EXTENDED APPLICATION REPORT NO. 16015B

Owner of this report:

AGC Glass Europe
166, Chaussée de la Hulpe
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Belgium

References:

This extended application report concerns test results obtained for a non-loadbearing glazed wall – type: Pyrobelite 9 EG – 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 eighteen pages and eleven 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 9 EG_Hardwoord frame_silicone.

Product family: Pyrobelite EG.

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, including edge and boundary conditions, is fully described in the test report provided in support of this extended application report listed in clause 2.1.

The drawings of test report 16015A, upon which this extended application report is based, are given in annexes 1 till 6. The part numbers in these annexes refer to the part numbers in the test report.

Short description

The test specimen consists of a symmetrical wooden frame made of two units and asymmetrical Pyribelite EG glass panes which are held into place with timber glazing beads.

The first unit (1759 mm x 2950 mm) contains five glass panes with the Pyrobelite glass segment at the unexposed side.

The second unit (1176 mm x 2950 mm) contains a large glass pane with the Pyrobelite glass segment at the exposed side.

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	16015A	AGC Glass Europe	29/05/2013	EN 1363-1:2012 EN 1364-1:1999

Exposure conditions during the fire resistance test:

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

Direction of exposure: The glazing system is asymmetrical:

- Orientation 1: glass pane [1]-[5]: the Pyrobelite 9 glass segment at the unexposed side (annex 1);
- Orientation 2: glass pane [6]: the Pyrobelite 9 glass segment at the exposed side (annex 1).

The framing system is symmetrical.

No load is applied.

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

2.2 Test results: Pyrobelite 9 at the unexposed side

Parameter	Results
Loadbearing capacity	Not applicable
Integrity	
Time of ignition of a cotton pad	44 minutes,
Time of occurrence of sustained flaming	44 minutes
Time of failure of gap gauge criterion	44 minutes
Thermal insulation	
Time after which the mean temperature rise at the unexposed side exceeds 140 °C	26 minutes
Time after which the maximum temperature rise at the unexposed side exceeds 180 °C	25 minutes
Radiation	
Time after which the radiation intensity exceeds 15 kW/m²	44 minutes
Mechanical action	Not applicable

The test duration was 44 minutes.

2.3 Test results: Pyrobelite 9 at the exposed side

Parameter	Results
Loadbearing capacity	Not applicable
Integrity	
Time of ignition of a cotton pad	44 minutes
Time of occurrence of sustained flaming	44 minutes
Time of failure of gap gauge criterion	44 minutes
Thermal insulation	
Time after which the mean temperature rise at the unexposed side exceeds 140 °C	30 minutes
Time after which the maximum temperature rise at the unexposed side exceeds 180 °C	38 minutes
Radiation	
Time after which the radiation intensity exceeds 15 kW/m²	44 minutes
Mechanical action	Not applicable

The test duration was 44 minutes.

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	not applicable
Exchange of glazing materials	Gaskets/glazing strips/setting blocks	§ 6.8	§ 3.3.6
Bead surface coverings	Change or adding surface coverings	§ 6.9	§ 3.3.7
Framing System			
Symmetry of the framing construction	Symmetrical / asymmetrical frames.	§ 7.1	§ 3.3.8
Exchange of frames (general)	Type of material / junction types / edge cover	§ 7.2.1	§ 3.3.9
Timber frames	Thickness / profile / timber type (char rate / density)	§ 7.2.2	§ 3.3.10
Metal frames	Frame materials / sections / thickness of chamber walls	§ 7.2.3	not applicable
Frame surface coverings	Change or adding frame surface coverings	§ 7.3	§ 3.3.11
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	§ 3.3.12
Glazed partitions classified EW	Increase in dimensions/ area Replication of whole element with EW classification	§ 8.2 § 8.3	§ 3.3.13 § 3.3.14
Installation angle	Change in installation angle	§ 8.4	§ 3.3.15

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 EG;
- 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 whole glazed partition 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 9 EG” glass panes can be replaced by thicker “Pyrobelite EG” glass panes, considering previous rules.

3.3.2 (A)symmetrical fire resistant glass

The fire resistant glass is asymmetrical and can only be used in the direction it was tested:

Orientation 1: the Pyrobelite 9 glass segment at the unexposed side.
Orientation 2: the Pyrobelite 9 glass segment at the exposed side

Attention: the classification times and the glass sizes are different for each orientation.

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% en 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 size/area of the largest rectangular glass panes in the reference tests are used to determine the maximum extended size/area.

Pyrobelite 9 at the unexposed side:

For the classification times

- EI 20, EI 15 and 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)
877	956	0.838	1052	1147	1.014
1683	850	1.431	2020	1020	1.731

Table 2

Pyrobelite 9 at the exposed side:

For the classification times

- EI 20, EI 15 and 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

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 area of the largest tested portrait and landscape format panes: $A_{new} \leq ½ \times (A_{portrait} + A_{landscape})$.

c) Other:

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 16015A, and cannot be extended further.

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

d) Results:

The results are given in:

Annex 7: the extended glass size for the indicated classification times, according to table 2.

Annex 8: the extended glass size for the indicated classification times, according to table 3.

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.

Pyrobelite 9 at the unexposed side:

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 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)
877	956	0.838	1052	1147	1.014
1683	850	1.431	2020	1020	1.731

Table 4

Pyrobelite 9 at the exposed side:

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 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

Table 5

The results are given in:

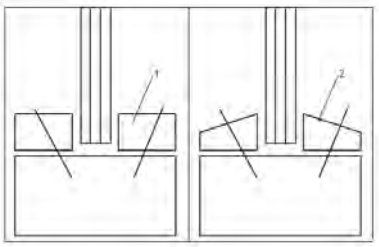
Annex 7: the extended glass size for the indicated classification times, according to table 4.

Annex 8: the extended glass size for the indicated classification times, according to table 5.

(*) the radiation intensity is calculated in annex 11 of this report and represents the worst case.

3.3.5 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 1395-1-2 or reference values. These shall demonstrate that the fire performance of the replacement timber bead is either the same or better than the timber beads 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 the 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 Exchange of glazing materials

Except for glazing beads, exchange of one glazing material (Gaskets/glazing, strips/setting blocks, …) 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.

3.3.7 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.

Any coverings on glazed elements classified EI shall be secured using only fixing method(s) proven in the reference test and/or by previously existing test data.

3.3.8 (A)symmetrical framing systems

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

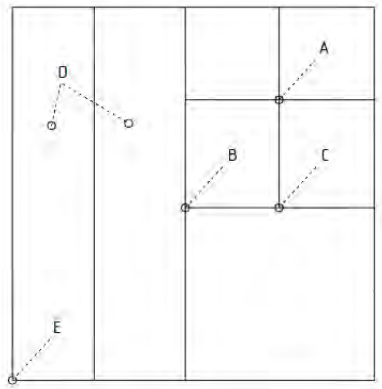
3.3.9 Exchange of frames

The tested glass panes are the same type but are tested in different orientations. Because the orientation of the glass can have an effect on the classification time the allowed junction types are limited to the junctions that where tested with glass that have the same orientation. Therefore the junction types are discussed separately for both orientations.

Frame unit 1: Pyrobelite 9 at the unexposed side:

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 not 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.

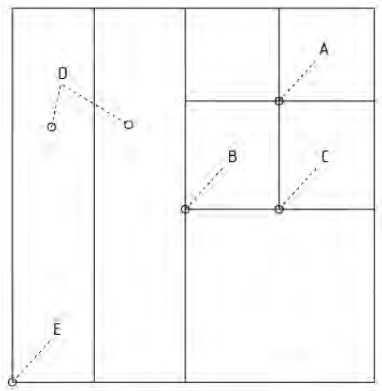


Schematic drawing 2

Frame unit 2: Pyrobelite 9 at the exposed side:

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

type A is not allowed: four panes joining together;
type B is not allowed: three panes joining together at one point including a full height vertical pane;
type C is not 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 3

3.3.10 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 491 kg/m³;
- Increased thickness of the frame: the thickness of the frame must be at least 72 mm.

3.3.11 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.
Any coverings on glazed partitions classified EI shall only be secured using fixing methods that do not impair the fire performance of the partition proven by the reference test and/or previously existing test data.

3.3.12 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.

The two units contain glass panes in the opposite direction. Therefore the frame units are discussed separately.
Note that the entire test specimen is 3000 mm x 3000 mm. The outer dimensions of the entire wooden frame are 2935 mm x 2950 mm. The slight decrease of the frame width

and height is caused by Rockwool sealing placed between the concrete frame and the wooden frame.
Because the wooden frame is discussed as two units, only the outer dimensions of the wooden frame units are considered.

Frame unit 1: Pyrobelite 9 at the unexposed side:

For the classification times

- EI 20, EI 15 and 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)
1759	2950	5.189	2111	3540	6.279

Table 6

Frame unit 2: Pyrobelite 9 at the exposed side:

For the classification times

- EI 20, EI 15 and 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)
1176	2950	3.469	1411	3540	4.198

Table 7

The results are given in:

Annex 9: the extended overall size for the indicated classification times, according to table 6.

Annex 10: the extended overall size for the indicated classification times, according to table 7.

3.3.13 Increase in dimensions for fire resistant glazed partitions: radiation

For fire resistant glazed partitions with an EW classification the rules in paragraph 3.3.12 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.

Frame unit 1: Pyrobelite 9 at the unexposed side:

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 the mentioned classification time.

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)
1759	2950	5.189	2111	3540	6.279

Table 8

Frame unit 2: Pyrobelite 9 at the exposed side:

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 the mentioned classification time.

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)
1176	2950	3.469	1411	3540	4.198

Table 9

The results are given in:

Annex 9: the extended overall size for the indicated classification times, according to table 8.

Annex 10: the extended overall size for the indicated classification times, according to table 9.

(*) the radiation intensity is calculated in annex 11 of this report and represents the worst case.

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

The two units contain glass panes in different positions. Additionally not all junction types are tested in both configurations. Therefore the replication of each frame unit is discussed separately.

Frame unit 1: Pyrobelite 9 at the unexposed side:

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 and EI 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:

Annex 11: radiation calculations.

Frame unit 2:Pyrobelite 9 at the exposed side:

In absence of the necessary junction types in this configuration, it's not possible to assemble a wider construction for E, EI and EW classified partitions.

3.3.15 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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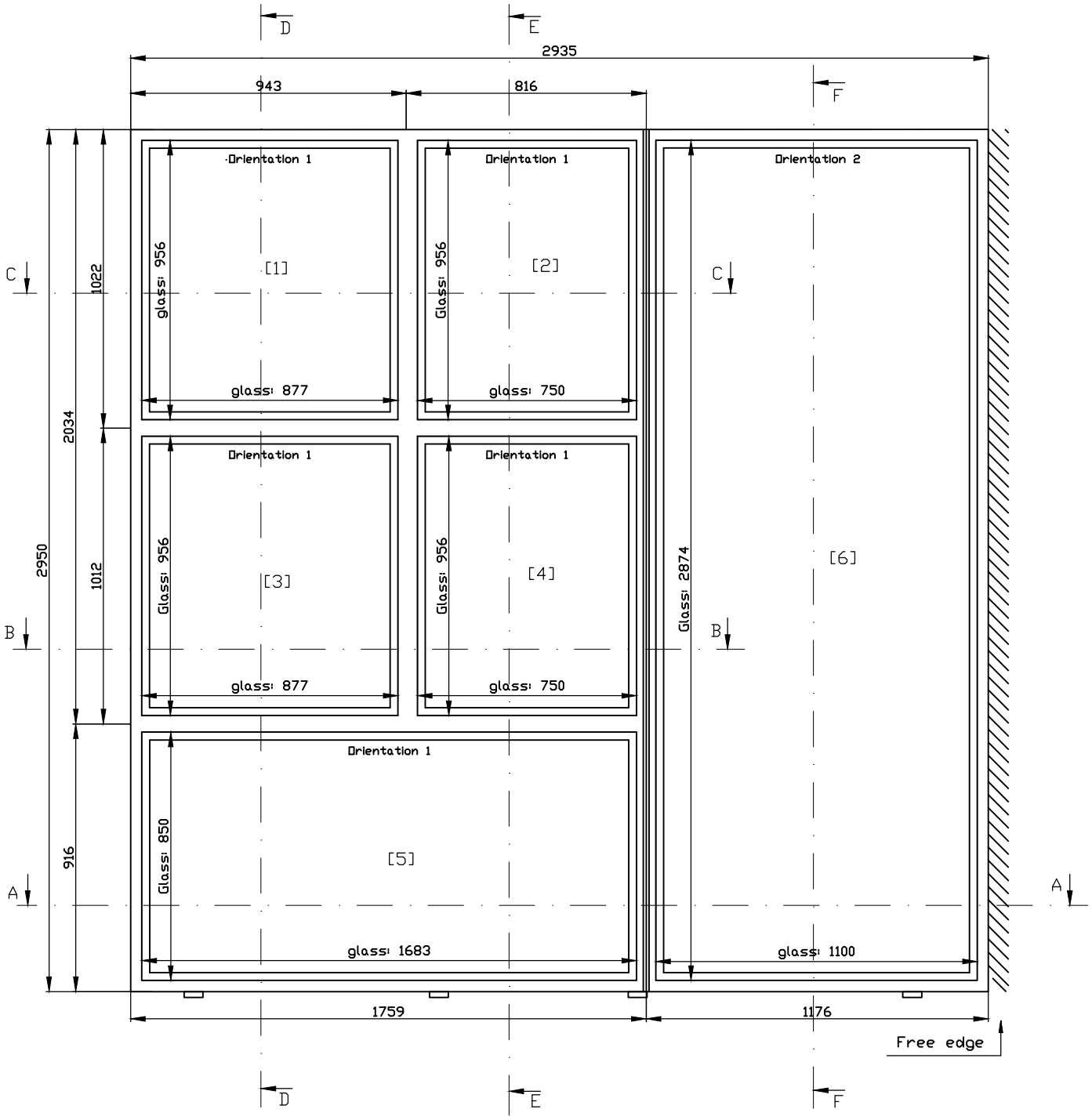
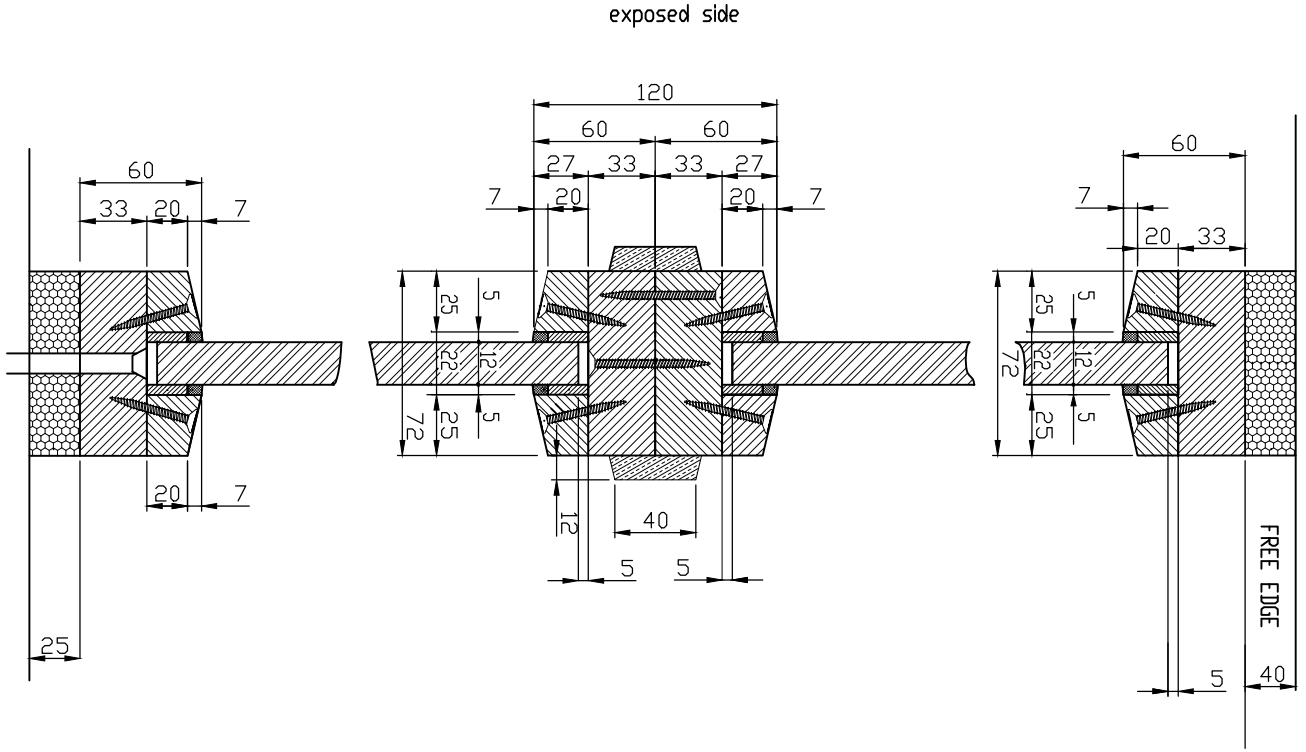
This document is the original version of this report and is written in English.

Front view (unexposed side) - dimensions.



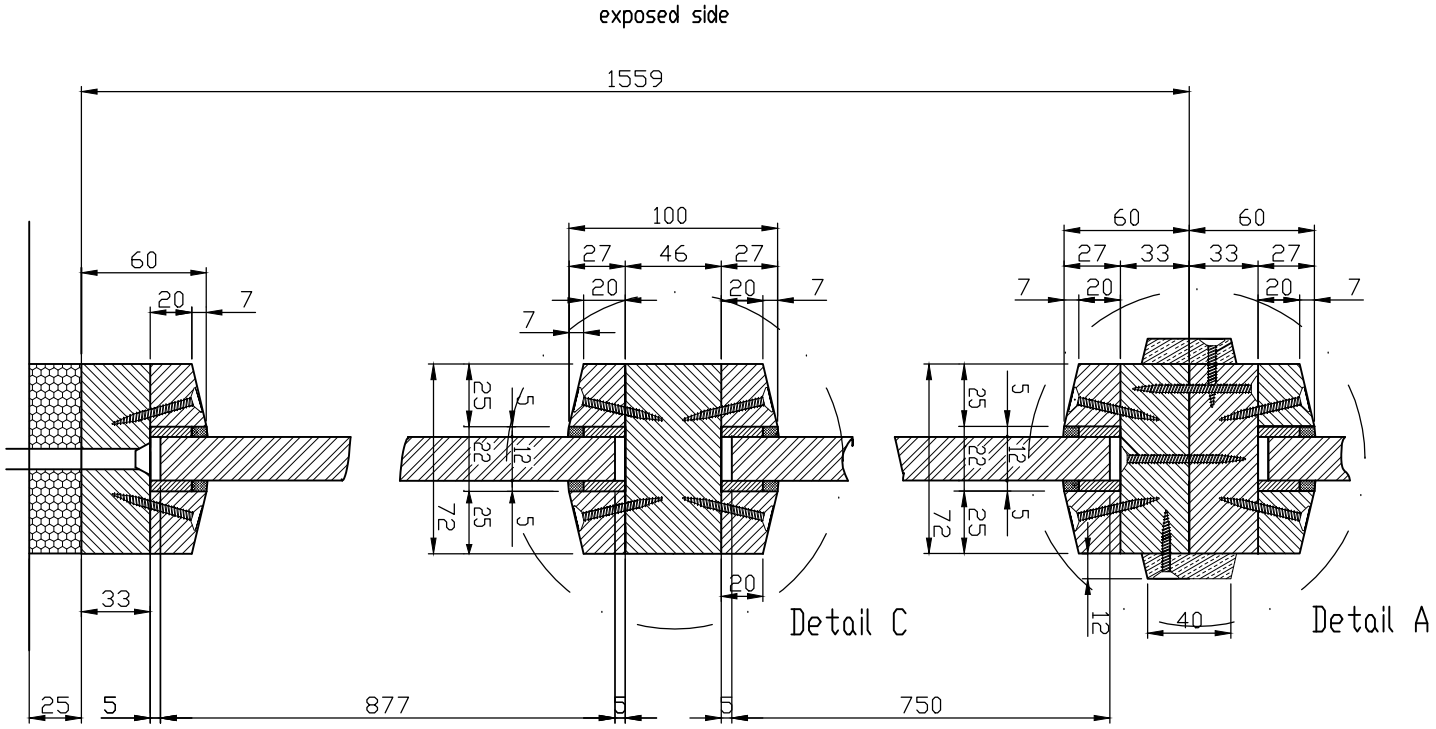
Dimensions in mm

Section A-A - dimensions.



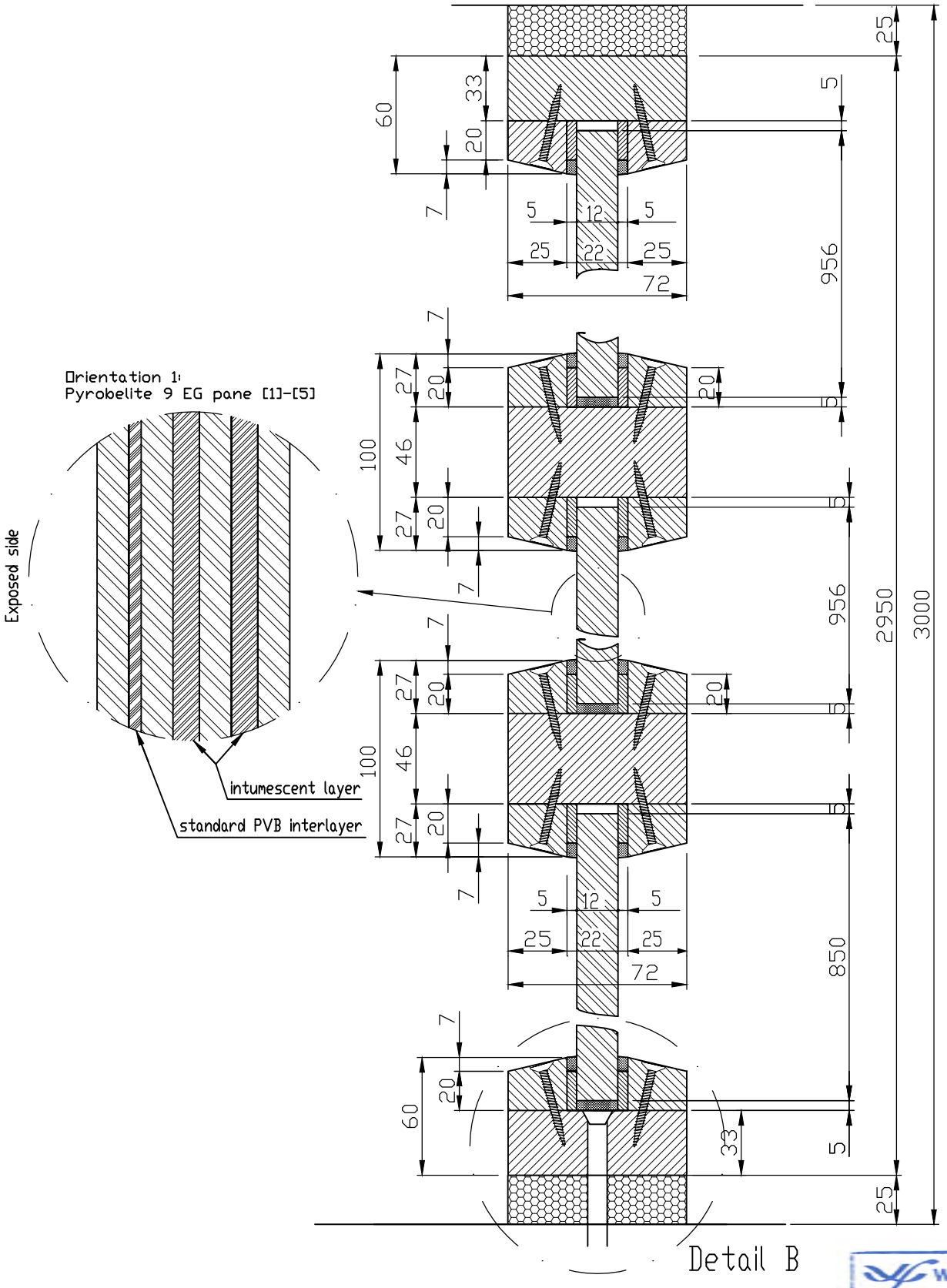
Dimensions in mm

Section BB and CC - dimensions.



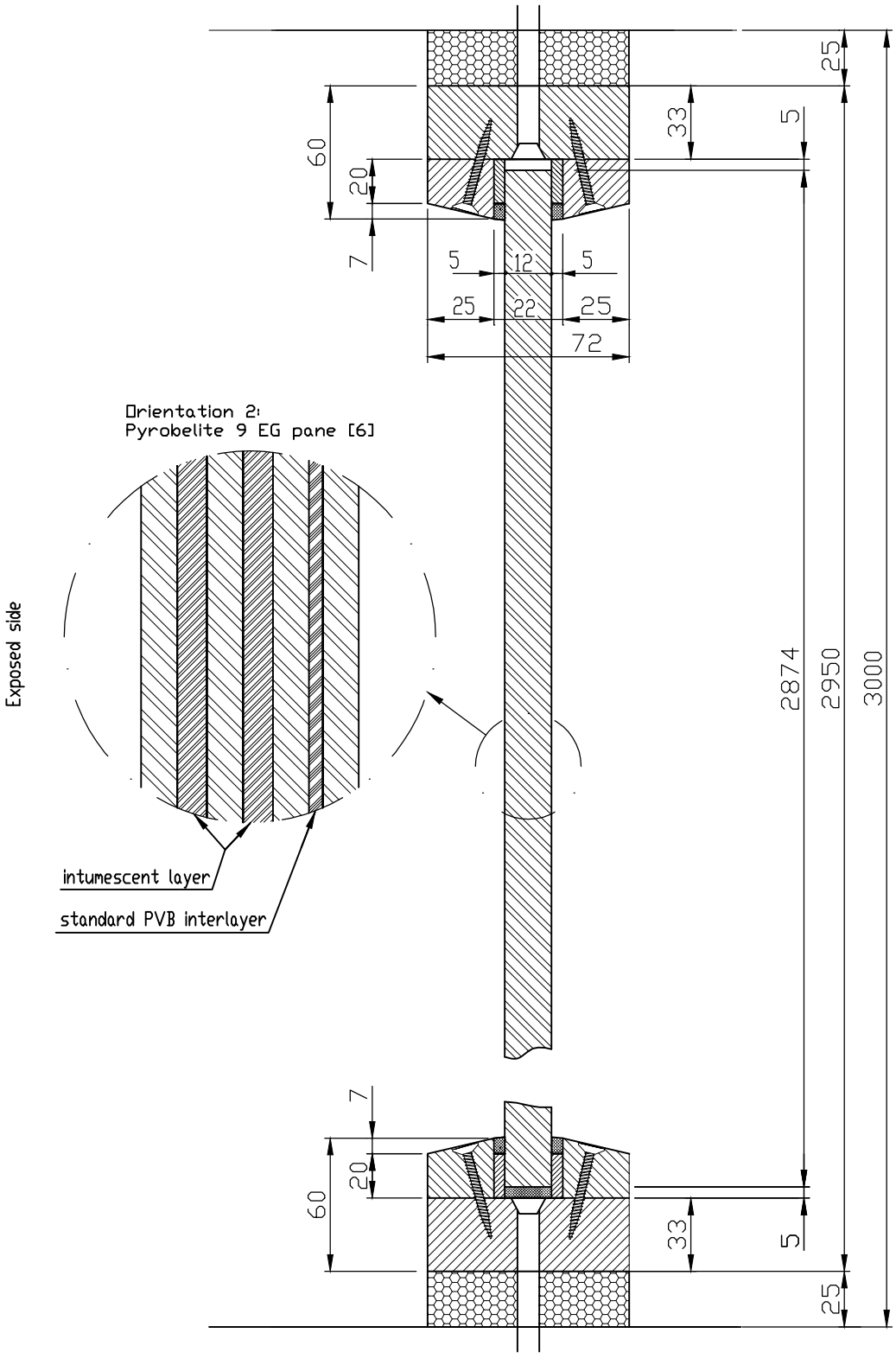
Dimensions in mm

Section D-D and E-E - dimensions.



Dimensions in mm

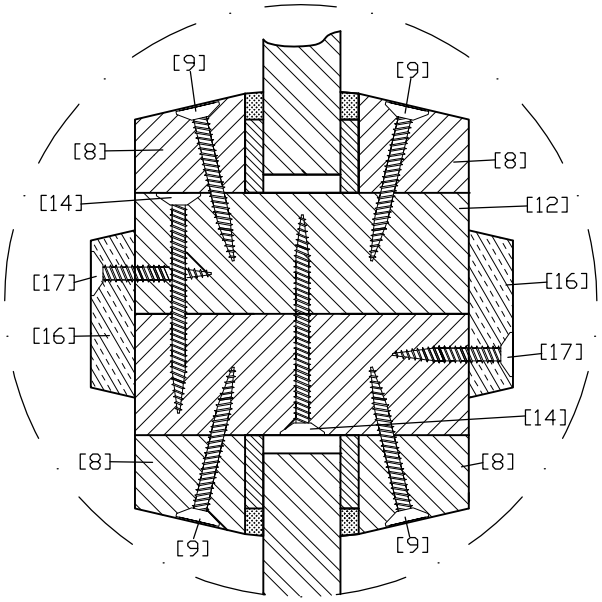
Section F-F - dimensions.



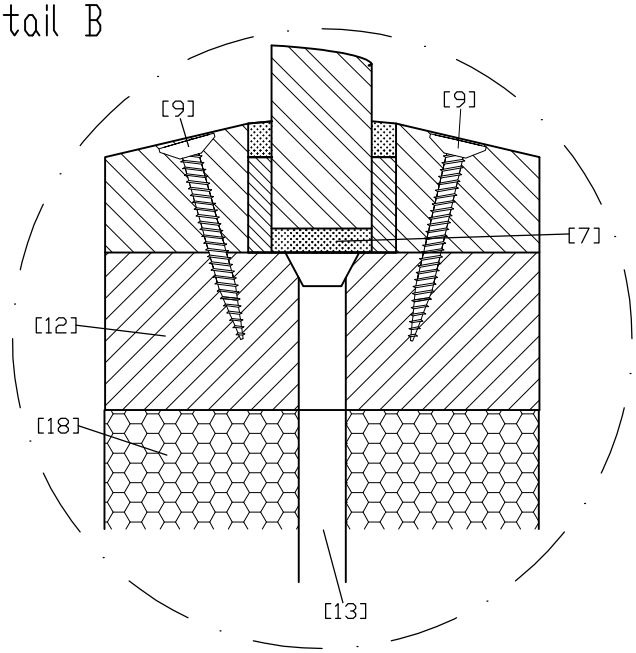
Dimensions in mm

Details.

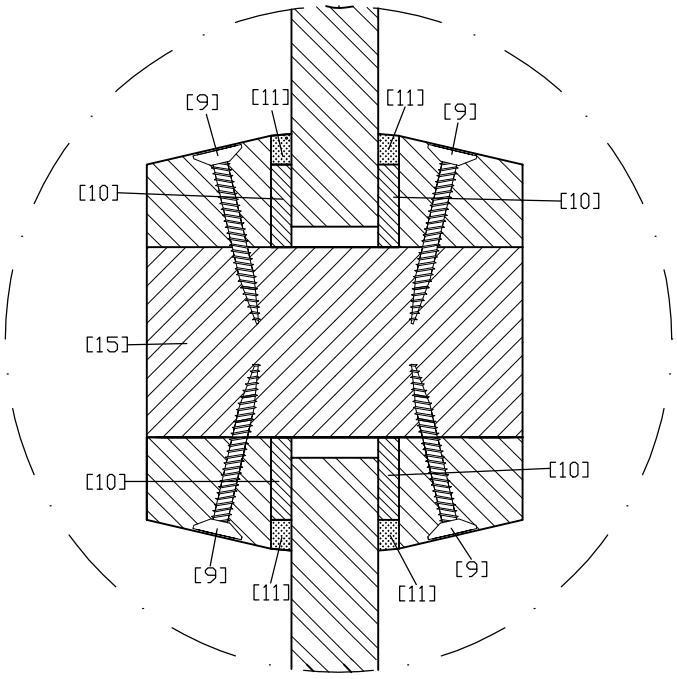
Detail A



Detail B



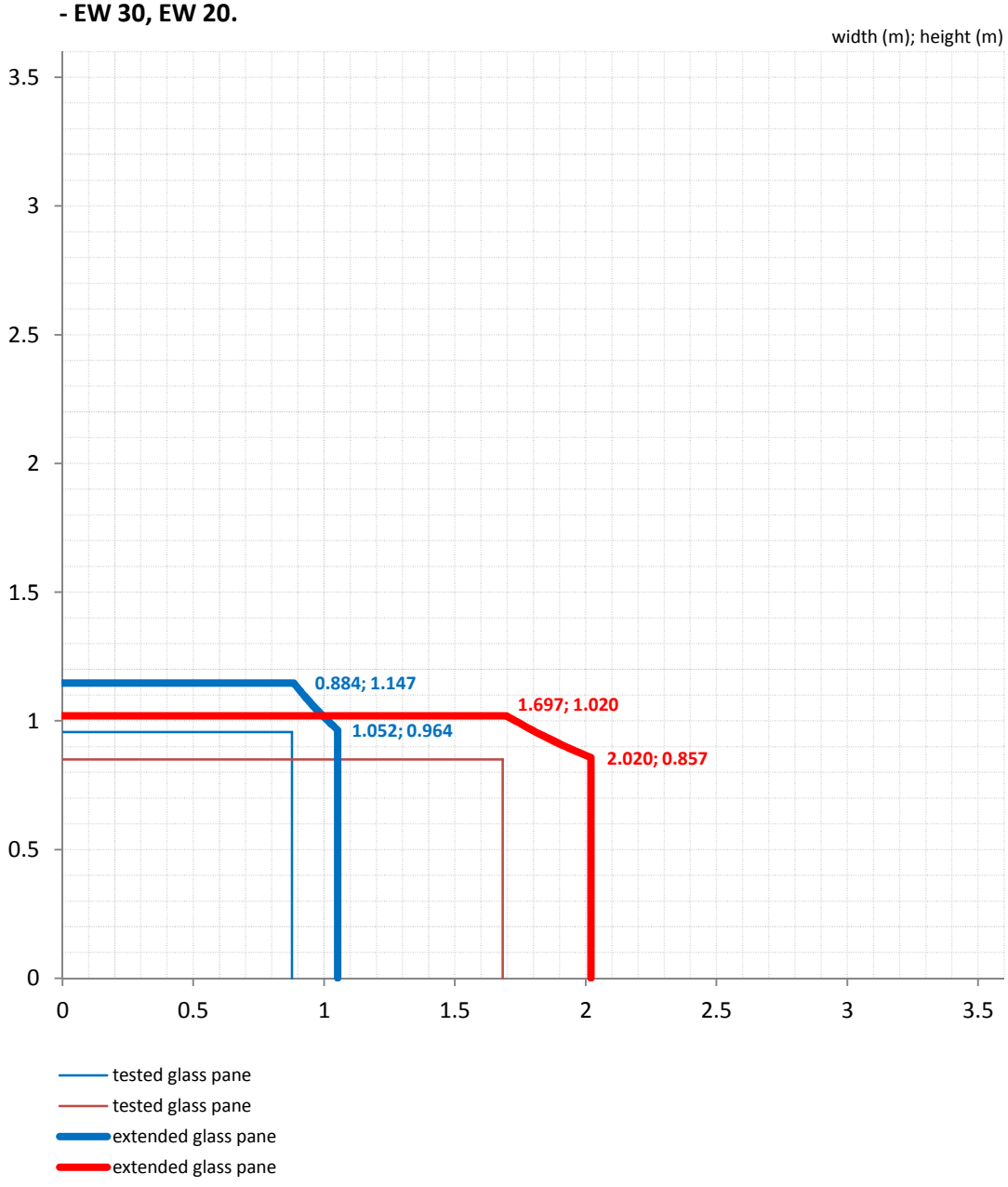
Detail C



Individual rectangular glass panes: pyrobelite 9 at the unexposed side, increase in area

The extended dimensions are only valid for the following classification times:

- EI 20, EI 15;
- E 30, E 20;
- EW 30, EW 20.



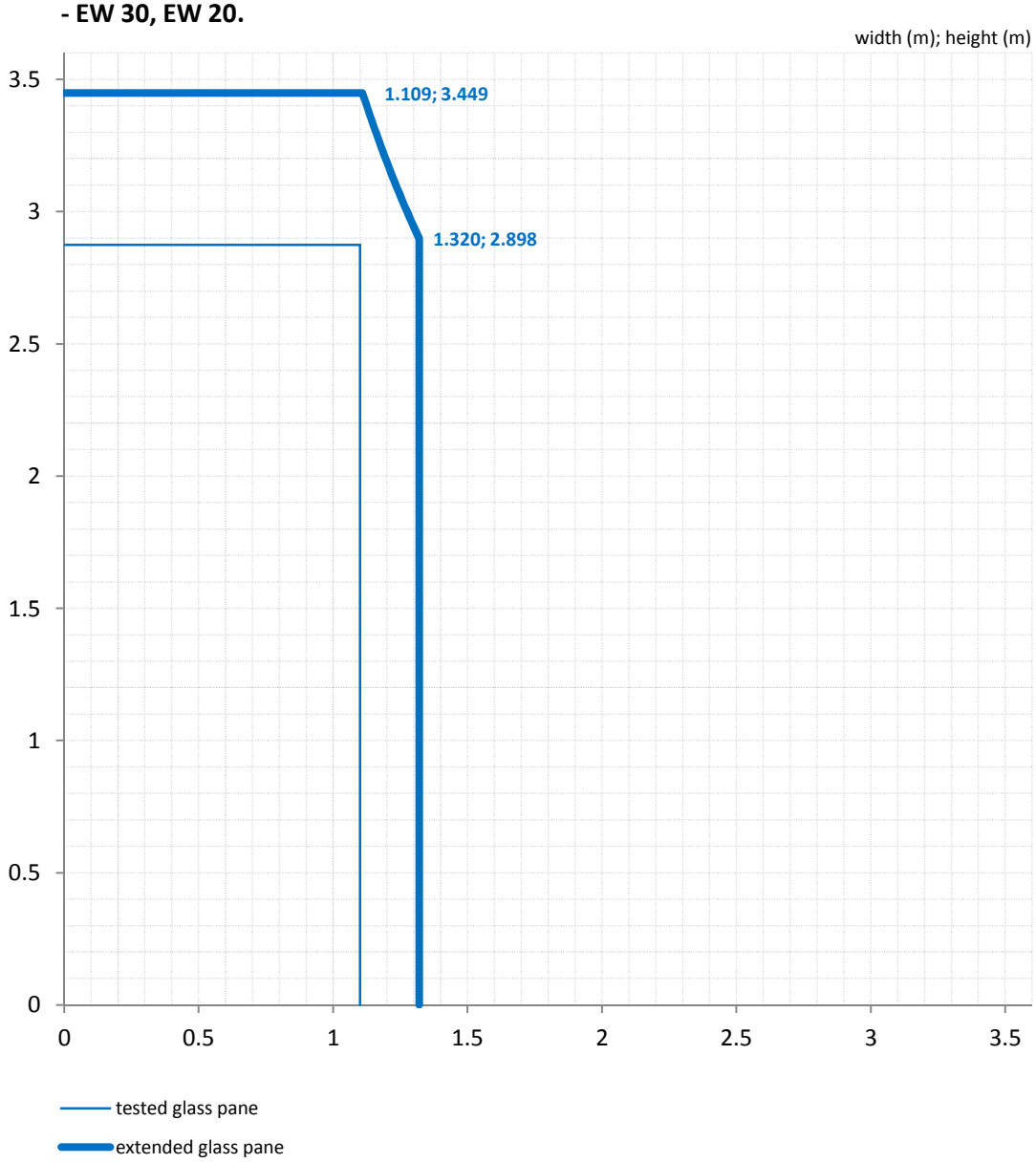
Note:

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).

Individual rectangular glass panes: pyrobelite 9 at the exposed side, increase in area

The extended dimensions are only valid for the following classification times:

- EI 20, EI 15;
- E 30, E 20;
- EW 30, EW 20.



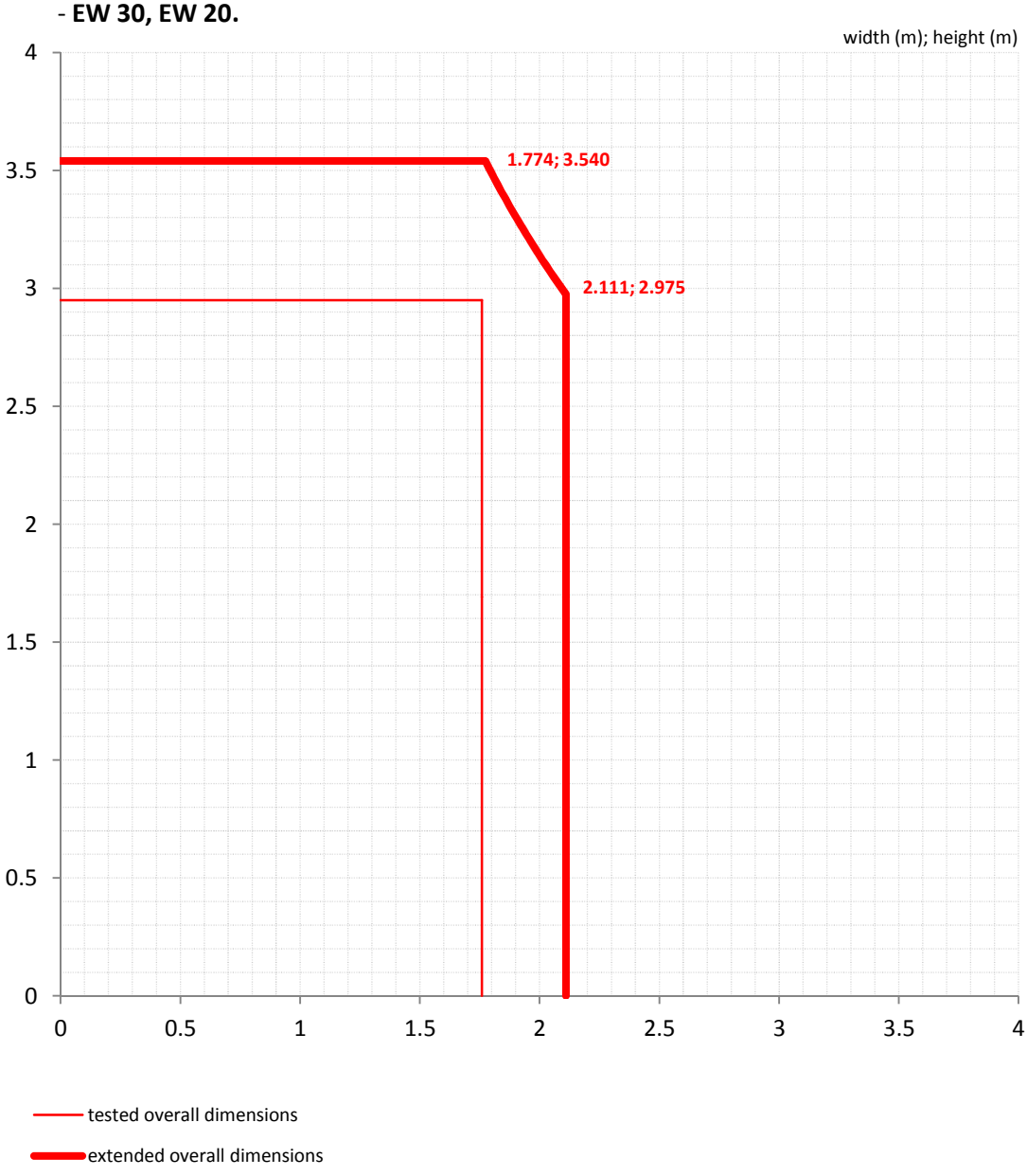
Note:

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: pyrobelite 9 at the unexposed side, increase in area

The extended dimensions are only valid for the following classification times:

- **EI 20, EI 15;**
- **E 30, E 20;**
- **EW 30, EW 20.**



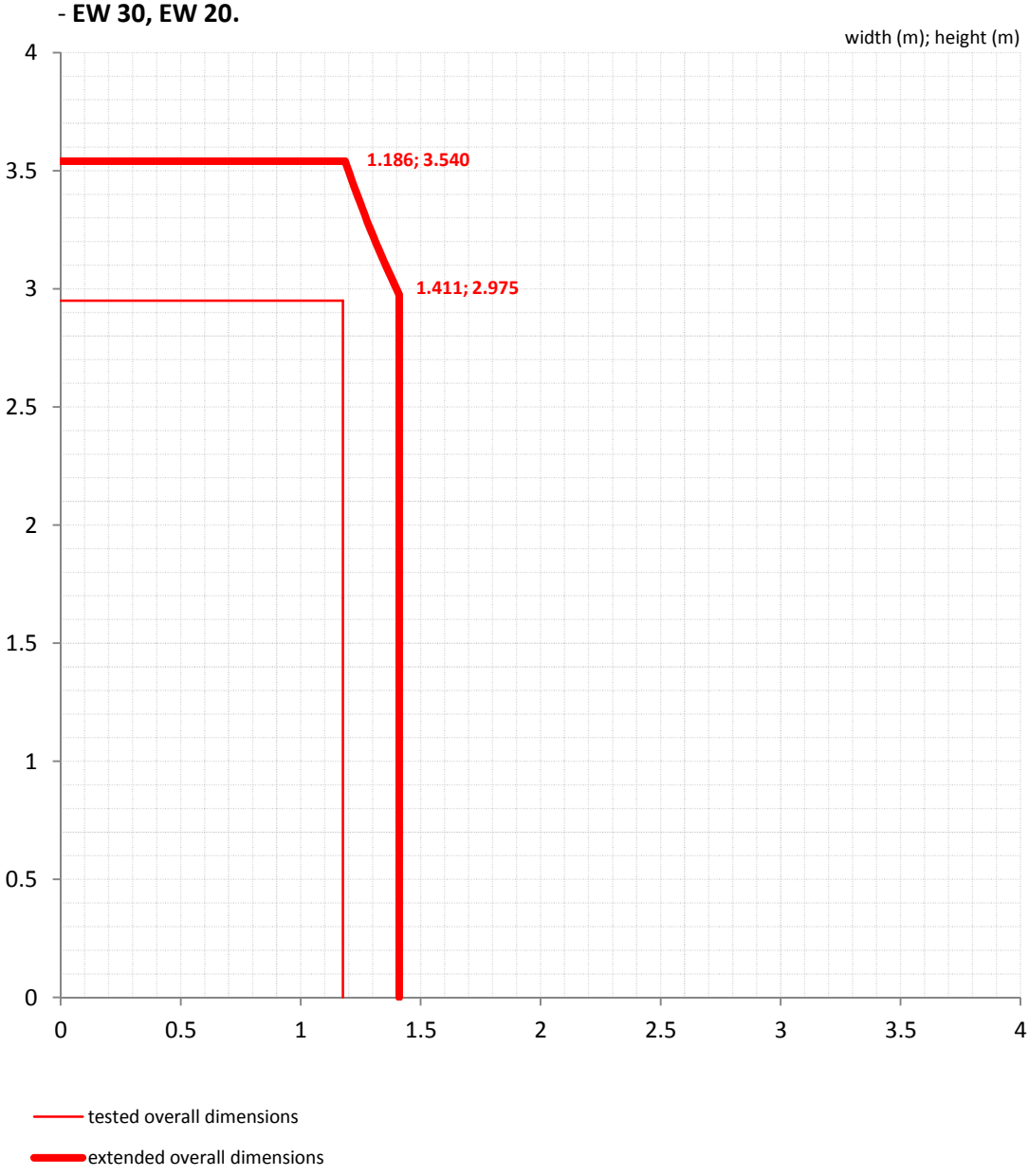
Note:

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.

Increase in overall dimensions and area of the partition: pyrobelite 9 at the exposed side, increase in area

The extended dimensions are only valid for the following classification times:

- **EI 20, EI 15;**
- **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.

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.
  = 2.299 kW/m² after 44 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):

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

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

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

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

$$W_{ext} = W_0 \cdot \frac{\varphi_{ext}}{\varphi_0} = \ 2.299\ kW/m^2 \cdot \frac{0.8742}{0.7352} = 2.734\ kW/m^2 \leq 15 kW/m^2$$