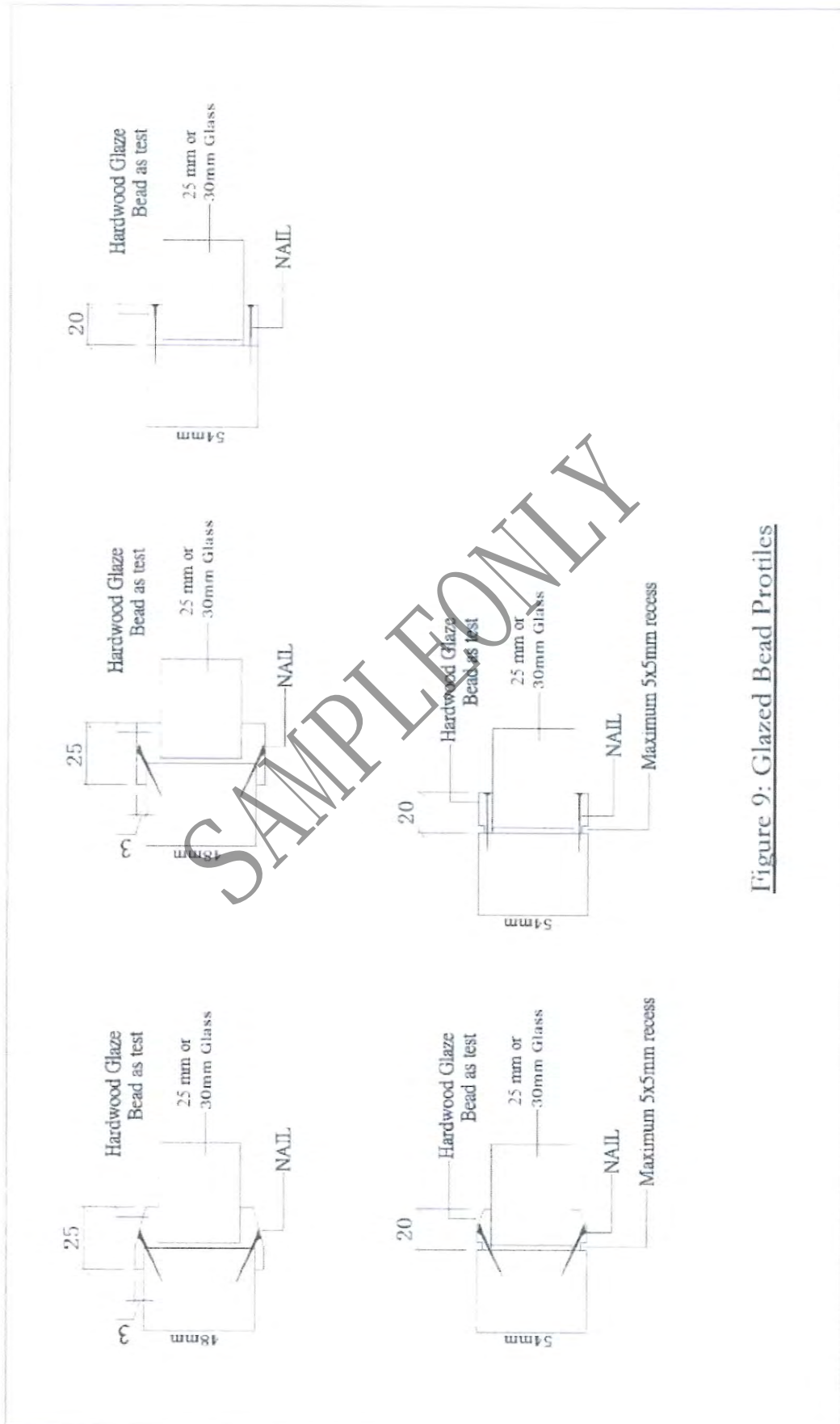
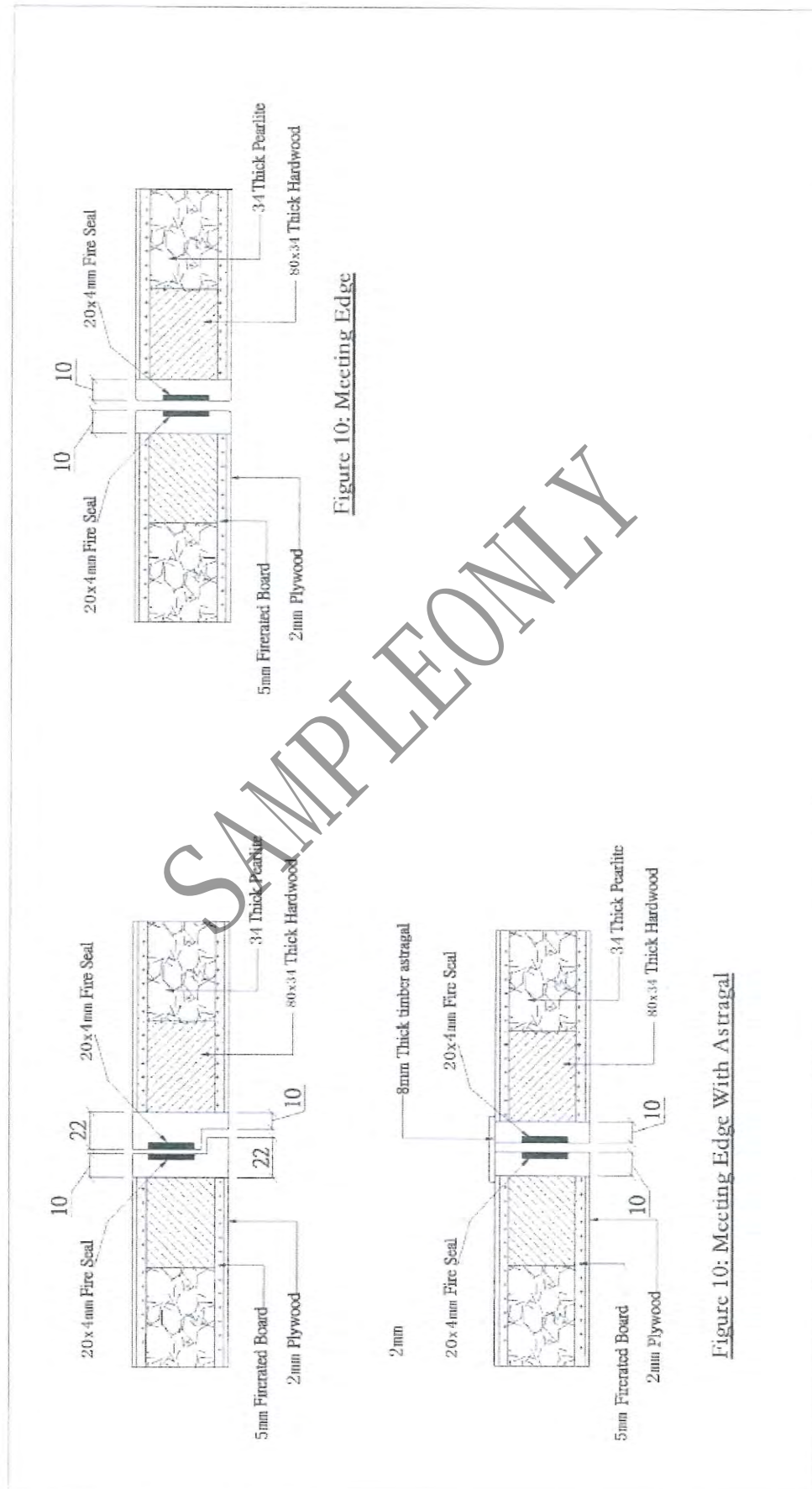


Figure 9: Glazed Bead Profiles



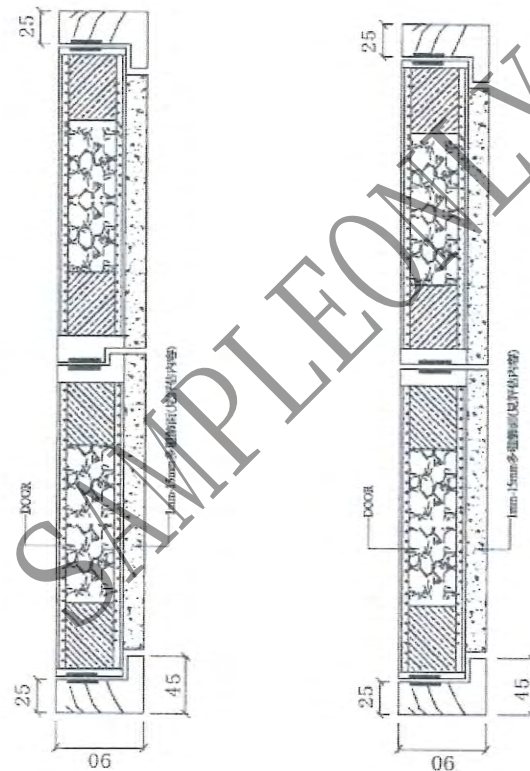
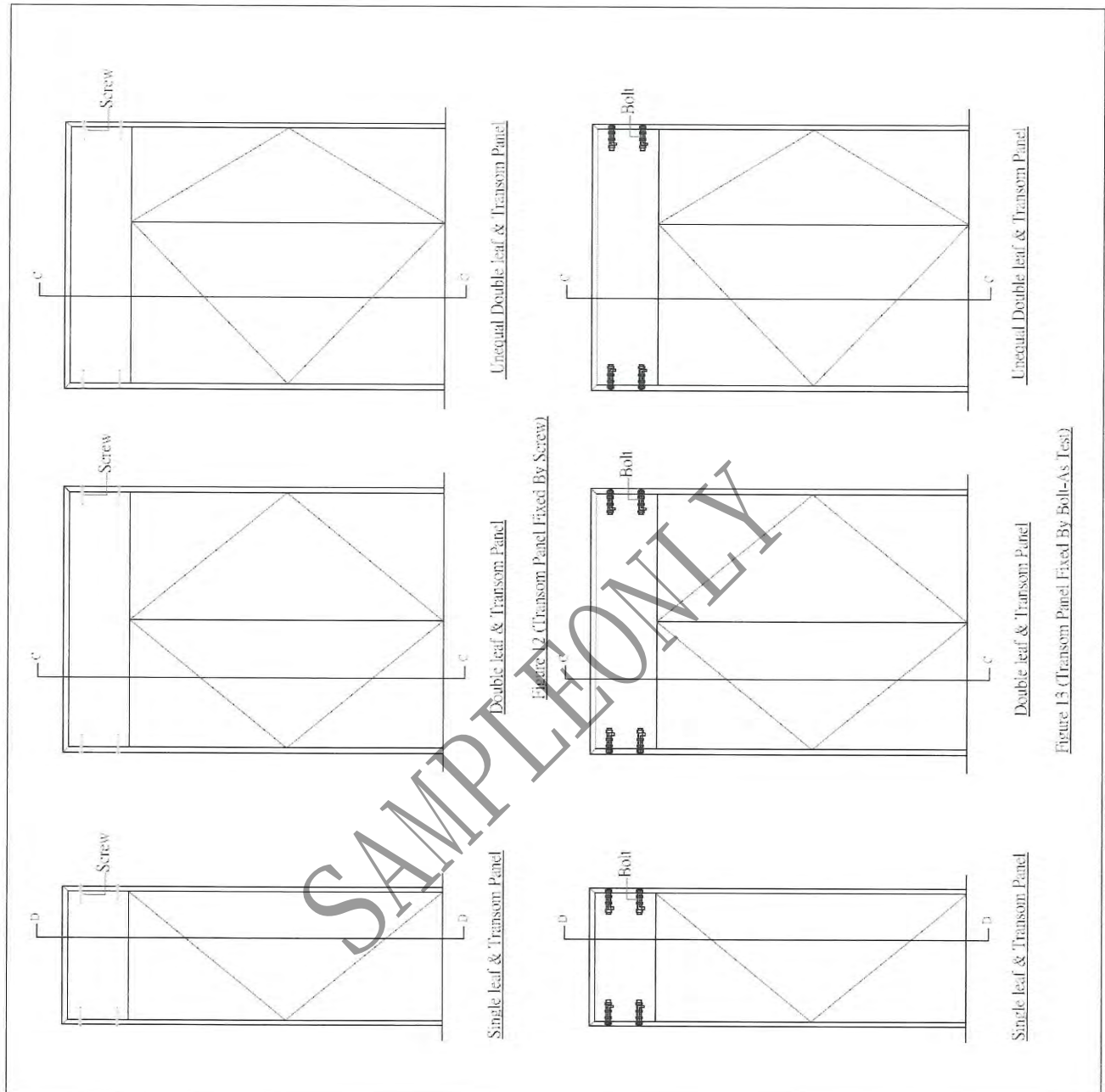


Figure 11



- End of report -

HK Pro-Tech Fire Prevention Building Materials Ltd.

Unit B, 22nd Floor, Johnson Centre, 13 Hau Fook Street,
Tsim Sha Tsui, Kowloon, Hong Kong

Date: 21 October 2022

Our Ref: R22K18-1A

TO WHOM IT MAY CONCERN

Re: Assessment Report no. R20H31-1A Issue 1 – Fire Resistance Performance of Insulated Composite Timber Doorsets For 60 Minutes Integrity and Insulation with respect to BS EN 1634-1: 2014 or BS 476: Part 22: 1987, Depending on Designs

The RED assessment report no. R20H31-1A_Issue 1 was issued on 11 August 2021 and will be expired on 5 November 2022. The specification and interpretation of test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. Whilst RED has conducted a review of the procedures adopted for the supporting data to ensure they are consistent with current practices, the assessment report no. R20H31-1A_Issue 1 has been reviewed and found satisfactory.

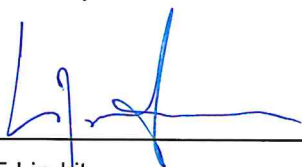
Therefore, it is recommended that the assessment report no. R20H31-1A_Issue 1 is valid until 4 November 2025 and another review shall be undertaken by 3 November 2025.

Declaration by the Applicant:

By distributing this copy of technical review, we, HK Pro-Tech Fire Prevention Building Materials Ltd., confirmed that there have been no changes to the material specifications, nor the methods of construction of the test specimen considered in the original appraisal of assessment report no. R20H31-1A_Issue 1.

Yours Sincerely,

Assessment by:



Dr. SZE Lip-kit

Authorized Signature

Research Engineering Development
Façade Consultants Limited

Reviewed by:



Ir Dr. YUEN Sai-wing, MHKIE (Fire)

Authorized Signature

Research Engineering Development
Façade Consultants Limited

This document is confidential and remains the property of RED. If contradictory data or any related evidence becomes available to RED, the assessment will be unconditionally withdrawn and the sponsor will be notified. This document is based on the given information, in which is declared by report sponsor that no contradictory data has become available.