EXTENDED APPLICATION REPORT NO. 16675B

Owner of this report:

AGC Glass Europe
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Belgium

References:

This extended application report concerns test results obtained for a non-loadbearing glazed wall – type: Pyrobelite 10 in a Timber frame_silicone and a Jansen ECO 60 frame_silicone – in accordance with the test method EN 1364-1:1999: Fire resistance tests for non-loadbearing elements – Part 1: Walls.

The extended application process of the test results is carried out in conformity with standard EN 15254-4:2008+A1:2011: Extended application of results from fire resistance tests – Non-loadbearing walls – Part 4: Glazed constructions.

The extended application process can also apply rules as defined in the following product standard: EN 14449:2005.

This extended application report consists of 18 pages and 19 annexes. The report is drafted in accordance with the standard procedure as specified in the standards EN 15725:2010 and prEN 15254-1:2005.

1 Details of the building element concerned

1.1 Nature

Product technical specifications: Pyrobelite 10 in a Timber frame_silicone and a Jansen ECO 60 frame_silicone.

Product family: Pyrobelite.

Intended use: in a glazed assembly intended specifically to provide fire resistance.

End-use application: non-loadbearing walls with glass, intended to be used in buildings and construction works.

1.2 Product description

The test element, Pyrobelite 10 in a Timber frame_silicone and a Jansen ECO 60 frame_silicone, including edge and boundary conditions, is fully described in the test reports provided in support of this extended application report listed in clause 2.1.

The drawings of test reports 15285A, 15517A and 16675A, upon which this extended application report is based, are given in the annexes 1 till 14. The part numbers in these annexes refer to the part numbers in the test reports.

1.3 Main purpose of this extended application report

The extended application report is written to determine the worst case exposure condition for the asymmetrical pyrobelite 10 glass.

In order to prove that the direction of exposure with the 6 mm glass segment at the exposed side is worst case, the data from test report 15285A is compared with the data from the reference test 16675A.

After determination of worst case, test report 15517A and 15285A will be used to determine the extended field of application.

2 Test report and test results in support of this extended application report

2.1 Test report

Name of the laboratory	Identification number of the test report	Owner of the test report	Date of the test	Test method
WFRGENT nv	15285A	AGC Glass Europe	23/12/2011	EN 1364-1:1999
WFRGENT nv	15517A	AGC Glass Europe	04/06/2012	EN 1364-1:1999
WFRGENT nv	16675A	AGC Glass Europe	04/07/2014	EN 1364-1:1999

2.2 Test results

2.2.1 15285A: Pyrobelite 10_Timber frame_silicone

Exposure conditions during the fire resistance test:

Temperature/time curve: standard as in EN 1363-1:1999.

Direction of exposure: The fire resistant glass is asymmetrical: the 6 mm glass segment is positioned at the exposed side (fire 6/3).
The rest of the glazing system is symmetrical.
The timber framing system is symmetrical.

No load was applied.

One vertical edge is free, the other edges are fixed.

Observations	Exceeded
Thermal insulation – I	
ΔT_m = 140°C	13 minutes
ΔT_M = 180°C	13 minutes
Integrity – E	
Spontaneous and sustained flaming	36 minutes
Failure with gap gauge ∅ 6 mm	36 minutes, no failure(2)
Failure with gap gauge ∅ 25 mm	36 minutes, no failure(2)
Ignition of cotton pad	36 minutes, no failure(1)
Radiation – W	
Radiation intensity = 15 kW/m²	36 minutes, no failure(2)

(1) No failure until thermal insulation failure.
(2) The test was stopped after 36 minutes for safety reasons.

2.2.2 15517A Pyrobelite 10_Jansen ECO 60 frame_silicone

Exposure conditions during the fire resistance test:

Temperature/time curve: standard as in EN 1363-1:1999.

Direction of exposure: The fire resistant glass is asymmetrical: the 6 mm glass segment is positioned at the exposed side (fire 6/3).
The rest if the glazing system is asymmetrical: glazing beads are positioned at the exposed side.
The steel framing system is asymmetrical: the fixing method of the frame to the surrounding construction is positioned at the unexposed side.

No load was applied.

One vertical edge is free, the other edges are fixed.

Observations	Exceeded
Thermal insulation – I	
ΔT_m = 140°C	14 minutes
ΔT_M = 180°C	10 minutes
Integrity – E	
Spontaneous and sustained flaming	43 minutes, no failure(2)
Failure with gap gauge ∅ 6 mm	43 minutes, no failure(2)
Failure with gap gauge ∅ 25 mm	43 minutes, no failure(2)
Ignition of cotton pad	43 minutes, no failure(1)
Radiation – W	
Radiation intensity = 15 kW/m²	43 minutes, no failure(2)

(1) No failure until thermal insulation failure.
(2) The test was stopped after 43 minutes at the request of the sponsor.

2.2.3 16675A: Pyrobelite 10_Timber frame_silicone

Exposure conditions during the fire resistance test:

Temperature/time curve: standard as in EN 1363-1:2012.

Direction of exposure: The fire resistant glass is asymmetrical: the 3 mm glass segment is positioned at the exposed side (fire 3/6).
The rest of the glazing system is symmetrical.
The timber framing system is symmetrical.

No load was applied.

One vertical edge is free, the other edges are fixed.

Observations	Exceeded
Thermal insulation – I	
ΔT_m = 140°C	13 minutes
ΔT_M = 180°C	15 minutes
Integrity – E	
Spontaneous and sustained flaming	40 minutes, no failure(2)
Failure with gap gauge ∅ 6 mm	40 minutes, no failure(2)
Failure with gap gauge ∅ 25 mm	40 minutes, no failure(2)
Ignition of cotton pad	40 minutes, no failure(1)
Radiation – W	
Radiation intensity = 15 kW/m²	40 minutes, no failure(2)

(1) No failure until thermal insulation failure.
(2) The test was stopped after 40 minutes for safety reasons.

3 Extended application

3.1 Principle applied for the extension of the field of application

This extended application procedure is based on method 1: established influence of product and end use parameters and method 4: calculation methods, both in accordance with the extended application standard EN 15254-4:2008+A1:2011 concerning the extension of the application field of glazing.

3.2 Parameters

PARAMETER	FACTOR	CLAUSE (EN 15254-4)	RESULTS (EXAP-report)
Glazing system			
Change of glass type and thickness	Replacement of glasses with the same glass product group	§ 6.1	§ 3.3.1
Symmetry of the glass construction	Symmetric / asymmetric glasses	§ 6.2	§ 3.3.2
Rectangular panes	Increase in pane area and aspect ratio	§ 6.3	§ 3.3.3
Circular and three- and (non-rectangular) four sided glass panes	Increase in area	§ 6.4	not applicable
Glass panes with EW classification	Increase in area	§ 6.5	§ 3.3.4
Timber beads	Exchange of timber species/ bead fixings / bead shape and dimensions	§ 6.6	§ 3.3.5
Metal beads	Exchange of bead fixing / bead shape and dimensions	§ 6.7	§ 3.3.6
Exchange of glazing materials	Gaskets/glazing strips/setting blocks	§ 6.8	§ 3.3.7
Bead surface coverings	Change or adding surface coverings	§ 6.9	§ 3.3.8
Framing System			
Symmetry of the framing construction	Symmetrical / asymmetrical frames.	§ 7.1	§ 3.3.9
Exchange of frames (general)	Type of material / junction types / edge cover	§ 7.2.1	§ 3.3.10
Timber frames	Thickness / profile / timber type (char rate / density)	§ 7.2.2	§ 3.3.11
Metal frames	Frame materials / sections / thickness of chamber walls	§ 7.2.3	§ 3.3.12
Frame surface coverings	Change or adding frame surface coverings	§ 7.3	§ 3.3.13
Supporting construction and fixing	High density, low density, rigid, flexible	§ 7.4	not applicable
Fire resistant glazed partitions			
Glazed partitions classified to E or EI	Increase in dimensions/area	§ 8.1	§ 3.3.14
Glazed partitions classified EW	Increase in dimensions/ area Replication of whole element with EW classification	§ 8.2 § 8.3	§ 3.3.15 § 3.3.16
Installation angle	Change in installation angle	§ 8.4	§ 3.3.17

3.3 Justification and results

3.3.1 Exchange of the fire resistant glass

a) Justification:

The exchange (replacement) of the glass, as tested in the reference test, for another fire resistant glass is allowed, provided that:

- both glasses are in the same product group: Pyrobelite;
- the replacement glass has at least the same or increased nominal thickness: the number of layers and the thickness of each layer must be at least the same as the exchanged glass. However, the structural stability of the glazed partition and the framing system must be maintained;
- the replacement glass must have evidence that it achieves at least the same fire resistance classification.

If the replacement glass was tested at a smaller or the same size/area as in the reference test (before extension) then the replacement glass cannot be changed from its tested size area.

If the replacement glass was tested at the same size/area as in the reference test (after extension) then this size of replacement can be used to replace the reference glass.

If the replacement glass was tested at a larger size/area than in the reference test (after extension) then the maximum size/area of the replacement glass can be no greater than the extended size/area of the glass as tested in the reference test.

b) Results:

The “Pyrobelite 10” glass panes can be replaced by thicker “Pyrobelite” glass panes, considering previous rules.

3.3.2 (A)symmetrical fire resistant glass

Fire resistance test evidence shall be provided for exposure to fire from both directions unless it can be determined which direction is the worst case. If this can be established by the use of previously existing test data then only fire resistance test evidence for the worst case is required.

a) Determination of worst case

Due to the asymmetrical nature of the fire resistant glass the worst case orientation has to be determined. In order to determine worse case the results of a fire resistance test (15285A) and a reference test (16675A) are compared.

	15285 (fire (6/3)	16675 (fire 3/6)
Thermal isulation (I)	13 minutes	13 minutes
Integrity (E)	36 minutes	40 minutes, no failure
Radiation (W)	36 minutes, no failure	40 minutes, no failure

In the reference test a glass pane of the same size of the largest glass pane during the fire resistance test has been tested in the same type of frame with the same fixing method. Only the orientation of the glass pane is different as given in paragraphs 2.2.1 and 2.2.3.

b) Result

By comparing the results of the two test we can conclude that in terms of integrity and radiation the glass pane with the 6 mm glass segment at the exposed side (fire 6/3) is the worst case. For this reason it can be concluded that the fire resistance test 15285A was tested with the worst case configuration. Therefore the results obtained in test report 15285A are also valid when the fire resistant glass is placed in the opposite direction.

c) Conclusion: Pyrobelite 10_Timber frame_silicone (test report 15285A)

The fire resistant glass is asymmetrical but based on the results of the worst case determination it can be used in both directions.

d) Conclusion: Pyrobelite 10_Jansen ECO 60 frame_silicone (test report 15517A)

The fire resistant glass is asymmetrical but based on the results of the worst case determination it can be used in both directions.

However the glazing system is asymmetrical and can only be used in the direction it was tested: the glazing beads are positioned at the exposed side.

3.3.3 Individual rectangular glass panes: aspect ratio and increase in area

a) Increase in dimensions:

An increase in the glass width, height and area is only allowed provided the length of overrun time in the reference test is as shown in table 1 below:

Classification time (minutes)	Overrun required
≤ 20	At least 3 minutes
30, 45 and 60	At least 6 minutes (*)
≥ 90	At least 10% of the classification time (**)
(*) for overrun times between 3 minutes and 6 minutes, the increase of any dimension is restricted to 50% of the calculated increase using the equations (1), (2) and (3). (**) for overrun times between 5% and 10% , the increase of any dimension is restricted to 50% of the calculated increase using the equations (1), (2) and (3).	

Table 1

The width or height may be increased in accordance with equations (1) or (2) respectively. Where both width and height are increased the maximum extended area shall be in accordance with equation (3).

(1) $w_{ext} \leq w_{max} = w_0 \times 1.20$

(2) $h_{ext} \leq h_{max} = h_0 \times 1.20$

(3) $A_{ext} \leq A_{max} = A_0 \times 1.21$

Where:

w_0,h_0, A_o is the width, height and area of the tested pane;

w_{ext}, h_{ext}, A_{ext} is the extended width, height and area of the pane;

w_{max}, h_{max}, A_{max} is the maximum extended width, height and area of the pane.

The original sizes/areas of the largest rectangular glass panes in the reference test are used to determine the maximum extended size/area of the “new pane”.

15285A: Pyrobelite 10_Timber frame_silicone

For the classification times:

- E 20: the required overrun time of 3 minutes is achieved;
- E 30: the required overrun time of 6 minutes is achieved.

The following table shows the calculated extended size/area:

Tested size/area			**Extended size/area**		
Width (mm)	**Height** (mm)	**Area** (m²)	**Width** (mm)	**Height** (mm)	**Area** (m²)
1100	2874	3.161	1320	3449	3.825
1683	850	1.431	2020	1020	1.731

Table 2

Annex 15: the extended glass size for the indicated classification times, according to table 2.

15517A: Pyrobelite 10_Jansen ECO 60 frame_silicone

For the classification times:

- E 20: the required overrun time of 3 minutes is achieved;
- E 30: the required overrun time of 6 minutes is achieved.

The following table shows the calculated extended size/area:

Tested size/area			**Extended size/area**		
Width (mm)	**Height** (mm)	**Area** (m²)	**Width** (mm)	**Height** (mm)	**Area** (m²)
1000	2860	2.860	1200	3432	3.461
1775	850	1.509	2130	1020	1.826

Table 3

Annex 16: the extended glass size for the indicated classification times, according to table 3.

b) Change in aspect ratio:

A change in aspect ratio of rectangular panes is allowed provided that the pane fits within the extended pane dimensions defined above. Additionally, a change in the aspect ratio of panes from portrait format into landscape format and vice versa, and change in area, is allowed, provided that:

- all panes covered by the reference tests were tested in an identical glazing system;
- the largest tested width as well as the largest tested height are not exceeded (width and height of different panes);
- the area of the “new pane” does not exceed the average of the largest tested portrait and landscape format panes: $A_{new} \leq ½ (A_{portrait} + A_{landscape})$.

c) Other:

15285A: Pyrobelite 10_Timber frame_silicone

Circular, triangular or 4 sided shapes can be cut from within the extended rectangular pane size. All other non-rectangular shapes, can only be cut from the original rectangular pane as described in 15285A, and cannot be extended further.

The framing system must be able to support the additional weight due to the increased pane area.

15517A: Pyrobelite 10_Jansen ECO 60 frame_silicone

Circular, triangular or 4 sided shapes can be cut from within the extended rectangular pane size. All other non-rectangular shapes, can only be cut from the original rectangular pane as described in 15517A, and cannot be extended further.

The framing system must be able to support the additional weight due to the increased pane area.

3.3.4 Individual panes in a wall: radiation

For fire resistant glass with an EW classification the rules in paragraphs 3.3.1, 3.3.2 and 3.3.3 apply together with the following:

$W_{ext} = W_0 \times [\varphi_{ext}/\varphi_0] \leq W_{max}$

Where:

W_0 is the measured radiation intensity from the test specimen at the time of classification;
W_{ext}, is the radiation intensity after extension;
W_{max} is the maximum allowed radiation intensity.

15285A: Pyrobelite 10_Timber frame_silicone

For the classification times:

- EW 20: the required overrun time of 3 minutes is achieved;
- EW 30: the required overrun time of 6 minutes is achieved.

Additionally, the radiation intensity after extension of the glazed wall is less than 15 kW/m² (*) for each of the mentioned classification times.

The following table shows the calculated extended size/area:

Tested size/area			**Extended size/area**		
Width (mm)	**Height** (mm)	**Area** (m²)	**Width** (mm)	**Height** (mm)	**Area** (m²)
1100	2874	3.161	1320	3449	3.825
1683	850	1.431	2020	1020	1.731

Table 4

Annex 15: the extended glass size for the indicated classification times, according to table 4.

(*) the radiation intensity is calculated in annex 18 of this report and represents the worst case.

15517A: Pyrobelite 10_Jansen ECO 60 frame_silicone

For the classification times:

- EW 20: the required overrun time of 3 minutes is achieved;
- EW 30: the required overrun time of 6 minutes is achieved.

Additionally, the radiation intensity after extension of the glazed wall is less than 15 kW/m² (*) for each of the mentioned classification times.

The following table shows the calculated extended size/area:

Tested size/area			**Extended size/area**		
Width (mm)	**Height** (mm)	**Area** (m²)	**Width** (mm)	**Height** (mm)	**Area** (m²)
1000	2860	2.860	1200	3432	3.461
1775	850	1.509	2130	1020	1.826

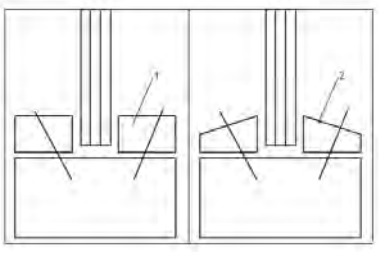
Table 5

Annex 16: the extended glass size for the indicated classification times, according to table 5.

(*) the radiation intensity is calculated in annex 19 of this report and represents the worst case.

3.3.5 15285A: Exchange of timber glazing beads

- In all cases, the exchange of timber species should be on the basis of density and/or comparative char rate tests (when available), calculations according to EN 1995-1-2 or reference values. These shall demonstrate that the fire performance of the replacement timber bead is either the same or better than that used in the reference test.



Schematic drawing 1

- A bead fixed by screws shall not be exchanged by a clipped or nailed bead unless this possibility has been shown to work, e.g. by previously existing test data.
- The bead height may be increased provided that increased edge cover on the glass can be demonstrated not to have a detrimental effect on its fire performance. The edge cover shall remain within the limits determined by the reference test or as determined by previously existing test data. A reduction of the bead height is not allowed: the bead height must be at least 27 mm.

- For EI classification of fire resistant glazed elements, exchange of the bead profile from a sloped or chamfered bead to a flat bead of the same height is allowed (see schematic drawing 1).
- For E and EW classified fire resistant glazed elements, exchange of the bead profile from a sloped or chamfered bead to a flat profile bead is not allowed unless suitably demonstrated by a reference test or previously existing test data (see schematic drawing 1).
- Reduction in bead depth is only allowed if it can be demonstrated not to have a detrimental effect on the fire performance. Previously existing test data is allowed.
- The bead depth may be increased without restraint: the bead depth must be at least 25 mm.

3.3.6 15517A: Exchange of metal glazing beads

It is not allowed to exchange the type of material used for the glazing beads.

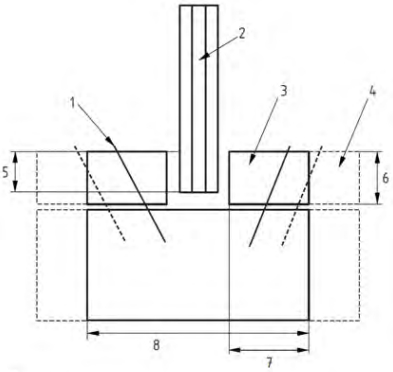
Changes in bead shape are only allowed if it can be demonstrated not to have a detrimental effect on the fire performance. Previously existing test data is allowed.

Clipped beads can be replaced by screw fixed or riveted beads but not vice-versa.

Bead depth (see schematic drawing 2, item 7) can be increased. The bead depth must be at least 35 mm.

Reductions in bead depth are only allowed if it can be demonstrated not to have a detrimental effect on the fire performance. Previously existing test data are allowed.

The bead height can be increased provided that the edge cover doesn't change or the increase in edge cover can be shown, e.g. by the reference test and/or by previously existing test data not to have a detrimental effect on the fire performance. The bead height (see schematic drawing 1, item 6) must be at least 20 mm.



Key

1 bead fixing e.g. screws, nails etc;
2 glass;
3 bead;
4 bead extended in depth;
5 edge cover;
6 bead height;
7 bead depth;
8 frame section depth.

Schematic drawing 2

3.3.7 Exchange of glazing materials

Except for glazing beads, exchange of one glazing material (Gaskets/glazing, strips/setting blocks, …) for another is allowed. But only if it can be demonstrated in the reference test and/or previously existing data that the exchange does not have a

detrimental effect on the fire performance within a comparable glazing system of the same product group.

3.3.8 Bead surface coverings

Decorative surface coverings of the glazing beads may be added where one does not exist, provided it can be demonstrated that the covering material achieves at least Class A2 when tested according to EN 13501-1. In addition it must be shown that they do not adversely affect the fire resistance performance of the fire resistant glazed element.

If the surface covering is not Class A2 then it has to be proven in reference test data and/or previously existing test data that it does not negatively affect the fire performance.

3.3.9 (A)symmetrical framing systems

15285A: Pyrobelite 10_Timber frame_silicone

The framing system is symmetrical and can be used in both directions.

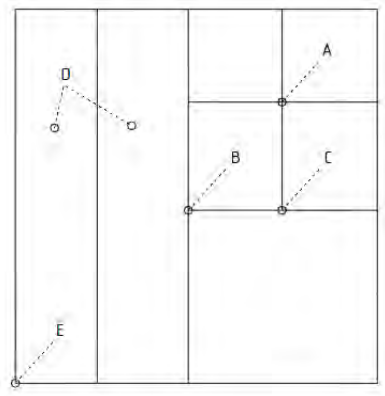
15517A: Pyrobelite 10_Jansen ECO 60 frame_silicone

The framing system is asymmetrical: the fixing method of the frame to the surrounding construction is positioned at the unexposed side.

3.3.10 Exchange of frames

Frames can be manufactured using all or some of the following allowed junction types:

type A is allowed:	four panes joining together;
type B is allowed:	three panes joining together at one point including a full height vertical pane;
type C is allowed:	three panes joining together at one point including a full width horizontal pane;
type D is not allowed:	two full panes side by side;
type E is allowed:	corner junction.



Schematic drawing 2

3.3.11 Timber frames

Exchange of the type of timber species used for the frame is allowed for fire resistant glass from the same glass product group as follows:

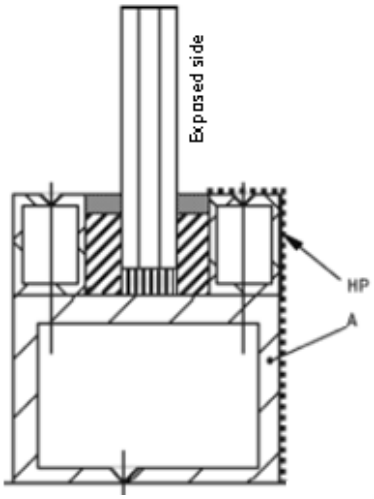
- Timber with the same or higher density, with the same or lower char rate and identical profile: the density must have at least a value of 550 kg/m³;
- Increased thickness of the frame: the thickness of the frame must be at least 71 mm.

3.3.12 Metal frames

It is not allowed to exchange the type of material used to construct the frame.

The frame section may be changed provided that it can be demonstrated that:

- the axial stress levels in the vertical elements and the bending stress are not increased in cold state;
- the HP/A factor for the frame and bead is not increased; (HP = Heated perimeter [mm]; A = Heated cross section [mm²])
- the depth of the section is not reduced;
- the wall thickness and number of chambers in the frame are not reduced.



Schematic drawing 3

3.3.13 Frame surface coverings

Decorative surface coverings of the framing members may be added where one does not exist, provided it can be demonstrated that the covering material achieves at least Class A2 when classified according to EN 13501-1. In addition it must be shown that they do not adversely affect the fire performance of the fire resistant glazed partition, e.g. in the case of replacement of coverings that provide a contribution to insulation performance.

3.3.14 Increase in overall dimensions and area of the glazed partition

An increase in the width, height and area is only allowed provided that the length of overrun time in the reference test is as shown in table 1 in paragraph 3.3.3.

The width or height may be increased in accordance with equations (1) or (2) respectively. Where both width and height are increased the maximum extended area shall be in accordance with equation (3).

(1) $w_{ext} \leq w_{max} = w_0 \times 1.20$
(2) $h_{ext} \leq h_{max} = h_0 \times 1.20$
(3) $A_{ext} \leq A_{max} = A_0 \times 1.21$

Where:

w_0,h_0, A_o is the width, height and area of the tested glazed partition;
w_{ext}, h_{ext}, A_{ext} is the extended width, height and area of the glazed partition;
w_{max}, h_{max}, A_{max} is the maximum extended width, height and area of the glazed partition.

For the classification times:

- E 20: the required overrun time of 3 minutes is achieved;
- E 30: the required overrun time of 6 minutes is achieved.

The following table shows the calculated extended size/area:

Tested size/area			**Extended size/area**		
Width (mm)	**Height** (mm)	**Area** (m²)	**Width** (mm)	**Height** (mm)	**Area** (m²)
3000	3000	9,000	3600	3600	10,890

Table 6

Annex 17: the extended glass size for the indicated classification times, according to table 6.

3.3.15 Increase in dimensions for fire resistant glazed partitions: radiation

For fire resistant glazed partitions with an EW classification the rules in paragraph 3.3.14 apply together with the following:

$W_{ext} = W_0 \times [\varphi_{ext}/\varphi_0] \leq W_{max}$

Where:

W_0 is the measured radiation intensity from the test specimen at the time of classification;
W_{ext} is the radiation intensity after extension;
W_{max} is the maximum allowed radiation intensity.

For the classification times:

- EW 20: the required overrun time of 3 minutes is achieved;
- EW 30: the required overrun time of 6 minutes is achieved.

Additionally, the radiation intensity after extension of the glazed wall is less than 15 kW/m² (*) for each of the mentioned classification times.

The following table shows the calculated extended size/area:

Tested size/area			**Extended size/area**		
Width (mm)	**Height** (mm)	**Area** (m²)	**Width** (mm)	**Height** (mm)	**Area** (m²)
3000	3000	9,000	3600	3600	10,890

Table 7

Annex 17: the extended glass size for the indicated classification times, according to table 7.

(*) the radiation intensity is calculated in annexes 18 and 19 of this report and represents the worst case.

3.3.16 Replication of the fire resistant glazed partition with reference to radiation

A wider construction achieved by replicating the fire resistant glazed partition as tested, by adding more units of the same fire resistant glazed partition side by side is allowed for E classified partitions.

A wider construction achieved by replicating the fire resistant glazed partition as tested, by adding more units of the same fire resistant glazed partition side by side, is allowed for EW classified partitions, providing that $W_{ext} \leq 15$ Kw/m² according to the calculations in the annexes listed below.

Annex 18: Pyrobelite 10_Timber frame_silicone: radiation calculations.

Annex 19: Pyrobelite 10_Jansen ECO 60 frame_silicone: radiation calculations.

3.3.17 Changing in installation angle

A change in the angle of installation of up to ± 10 degrees from the vertical is allowed. No further increase in the angle of installation is allowed.

4 Extended application results

4.1 Application range – product family

This extended application is valid for the product as described in clause 1 of this report.

4.2 Fire performance parameters

The results are reproduced in clause 3.3 of this extended application report.

5 Duration of the validity of the extended application report

At the time the standard EN 15254-4:2008+A1:2011 was published, no decision was made concerning the duration of validity of the extended application document.

6 Additional statement

The extended application results relate to the behaviour of a product/product family under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product/product family in use.

SIGNED

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APPROVED

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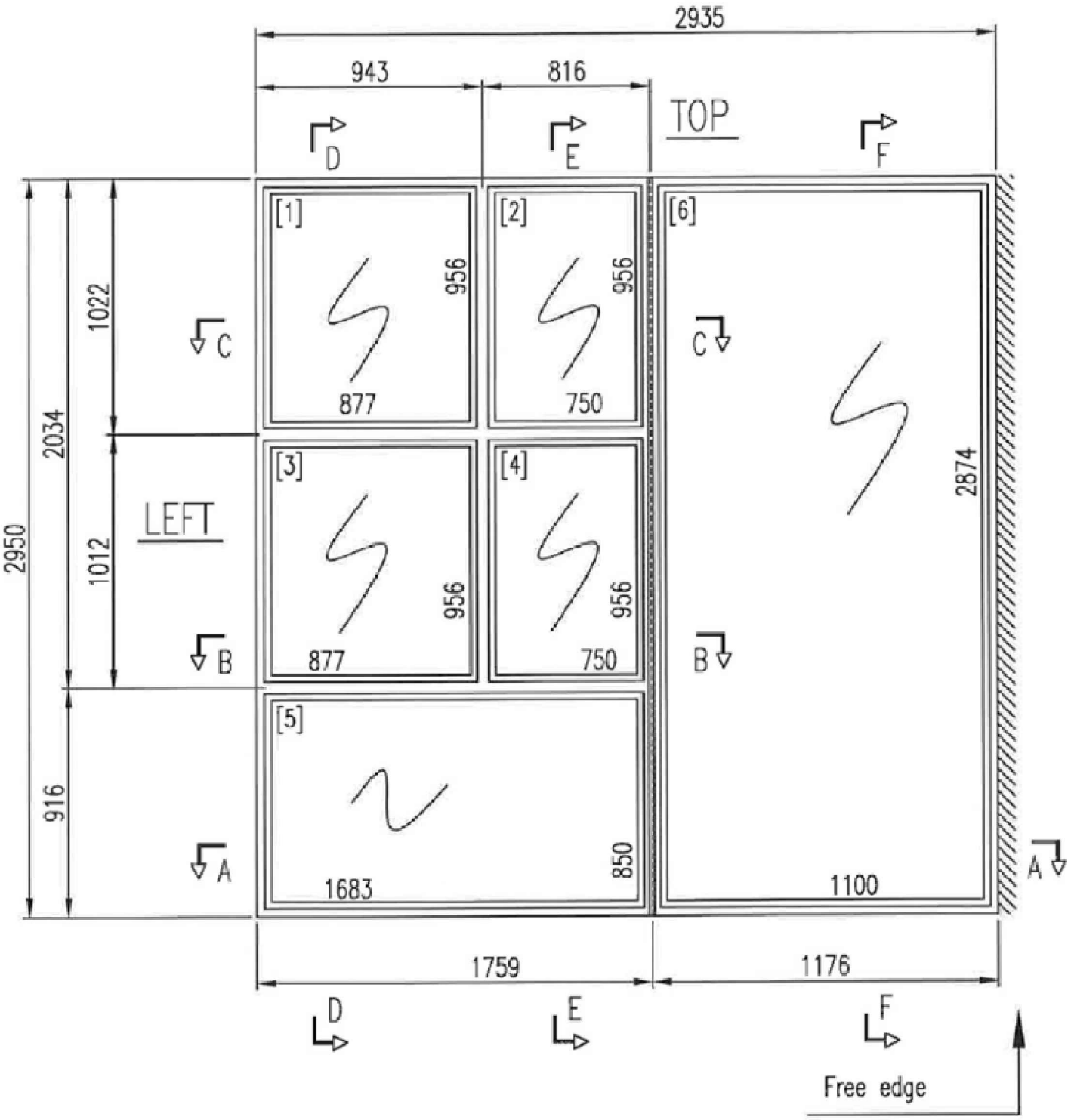
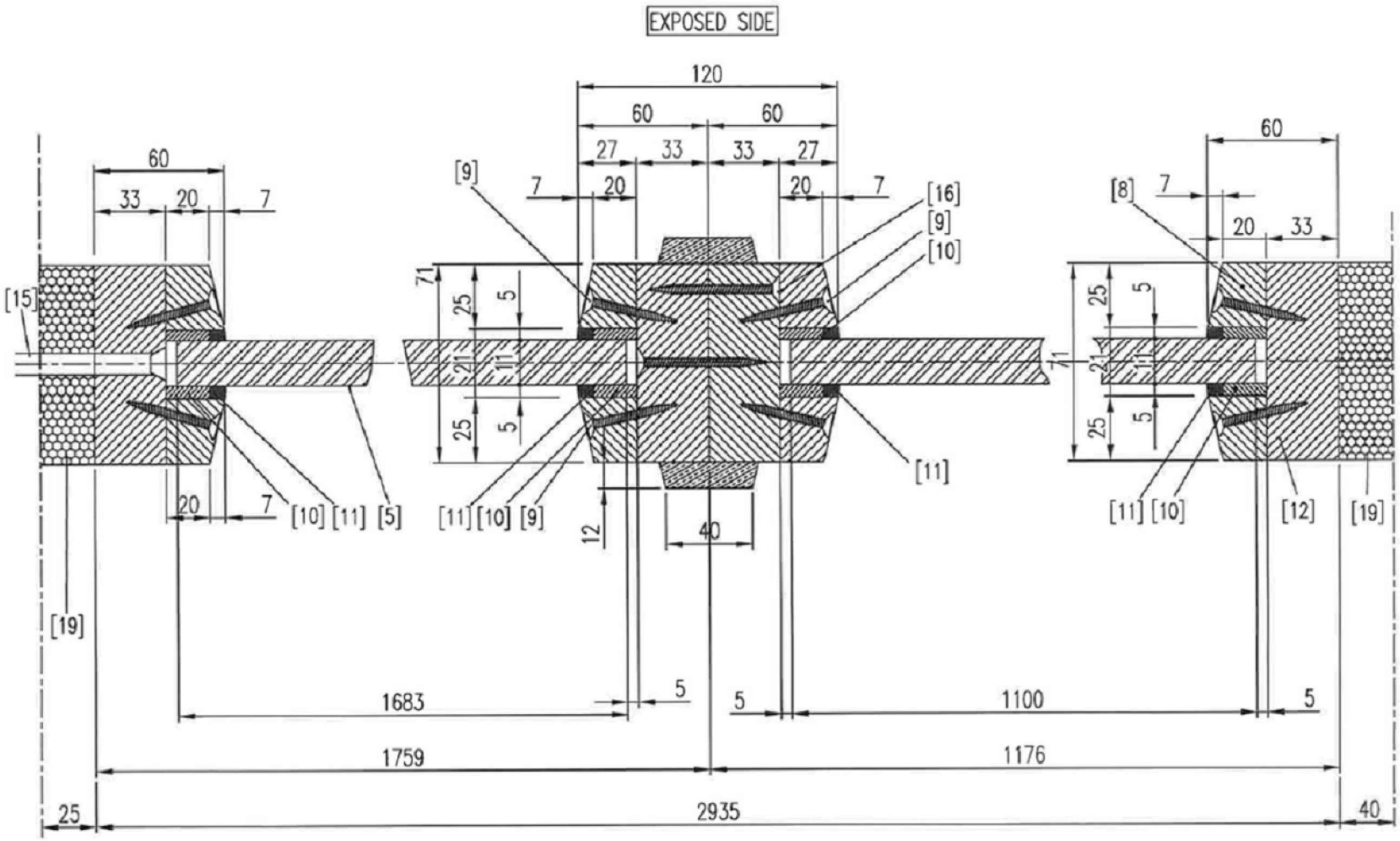
2014.09.05 12:03:12 +02'00'

This document is the original version of this report and is written in English.

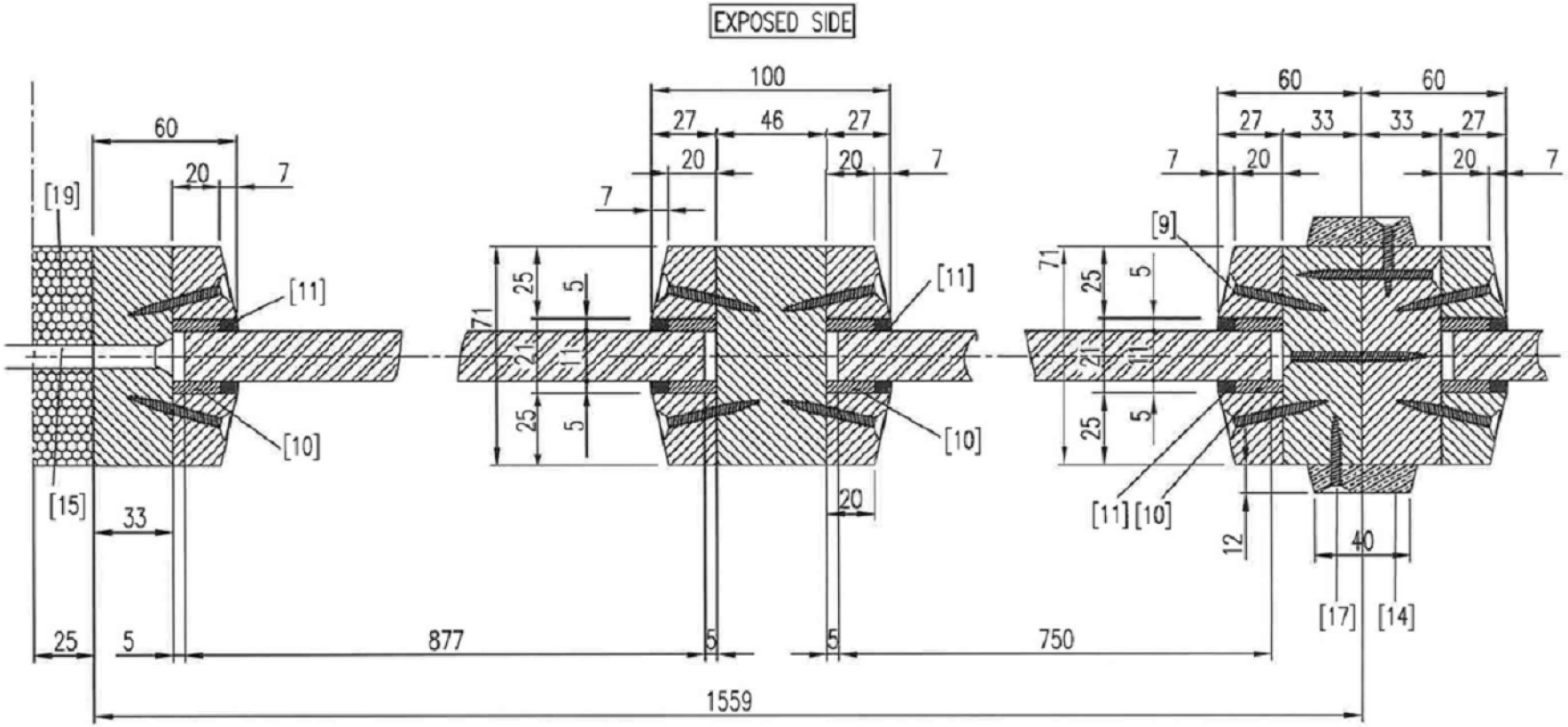
15285A: Front view (unexposed side) - dimensions



15285A: Section A-A



15285A: Section B-B and C-C



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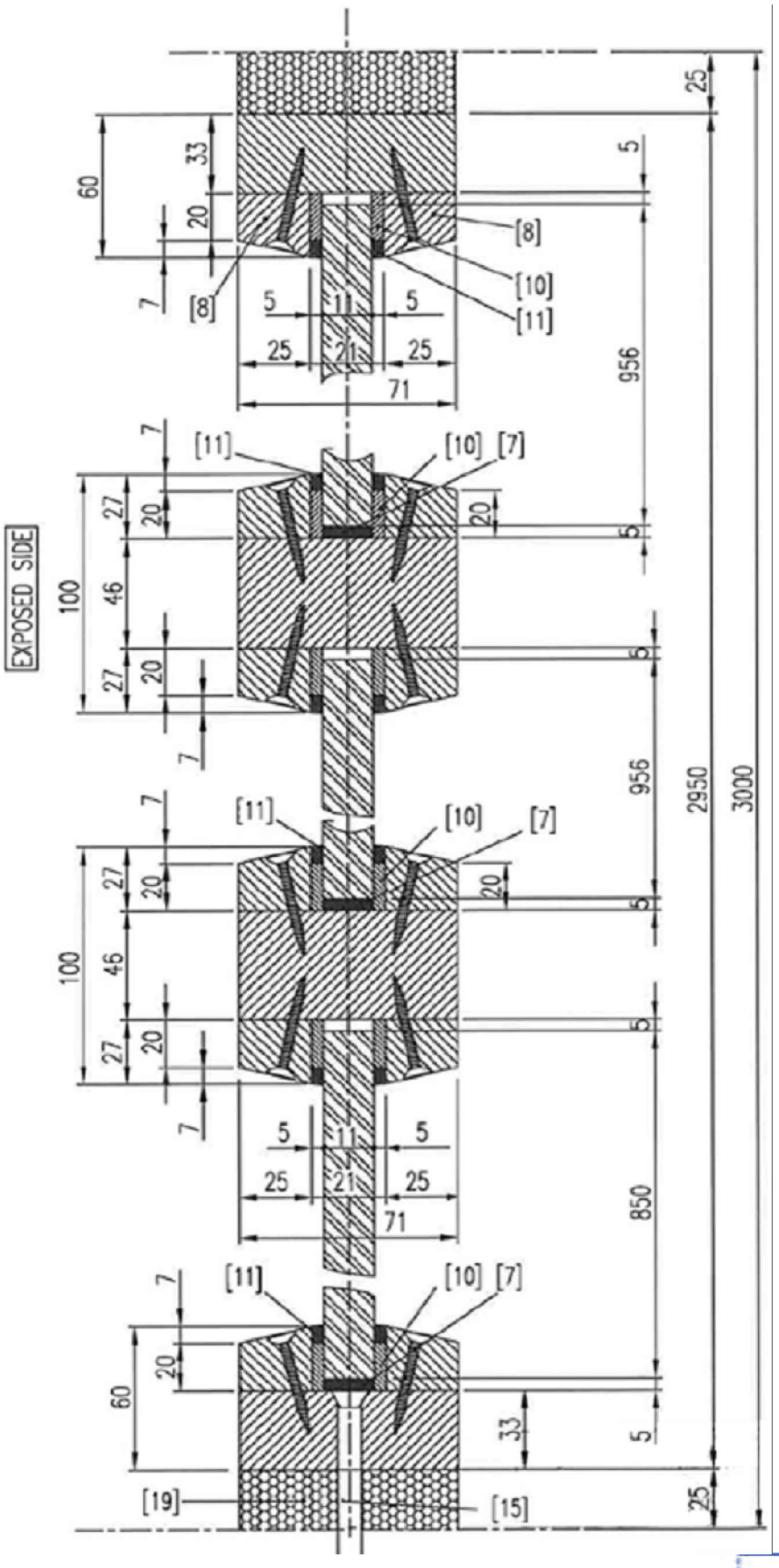
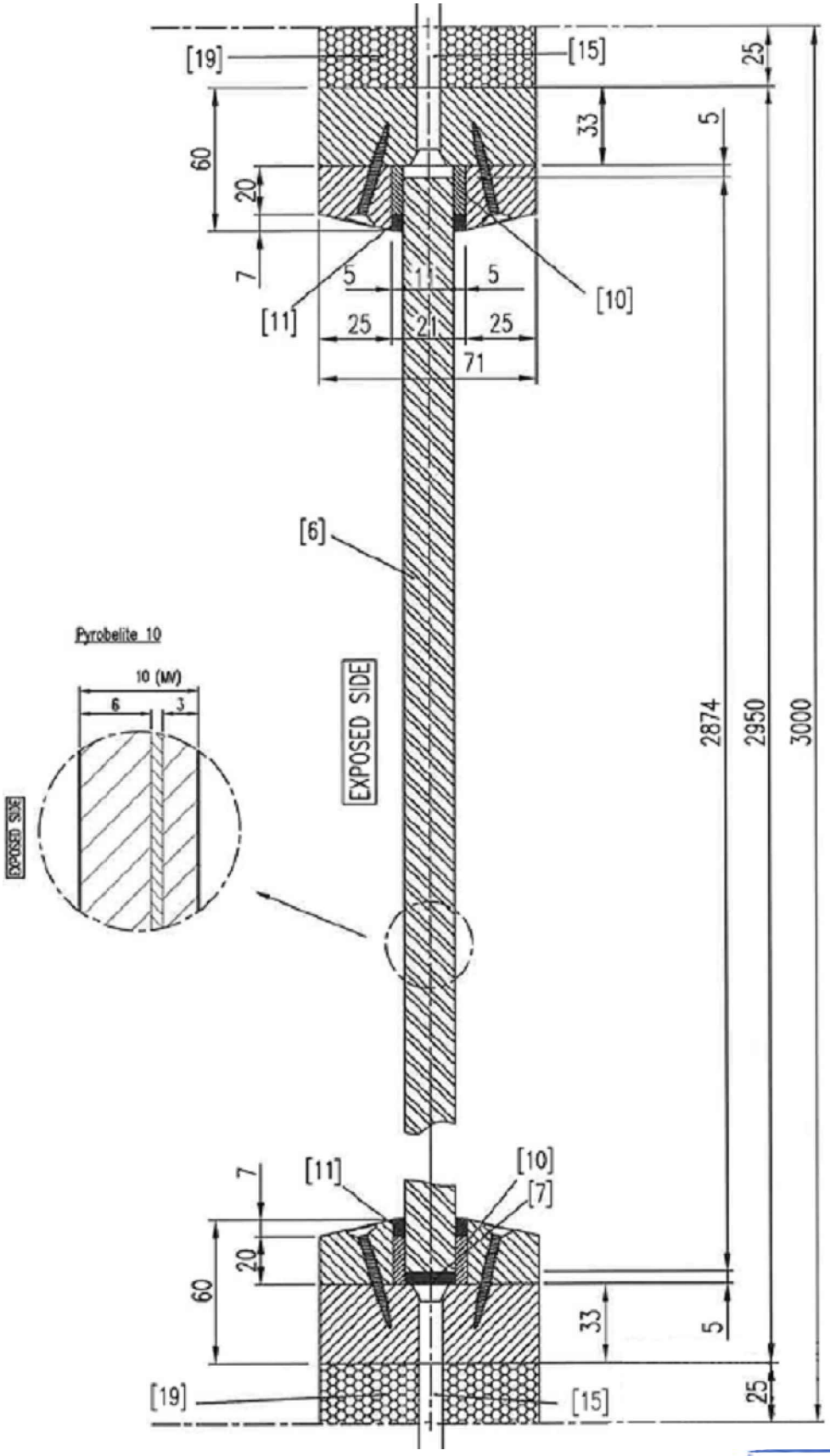
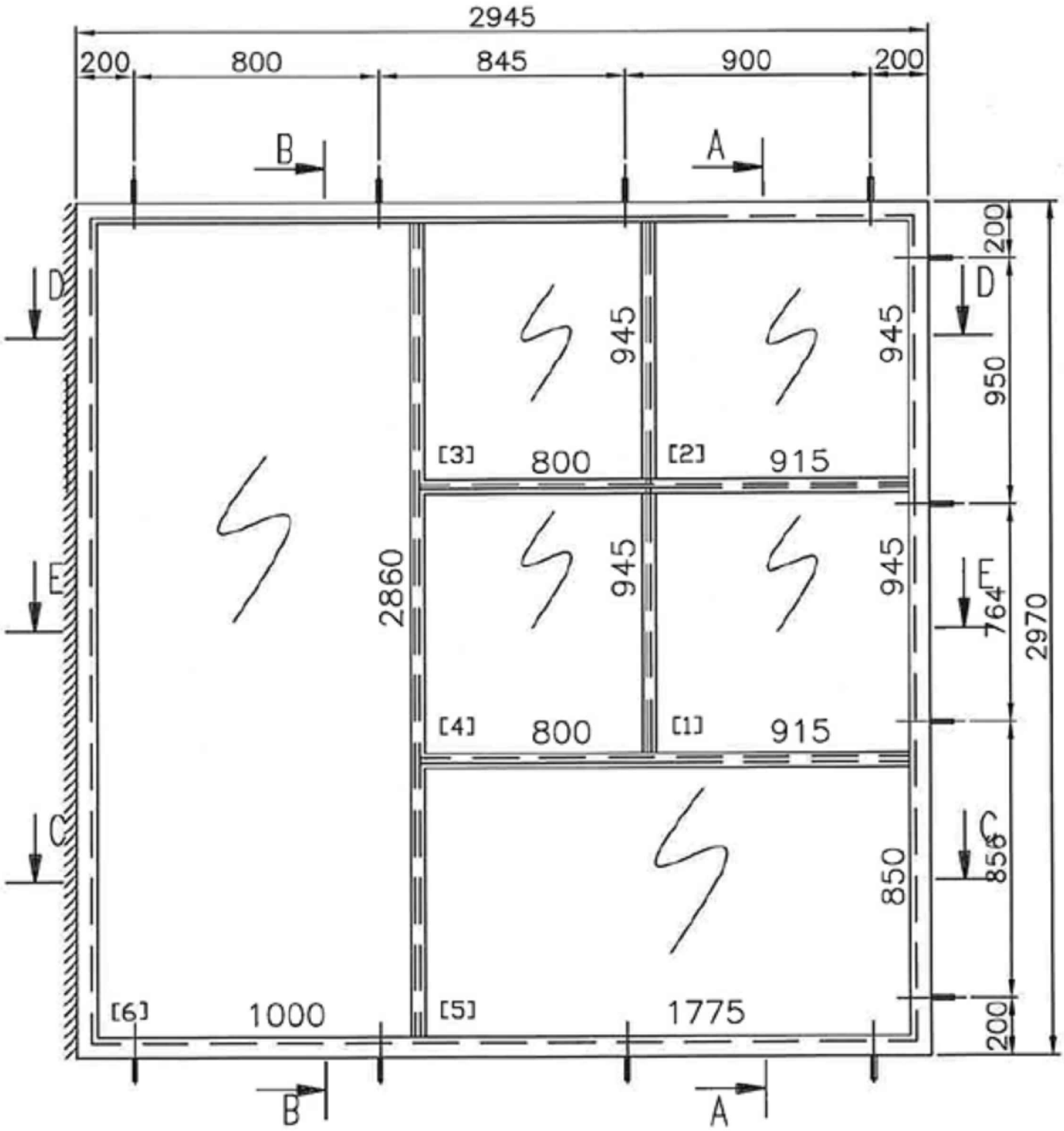
15285A: Section D-D and E-E



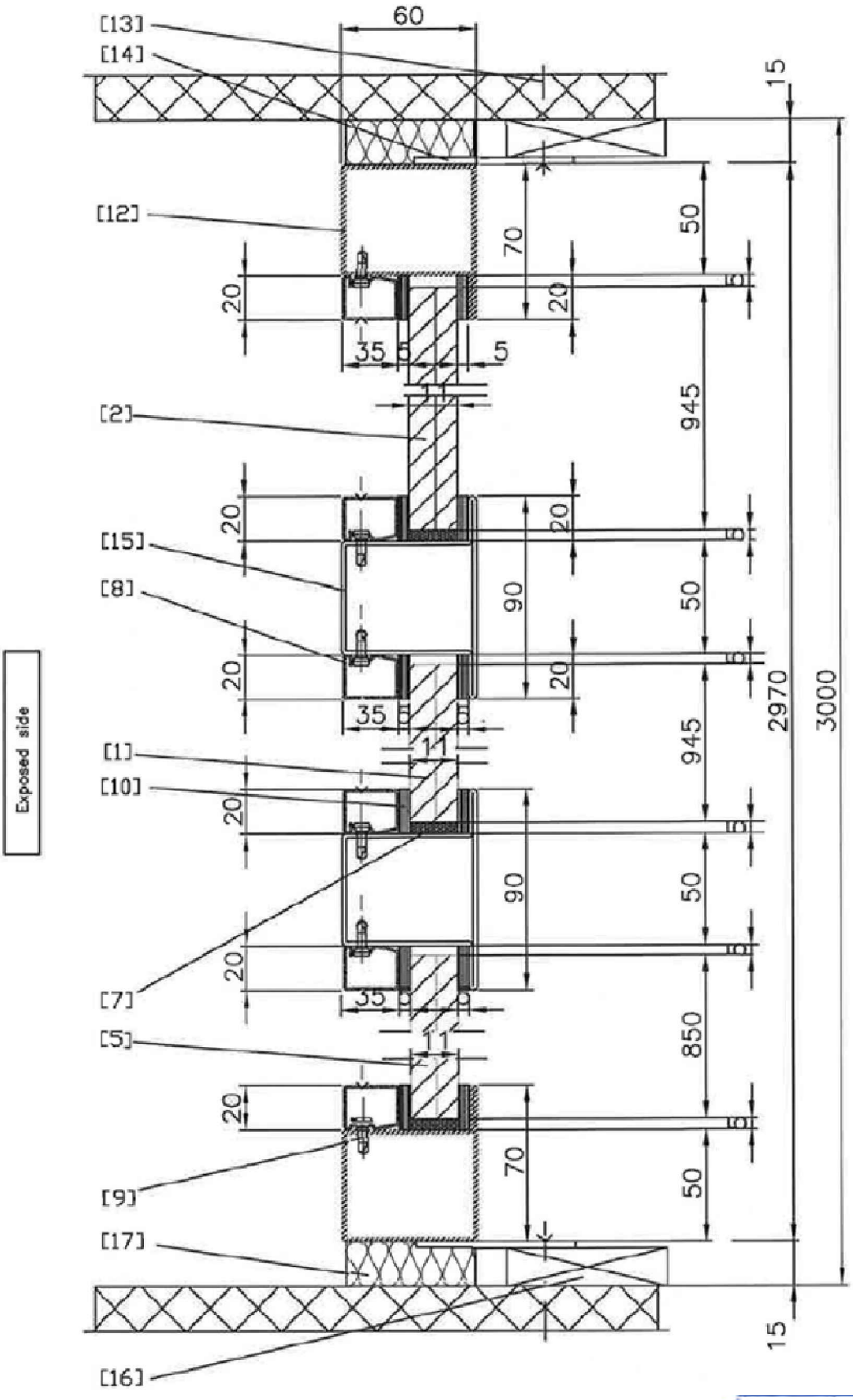
15285A: Section F-F



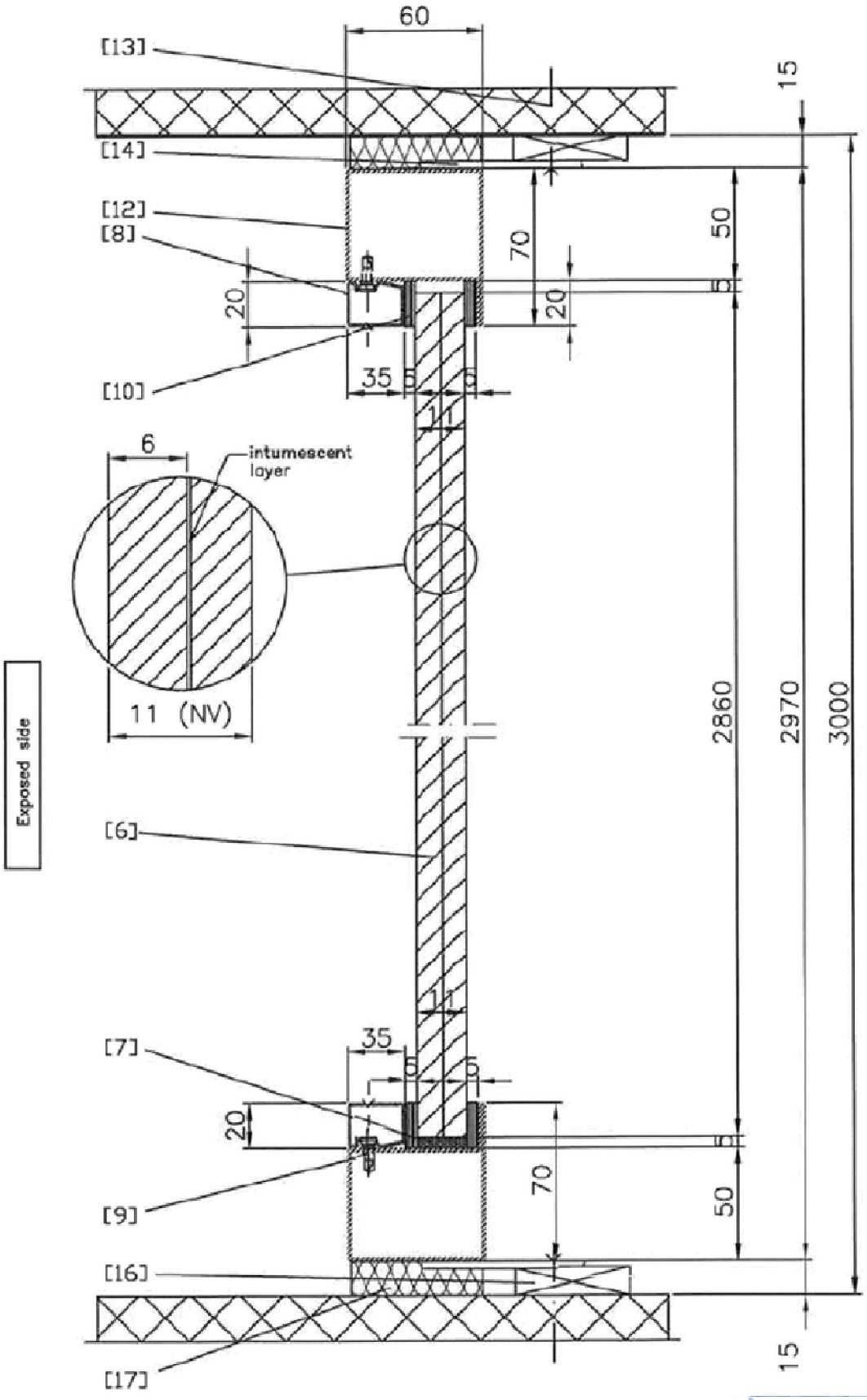
15517A: Front view (unexposed side) - dimensions



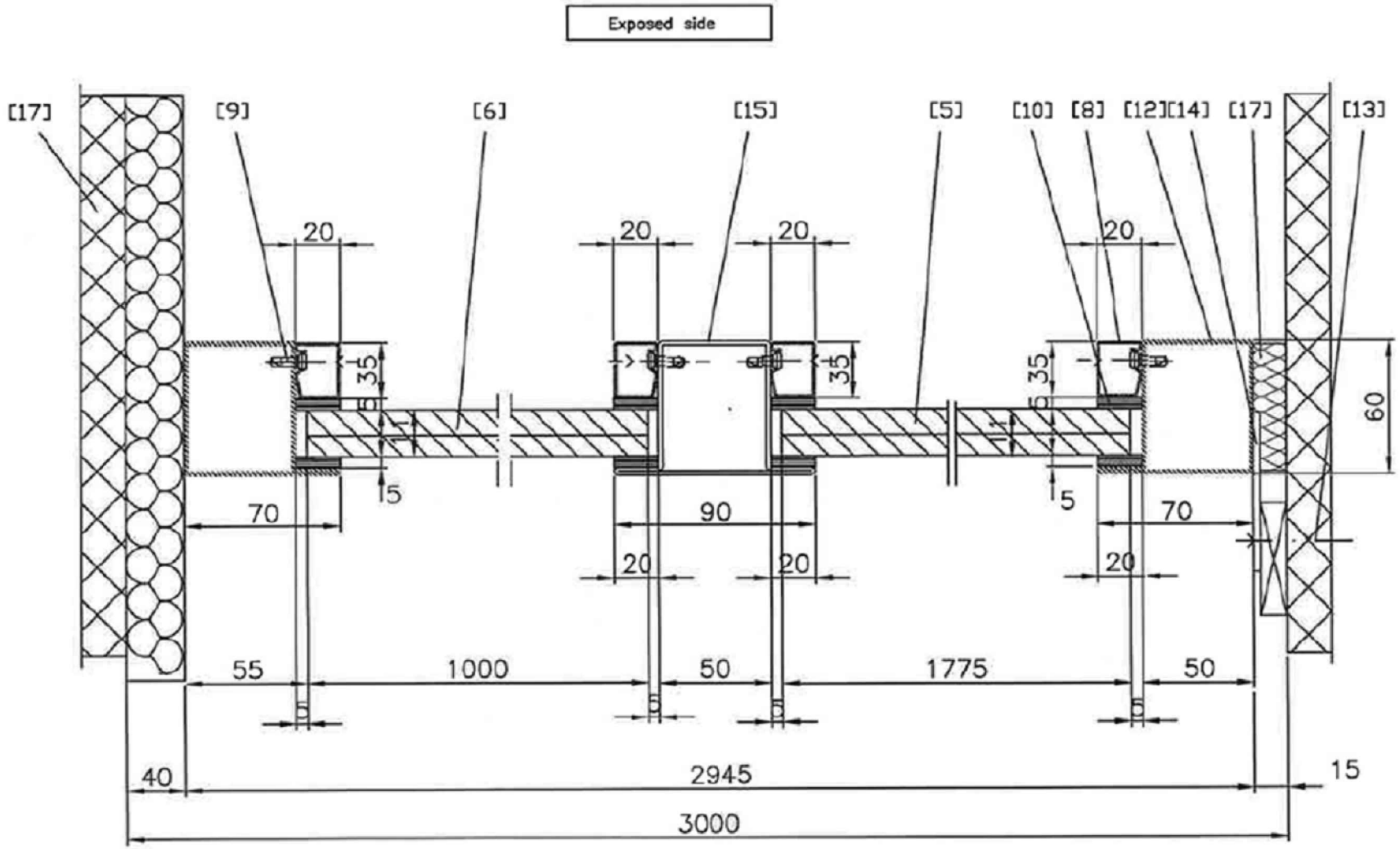
15517A: Section A-A



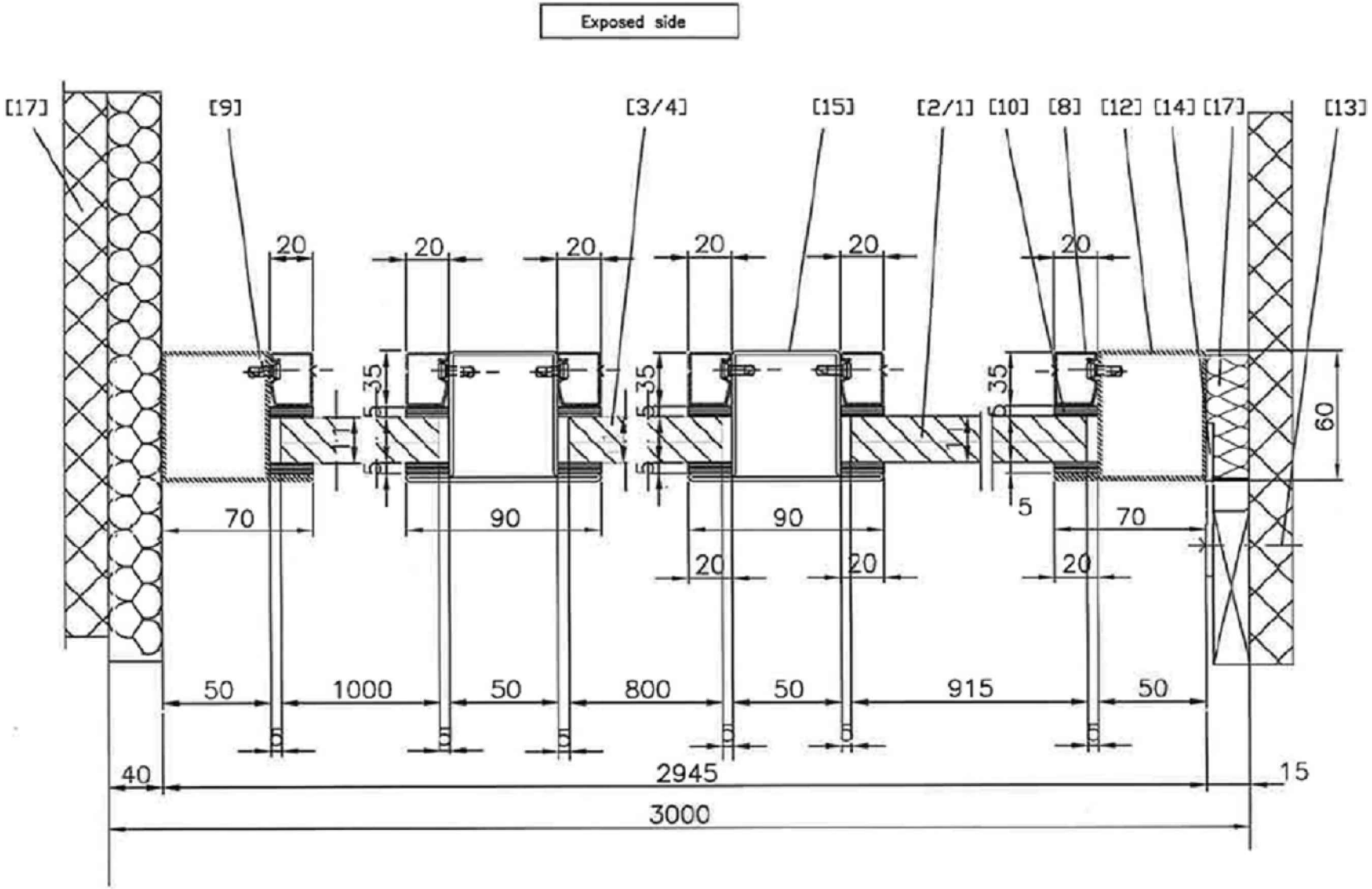
15517A: Section B-B



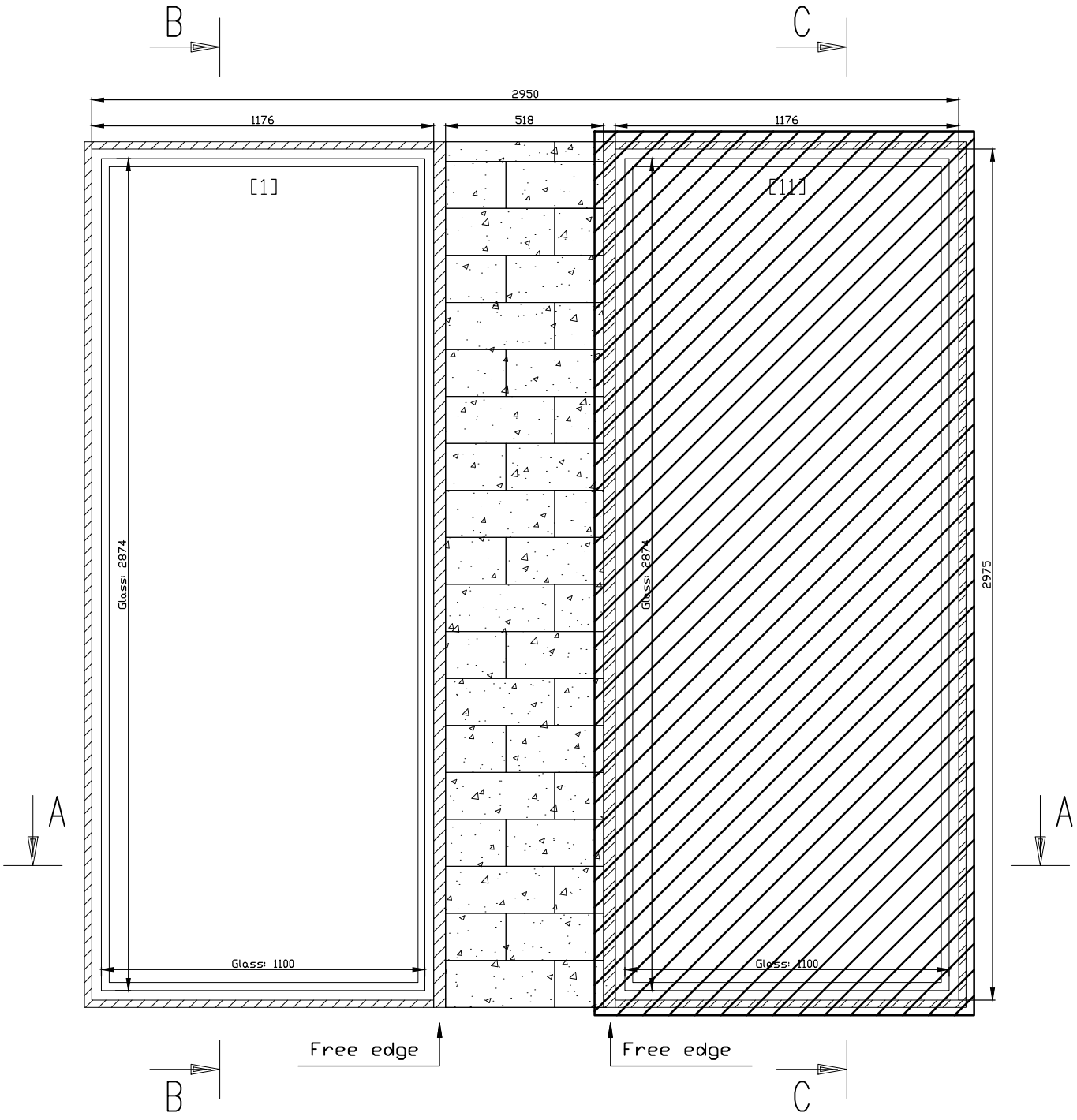
15517A: Section C-C



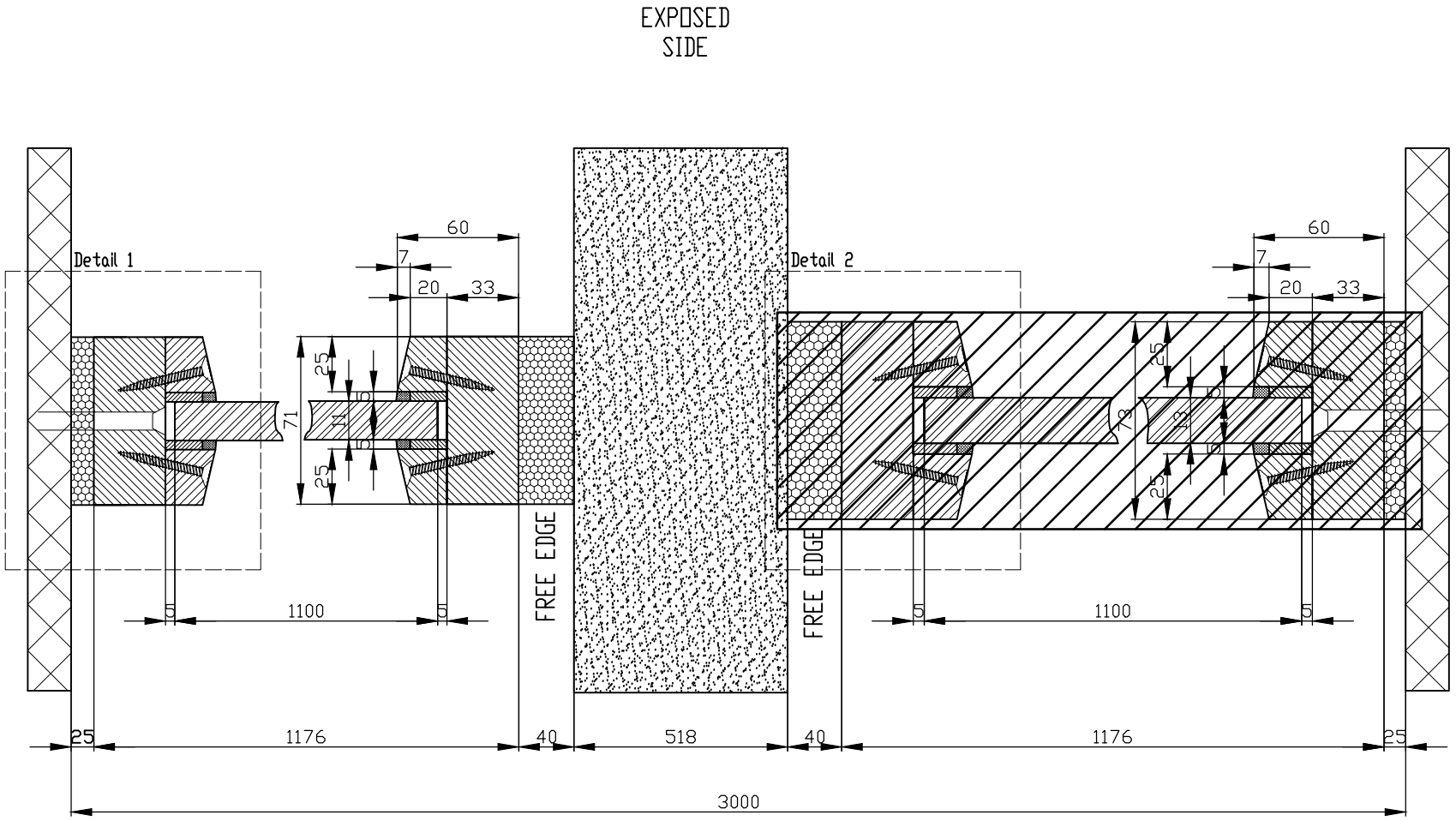
15517A: Section D-D and E-E



16675A: Front view (unexposed side) - dimensions



16675A: Section A-A - dimensions



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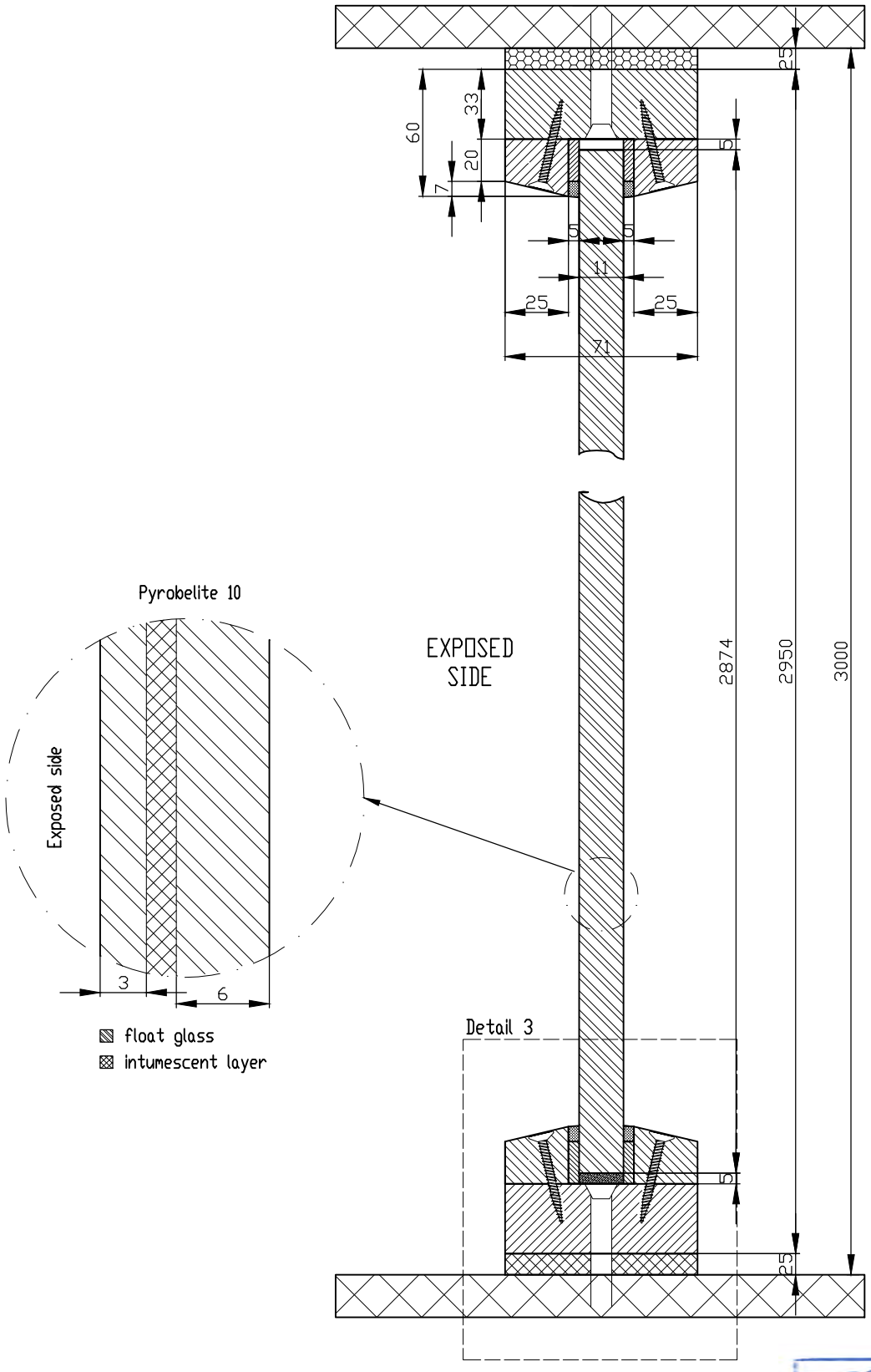
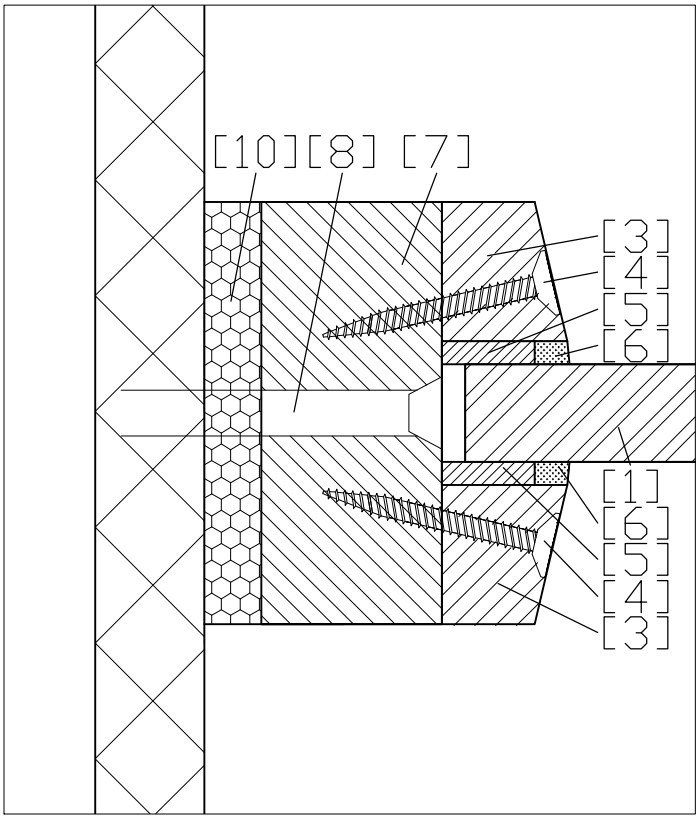
16675A: Section B-B - dimensions

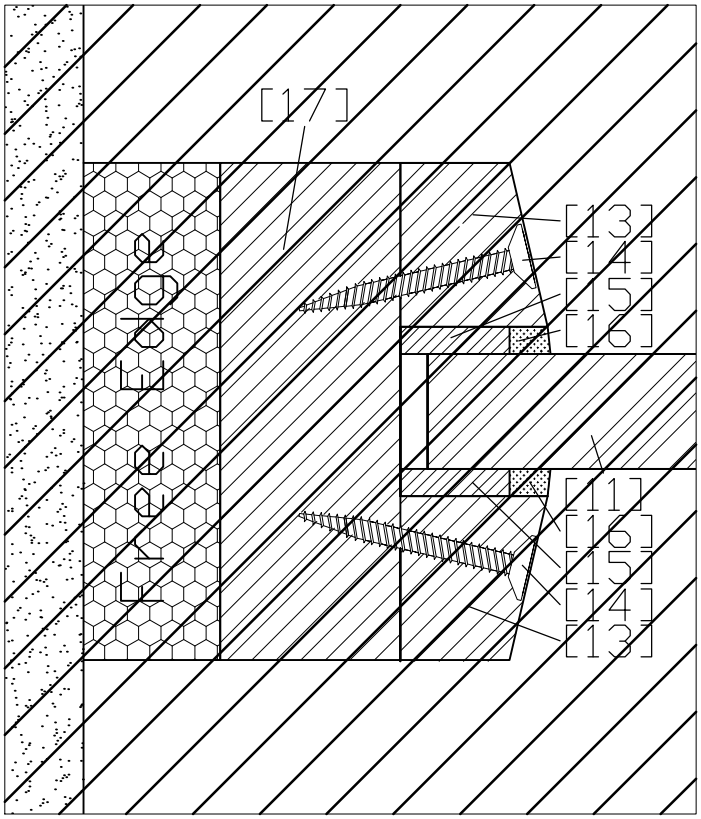


16675A: Details

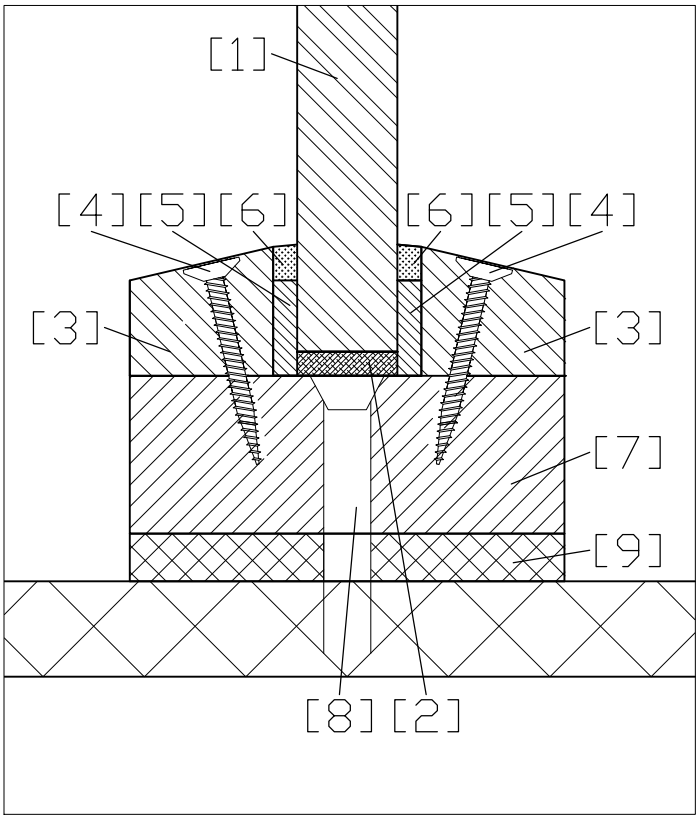
Detail 1



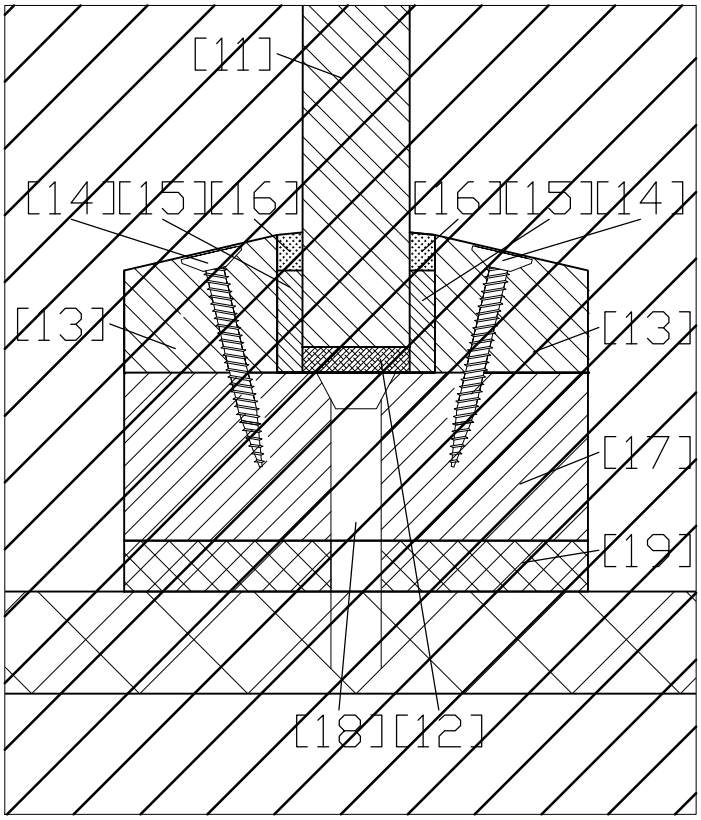
Detail 2



Detail 3

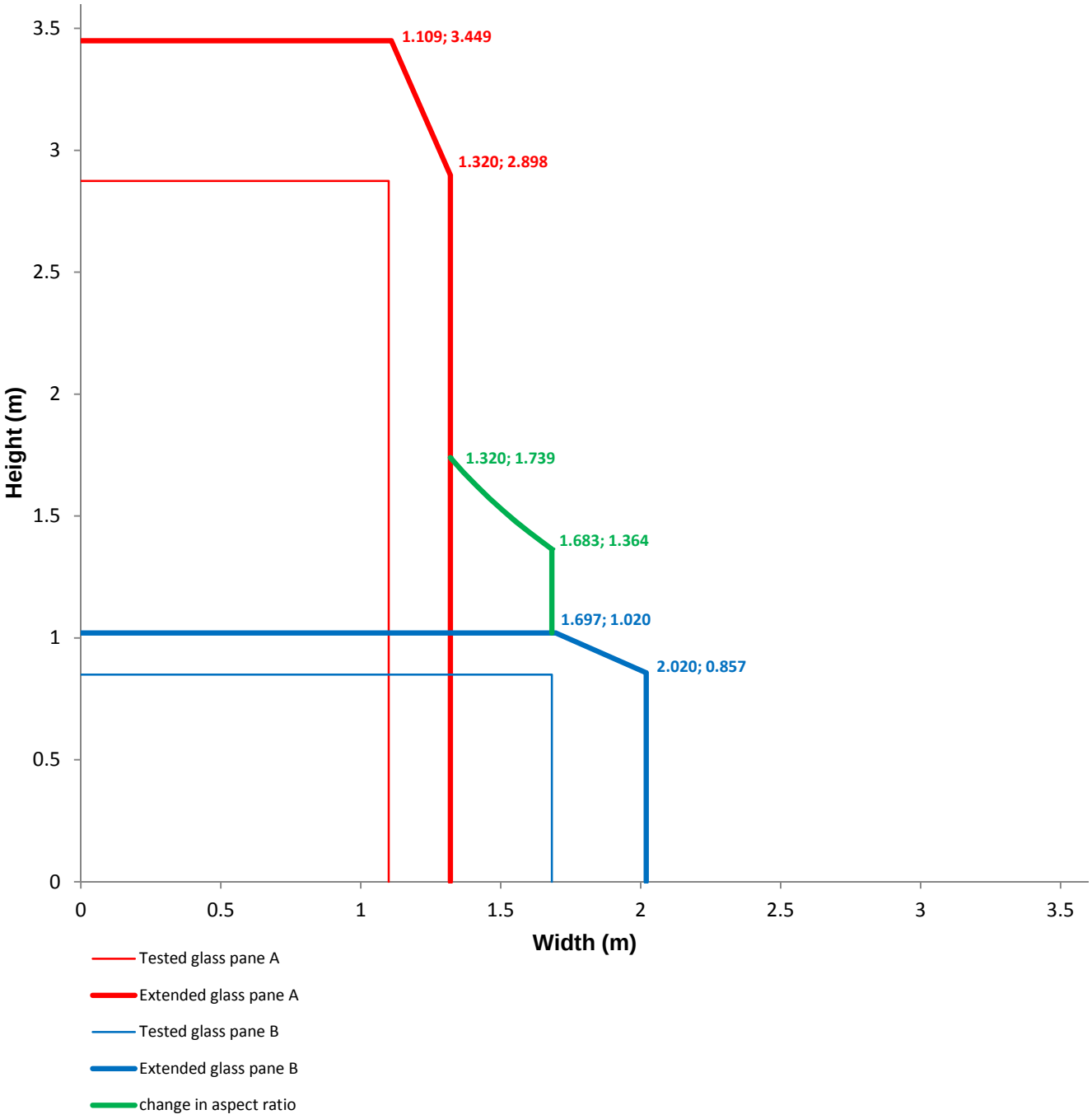


Detail 4



Pyrobelite 10_Timber frame_silicone
Individual rectangular glass panes: aspect ratio and increase in area

The extended dimensions are only valid for the following classification times:
- **E 30, E 20;**
- **EW 30, EW 20.**

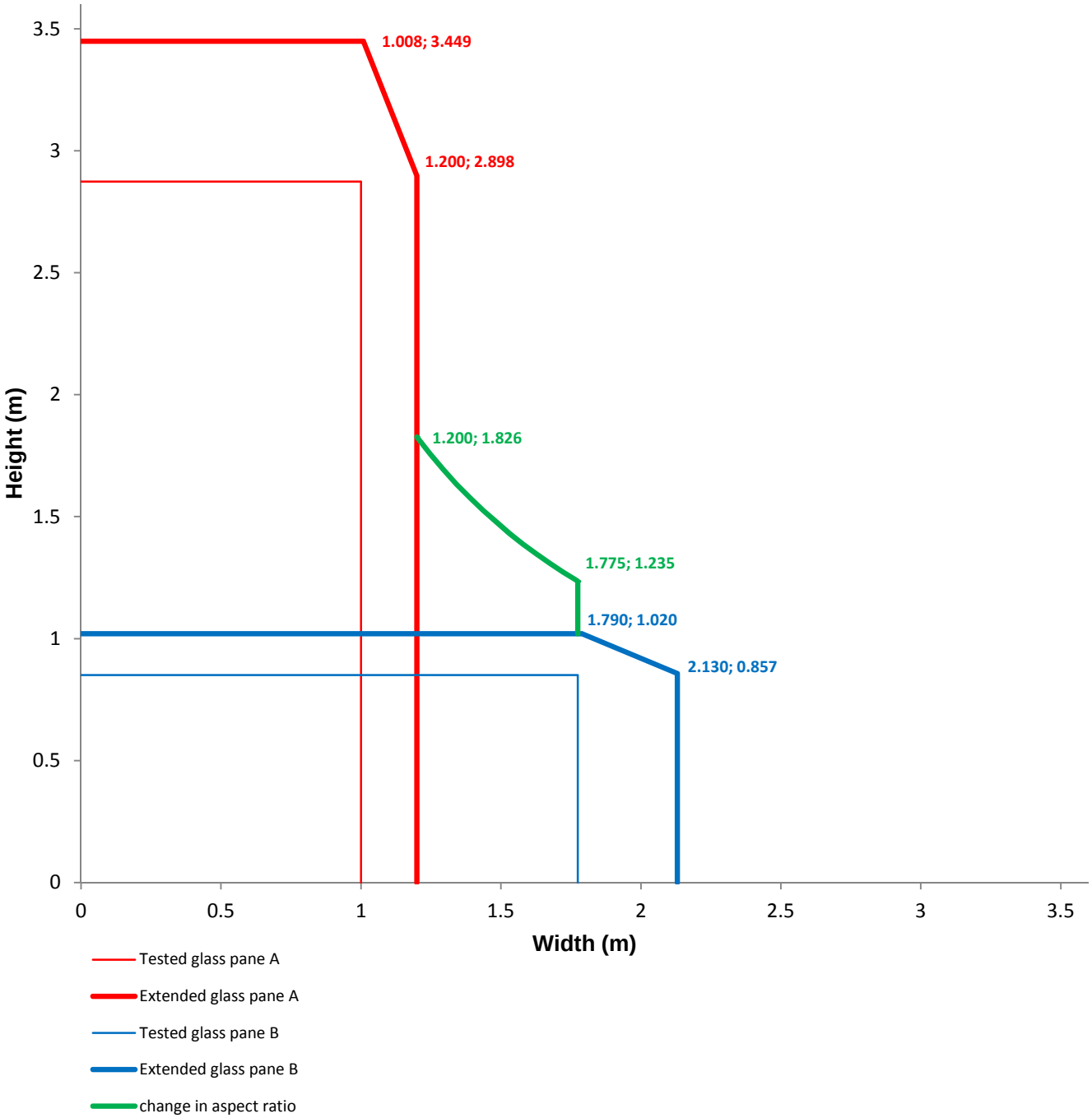


Note:

The maximum dimensions of circular, triangular and four sided shaped glass panes are represented by the thickest lines (extended dimensions). The maximum dimensions of the other non rectangular glass panes are represented by the thinnest lines (tested dimensions).

Pyrobelite Jansen ECO 60 frame silicone
Individual rectangular glass panes: aspect ratio and increase in area

The extended dimensions are only valid for the following classification times:
- **E 30, E 20;**
- **EW 30, EW 20.**

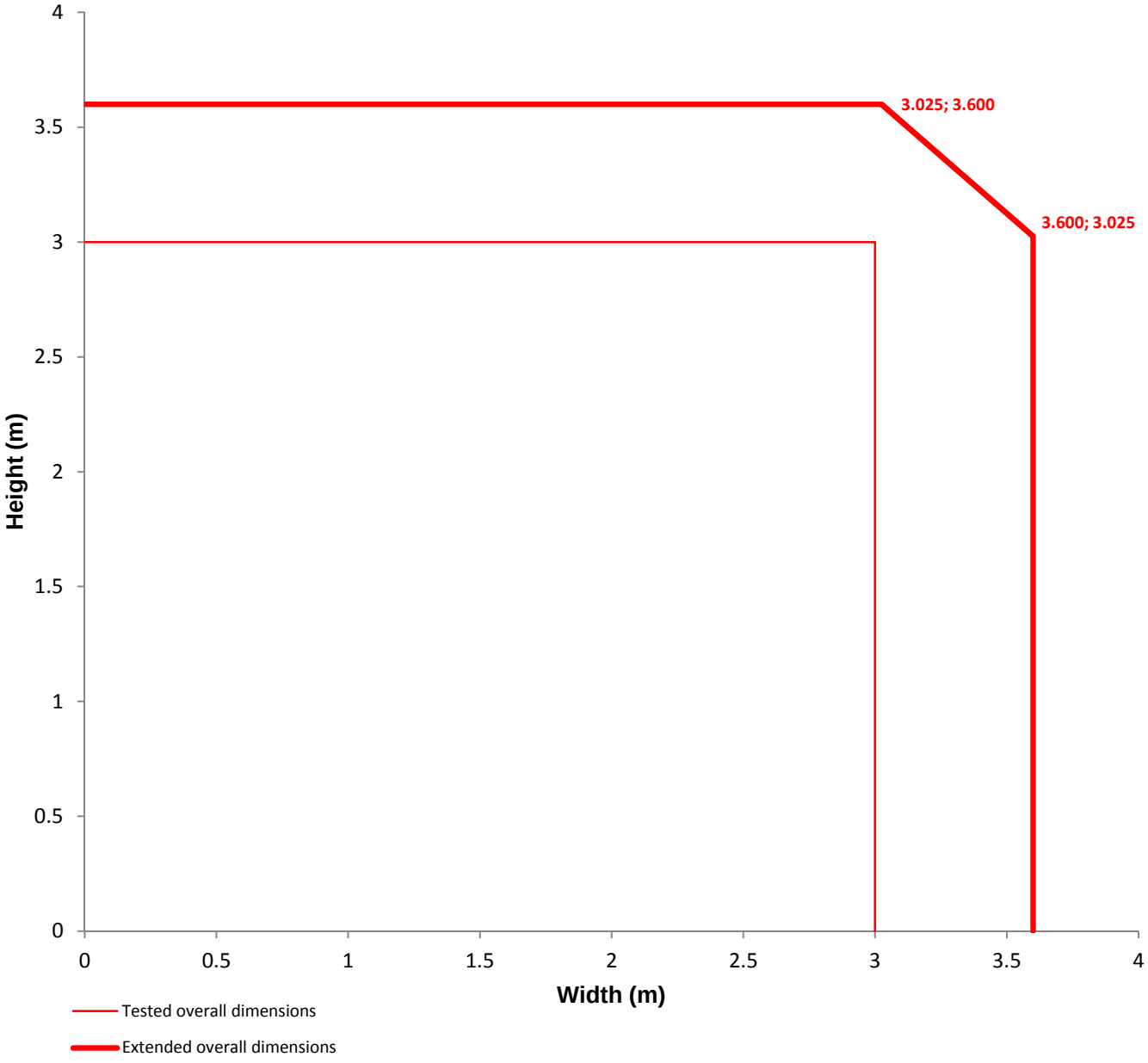


Note:

The maximum dimensions of circular, triangular and four sided shaped glass panes are represented by the thickest lines (extended dimensions). The maximum dimensions of the other non rectangular glass panes are represented by the thinnest lines (tested dimensions).

Increase in overall dimensions and area of the partition

The extended dimensions are only valid for the following classification times:
- **E 30, E 20;**
- **EW 30, EW 20.**



Note:

The maximum overall dimensions of the fire resistant glazed partition are represented by the thickest lines. A wider construction achieved by replicating the extended fire resistant glazed partition is allowed.

Pyrobelite 10 Timber frame silicone: RADIATION CALCULATIONS

An increase in radiation is not proportional to an increase in area of the test specimen. However, for a rectangular test specimen it can be calculated according to the following mathematical functions:

$$W_{ext} = W_0 \cdot \frac{\varphi_{ext}}{\varphi_0} \leq W_{max}$$

$$\varphi_0 = \frac{2}{\pi}\left[\frac{w_0}{\sqrt{w_0^2 + 4.d^2}} . \tan^{-1}\left(\frac{h_0}{\sqrt{w_0^2 + 4.d^2}}\right) + \frac{h_0}{\sqrt{h_0^2 + 4.d^2}} . \tan^{-1}\left(\frac{w_0}{\sqrt{h_0^2 + 4.d^2}}\right)\right]$$

$$\varphi_{ext} = \frac{2}{\pi}\left[\frac{w_{ext}}{\sqrt{w_{ext}^2 + 4.d^2}} . \tan^{-1}\left(\frac{h_{ext}}{\sqrt{w_{ext}^2 + 4.d^2}}\right) + \frac{h_{ext}}{\sqrt{h_{ext}^2 + 4.d^2}} . \tan^{-1}\left(\frac{w_{ext}}{\sqrt{h_{ext}^2 + 4.d^2}}\right)\right]$$

Where:

W_{ext}	= is the radiation of the test specimen after extension.
W_0	= is the measured radiation from the test specimen at the time of classification.
	= 10.36 kW/m² after 36 minutes.
W_{max}	= 15 kW/m².
d	= is the distance between the test specimen and the sensor.
	= 1 m.
w_0,h_0	= is the width and the height of the test specimen.
w_{ext},h_{ext}	= is the extended width and the height of the test specimen.

For an extension of h_{ext} to 3.6 meters and an extension of w_{ext} to infinity (worst case):

$$\varphi_{ext} = \lim_{+\infty} \frac{2}{\pi}\left[\frac{w_{ext}}{\sqrt{w_{ext}^2 + 4.d^2}} . \tan^{-1}\left(\frac{h_{ext}}{\sqrt{w_{ext}^2 + 4.d^2}}\right) + \frac{h_{ext}}{\sqrt{h_{ext}^2 + 4.d^2}} . \tan^{-1}\left(\frac{w_{ext}}{\sqrt{h_{ext}^2 + 4.d^2}}\right)\right]$$

$$\varphi_{ext} = \frac{2}{\pi} . \left[0 + \frac{3.6}{\sqrt{3.6^2 + 4}} . \frac{\pi}{2}\right] = 0.8742$$

$$\varphi_0 = \frac{2}{\pi}\left[\frac{w_0}{\sqrt{w_0^2 + 4.d^2}} . \tan^{-1}\left(\frac{h_0}{\sqrt{w_0^2 + 4.d^2}}\right) + \frac{h_0}{\sqrt{h_0^2 + 4.d^2}} . \tan^{-1}\left(\frac{w_0}{\sqrt{h_0^2 + 4.d^2}}\right)\right]$$

$$\varphi_0 = \frac{2}{\pi}\left[\frac{3}{\sqrt{13}} . \tan^{-1}\left(\frac{3}{\sqrt{13}}\right) + \frac{3}{\sqrt{13}} . \tan^{-1}\left(\frac{3}{\sqrt{13}}\right)\right] = 0.7352$$

$$W_{ext} = W_0 \cdot \frac{\varphi_{ext}}{\varphi_0} = \ 10.36\ kW/m^2 \cdot \frac{0.8742}{0.7352} = 12.32\ kW/m^2 \leq 15 kW/m^2$$

Pyrobelite 10 Jansen ECO 60 frame silicone: RADIATION CALCULATIONS

An increase in radiation is not proportional to an increase in area of the test specimen. However, for a rectangular test specimen it can be calculated according to the following mathematical functions:

$$W_{ext} = W_0 \cdot \frac{\varphi_{ext}}{\varphi_0} \leq W_{max}$$

$$\varphi_0 = \frac{2}{\pi}\left[\frac{w_0}{\sqrt{w_0^2 + 4.d^2}} . \tan^{-1}\left(\frac{h_0}{\sqrt{w_0^2 + 4.d^2}}\right) + \frac{h_0}{\sqrt{h_0^2 + 4.d^2}} . \tan^{-1}\left(\frac{w_0}{\sqrt{h_0^2 + 4.d^2}}\right)\right]$$

$$\varphi_{ext} = \frac{2}{\pi}\left[\frac{w_{ext}}{\sqrt{w_{ext}^2 + 4.d^2}} . \tan^{-1}\left(\frac{h_{ext}}{\sqrt{w_{ext}^2 + 4.d^2}}\right) + \frac{h_{ext}}{\sqrt{h_{ext}^2 + 4.d^2}} . \tan^{-1}\left(\frac{w_{ext}}{\sqrt{h_{ext}^2 + 4.d^2}}\right)\right]$$

Where:

W_{ext}	= is the radiation of the test specimen after extension.
W_0	= is the measured radiation from the test specimen at the time of classification.
	= 7.3 kW/m² after 36 minutes.
W_{max}	= 15 kW/m².
d	= is the distance between the test specimen and the sensor.
	= 1 m.
w_0,h_0	= is the width and the height of the test specimen.
w_{ext},h_{ext}	= is the extended width and the height of the test specimen.

For an extension of h_{ext} to 3.6 meters and an extension of w_{ext} to infinity (worst case):

$$\varphi_{ext} = \lim_{+\infty} \frac{2}{\pi}\left[\frac{w_{ext}}{\sqrt{w_{ext}^2 + 4.d^2}} . \tan^{-1}\left(\frac{h_{ext}}{\sqrt{w_{ext}^2 + 4.d^2}}\right) + \frac{h_{ext}}{\sqrt{h_{ext}^2 + 4.d^2}} . \tan^{-1}\left(\frac{w_{ext}}{\sqrt{h_{ext}^2 + 4.d^2}}\right)\right]$$

$$\varphi_{ext} = \frac{2}{\pi} . \left[0 + \frac{3.6}{\sqrt{3.6^2 + 4}} . \frac{\pi}{2}\right] = 0.8742$$

$$\varphi_0 = \frac{2}{\pi}\left[\frac{w_0}{\sqrt{w_0^2 + 4.d^2}} . \tan^{-1}\left(\frac{h_0}{\sqrt{w_0^2 + 4.d^2}}\right) + \frac{h_0}{\sqrt{h_0^2 + 4.d^2}} . \tan^{-1}\left(\frac{w_0}{\sqrt{h_0^2 + 4.d^2}}\right)\right]$$

$$\varphi_0 = \frac{2}{\pi}\left[\frac{3}{\sqrt{13}} . \tan^{-1}\left(\frac{3}{\sqrt{13}}\right) + \frac{3}{\sqrt{13}} . \tan^{-1}\left(\frac{3}{\sqrt{13}}\right)\right] = 0.7352$$

$$W_{ext} = W_0 \cdot \frac{\varphi_{ext}}{\varphi_0} = \ 7.3\ kW/m^2 \cdot \frac{0.8742}{0.7352} = 8.7\ kW/m^2 \leq 15 kW/m^2$$