



# **FIRE TECHNICAL OPINION**

## **FC10138-01 ISSUE 2**

**FIRE RESISTANCE OF REYNEARS CS 77-FP GLAZED SCREENS AND DOORSETS**

**CLIENT**

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REPORT NUMBER:

**FC10138-01 ISSUE 2**

ISSUE DATE:

**19 August 2022**

REVIEW/EXPIRY DATE

**19 August 2027**

PAGE:

**1 of 24**

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## ASSESSMENT OBJECTIVE

To assess the fire resistance, in accordance with AS 1530.4:2014, of the Reynaers CS 77-FP glazed screens and doorsets.

## CONCLUSION

It is considered that the glazed screens constructed with the Reynaers CS 77-FP30 and CS 77-FP60 aluminium profiles, as described in test reports 2008-Efectis-RO0798 and 2008-Efectis-RO0171, together with Pilkington Pyrostop® or AGC Pyrobel® insulating glass of the maximum size stated, can achieve Integrity and Insulation (FRL), in accordance with AS 1530.4:2014, as listed in the following table.

### Glazed screens and single and pair leaf doorsets with Pilkington Pyrostop® and AGC Pyrobel® glass

Product Code	Nominal thickness (mm)	FRL (minutes)	Max. Pane Dimension (mm)	Max. Pane Area (m <sup>2</sup> )
Pyrostop® 30-10	15	-/30/30	2,090	2.91
Pyrobel® 17N or 17N EG	17	-/30/30	2,860	3.15
Pyrostop®30-20	18	-/30/30	2,090	2.91
Pyrostop®60-101	23	-/60/60	2,090	2.92
Pyrobel® 25 or 25 DGU	25	-/60/60	2,700	3.84
Pyrostop®60-201	27	-/60/60	2,090	2.92

## LIMITATION

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REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

**19 August 2022**

**19 August 2027**

**2 of 24**

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# CONTENTS

<b>SIGNATORIES .....</b>	<b>5</b>
<b>DOCUMENT REVISION STATUS .....</b>	<b>5</b>
<b>1. INTRODUCTION .....</b>	<b>6</b>
<b>2. BACKGROUND .....</b>	<b>6</b>
2.1 Efectis Nederland fire resistance report 2008-Efectis-R0798 .....	6
2.2 Efectis Nederland fire resistance report 2008-Efectis-R0171 [Rev. 1] .....	6
2.3 Efectis Nederland fire resistance report 2008-Efectis-R0174 .....	7
2.4 Ift Rosenheim fire resistance test report 271 37150 .....	8
2.5 Ift Rosenheim fire resistance report 271 43283 .....	8
2.6 Building Research Institute fire resistance report No. 1019.1/07 .....	9
2.7 EXOVA Warringtonfire Assessment report WF No. 182465 .....	10
2.8 Efectis Nederland report 2008-Efectis-RO934[Rev.2] .....	10
2.9 Efectis Nederland fire resistance report 2016-Efectis-R001762 .....	11
<b>3. DISCUSSION.....</b>	<b>11</b>
3.1 EN 1364-1: 1999 / EN 1634-1:2001 and AS 1530.4:2014 .....	11
3.1.1 Furnace conditions.....	11
3.1.2 Failure criteria Integrity.....	12
3.1.3 Insulation.....	12
3.2 Glazed screens .....	12
3.3 Glazed Doorsets .....	13
3.3.1 Integrity.....	13
3.3.2 Insulation.....	13
3.4 Alternative Pyrobel® glazing.....	14
3.5 Maximum dimension of glazing .....	14
<b>4. CONCLUSION.....</b>	<b>15</b>

## FIGURES

Figure 1: Vertical section through 30 minute glazed screen .....	16
Figure 2: Horizontal section through 30 minute glazed screen .....	17
Figure 3: Vertical section through 60 minute glazed screen .....	18
Figure 4: Horizontal section through 60 minute glazed screen .....	19
Figure 5: Vertical cross section through 30 minute single leaf doorset .....	20
Figure 6: Horizontal cross section through 30 minute single leaf doorset .....	21
Figure 7: Vertical cross section through 30 minute pair leaf doorset.....	22
Figure 8: Horizontal cross section through 30 minute pair leaf doorset .....	23
Figure 9: Horizontal cross section through 60 minute pair leaf doorset .....	24



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

**19 August 2022**

**19 August 2027**

**3 of 24**

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EXTRACTS OR ABRIDGMENTS OF THIS REPORT SHALL NOT BE PUBLISHED WITHOUT PERMISSION FROM BRANZ LTD.

# TABLES

Table 1: Pilkington Pyrostop® glazing in screens and doorsets ..... 10



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

**19 August 2022**

**19 August 2027**

**4 of 24**

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT.  
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# DOCUMENT REVISION STATUS

ISSUE NO.	DATE ISSUED	REVIEW DATE	DESCRIPTION
01	20 September 2018	20 September 2023	Initial Issue
02	19 August 2022	19 August 2027	Addition of Pyrobel® 17 and 25 and increased glazing size, (project ref: FC15591)



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

**19 August 2022**

**19 August 2027**

**5 of 24**

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT.  
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# 1. INTRODUCTION

This report gives BRANZ's assessment on the fire resistance, in accordance with AS 1530.4:2014, of the Reynaers CS 77-FP aluminium framed glazed screens and doorsets.

## 2. BACKGROUND

### 2.1 Efectis Nederland fire resistance report 2008-Efectis-R0798

In the fire resistance test described in Efectis Nederland fire resistance report 2008-Efectis-R0798 the specimen was a glazed partition wall constructed of aluminium profiles, type CS 77-FP30 of Reynaers Aluminium provided with Pilkington glazing, type Pyrostop® 30-10, thickness 15 mm.

The aluminium frame, with outer dimensions 2,960 mm wide x 2,980 mm high was constructed of:

- Aluminium framework constructed of aluminium profiles type CS 77-FP30;
- Kerafix Coolmax filling strip 20 mm x 34 mm in the central part of the frame;
- EPDM sealing profiles each side of the glass panes;
- Kerafix Flextrem intumescent strips, 30 mm x 2 mm between the edges of the glass and the profiles;
- Glass fibre reinforced phenol resin 3 mm thick glazing blocks and phenol resin glass supports to hold the glass in place;
- Inox glazing clips and glazing beads to secure the panes;
- Rockwool insulation was used to fill the cavity between the edge frame and the concrete support frame.

The frame enclosed Pilkington glazing, type Pyrostop® 30-10, with a thickness of 15 mm with the dimensions of two panes 1,392 mm wide x 1,902 mm (2.67 m<sup>2</sup>), one pane 652 mm wide x 902 mm high (0.60 m<sup>2</sup>), one pane 678 mm wide x 902 mm high (0.62 m<sup>2</sup>) and one pane 1,392 mm wide x 902 mm high (1.28 m<sup>2</sup>).

Vertical and horizontal cross sections of the construction are shown in Figure 1 and Figure 2 respectively.

The specimen glazed screen was tested in accordance with EN 1364-1: 1999 for a duration of 40 minutes and achieved the following fire resistance:

Integrity (E)	40 minutes (no failure)
Insulation (I)	39 minutes

### 2.2 Efectis Nederland fire resistance report 2008-Efectis-R0171 [Rev. 1]

In the fire resistance test described in Efectis Nederland fire resistance report 2008-Efectis-R0171 [Rev. 1] the specimen was a glazed partition wall constructed of aluminium profiles, type CS 77-FP60 of Reynaers Aluminium provided with Pilkington glazing, type Pyrostop® 60-101, thickness 23 mm.



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

**19 August 2022**

**19 August 2027**

**6 of 24**

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT.  
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The aluminium frame, with outer dimensions 2,960 mm wide x 2,980 mm high was constructed of:

- Aluminium framework constructed of aluminium profiles type CS 77-FP60;
- Three Kerafix Coolmax filling strips, 37 mm x 16 mm, 34 mm x 20 mm and 29 mm x 9 mm in the three parts of the frame;
- Reinforcement profiles at the non-fire side of the middle and free edge of the frame to avoid too much deflection;
- EPDM sealing profiles each side of the glass panes;
- Kerafix Flextrem intumescent strips, 30 mm x 2 mm between the edges of the glass and the profiles;
- Glass fibre reinforced phenol resin 3 mm thick glazing blocks and phenol resin glass supports to hold the glass in place;
- Inox glazing clips and glazing beads to secure the panes;
- Rockwool insulation was used to fill the cavity between the edge frame and the concrete support frame.

The frame enclosed Pilkington glazing, type Pyrostop® 30-101, with a thickness of 23 mm with the dimensions of two panes 1,394 mm wide x 1,901 mm (2.65 m<sup>2</sup>), one pane 654 mm wide x 907 mm high (0.59 m<sup>2</sup>), one pane 680 mm wide x 907 mm high (0.62 m<sup>2</sup>) and one pane 1,394 mm wide x 907 mm high (1.26 m<sup>2</sup>).

Vertical and horizontal cross sections of the construction are shown in Figure 3 and Figure 4 respectively.

The specimen glazed screen was tested in accordance with EN 1364-1: 1999 for a duration of 67 minutes and achieved the following fire resistance:

Integrity (E)	67 minutes
Insulation (I)	66 minutes

## 2.3 Efectis Nederland fire resistance report 2008-Efectis-R0174

In the fire resistance test described in Efectis Nederland fire resistance report 2008-Efectis-R0174 the specimen was a single leaf glazed doorset constructed of aluminium profiles, type CS 77-FP30 of Reynaers Aluminium provided with Pilkington glazing, type Pyrostop® 30-10, thickness 15 mm.

The aluminium single door frame, with outer dimensions 1,300 mm wide x 2,353 mm high was constructed similar to that of the 30 minute glazed screen described in Section 2.1 above and mounted in an aerated light weight concrete wall with an aperture approximately 1,340 mm wide x 2,373 mm high. The door leaf was 2,300 mm high x 1,204 mm wide x 68 mm thick and was fitted with five tripartite aluminium hinges, a stainless steel three-point Wilka safety lock, a GEZE type TS 5000 door spring and three Inox anti-lift pins to the hinge side. A brush seal and an intumescent strip 25 mm x 2 mm was fitted to the bottom edge of the door leaf. EPDM sealing profiles were applied around both vertical door edges and head edge between the frame and leaf.



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

**19 August 2022**

**19 August 2027**

**7 of 24**

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT.  
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The door leaf enclosed Pilkington glazing, type Pyrostop® 30-10, with a thickness of 15 mm and with pane dimensions of 1,040 mm wide x 2,136 mm high (2.22 m<sup>2</sup>) fixed at the fire side with aluminium glazing beads.

Vertical and horizontal cross sections of the construction are shown in Figure 5 and Figure 6 respectively.

The specimen glazed screen was tested in accordance with EN 1634-1: 2000 for a duration of 46 minutes and achieved the following fire resistance:

Integrity (E)	36 minutes (no failure)
Insulation (I <sub>1</sub> )	21 minutes
Insulation (I <sub>2</sub> )	36 minutes

## 2.4 Ift Rosenheim fire resistance test report 271 37150

In the fire resistance test described in ift Rosenheim fire resistance test report 271 37150 the specimen was a pair leaf glazed doorset designated CS 77-FP (30) constructed of aluminium profiles, type CS 77-FP30 of Reynaers Aluminium provided with Pilkington glazing, type Pyrostop® 30-10, thickness 15 mm.

The aluminium pair leaf door frame, with outer dimensions 2,362 mm wide x 2,319 mm high and clear opening 2,260 mm wide x 2,268 mm high, was constructed similar to that of the 30 minute glazed screen described in Section 2.1 above and mounted in an aluminium framed glazed screen. Each door leaf was 2,300 mm high x 1,160 mm wide x 68 mm thick and were fitted with five aluminium hinges and a BKS tubular frame panic lock.

Each door leaf enclosed Pilkington glazing, type Pyrostop® 30-10, with a thickness of 15 mm with pane dimensions of 261 mm wide x 689 mm high, 261 mm wide x 1,385 mm high, 673 mm wide x 689 mm high and 673 mm wide x 1,385 mm high (0.93 m<sup>2</sup>) fixed at the fire side with aluminium glazing beads.

Vertical and horizontal cross sections of the construction are shown in Figure 7 and Figure 8 respectively.

The specimen glazed screen and pair doorset was tested in accordance with EN 1634-1: 2000 for a duration of 36 minutes and achieved the following fire resistance:

Integrity (E)	36 minutes (no failure)
Insulation (I <sub>1</sub> )	26 minutes
Insulation (I <sub>2</sub> )	33 minutes

## 2.5 Ift Rosenheim fire resistance report 271 43283

In the fire resistance test described in ift Rosenheim fire resistance test report 271 43283 the specimen was a single leaf glazed doorset designated CS 77-FP (60) constructed of aluminium profiles, type CS 77-FP60 of Reynaers Aluminium provided with Pilkington glazing, type Pyrostop® 60-181, thickness 48 mm mounted in a concrete block wall.



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

**19 August 2022**

**19 August 2027**

**8 of 24**

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT.  
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The aluminium single leaf door frame, with outer dimensions 1,396 mm wide x 2,658 mm high and clear opening 1,260 mm wide x 2,572 mm high, was constructed similar to that of the 60 minute glazed screen described in Section 2.2 above. The door leaf was 2,600 mm high x 1,300 mm wide x 68 mm thick and was fitted with three aluminium hinges, a three pin BKS tubular frame panic lock and a Geze door closer.

The door leaf enclosed Pilkington glazing, type Pyrostop® 60-181, with a thickness of 48 mm with pane dimensions of 1,134 mm wide x 2,434 mm high, (2.76 m<sup>2</sup>) fixed at the non-fire side with aluminium glazing beads.

The frame construction and detail of mounting the glazing is essentially the same as the glazed screen described in 2.2 above and as shown in Figures 3 and 4. The mounting of the door leaf is essentially the same as shown in Figures 5 and 6 except for the deeper frame and thicker glass.

The specimen glazed pair doorset was tested in accordance with EN 1634-1: 2008 for a duration of 64 minutes and achieved the following fire resistance:

Integrity (E)	55 minutes
Insulation (I <sub>1</sub> )	55 minutes
Insulation (I <sub>2</sub> )	55 minutes

## **2.6 Building Research Institute fire resistance report No. 1019.1/07**

In the fire resistance test described in Building Research Institute, Poland, fire resistance test report No. 1019.1/07 the specimen was a pair leaf glazed doorset designated CS 77-FP 60 constructed of aluminium profiles, type CS 77-FP60 of Reynaers Aluminium provided with Pilkington glazing, type Pyrostop® 60-101, thickness 23 mm.

The aluminium pair leaf door frame, with outer dimensions 2,396 mm wide x 2,353 mm high was constructed similar to that of the 60 minute glazed screen described in Section 2.2 above and mounted in a concrete block wall. Each door leaf was 2,300 mm high x 1,396 mm wide x 68 mm thick and was fitted with five aluminium hinges, three anti-lift pins, a GEZE automatic door closer and a BKS lock with additional pin at the top of the leaf.

Each door leaf enclosed Pilkington glazing, type Pyrostop® 60-101, with a thickness of 23 mm with pane dimensions of 996 mm wide x 2,136 mm high (2.13 m<sup>2</sup>) fixed at the fire side with aluminium glazing beads.

The frame construction and detail of mounting the glazing is essentially the same as the glazed screen described in 2.2 above and as shown in Figures 3 and 4. The mounting of the door leaves is essentially the same as shown in Figures 5 and 6 except for the deeper frame and thicker glass. A horizontal cross section of the construction is shown in Figure 9.



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

**19 August 2022**

**19 August 2027**

**9 of 24**

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The specimen glazed screen was tested in accordance with EN 1634-1: 2002 for a duration of 68 minutes and achieved the following fire resistance:

Integrity	68 minutes (no failure)
Insulation	61 minutes

## 2.7 EXOVA Warringtonfire Assessment report WF No. 182465

EXOVA Warringtonfire assessment report WF No. 182465 considered the field of application for Reynaers CS 77-FP glazed screens and doorsets incorporating Pilkington Pyrostop® fire resistant glass. The report considered the results of a number of tests of glazed screens and glazed doorsets, including those described in Section 2 above, and subject to the recommendations of the report being followed, concluded that the glazed screens and doorsets should provide 30 minutes or 60 minutes integrity and insulation performance in accordance with EN 1364-1:1999 or EN 1634-1:2000, as appropriate dependant on the glass type as follows:

**Table 1: Pilkington Pyrostop® glazing in screens and doorsets**

Product Code	Nominal thickness (mm)	Integrity/Insulation (minutes)	Max. Pane Height (mm)	Max. Pane Width (mm)	Max. Pane Area (m <sup>2</sup> )
<b>Glazed Screens</b>					
30-10	15	30/30	1,902	1,392	2.65
30-20	18	30/30	1,910	886	1.69
60-101	23	60/60 (I <sub>2</sub> )	1,901	1,394	2.65
60-201	27	60/60 (I <sub>2</sub> )	1,901	1,394	2.65
<b>Glazed Doorsets</b>					
30-10	15	30/30	2,136	1,040	2.22
30-20	18	30/30	2,136	1,040	2.22
60-101	23	60/60 (I <sub>2</sub> )	2,136	1,136	2.43
60-201	27	60/60 (I <sub>2</sub> )	2,136	1,136	2.43

## 2.8 Efectis Nederland report 2008-Efectis-RO934[Rev.2]

Efectis Nederland report 2008-Efectis-RO934[Rev.2] provided a summary of fire resistance test results obtained for door constructions, constructed from profiles of type Reynaers CS 77-FP (EI60) fire tests according to EN 1634-1. The report considered the results from a number of tested doorsets, including those described in Section 2 above, and concluded:

For the Reynaers aluminium NV/SA developed Fire-Proof aluminium glazed wall and door systems (called CS 77-FP), based on the obtained test results, and further explanations given in the report, the following EN 13501-2 classifications are valid for the door constructions:

E60, EI<sub>45</sub> and EI<sub>260</sub>

The report also stated that the classifications will be equally valid for variations of this type of door constructions under the relevant conditions stated in the conclusion to the report.



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

**19 August 2022**

**19 August 2027**

**10 of 24**

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT.  
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## 2.9 Efectis Nederland fire resistance report 2016-Efectis-R001762

In the fire resistance test described in Efectis Nederland fire resistance report 2016-Efectis-R001762 the specimen was a glazed partition wall constructed of aluminium profiles, type CS 77-FP(EI60) manufactured by Reynaers Aluminium NV, provided with AGC Glass Europe glazing, type Pyrobel® 25 mono and type Pyrobel® 25 DGU (double glazed unit).

The frame enclosed AGC glazing, type Pyrobel® 25, with a total thickness of 26.5 mm with the dimensions of one pane 1,500 mm wide x 560 mm high (0.84 m<sup>2</sup>) and one pane 1,500 mm wide x 3,200 mm high (4.8 m<sup>2</sup>) and Type Pyrobel® 25 DGU one pane 1,500 mm wide x 560 mm high (0.84 m<sup>2</sup>) and one pane 1,500 mm wide x 3,200 mm high (4.8 m<sup>2</sup>).

The specimen glazed screen was tested in accordance with EN 1364-1: 1999 for a duration of 70 minutes and achieved the following fire resistance:

Integrity (E)	70 minutes (no failure)
Insulation (I)	69 minutes

## 3. DISCUSSION

### 3.1 EN 1364-1: 1999 / EN 1634-1:2001 and AS 1530.4:2014

The glazed screens described in Section 2 above were tested in accordance with fire resistance test standard EN 1364-1 *Fire resistance tests for non-load-bearing element – Part 1*: and the glazed doorsets were tested in accordance with fire resistance test standard EN 1634-1 *Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware – Part 1: Fire resistance test for door and shutter assemblies and openable windows*. These test standards reference EN 1363-1 *Fire resistance tests – Part 1: General requirements*, which defines the furnace conditions and failure criteria. A comparison between EN 1363-1, EN 1364-1, EN 1634-1 and AS 1530.4:2014 has been undertaken and the significant differences are discussed below.

#### 3.1.1 Furnace conditions

All three standards specify the same time/temperature curve which starts at nominally 20°C. EN 1363-1 specifies the use of plate thermometers in the furnace whereas AS 1530.4 specifies 3 mm mineral insulated metal sheathed thermocouples but does allow plate thermometers to be used. The furnace limits are also similar between standards. Reviewing the test reports, it is considered that the temperature conditions in the furnace would meet the requirements of AS 1530.4.

The pressure gradient assumed in the EN standard is defined as 8.5 Pa/m whereas AS 1530.4 defines a gradient of 8.0 Pa/m. Both standards define the neutral pressure plane to be set at 500 mm above the sill of the furnace for vertical specimens. Although the gradient is slightly different between standards it is considered that the test would have complied with the pressure limits defined in AS 1530.4.

It is considered that the furnace temperature and pressure conditions of the fire resistance tests would have complied with AS 1530.4:2014.



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

**19 August 2022**

**19 August 2027**

**11 of 24**

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT.  
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### 3.1.2 Failure criteria Integrity

All three test standards define integrity failure for insulated specimens to occur if flaming in excess of 10 seconds occurs, if a cotton pad applied at any gap or fissure ignites, or if gaps in excess of 6 mm x 150 mm or 25 mm diameter occur where the gauge can pass through the specimen into the furnace except that for AS 1530.4 the 6 mm gap gauge is not applied at the sill of door leaves and the cotton pad is not applied to areas where the adjacent temperature exceeds 300°C.

### 3.1.3 Insulation

For all separating elements except doors and shutters, both the EN and AS test standards state the performance level used to define thermal insulation shall be the mean temperature rise on the unexposed face limited to 140°C above the initial mean temperature, with a maximum rise at any point limited to 180°C above the mean temperature.

For doors and shutters the EN test standard uses two different insulation failure criteria as follows:

**Thermal insulation I<sub>1</sub>** – The mean temperature rise on the unexposed face of the specimen the door leaf shall be limited to 140°C above the initial mean temperature, with the maximum temperature rise at any point of the door leaf limited to 180°C. No temperature measurements shall be taken into account on the door leaf within 25 mm of the border line of the visible part of the door leaf. The temperature rise at any point on the door frame shall be limited to 180°C, measured at 100 mm from the visible edge of the door leaf if the frame is wider than 100 mm, otherwise it shall be measured at the frame/supporting construction boundary.

**Thermal insulation I<sub>2</sub>** - The mean temperature rise on the unexposed face of the door leaf shall be limited to 140°C above the initial mean temperature, with the maximum temperature rise at any point of the specimen limited to 180°C. No temperature measurements shall be taken into account on the door leaf within 100 mm from the border line of the visible part of the door leaf. The temperature rise at any point on the door frame shall be limited to 360°C, measured at 100 mm from the visible edge of the door leaf, if the frame is wider than 100 mm, otherwise it shall be measured at the frame/supporting construction boundary.

The AS 1530.4 test standard uses the same criteria as that required for EN thermal insulation I<sub>2</sub> stated above except that the maximum temperature rise measured on the door frame shall not exceed 180°C and the temperature rise on the supporting structure measured at specified positions 100 mm from the door frame are also taken into account.

## 3.2 Glazed screens

The fire resistance tests described in Clauses 2.1 and 2.2 above have demonstrated that glazed screens constructed with the Reynaers CS 77-FP30 and CS 77-FP60 aluminium profiles together with Pilkington Pyrostop® 30-10 and 60-101 insulating glass, as described in the test reports, can achieve Integrity and Insulation of at least 30 minutes and 60 minutes respectively. As the furnace conditions and integrity and insulation criteria are the same between the EN 1364-1 and AS 1530.4:2014 test standards it is considered that glazed screens would also achieve the same fire resistance if tested in accordance with AS 1530.4:2014. The alternative glazing considered in EXOVA Warringtonfire assessment report WF No. 182465 described in Section 2.7 above would also be applicable.



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

**19 August 2022**

**19 August 2027**

**12 of 24**

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT.  
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## 3.3 Glazed Doorsets

### 3.3.1 Integrity

The fire resistance tests described in Clauses 2.3 to 2.6 above have demonstrated that glazed doorsets constructed with the Reynaers CS 77-FP30 and CS 77-FP60 aluminium profiles together with Pilkington Pyrostop® 30-10 and 60-101 insulating glass, as described in the test reports, can achieve Integrity of at least 30 minutes and 60 minutes respectively except the single leaf doorset described in ift Rosemheim fire resistance test report 271 43283 which only achieved Integrity of 55 minutes and Insulation I<sub>2</sub> of 55 minutes. The integrity failure of this doorset was due to a gap developing between the glass and the door frame. Based on the conclusions given in Efectis summary report No. 2008-Efectis-RO934 provided the relevant conditions included in the conclusions of the report are applied to the doorsets the range of single leaf and pair leaf glazed doorsets will achieve at least 30 minutes and 60 minutes Integrity. As the furnace conditions and integrity criteria are the same between the EN 1634-1 and AS 1530.4:2014 test standards it is considered that the glazed doorsets would also achieve the same Integrity if tested in accordance with AS 1530.4:2014. The alternative glazing considered in EXOVA Warringtonfire assessment report WF No. 182465 described in Section 2.7 above would also be applicable.

### 3.3.2 Insulation

The fire resistance tests described in Clauses 2.3 to 2.6 above have demonstrated that glazed doorset constructed with the Reynaers CS 77-FP30 and CS 77-FP60 aluminium profiles together with Pilkington Pyrostop® 30-10 and 60-101 insulating glass, as described in the test reports, can achieve Insulation I<sub>2</sub> of at least 30 minutes and 60 minutes respectively except the single leaf doorset described in ift Rosemheim fire resistance test report No. 271 43283 which only achieved Insulation I<sub>2</sub> of 55 minutes for a temperature rise of 360°C on the frame. As discussed in clause 3.1.3 above the significant difference between the insulation criteria of the EN test standard and the AS test standard is that the maximum temperature measured on the frame of the doorset is limited to a temperature rise of 180°C and this maximum rise is also applicable to the surrounding wall. As in all the tests described in Section 2 above, the doorsets were mounted in a concrete or masonry wall of at least 180 mm thick it is expected that the temperature rise measured on these walls would not exceed 180°C for at least 60 minutes. The temperatures measured on the frames of the doorsets in the tests described in the test reports have determined that the 180°C rise criterion was in all cases exceeded after 30 minutes and before 60 minutes. It is therefore considered that the glazed doorsets would achieve Insulation of at least 30 minutes if tested in accordance with AS 1530.4:2014. The alternative glazing considered in EXOVA Warringtonfire assessment report WF No. 182465 described in Section 2.7 above would also be applicable.



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

**19 August 2022**

**19 August 2027**

**13 of 24**

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### 3.4 Alternative Pyrobel® glazing

The fire resistance test described in Efectis Nederland test report 2016-Efectis-R001762, listed in Clause 2.9 above, demonstrated that AGC manufactured Pyrobel® 25 and Pyrobel® 25 DGU (double glazed unit) glass can both achieve Integrity and Insulation of at least 60 minutes in accordance with test standard EN 1364-1 when mounted in a CS 77-FP(EI60) frame system manufactured by Reynaers Aluminium NV. It is therefore considered that if this glass is used in the insulated glazed screens and insulated single and pair leaf doorset constructions they would also achieve Integrity and Insulation of at least 60 minutes in accordance with AS 1530.4:2014.

Similarly the AGC manufactured Pyrobel® 17N and 17N EG (double glazing unit) glass has been tested and certified as having a fire resistance of EI45 in accordance with EN 1364-1 and EN 1634-1 when mounted in an insulated frame. It is therefore considered that if this glass is used in the glazed screens and insulated single and pair leaf doorset constructions they would also achieve Integrity and Insulation of at least 30 minutes in accordance with AS 1530.4:2014.

### 3.5 Maximum dimension of glazing

In Efectis Nederland fire resistance test 2008-Efectis-R0798 the largest pane of Pyrostop® 30-10 glass was 1,902 mm high x 1,392 mm wide (area 2.647 m<sup>2</sup>). However in this test the glazing achieved Integrity of 40 minutes without failure and Insulation of 39 minutes which is at least 30% greater than the 30 minutes fire resistance required and hence it is considered that the glass pane can be 10% larger in maximum dimension and area, i.e. the maximum allowable pane can have a maximum dimension of 2,090 mm and area of 2.91 m<sup>2</sup>. It is considered that the thicker version of this glass will also be acceptable at this size.

Similarly, in Efectis Nederland fire resistance test 2008-Efectis-R0171 the largest pane of 60-101 glass was 1,901 mm high x 1,394 mm wide (area 2.65 m<sup>2</sup>). However in this test the glazing achieved Integrity of 67 minutes and Insulation of 66 minutes which is at least 10% greater than the 60 minutes fire resistance required and hence it is considered that the glass pane can be 10% larger in maximum dimension and area, i.e. the maximum allowable pane can have a maximum dimension of 2,090 mm and area of 2.92 m<sup>2</sup>. It is considered that the thicker version of this glass will also be acceptable at this size.

It is generally accepted that the size of fire-resistant glass is limited by the maximum dimension and that portrait orientation is the most onerous, because the weight of the glass would tend to cause the glass to flow out of the top frame. It is therefore considered that the glass panel may be lesser in height or in landscape orientation provided that the maximum 2,090 mm dimension and 2.91 m<sup>2</sup> and 2.92 m<sup>2</sup> area is not exceeded.

The Pyrobel® fire resistant glass has been similarly certified for use in aluminium glazed screens with maximum pane sizes as follows:

- Pyrobel® 17 2,860 mm and 3.15 m<sup>2</sup>
- Pyrobel® 25 2,700 mm and 3.84 m<sup>2</sup>



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

**19 August 2022**

**19 August 2027**

**14 of 24**

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## 4. CONCLUSION

It is considered that the glazed screens constructed with the Reynaers CS 77-FP30 and CS 77-FP60 aluminium profiles, as described in test reports 2008-Efectis-RO0798 and 2008-Efectis-RO0171, together with Pilkington Pyrostop® or AGC Pyrobel® insulating glass of the maximum size stated, can achieve Integrity and Insulation (FRL), in accordance with AS 1530.4:2014, as listed in the following table.

### Glazed screens and single and pair leaf doorsets with Pilkington Pyrostop® and AGC Pyrobel® glass

Product Code	Nominal thickness (mm)	FRL (minutes)	Max. Pane Dimension (mm)	Max. Pane Area (m <sup>2</sup> )
Pyrostop® 30-10	15	-/30/30	2,090	2.91
Pyrobel® 17N or 17N EG	17	-/30/30	2,860	3.15
Pyrostop®30-20	18	-/30/30	2,090	2.91
Pyrostop®60-101	23	-/60/60	2,090	2.92
Pyrobel® 25 or 25 DGU	25	-/60/60	2,700	3.84
Pyrostop®60-201	27	-/60/60	2,090	2.92



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

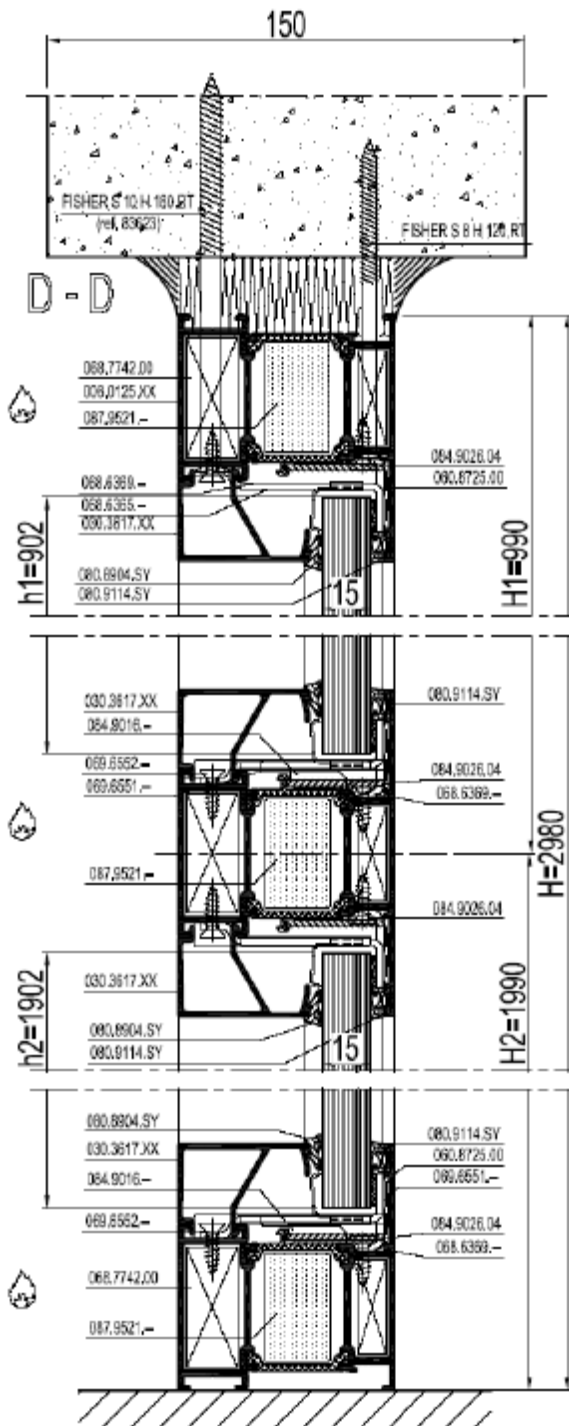
**19 August 2022**

**19 August 2027**

**15 of 24**

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Figure 1: Vertical section through 30 minute glazed screen



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

**19 August 2022**

**19 August 2027**

**16 of 24**

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Figure 2: Horizontal section through 30 minute glazed screen

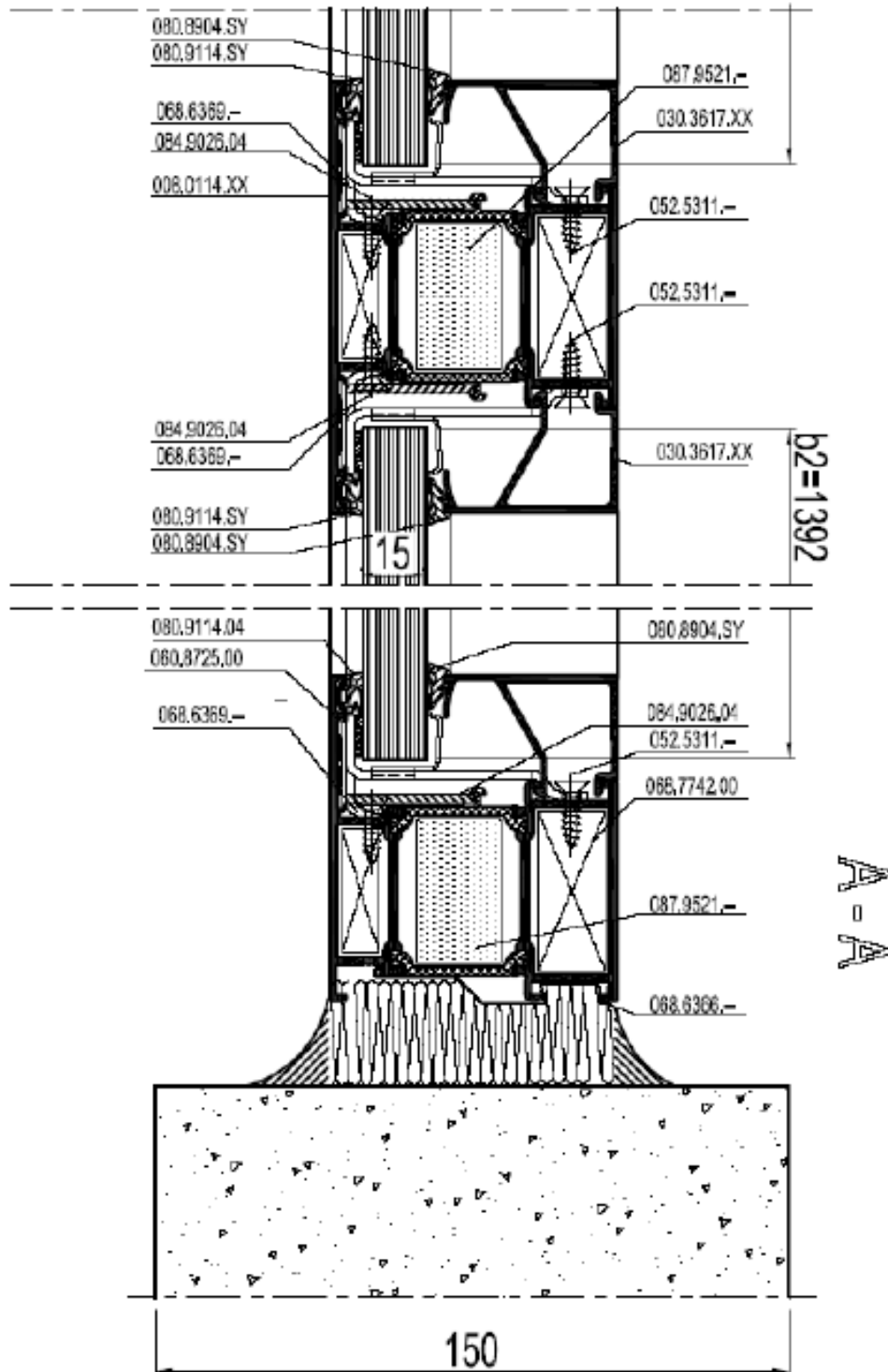


Figure 3: Vertical section through 60 minute glazed screen

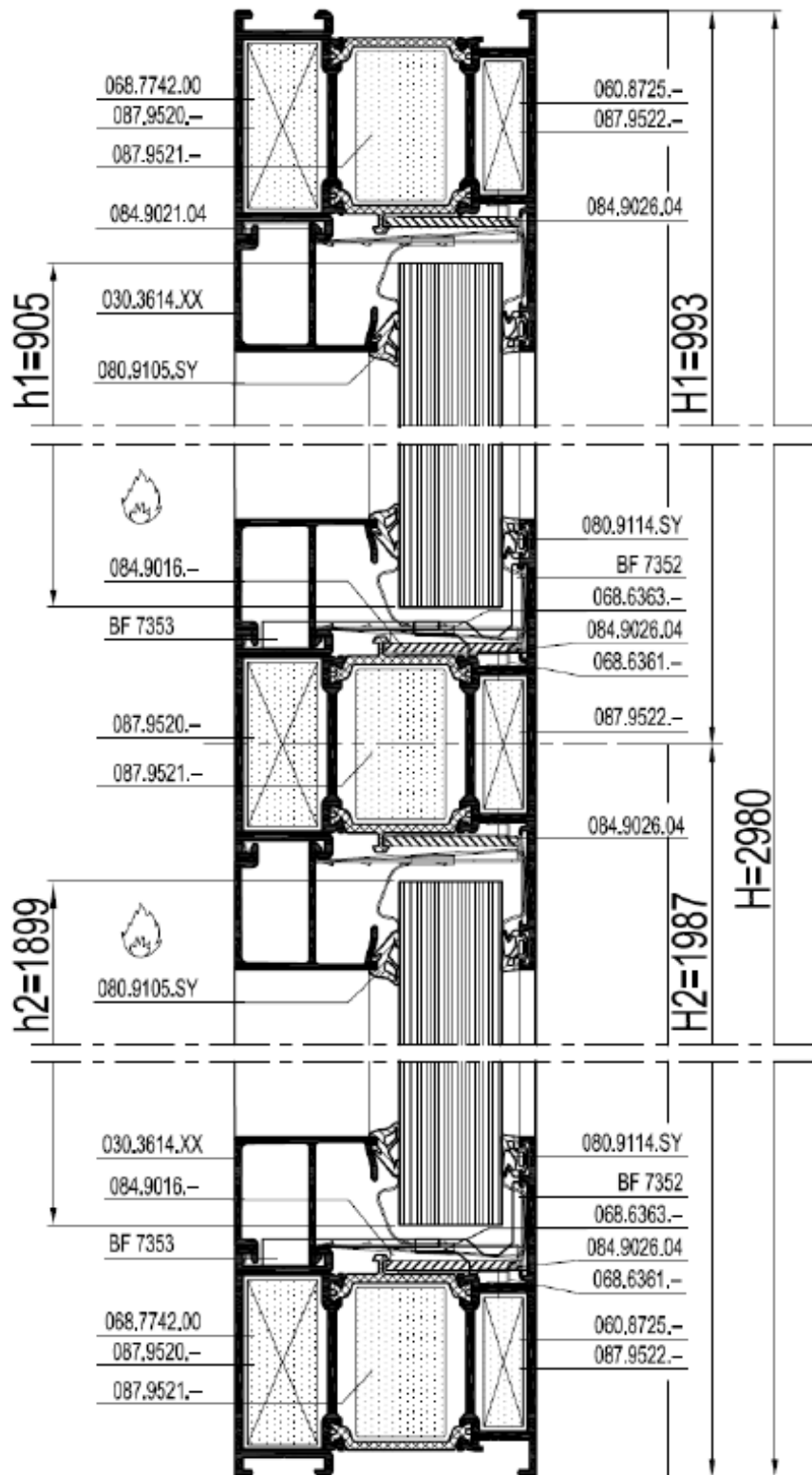


Figure 4: Horizontal section through 60 minute glazed screen

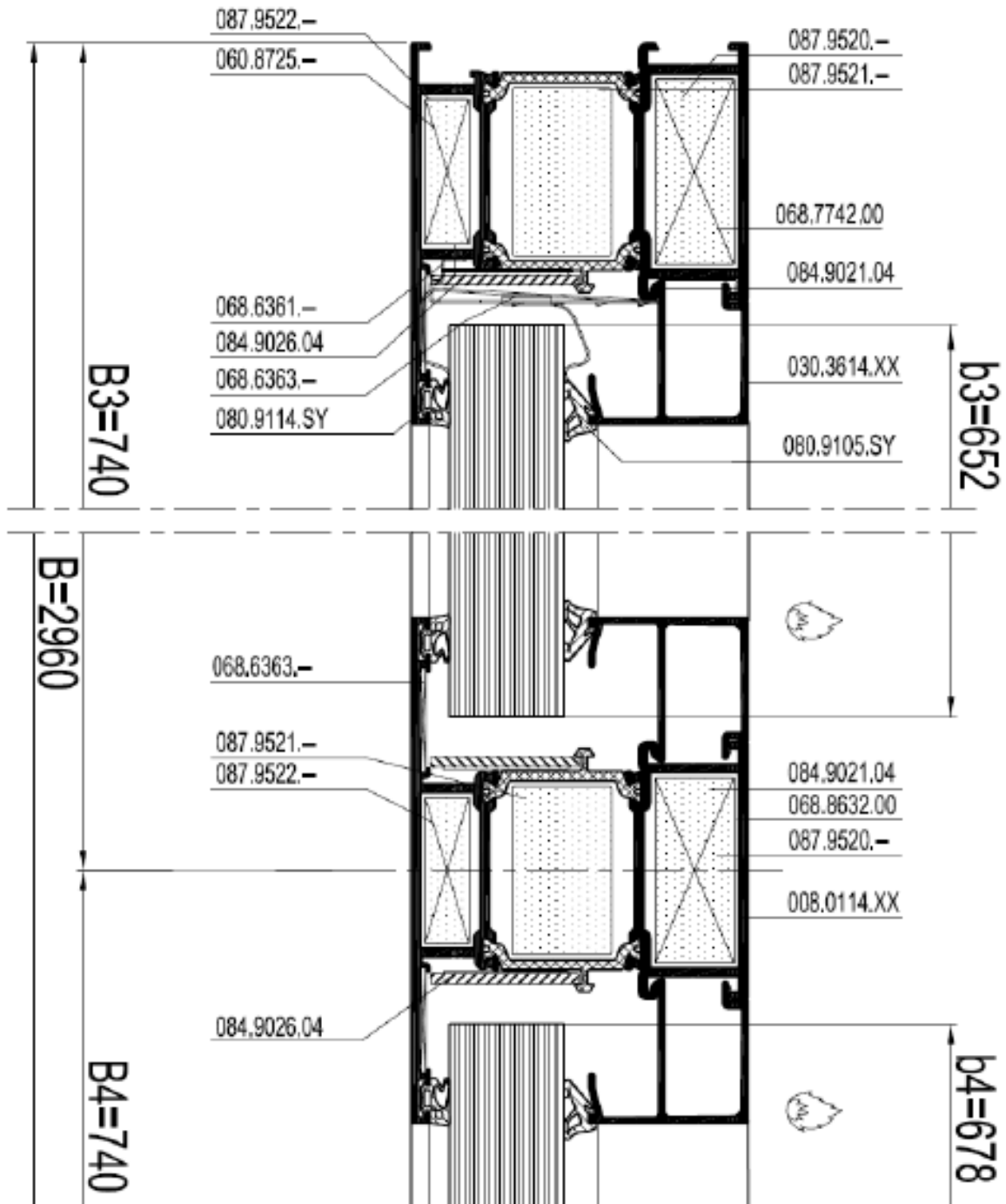
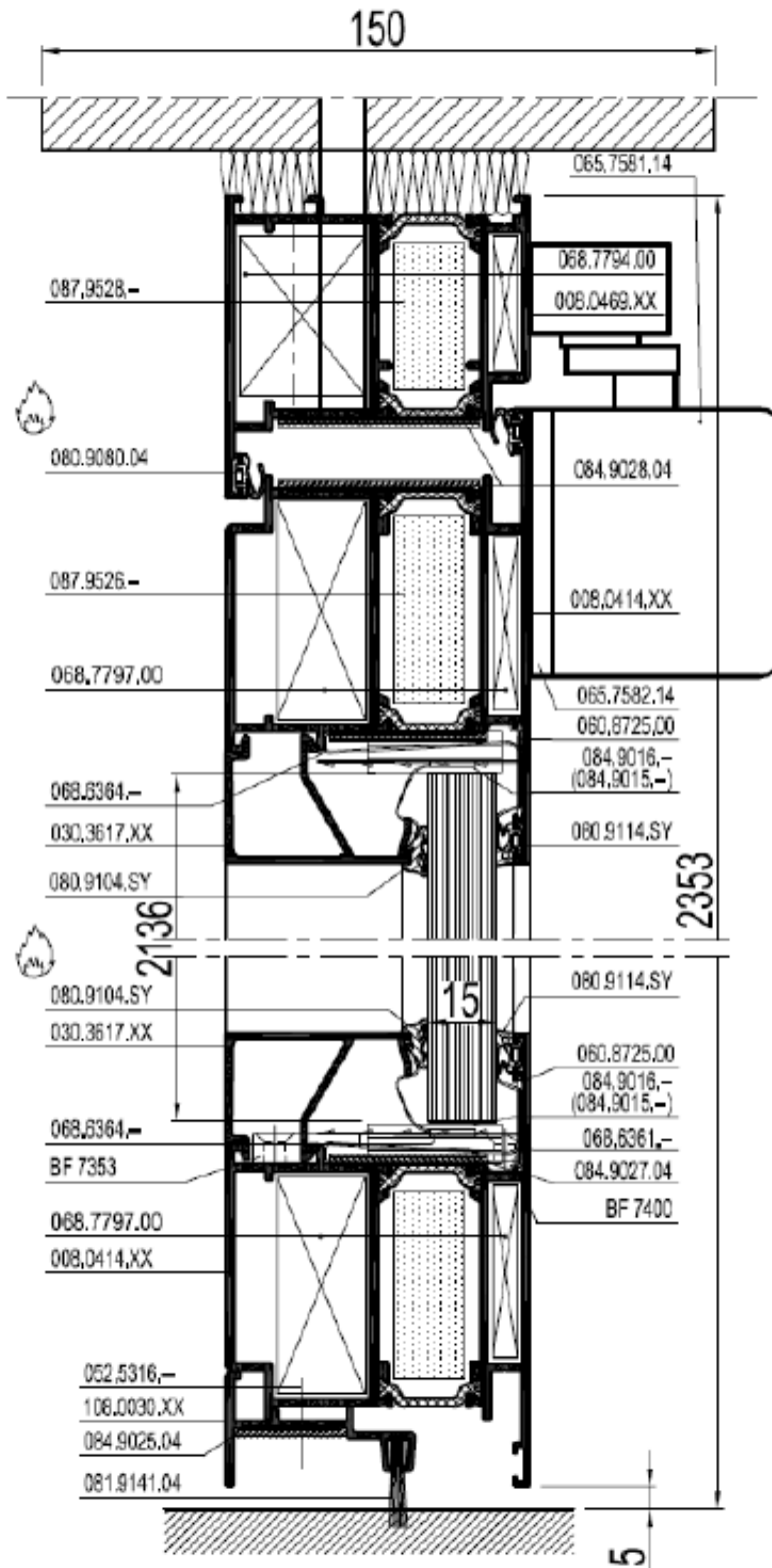


Figure 5: Vertical cross section through 30 minute single leaf doorset



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

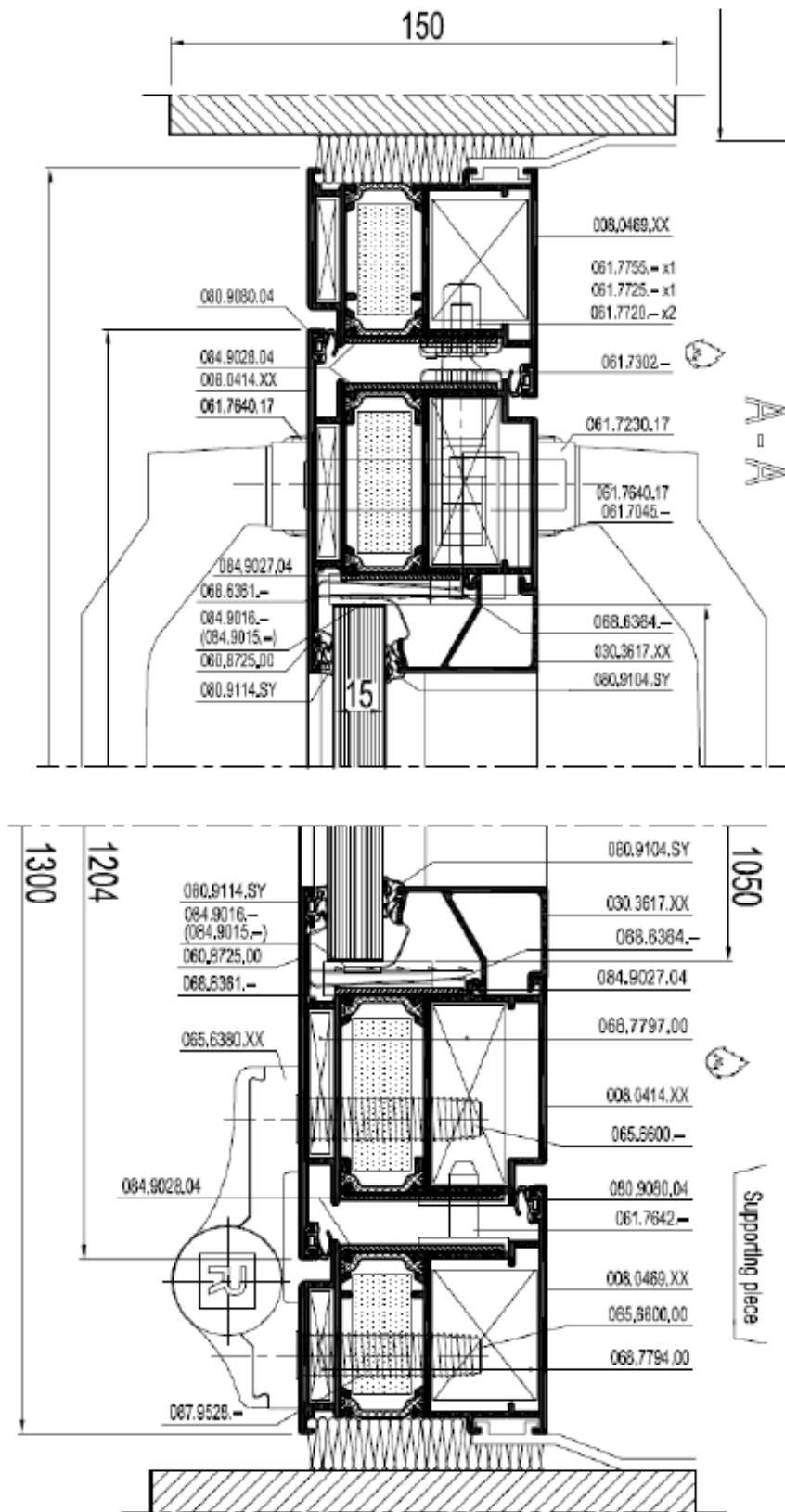
**19 August 2022**

**19 August 2027**

**20 of 24**

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Figure 6: Horizontal cross section through 30 minute single leaf doorset



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

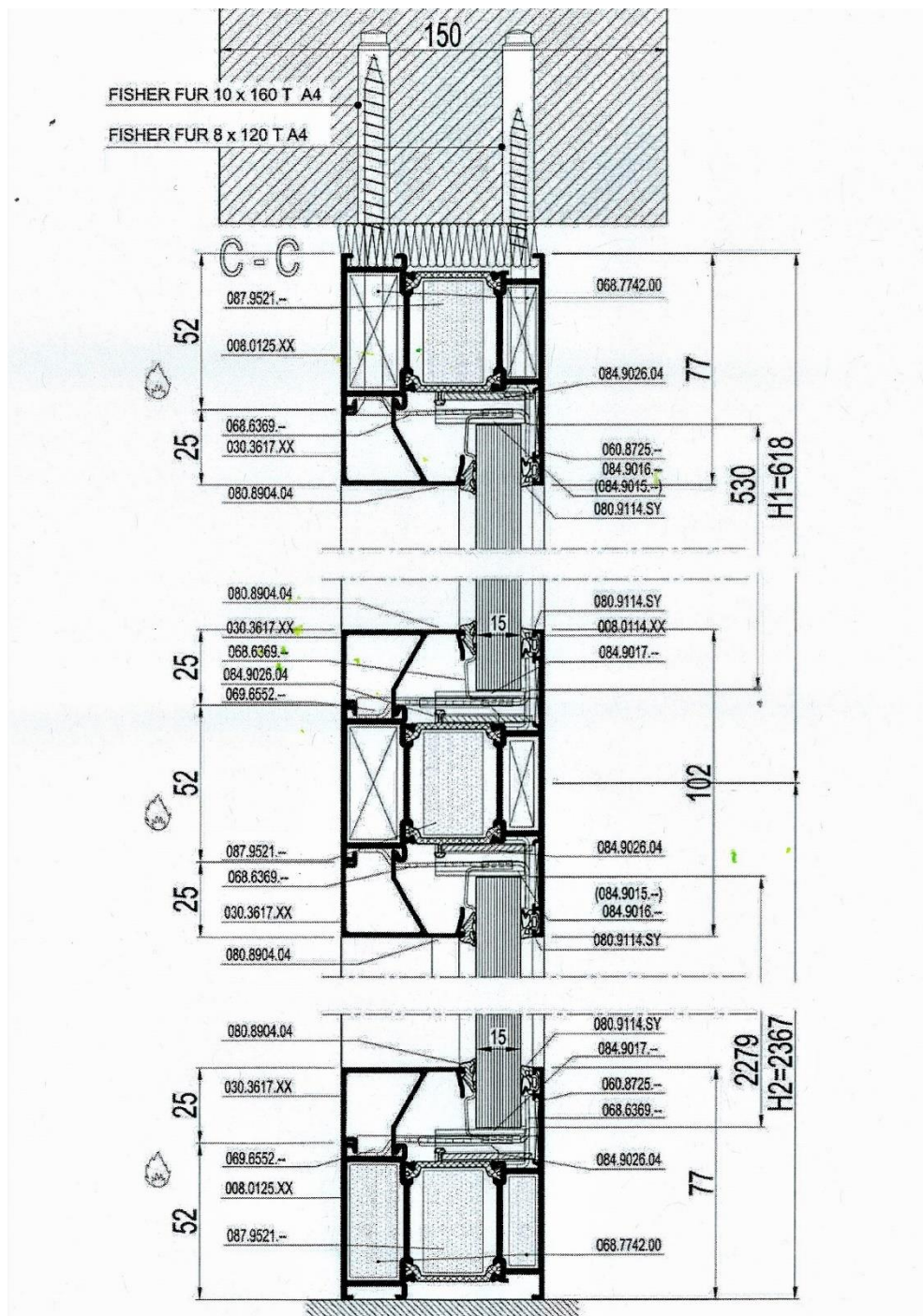
**19 August 2022**

**19 August 2027**

**21 of 24**

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Figure 7: Vertical cross section through 30 minute pair leaf doorset



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

**19 August 2022**

**19 August 2027**

**22 of 24**

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Figure 8: Horizontal cross section through 30 minute pair leaf doorset

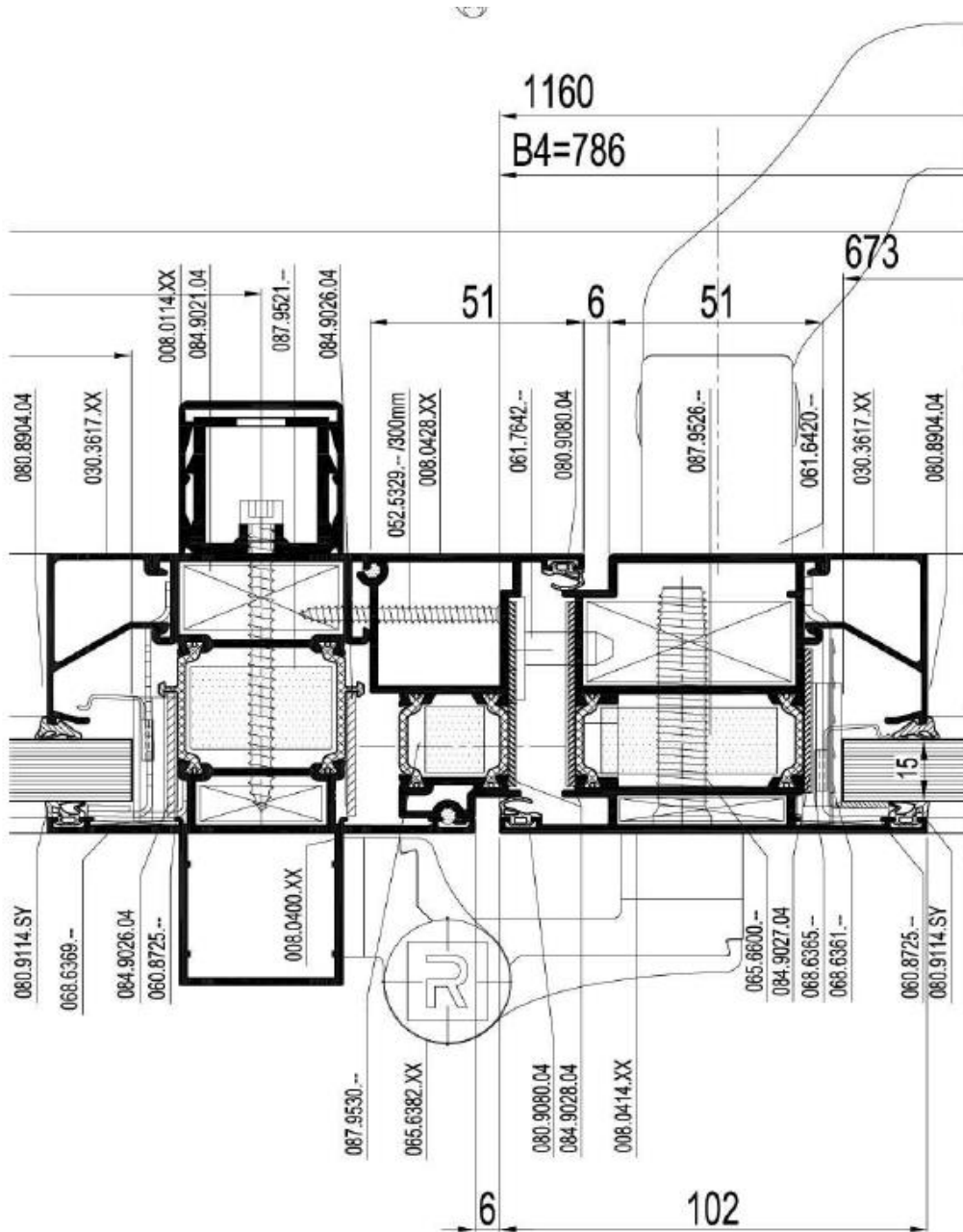
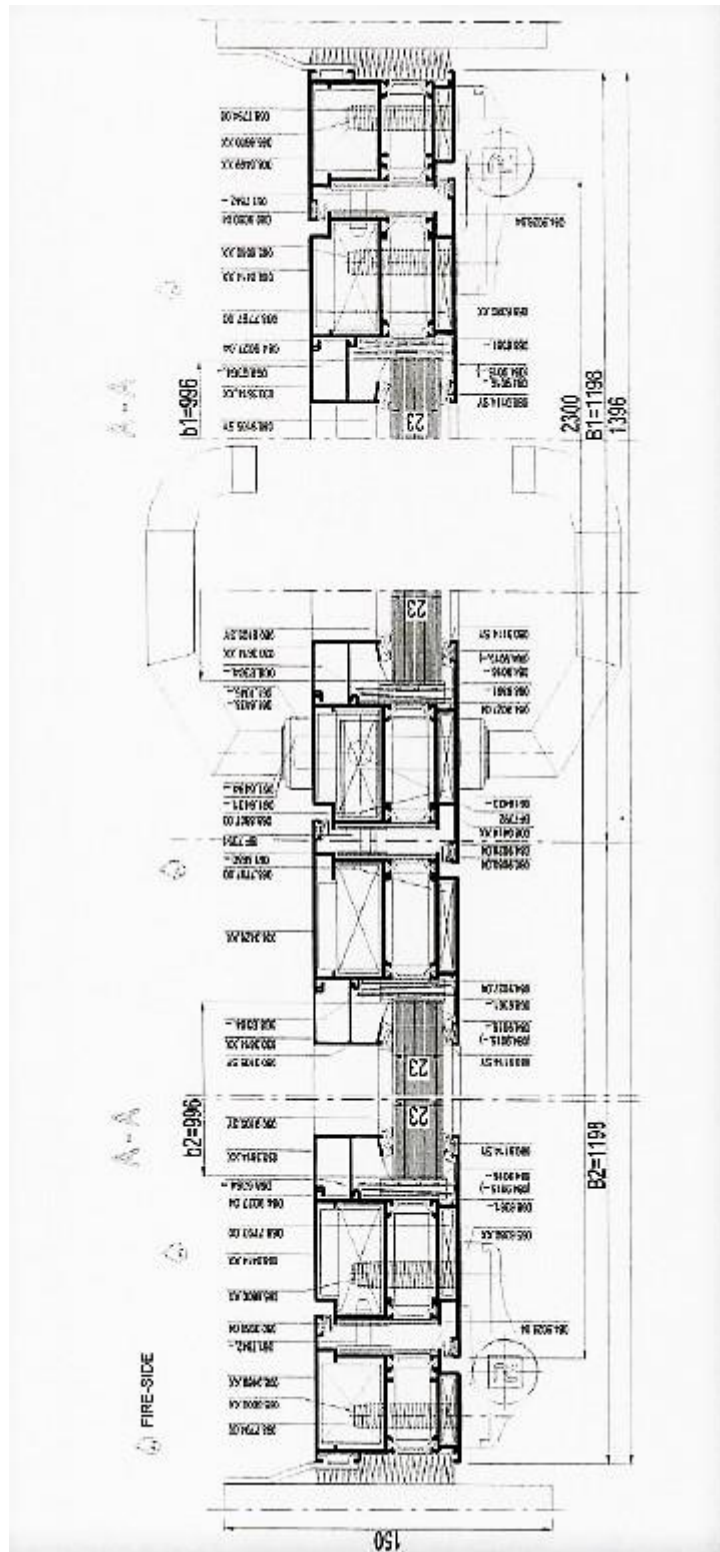


Figure 9: Horizontal cross section through 60 minute pair leaf doorset



REPORT NUMBER:

ISSUE DATE:

REVIEW/EXPIRY DATE

PAGE:

**FC10138-01 ISSUE 2**

**19 August 2022**

**19 August 2027**

**24 of 24**

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