

ASSESSMENT REPORT

Fire Resistance Performance of Timber Doorset Assemblies

Report No.: R16E12-1A

Issue Date: 5 July, 2016

Date of Review: 4 July, 2021

Report Sponsor

Garish Crown Fire Engineering & Consultancy
Unit 25, Upper Ground Floor,
Block B, Wah Lok Industrial Centre (Phase 1),
37-41 Shan Mei Street, Fotan, Shatin, HK

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

CONTENT

Section	Description	Page
1	INTRODUCTION	3
2	ASSUMPTIONS	3
3	SUPPORTING DATA	4
4	PROPOSAL & DISCUSSION	9
5	CONCLUSION	19
6	DECLARATION BY APPLICANT	19
7	VALIDITY	19
8	SIGNATORIES	19

REVISION HISTORY

Issue date (DD/MM/YYYY)	Issue number	Remark
05/07/2016	0	Initial version

FIRE RESISTANCE PERFORMANCE OF TIMBER DOORSET ASSEMBLIES

1 INTRODUCTION

This assessment report presents an appraisal of a single-acting, double-leaf timber doorset as tested and described in R07L06B issued by Research Engineering Development Facade Consultants Limited (RED). It is prepared for Garish Crown Fire Engineering & Consultancy of Unit 25, Upper Ground Floor, Block B, Wah Lok Industrial Centre (Phase 1), 37-41 Shan Mei Street, Fotan, Shatin, Hong Kong. The proposed doorsets are required to provide a fire resistance performance of 60 minutes integrity and insulation with respect to BS 476: Part 22: 1987.

2 ASSUMPTIONS

The proposed doorsets are assumed to be installed in a similar manner to that of the previously tested doorset by competent installers. It is assumed that the modified systems 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 related to the 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 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 If contradictory data or any related evidence becomes available to RED, the assessment will be unconditionally withdrawn and the sponsor will be notified.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 Evidences

Report no.	Sections	Description
Primary Test Evidences		
R07L06B	4.1 - 4.2	Supporting test evidence for the general construction of doorsets.
Secondary Test Evidences		
WF 167746	4.2	Supporting test evidence for the use of "Pyroplex" intumescent seals
WARRES 118555	4.2	Supporting test evidence for the use of "Lorient" Intumescent seals
BETC-2000-F-012	4.2	Supporting test evidence for the use of 30 mm thick Longdian insulated glass
I3E06	4.2	Supporting test evidence for the use of Keymax EI60/60-25 insulated glass
R08A17	4.2	Supporting test evidence for the use of 'Bonco 383' concealed door closer and 'GEZE TS 550' floor spring
IT13-154	4.2	Supporting test evidence for the use of "Ying Mu" Intumescent seals

3.2 Primary Test Evidences

3.2.1 RED Test Report R07L06B*

A fire resistance test in accordance with BS 476: Part 22: 1987 on a partially insulated, double-leaf, single-acting timber doorset was performed at the RED laboratory on 14 December, 2007. Test sponsor was Garish Crown Fire Engineering & Consultancy.

The double-leaf timber doorset had overall dimensions of 2,174 mm wide by 2,339 mm high. It was comprised of a timber door frame incorporated with equal door leaves. Each door leaf was with sizes of 1,055 mm wide by 2,300 mm high by 50 mm thick and hung to the door frame by 3 nos. of 'Commy HS -1016' stainless steel butt hinges with sizes of 102 mm by 102 mm. 'Commy 103' and 'Dorma TS-68' surface mounted overhead door closers were fixed on the unexposed side of left and right door leaf respectively. A 'Yale CA 5907 x US32D' mortise knob latchset and 2 nos. of 'Commy SA-1013' flush bolt were installed on the left and right door leaf respectively. There was 10 mm lipping applied around the perimeter of door leaves. The left and right door leaf was incorporated with a glazed panel with vision sizes of 305 mm wide by 805 mm high and 177 mm wide by 1,130 mm high respectively. An intumescent seal with sizes of 30 mm wide by 4 mm thick was installed at the jambs and head of door frame. An intumescent seal of 15 mm wide by 4 mm thick was installed at the meeting edge rebate of each door leaf. The assembly satisfied the integrity and insulation criteria of BS 476: Part 22: 1987 for 67 minutes (see R07L06B) for full details).

3.3 Secondary Test Evidences

3.3.1 Bodycote Warringtonfire WF Test Report No. 167746*

A fire resistance test stated to be in accordance with Section 6 of BS 476: Part 22: 1987 on a fully insulated, single-acting, double-leaf timber doorset with overall dimensions of 2,085 mm wide by 2,144 mm high was performed at the Bodycote Warringtonfire on 25 November 1996. The test sponsor was Pyroplex Limited who had permitted the use of this data. Each door leaf was with sizes of 1,000 mm wide by 2,100 mm high by 54 mm thick and hung to the door frame by 3 nos. of 102 mm by 35 mm wild flaps 'ASSA 3228' lift off stainless steel butt hinges. Each door leaf was incorporated with a 'Geze' surface mounted overhead door closer on the exposed surface. A mortise latch was fitted to the active door leaf. A 'Pyroplex' intumescent seal with sizes of 20 mm wide by 4 mm thick was installed at each jamb and head of door frame, central to the door leaf edge. The assembly satisfied the integrity and insulation criteria for 75 minutes of BS 476: Part 22: 1987 (see WF No. 167746 for full details).

*Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS476: Part 22: 1987 and found it suitable for this assessment.

3.3.2 Warrington Fire Research Centre WARRES No. 118555*

A fire resistance test stated to be in accordance with Section 6 of BS 476: Part 22: 1987 on a fully insulated, single-acting, unequal double-leaf timber doorset with overall dimensions of 1,191 mm wide by 2,092 mm high was performed at the Warrington Fire Research Centre on 4 June 2001. The test sponsor was Lorient Polyproducts Limited who had permitted the use of this data. The doorset was incorporated with unequal door leaves with sizes of 794 mm wide by 2,040 mm high by 54 mm thick and 300 mm wide by 2,040 mm high by 54 mm thick respectively. Each door leaf was hung to the door frame by 'Cooke Bros' hinges with blade sizes of 101 mm by 31 mm by 2 mm thick and incorporated with a 'Dorma' surface mounted overhead door closer on the exposed surface. A latch was fitted to the active leaf. A 'Lorient LP2004 (Batch 617 sodium silicate)' intumescent seal with sizes of 20 mm wide by 4 mm thick was applied along the rebate of the jambs and head of door frame, central to the door leaf edge. The assembly satisfied the integrity and insulation criteria for 75 minutes according to BS 476: Part 22: 1987 (see WARRES No. 118555 for full details).

3.3.3 Forte Test Report No. IT14-048*

A fire resistance test stated to be in accordance with BS EN 1634-1: 2008 on an insulated double-leaf composite timber door with glazed panel and overhead panel was performed by the Forte Testing and Consultants Company Limited on 20 January, 2014 was conducted. The doorset have nominal overall sizes of 2,529 mm wide by 2,950 mm high by 60 mm thick. The door leaves were 1,300 mm wide by 2,440 mm high by 54 mm thick and 1,150 mm wide by 2,440 mm high by 54 mm thick respectively. One of the door leaf was incorporated with vision panel fitted with 25 mm thick 'Ying Mu' insulated glass with vision sizes of 165 mm wide by 1,015 mm high.

The specimen satisfied the integrity and insulation criteria of BS EN 1634-1: 2008 for the following periods:

Integrity:	Cotton Pad	74 Minutes (No failure)
	Gap Gauge	74 Minutes (No failure)
	Sustained Flaming	73 Minutes (No failure)
Insulation(I₁):	Doorset without vision panel	73 Minutes[#]
Insulation:	Vision panel	73 Minutes[#]

Insulation performance was deemed not to satisfy simultaneously as the integrity failure occurred.

The test was discontinued after a heating period of 74 minutes (see IT 14-048 for full details).

* see note on page 4

3.3.4 RED Test Report No. R08A17*

A fire resistance test in accordance with Sections 6 and 7 of BS 476: Part 22: 1987 on 2 nos. of specimens of one single-leaf and one double-leaf, single-acting timber doorsets, namely doorsets 'A' and 'B' respectively, were performed at the RED laboratory on 23 January 2008. The test sponsor was Leung's Wooden Co., Limited who had permitted to use this data. Only doorset 'B' was considered in this assessment. The doorset 'B' was mounted such that the left door leaf swinging towards the heating condition whereas the right door leaf was with double-swing configuration.

Doorset 'B' had overall dimensions of 1,681 mm wide by 2,137 mm high. It was comprised of a timber door frame incorporated with equal door leaves which constructed by 44 mm thick hardwood door core sandwiched by 5 mm thick plywood facings on both sides. The left door leaf was hung to the door frame by 3 nos. of stainless steel butt hinges with sizes of 102 mm by 102 mm by 3 mm thick and the right door leaf was supported by 'GEZE TS 550' floor spring. Two door bolts were fixed on the unexposed surface of each door leaf. A 'Bonco 383' concealed door closer with 'Lorient' intumescent enclosure was installed at the left door leaf. Each door leaf was incorporated with a nominal 6 mm thick 'Firelite' glass panel with vision sizes of 130 mm wide by 780 mm high. An intumescent seal with sizes of 30 mm wide by 4 mm thick was installed at the left jamb and head of door frame and bottom rail's lipping of both door leaves. An intumescent seal with sizes of 15 mm wide by 4 mm thick was installed at the right jamb of door frame and meeting edge of right door leaf. 2 nos. of intumescent seal with sizes of 10 mm wide by 4 mm thick was installed at the meeting edge of left door leaf and right vertical edge of right door leaf. The door bolts were latched during the test. The specimen satisfied the integrity and insulation criteria of BS 476: Part 22: 1987 for 37 minutes and the test was discontinued after a period of 63 minutes. The integrity failure observed was due to sustained flaming occurred at both vision panels and no other integrity failure was observed during the heating period of 63 minutes (see R08A17 for full details).

* see note on page 4

3.3.5 FORTE Test Report No. IT13-154

A fire resistance test stated to be in accordance with BS EN 1634-1: 2008 on two doorsets, referenced 'Door A' and 'Door B'. The report only recorded the result of 'Door A'. 'Door A' was a single-acting, double-leaf, insulated composite timber doorset with single vision panel. The test was performed on 19 June 2013. The test sponsor was Leung's Wooden Co., Limited and Garish Crown Fire Engineering & Consultancy. The 'Door A' was mounted such that the left door leaf swinging towards the heating condition.

'Door A' had overall dimensions of 1,589 mm wide by 2,347 mm high by 100 mm thick. It was comprised of two unequal-width door leaves of sizes 2,300 mm high by 1,050 mm wide and 450 mm wide, respectively. Both door leaves were 62 mm thick. The section of door frame was 65 mm wide by 100 mm thick with 25 mm high single door stop. The door leaf was composed of 45 mm wide by 38 mm thick wooden slabs stiles and rails. The space in between the stiles and rails were filled with 38 mm thick perlite with density of 380 kg/m³. Both sides of the core were covered by two layers of magnesium oxide boards of 5 mm thick and 3 mm thick respectively. The facings of the door leaf was 4 mm thick MDF on exposed side and 4 mm thick plywood on unexposed side, respectively.

One of the door leaf was incorporated with a vision panel with vision sizes of 240 mm wide by 840 mm high fitted with 42 mm thick Hengbao glass. The depth of cover of glass edge was 25 mm. The leaves were hung to the door frame by 'BONCO BI-4435 BB' butt hinges and 'BEST PH102mm' spring hinges. The door leaf head was fitted with 'BONCO B3-2005' door closers.

The specimen satisfied the integrity and insulation criteria of BS EN 1634-1: 2008 for the following periods:

Integrity:	Cotton Pad	122 Minutes (No failure)
	Gap Gauge	122 Minutes (No failure)
	Sustained Flaming	122 Minutes (No failure)
Insulation:		122 Minutes

The test was discontinued after a heating period of 122 minutes** (see IT 13-154 for full details).

** the report has mentioned two termination times of 122 minutes and 127 minutes.

4 PROPOSAL & DISCUSSION

4.1. The use of test evidence, which was tested in accordance with BS EN 1634-1: 2008, for the assessment against BS 476: Part 22: 1987

Proposal

It is proposed that the test evidence, which was tested in accordance with BS EN 1634-1: 2008, for the assessment of doorsets with respect to BS 476: Part 22: 1987.

Discussion

The fire test on the insulated doorset as tested and described in Forte test report nos. IT13-154 and IT14-048 were stated to be carried out in accordance with BS EN 1634-1: 2008. From the test evidences, the doorsets with vision panels were tested in accordance with BS EN 1634-1: 2008. 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 behavior 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 test to BS EN 1634-1: 2008 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: 2008 was used, which was normally deemed to be more onerous. The passing criteria for the standards of BS EN 1634-1: 2008 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. Since the integrity and insulation criteria of BS EN 1634-1: 2008 and BS 476: Part 22: 1987 are basically the same, we can conservatively conclude that the insulated glazing assemblies as tested and described in Forte IT13-154 and IT14-048 will achieve similar results if tested in accordance with BS 476: Part 22: 1987.

4.2. Timber doorsets for 60 minutes integrity and insulation with respect to BS 476: Part 22: 1987.

Proposal

The proposed constructions are single-acting timber doorsets, basically similar to the one tested and described in R07L06B. The proposed timber doorsets may provide 60 minutes integrity and insulation in accordance with BS 476: Part 22: 1987 with the following variations:

- a) the doorset may be modified to single-leaf;
- b) alternative types of intumescent seal may be installed on either the stile lippings or the door frame, as shown in table 1;
- c) a modest variation (as much as 18%) in the aspect ratio of the door leaf is allowed, with 10% increase in area, as show in table 2 and figure 1, removal of vision panel is allowed;
- d) alternative types of glass and pane shapes and sizes for the glazed panels are possible, as shown in table 3;
- e) the meeting edge profile may be modified as plain without rebate, the intumescent seals arrangement may be modified as shown in figure 3;
- f) the depth of the rebate may be reduced from 18 mm to 15 mm provided that the intumescent seals applied to the door frame reveal increased from 15 mm wide to at least 20 mm wide;
- g) 'Bonco 383' concealed door closer with 'Lorient' intumescent enclosure as tested and described in R08A17 may be incorporated. The thickness of door leaves core shall be increased from 40 mm to 44 mm thick (the same thickness as tested and described in R08A17); and
- h) 'GEZE TS 550' floor spring as tested and described in R08A17 may be incorporated, provided that all the following requirements are satisfied:
 - i) the thickness of door leaves core shall be increased from 40 mm to 44 mm thick, which is the same as tested and described in R08A17;
 - ii) all the protection, construction and fixing details of the floor spring shall be the same as tested and described in R08A17;
 - iii) the door frame profiles and the application of intumescent seals at the vertical edges of door leaf and frame shall be the same as tested and described in R08A17 to accommodate the double-action of the floor spring; and
 - iv) An intumescent seal with sizes of 30 mm wide by 4 mm thick shall be fitted centrally at the head of door frame as tested and described in R08A17. 2 nos. of additional intumescent seal with sizes of 10 mm wide by 4 mm thick shall be fitted at the top edge of door leaves;
- i) the door leaf and door frame surface may be clad with maximum 1.0 mm thick stainless steel or aluminium sheet either on exposed or unexposed side.

Table 1 - Intumescent seal for proposed doorsets

Reference Test Report	No. of seal	Brand/Reference	Sizes
WF No. 167746	1	Pyroplex	20 mm x 4 mm thick
WARRES No. 118555	1	Lorient LP2004 (Batch 617 sodium silicate)	20 mm x 4 mm thick
Forte 13-154	1	Ying Mu	10 mm x 4 mm thick 30 mm x 4 mm thick

Table 2 - Door leaf sizes (60 minutes integrity and insulation)

Reference Test Report	Integrity (min)	Insulation (min)	Tested door leaf sizes			Proposed door leaf sizes		
			Max. Width (mm)	Max. Height (mm)	Max. Area (m ²)	Max. Width (mm)	Max. Height (mm)	Max. Area (m ²)
R07L06B	67	67	1,055	2,300	2.43	1,240	2,700	2.67

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

Table 3 - Aperture sizes of glazed panels for door leaves

Type of Glass	Reference Test Report	Integrity (min)	Insulation (min)	Tested aperture sizes			Proposed aperture sizes		
				Max. Width (mm)	Max. Height (mm)	Max. Area (m ²)	Max. Width (mm)	Max. Height (mm)	Max. Area (m ²)
6 mm thick Pilkington	R07L06B	67	--	305	805	0.25	351	1300	0.3
		67	--	177	1,130	0.2			
25 mm thick Ying Mu	IT14-048	73	73	165	1,015	0.17	190	1,167	0.2

For the above table, the minimum edge distance of glass panel shall be at least 120 mm, which is the same as tested and described in R07L06B. A reduction in width is required for an increase in height, or vice versa. All other details such as glazing materials and allowance for expansion shall be the same as tested.

Discussion

The test evidence provided by R07L06B showed that the single-acting, double-leaf timber doorset satisfied 67 minutes integrity and insulation criteria of BS 476: Part 22: 1987.

- a) The timber doorset as tested and described in R07L06B was with equal-width, double-leaf configuration. This is deemed to be more onerous as the presence of the meeting stiles and the 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 double-leaf doorset is expected to be maintained for a single-leaf doorset.
- b) It is important that the types, sizes and fitting details for the intumescent seals around the door edges remain the same as tested. These products can often exhibit significant characteristics, which could alter the fire performance obtained during the test. The adequacy of the use of at least 1 no. of 20 mm wide by 4 mm thick 'Lorient' or 'Pyroplex' intumescent strip enclosed in brown PVC channel and fixed on the stile lippings or the head and jambs of door frame is positively appraised to maintain 60 minutes integrity and insulation requirement, which are supported by the test evidences as shown in WF No. 167746 and WARRES No. 118555. Moreover, the meeting stiles of door leaves shall be placed with 15 mm wide by 4 mm thick intumescent strips which is the same as tested and described in R07L06B. The use of 'Ying Mu' intumescent seal is supported by the test evidence Forte IT13-154 which described a test of timber doorset to BS EN 1634-1: 2008 and achieved a fire resistance performance of at least 60 minutes. The size of the 'Ying Mu' intumescent seal to be applied shall replicate the tested size.
- c) The timber doorset as tested and described in R07L06B retained in position for at least 60 minutes. A modest variation (as much as 18%) in the aspect ratio of the door leaf is allowed, with 10% increase in area, as shown in Table 2. A performance overrun of more than 10% is used to justify this change. In our opinion, this modification 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. Moreover, the proposed sizes of the door leaf may be reduced to a minimum of 400 mm wide by 400 mm high. The proposed doorsets with reduced sizes is considered to present a similar or reduced level of risk. Therefore, the proposed doorsets are expected to satisfy at least 60 minutes integrity and insulation criteria of BS 476: Part 22: 1987, provided that the sizes and locations of intumescent seals for the doorsets are the same as tested. All other construction and fixing details of the doorsets shall be the same as tested.
- d) The test evidence provided by R07L06B showed that the double-leaf timber doorset incorporated with 6 mm thick 'Pilkington' glazed panels satisfied for at least 60 minutes integrity and insulation. The tested glazing system is expected to be adequate for retaining alternative types of glass in

position in a satisfactory manner for the required period of 60 minutes. Alternative types of glazed panels which are deemed to be suitable for incorporation are shown in table 3. All glazed panels have been proved by test evidence that satisfactory fire resistance performance of at least 60 minutes was achieved. From our experience, the proposed modification in the aspect ratio of the glazed panels with the area as shown in table 3 is not expected to affect the fire resistance performance achieved by the tested doorset. The glazing channels of the proposed glazing beads shall be at least 25 mm high and the profile may be varied as shown in Figure 2. For the fixing of the glass panel, especially for insulated glass, the most important parameter would be the height of the glazing beads, provided the height of the glazing beads is as proposed, the glazed panel shall achieve the fire resistance performance of 60 minutes. The minimum edge distance of glass panels shall be at least 120 mm, which is the same as tested and described in R07L06B. All other details such as glazing materials and allowance for expansion shall be the same as tested.

The door leaf constructed without the vision panels represent a reduced risk of integrity failure as no timber material is removed from the door leaf and substituted by heterogeneous materials which requires additional protection. The proposal is considered acceptable.

- e) In the test evidence R07L06B, the doorset was tested with rebated meeting edge between leaves. The rebated meeting edge is considered as a more onerous meeting edge design since theoretically, the chance for formation of through gap during a fire test is higher due to differential movement between door leaves. The modification from rebated meeting edge to plain meeting is considered represent a less onerous situation and is therefore acceptable. The arrangement of the intumescent seals at the meeting edge may be modified as shown in Figure 3. Since the total width of the intumescent seals protection fitted at the meeting edge is at least 30 mm wide in total, the achieved fire resistance performance shall be maintained.
- f) It is proposed that the depth of the frame rebate may be reduced from 18 mm to 15 mm. Since the doorset achieved the fire resistance performance of 67 minutes without the integrity and insulation failure. Also from the observation, there are no obvious weakness occurred at the clearance between the door leaf and the door frame. The results shows a confidence buffer for the minor adjustment on the rebate depth. However, in order to ensure a conservative approach to compensate for the modification, it is proposed that additional intumescent seals of 10 mm wide by 4 mm thick shall be fitted at the door frame so as to enhanced the overall fire resistance performance. Compare to the reduce of the rebate depth, the use of additional intumescent seals shall be a more functional approach to enhance the fire resistance performance.
- g) From the test evidence of R08A17, 'Bonco 383' concealed door closer with 'Lorient' intumescent enclosure was installed at the left door leaf. The double-leaf timber doorset satisfied the integrity

and insulation criteria of BS 476: Part 22: 1987 for 37 minutes. The integrity failures were due to sustained flaming observed around the glazed bead of vision panel on the right door leaf after a heating period of 37 minutes and around the glazed bead of vision panel on the left door leaf after the heating period of 57 minutes. Regardless these failures observed at the vision panels, the timber doorset satisfied at least 60 minutes integrity and insulation criteria of BS 476: Part 22: 1987 and no integrity failure was observed from the 'Bonco 383' concealed door closer with 'Lorient' intumescent enclosure during the test. Hence the above proposal is positively appraised, provided that the thickness of door leaves core shall be increased from 40 mm to 44 mm thick as tested and described in R08A17. All the sizes, locations and numbers of intumescent seals around the concealed door closer shall be the same as tested.

- h) It is proposed that 'GEZE TS 550' floor spring as tested and described in R08A17 may be incorporated into the timber doorset as tested and described in R07L06B. From the test evidence of R08A17, the right door leaf was supported by 'GEZE TS 550' floor spring such that the right door leaf was with double-swing configuration. The double-leaf timber doorset satisfied the integrity and insulation criteria of BS 476: Part 22: 1987 for 37 minutes. The integrity failures were due to sustained flaming observed around the glazed bead of vision panel on the right door leaf after a heating period of 37 minutes and around the glazed bead of vision panel on the left door leaf after the heating period of 57 minutes. Regardless these failures observed at the vision panels only, the timber doorset satisfied at least 60 minutes integrity and insulation criteria of BS 476: Part 22: 1987, and no integrity failure observed from the 'GEZE TS 550' floor spring installed at the right door leaf during the test. Hence the incorporation of the 'GEZE TS 550' floor spring into the proposed timber doorsets is positively appraised, provided that all the requirements stated in the above proposal are satisfied. In addition to increase the thickness of door leaves core to 44 mm, the proposal requires 2 nos. of additional intumescent seal with sizes of 10 mm wide by 4 mm thick to be fitted at the top edge of door leaves. All the protection, construction and fixing details of the floor spring shall be the same as tested and described in R08A17. From our experience, the proposed timber doorsets with the 'GEZE TS 550' floor springs as tested and described in R08A17 is not expected to have detrimental effect on the fire resistance performance achieved.
- i) It is proposed that the door leaves and frame of the tested doorset may be clad with maximum 1.0 mm thick stainless steel and aluminium sheets either on exposed or unexposed side of door leaves. Adhesive shall be used to assist in attaching the cladding to the doorset. The acceptable adhesive we recommended shall be a non-combustible, water-based, ceramic adhesive. The plastic laminate shall achieve Class 1 if tested to BS 476: Part 7. From our experience, it is reasonable to expect that applying plastic laminates to the tested doorset will not have detrimental effect on the fire resistance performance achieved as the unexposed surface mean temperature

rise of the tested door leaves were generally less than 80°C at a heating period of 60 minutes, provided that the door leaves core is maintained the same as the tested prototype. The method of applying the proposed cladding is intended to permit it to expand independently. We propose to use the adhesives that have been previously tested or are non-combustible, which avoids the risk of ignition of the adhesives and flaming observed on the unexposed face (integrity loss). It is expected that differential expansion of the cladding relative to the door leaf and frame 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 achieve

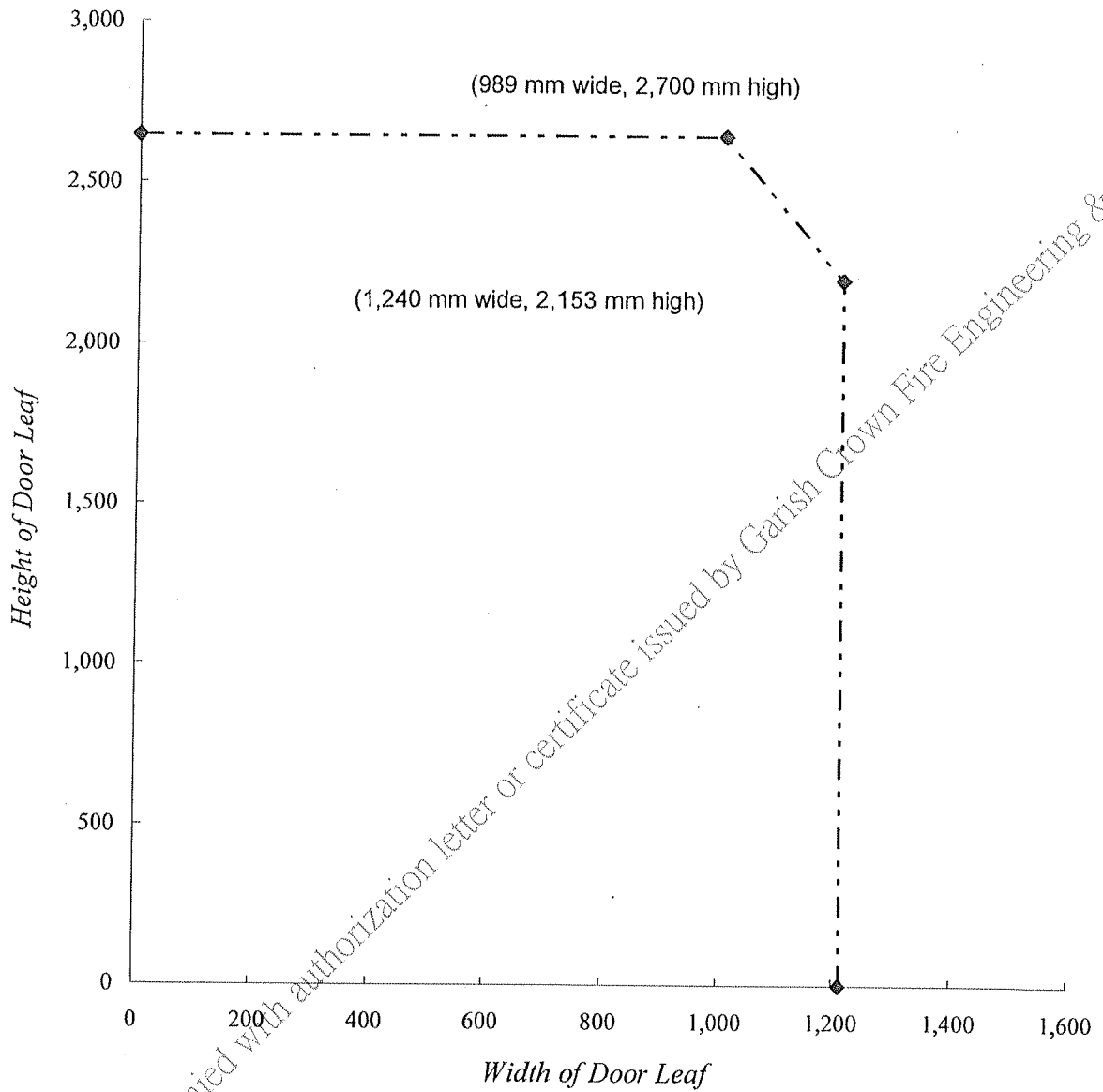


Figure 1 - Door leaf sizes (60 minutes integrity and insulation)

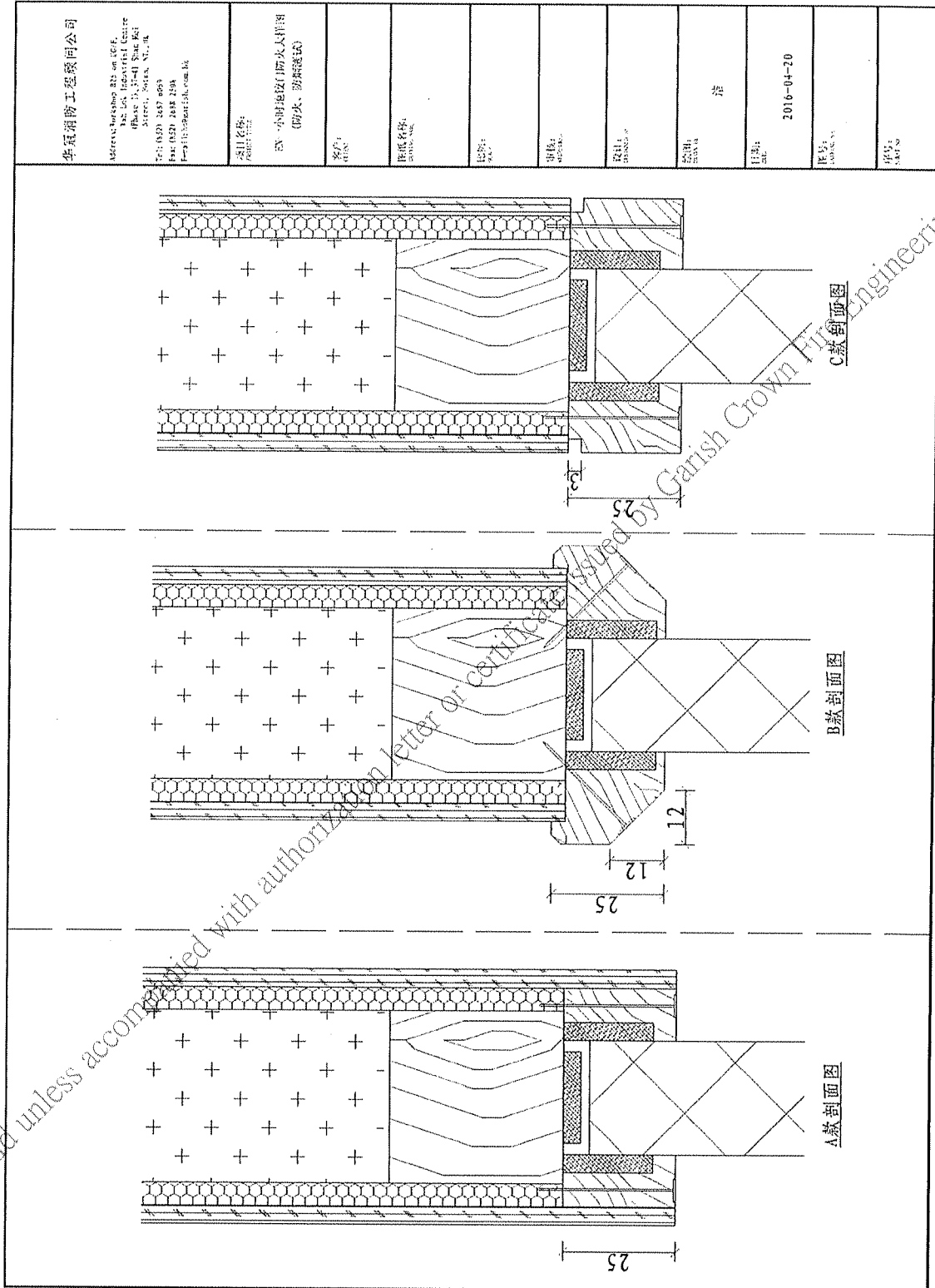


Figure 2 - The glazing beads details for glazed panel fitted with insulation glass

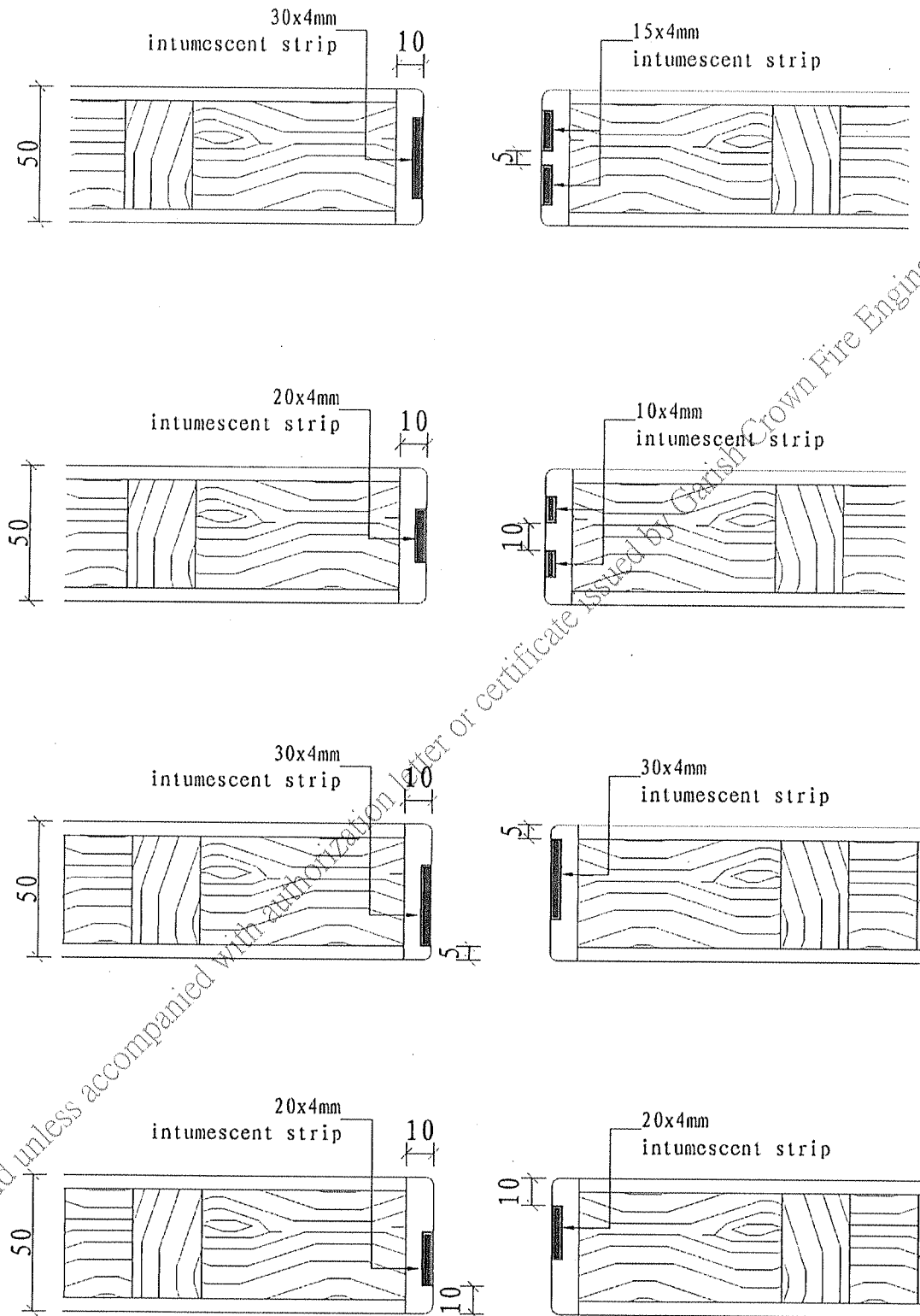


Figure 3 - Different intumescent seals arrangement for plain meeting edge

5 CONCLUSION

The proposed doorset are based on the specimen as tested and described in R07L06B and modified as described in Section 4. The proposed doorsets will satisfy a fire resistance performance of 60 minutes integrity and insulation with respect to BS 476: Part 22: 1987

6 DECLARATION BY APPLICANT

We, Garish Crown Fire Engineering & Consultancy, confirm that the material, component or element of structure, which is 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

Test Consultant

Research Engineering Development

Façade Consultants Limited

Reviewed by:

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

Authorized Signature

Research Engineering Development

Façade Consultants Limited

- End of Report -