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TEST REPORT

| | | |
|-----------------------|---------------------|---|
| Laboratory CAR | O/References | DE 651 XK 869 CAR 13305/2 Page 1/12 |
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|------------------------------------|--|-------------------------------------|---------------|
| Requested by | SOLUTIA EUROPE BVBA CORPORATE VILLAGE – ARAMIS BUILDING LEONARDO DA VINCILAAN 1 1935 ZAVENTEM TEL: 0470/88.44.73 - FAX:02/746.50.00 | | |
| Date of the order | 2014.04.11 | Samples registration | N-2014-11-022 |
| | | Date of reception of samples | 2014.02.17 |
| Date of the test | 2014.02.17 to 2014.02.21 | | |
| Date of issue of the report | 2014.05.09 | | |
| Test carried out | Dynamic and static tests on balustrade elements | | |
| References | <i>NBN B03-004: Balustrade of buildings (2010)</i> <i>prNBN B03-004: Balustrade of buildings (in preparation)</i> | | |

This test report contains 12 pages and 1 appendix. This test report may only be reproduced in its entirety. Each page of the original report has been stamped (in red) by the laboratory and initialled by the head of laboratory. The results and findings are only valid for the tested samples.

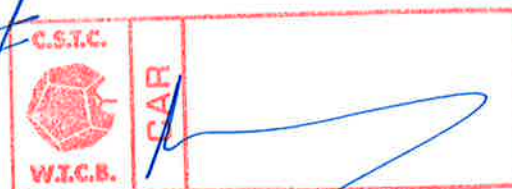
- No sample
- Sample(s) subjected to destructive test
- Sample(s) to be removed from our laboratories 30 calendar days after sending of the report, save in the case of a further written request



Ing. I. Knoops
 Researcher



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1 INTRODUCTION

At request of the company Solutia Europe bvba, represented by Mr R. Speelman, the laboratory CAR of the BBRI has carried out static (horizontal loads) and dynamic tests on balustrade elements for different combinations of profiles and glass panes. The results of these tests are given in the report with reference "CAR 13305/2".

2 DESCRIPTION OF THE TEST PIECES

The test pieces were received at the research centre of the BBRI in Limelette on February 17th 2014 and were registered in the receipts register of test pieces under the number N-2014-11-022 by the laboratory "Roof and Façade elements". It concerns glass balustrade elements for which the composition and dimensions are stated below.

2.1 SCHEMATIC REPRESENTATION OF THE TEST PIECE

The schematic representation of the test pieces is shown on *Figure 1*.

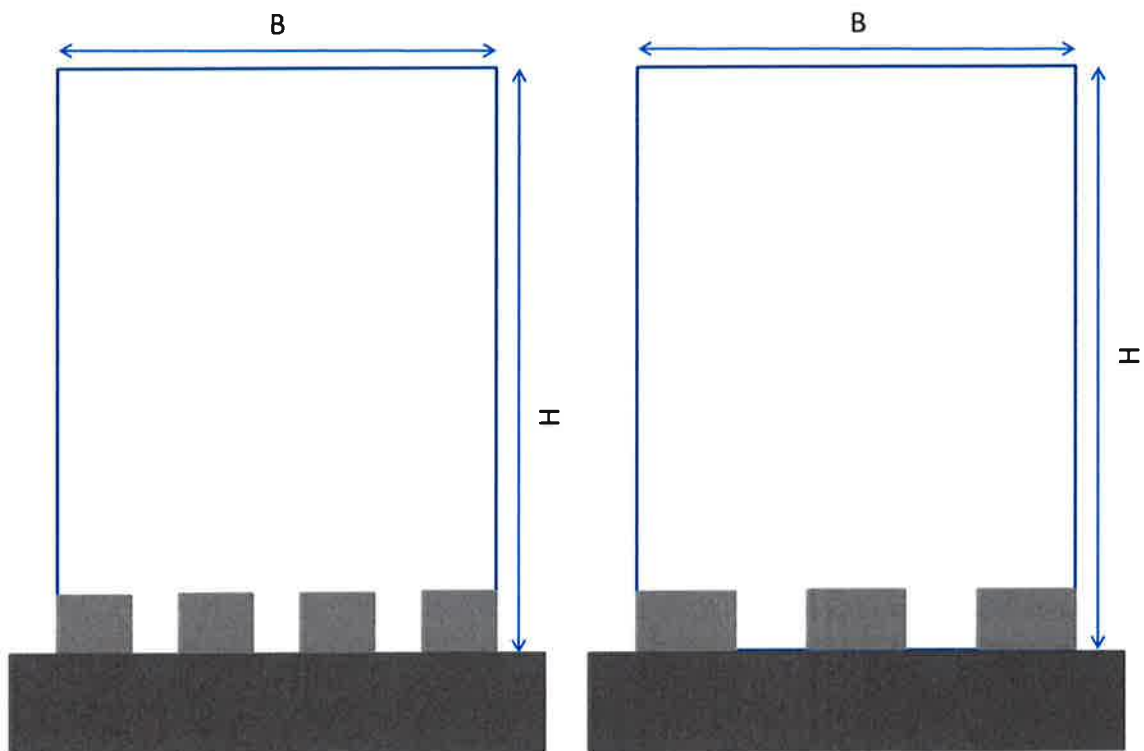
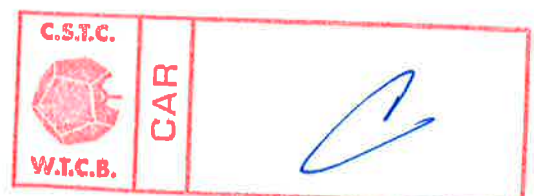


Figure 1: Schematic representation of the test pieces: Aluminco profile, Crystal line (Left types B and C, right type E)



2.2 DIMENSIONS OF THE TEST PIECE

The dimensions of the test pieces and their combination with the different profiles are given in Table 1.

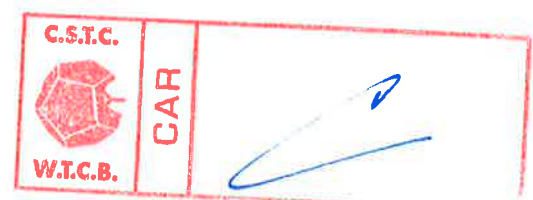
| No. | Glass panes | | | | | Profile |
|-----|------------------------|--|---------------|-------------|------------|--|
| | Type | Composition | Interlayer | Height (mm) | Width (mm) | |
| 1 | 88.4 mix | 8 mm laminated/ 0.76 mm DG 41 / 0.76 mm RB 41/ 8 mm laminated | DG 41 + RB 41 | 1200 | 1200 | Aluminco, Crystal line Type B (4 pieces) |
| 2 | 88.2 DG 41 | 8 mm laminated / 0,76 mm DG 41 / 8 mm laminated | DG 41 | 1200 | 1200 | Aluminco, Crystal line Type C (4 pieces) |
| 3 | 1212.4 toughened DG 41 | 12 mm toughened / 1.52 mm DG 41 / 12 mm toughened | DG 41 | 1200 | 1200 | Aluminco, Crystal line Type E (3 pieces) |
| 4 | 1010.2 DG 41 | 10 mm laminated / 0,76 mm DG 41 / 10 mm laminated | DG 41 | 1200 | 1200 | Aluminco, Crystal line Type E (3 pieces) |
| 5 | 1010.4 mix | 10 mm laminated / 0,76 mm DG 41 / 0,76 mm RB 41/ 10 mm laminated | DG 41 + RB 41 | 1200 | 1200 | Aluminco, Crystal line Type E (3 pieces) |
| 6 | 1212.4 mix | 12 mm laminated / 0,76 mm DG 41 / 0,76 mm RB 41/ 12 mm laminated | DG 41 + RB 41 | 1200 | 1200 | Aluminco, Crystal line Type E (3 pieces) |
| 7 | 1212.4 DG 41 | 12 mm laminated / 1,52 mm DG 41 / 12 mm laminated | DG 41 | 1200 | 1200 | Aluminco, Crystal line Type E (3 pieces) |

Table 1: Dimensions of the used test pieces and profiles

An overview of the different test pieces is given in Figure 1.



Picture 1: Aluminco, Crystal line type B





Picture 2: Aluminco, Crystal line type E

2.3 DESCRIPTION OF THE TEST PIECE

The characteristics of the elements constituting the test pieces are given by the applicant and described here below:

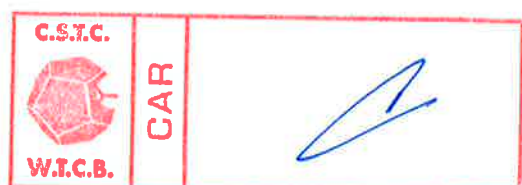
- Glass composition: the various used glass panes are summarized in Table 1 above
- Fixation on the substrate via an aluminium profile (top-mount). The various glass support profiles are summarized in Table 1 above and are given in Appendix 1
- Drawings: the cross-sections and detailed drawings of the elements are given in Appendix 1

3 DESCRIPTION OF THE TESTS

The object of the test is to verify the behaviour of the balustrade under:

- Static loads: horizontal outwardly directed static service and safety loads (linearly distributed and point horizontal loads). These loads must be combined with the wind loads (*Table 2* gives the dynamic peak pressure to be multiplied by a pressure coefficient of -2).
- Dynamic load: soft body impact test

The loads and their combinations for the static tests on the one hand and the drop height for the soft body impact test on the other hand, are described in the NBN B 03-004 "Balustrades of buildings" (2010). The requirements for residential buildings and offices were used.



After the static tests under horizontal loads, the element must meet the following criteria¹:

- Service:
 - Under load: glass deflection $\leq H/60$ or a maximum of 20 mm (25 mm²) where H is the protection height of the balustrade expressed in mm. The deformation is measured at the level of 1000 mm of the balustrade.
 - Residual deformation ≤ 3 mm
- Security: Residual deformation $\leq H/125$ (the glass may not break)

The observations after the tests were noted.

After the impact test, the following criteria must be met:

- The filling element may not separate from the structure of the balustrade
- No fragments that could injure persons may become detached. (In the case of balustrade in structural glass (e.g. clamped), it must continue to exercise its function under the application of a punctual load of 200 N for 30 seconds.)
- The impact body must not pass through the balustrade upon impact
- After the impact, the passage of the hexagonal calibre as defined in 5.2.1 of the NBN B03-004 may not be possible (under a negligible force) for the balustrades without panel
- After the impact, it must not be possible for the balustrades with filling panels to allow the passage of a steel ball with a diameter of 76 mm

| Reference heights z_e | | | | | | | | | | | | | |
|-------------------------|----------------|--------------------------------|-----|-----|-----|--------------------------------|-----|-----|-----|--------------------------------|-----|-----|-----|
| | | Wind exposure class 1 | | | | Wind exposure class 2 | | | | Wind exposure class 3 | | | |
| Reference speed | $v_b, 0$ (m/s) | 26 | 25 | 24 | 23 | 26 | 25 | 24 | 23 | 26 | 25 | 24 | 23 |
| Roughness categories | | Reference heights (z_e) to | | | | Reference heights (z_e) to | | | | Reference heights (z_e) to | | | |
| Coastal area | 0 | | | | | | | | | | | | |
| Plain | I | | | | | | | | | 2m | 2m | 4m | 5m |
| Grove | II | | | 2m | 3m | 3m | 3m | 4m | 6m | 5m | 6m | 8m | 11m |
| Suburb - Forest | III | 5m | 6m | 7m | 9m | 9m | 12m | 15m | 19m | 15m | 19m | 21m | 21m |
| Town | IV | 15m | 17m | 21m | 25m | 25m | 30m | 30m | 30m | 30m | 30m | 30m | 30m |
| Dyn. peak pressure | $q_p(z_e)=$ | 544 Pa | | | | 693 Pa | | | | 815 Pa | | | |
| Reference heights z_e | | | | | | | | | | | | | |
| | | Wind exposure class 4 | | | | Wind exposure class 5 | | | | Wind exposure class 6 | | | |
| Reference speed | $v_b, 0$ (m/s) | 26 | 25 | 24 | 23 | 26 | 25 | 24 | 23 | 26 | 25 | 24 | 23 |
| Roughness categories | | Reference heights (z_e) to | | | | Reference heights (z_e) to | | | | Reference heights (z_e) to | | | |
| Coastal area | 0 | 3m | | | | 5m | | | | 8m | | | |
| Plain | I | 4m | 5m | 8m | 11m | 7m | 10m | 14m | 22m | 12m | 14m | 27m | 42m |
| Grove | II | 8m | 11m | 15m | 16m | 14m | 16m | 16m | 22m | 16m | 16m | 27m | 42m |
| Suburb - Forest | III | 21m | 21m | 21m | 21m | 21m | 21m | 21m | 22m | 21m | 21m | 27m | 42m |
| Town | IV | 30m | 30m | 30m | 30m | 30m | 30m | 30m | 30m | 30m | 30m | 30m | 42m |
| Dyn. peak pressure | $q_p(z_e)=$ | 950 Pa | | | | 1086 Pa | | | | 1224 Pa | | | |
| Reference heights z_e | | | | | | | | | | | | | |
| | | Wind exposure class 7 | | | | | | | | | | | |
| Reference speed | $v_b, 0$ (m/s) | 26 | 25 | 24 | 23 | | | | | | | | |
| Roughness categories | | Reference heights (z_e) to | | | | | | | | | | | |
| Coastal area | 0 | 15m | | | | | | | | | | | |
| Plain | I | 21m | 31m | 48m | 78m | | | | | | | | |
| Grove | II | 21m | 31m | 48m | 78m | | | | | | | | |
| Suburb - Forest | III | 21m | 31m | 48m | 78m | | | | | | | | |
| Town | IV | 30m | 31m | 48m | 78m | | | | | | | | |
| Dyn. peak pressure | $q_p(z_e)=$ | 1364 Pa | | | | | | | | | | | |

Table 2: Wind classes according to prNBN B 03-004 (in preparation)

¹ Between brackets and italics, the updated criteria according to the prNBN B03-004

² Absolute value. No more criteria in relation to the balustrade height.



4 RESULTS OF THE TESTS

The results that do not meet the test criteria are indicated in red and bold in the tables.

The results that meet the test criteria according to the standard under review are indicated in blue and bold in the tables.

4.1 PROFILE TYPE B (ALUMINCO)

4.1.1 STATIC TESTS

The results of the static tests are summarized in *Table 3*.

The static loads were applied to one glass pane. The tests were conducted without wind pressure.

| Type B (Aluminco): residential buildings and offices | | | | | | |
|---|--------------|----------|---|------------------|--|-----------------------------|
| <i>Serviceability Limit States</i> | | | | | | |
| Profile model | Glazing type | Category | Base horizontal load for the load combination | Wind class (WCI) | Test criteria (mm) | |
| | | | | | Glass deformation (current standard 20 mm; pre-standard 25 mm) | Residual deformation (3 mm) |
| Model B | 88.4 mix | A | $q_{k,h}$: 0,5 kN/m | / | 21,43 | 1,91 |
| | | A | $Q_{kh,1}$: 0,5 kN | / | 21,16 | 1,74 |
| | | | $Q_{kh,2}$: 0,5 kN* | | Not requested | |
| <i>Ultimate Limit States</i> | | | | | | |
| Profile model | Glazing type | Category | Base horizontal load for the load combination | Wind class (WCI) | Test criteria (authorized max. deformation) | |
| | | | | | Residual deformation (9,6mm) | |
| Model B | 88.4 mix | A | $q_{k,h}$: 0,5 kN/m | / | Broken | |
| | | A | $Q_{kh,1}$: 0,5 kN | / | 3,92 | |
| | | | $Q_{kh,2}$: 0,5 kN* | | Not requested | |

Table 3: Results of the static tests

Note: The values in red do not satisfy and the values in blue satisfy according to the prENB B03-004, but not according to the current NBN B03-004

- with
- $q_{k,h}$: uniform horizontal linear load applied at the level of 1000 mm of the railing³.
 - $Q_{kh,1}$: horizontal point load for the local verification at the 1000 mm of the railing³
 - $Q_{kh,2}$: horizontal point load for the location verification under protection height, applied to the most unfavourable position.
- *: These tests were not carried out as the uppermost boundary conditions are more decisive.

³From the uppermost level of the profile foot



Conclusion

The tested balustrade (Aluminco profile type B, with an 88.4 mix) meets the requirements of **prNBN B03-004** for *residential buildings* w.r.t. the uniform horizontal linear and concentrated static loads

- in Serviceability Limit States
- without wind load

The tested balustrade (Aluminco profile type B, with an 88.4 mix) meets the requirements of **NBN B03-004** for *residential buildings* w.r.t. concentrated static loads

- in Ultimate Limit States
- without wind load

4.1.2 DYNAMIC TESTS

The results of the impact test out are summarized in *Table 4*.

| Balustrade | Drop height (mm) | Impact point | Comments |
|-----------------------|------------------|--|---|
| Model B with 88.4 mix | 300 | 110 cm from the ground, in the corner of the glass panel | OK, meets the criteria presented in § 3 |

Table 4: Results of the soft body impact test

Conclusion

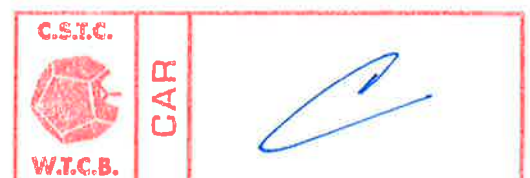
The tested balustrade (Aluminco profile type B, with an 88.4 mix float) meets the requirements of **NBN B03-004** for *residential buildings* w.r.t. the impact test of a soft heavy body.

4.2 PROFILE TYPE C (ALUMINCO)

4.2.1 STATIC TESTS

The results of the static tests are summarized in *Table 5*.

The static loads were applied to one glass pane. The tests were conducted with wind pressure.



| Type C (Aluminco): residential buildings | | | | | | |
|--|--------------|----------|---|------------------|--|-----------------------------|
| Serviceability Limit States | | | | | | |
| Profile model | Glazing type | Category | Base horizontal load for the load combination | Wind class (WCI) | Test criteria (mm) | |
| | | | | | Glass deformation (current standard 20 mm; pre-standard 25 mm) | Residual deformation (3 mm) |
| Model C | 88.2 DG 41 | A | $q_{k,h}$: 0,5 kN/m | 2 | Broken | / |
| | | A | $Q_{kh,1}$: 0,5 kN | 2 | / | / |
| | | | $Q_{kh,2}$: 0,5 kN* | | Not requested | |
| Ultimate Limit States | | | | | | |
| Profile model | Glazing type | Category | Base horizontal load for the load combination | Wind class (WCI) | Test criteria (authorized max. deformation) | |
| | | | | | Residual deformation (9,6mm) | |
| Model C | 88.2 DG 41 | A | $q_{k,h}$: 0,5 kN/m | 2 | / | |
| | | A | $Q_{kh,1}$: 0,5 kN | 2 | / | |
| | | | $Q_{kh,2}$: 0,5 kN* | | Not requested | |

Table 5: Results of the static tests

Note: The values in red do not satisfy and the values in blue satisfy according to the prNBN B03-004, but not according to the current NBN B03-004

- with $q_{k,h}$: uniform horizontal linear load applied at the level of 1000 mm of the railing⁴.
 $Q_{kh,1}$: horizontal point load for the local verification at the 1000 mm of the railing³
 $Q_{kh,2}$: horizontal point load for the location verification under protection height, applied to the most unfavourable position.
 *: These tests were not carried out as the uppermost boundary conditions are more decisive.
 /: tests were not executed

Conclusion

The tested balustrade (profile C Aluminco, with an 88.2 DG 41) does **NOT** meet the requirements of prNBN B03-004 for residential buildings w.r.t. uniform horizontal linear static loads under wind class 2.

4.2.2 DYNAMIC TESTS

These were not carried out given the failure of the uniform horizontal linear static loads.



⁴From the uppermost level of the profile foot

4.3 PROFILE TYPE E (ALUMINCO)

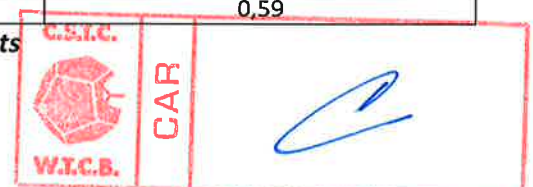
4.3.1 STATIC TESTS

The results of the static tests are summarized in *Table 6*.

The static loads were applied to five glass panes. The tests were conducted with and without wind pressure.

| Type E (Aluminco): residential buildings and offices | | | | | | |
|--|------------------------|----------|---|------------------|--|-----------------------------|
| Serviceability Limit States | | | | | | |
| Profile Model | Glazing type | Category | Base horizontal load for the load combination | Wind class (WCI) | Test criteria (mm) | |
| | | | | | Glass deformation (current standard 20 mm; pre-standard 25 mm) | Residual deformation (3 mm) |
| Model E | 1212.4 DG 41 toughened | C5a≤2m | $q_{k,h}$: 3,0 kN/m | / | 32,91 | 3,75 |
| | | C5a≤2m | $Q_{kh,1}$: 2,0 kN | / | 25,15 | 0,31 |
| | | | $Q_{kh,2}$: 0,5 kN* | | Not requested | |
| Model E | 1010.2 DG 41 | B | $q_{k,h}$: 1,0 kN/m | 1 | 23,19 | 1,27 |
| | | A | $q_{k,h}$: 0,5 kN/m | 3 | 22,45 | 0,71 |
| | | | $Q_{kh,2}$: 0,5 kN* | | Not requested | |
| Model E | 1010.4 mix | B | $q_{k,h}$: 1,0 kN/m | / | 23,68 | 2,94 |
| | | B | $Q_{kh,1}$: 1,0 kN | / | 20,95 | 0,99 |
| Model E | 1212.4 mix | B | $q_{k,h}$: 1,0 kN/m | 2 | 23,36 | 1,88 |
| Model E | 1212.4 DG 41 | B | $q_{k,h}$: 1,0 kN/m | 3 | 13,93 | 0,20 |
| | | B | $Q_{kh,1}$: 1,0 kN | 3 | 12,98 | 0,05 |
| | | B | $q_{k,h}$: 1,0 kN/m | 5 | 21,91 | 0,15 |
| | | B | $Q_{kh,1}$: 1,0 kN | 5 | Ok (see WCI 3) | Ok (see WCI 3) |
| Ultimate Limit States | | | | | | |
| Profile Model | Glazing type | Category | Base horizontal load for the load combination | Wind class (WCI) | Test criteria (authorized max. deformation) | |
| | | | | | Residual deformation (9,6mm) | |
| Model E | 1212.4 DG 41 toughened | C5a≤2m | $q_{k,h}$: 3,0 kN/m | / | 8,13 | |
| | | C5a≤2m | $Q_{kh,1}$: 2,0 kN | / | 0,22 | |
| | | | $Q_{kh,2}$: 0,5 kN* | | Not requested | |
| Model E | 1010.2 DG 41 | B | $q_{k,h}$: 1,0 kN/m | 1 | 2,60 | |
| | | B | $Q_{kh,1}$: 1,0 kN | 1 | 0,80 | |
| | | A | $q_{k,h}$: 0,5 kN/m | 3 | 0,40 | |
| | | A | $Q_{kh,1}$: 0,5 kN | 3 | 1,10 | |
| | | | $Q_{kh,2}$: 0,5 kN* | | Not requested | |
| Model E | 1010.4 mix | B | $q_{k,h}$: 1,0 kN/m | / | 4,74 | |
| | | B | $Q_{kh,1}$: 1,0 kN | / | 2,34 | |
| Model E | 1212.4 mix | B | $q_{k,h}$: 1,0 kN/m | 2 | 3,39 | |
| | | B | $Q_{kh,1}$: 1,0 kN | 2 | 2,12 | |
| Model E | 1212.4 DG 41 | B | $q_{k,h}$: 1,0 kN/m | 3 | 1,17 | |
| | | B | $Q_{kh,1}$: 1,0 kN | 3 | 0,70 | |
| | | B | $q_{k,h}$: 1,0 kN/m | 5 | 0,82 | |
| | | B | $Q_{kh,1}$: 1,0 kN | 5 | 0,59 | |

Table 6: Results of the static tests



Note: The values in red do not satisfy and the values in blue satisfy according to the prNBN B03-004, but not according to the current NBN B03-004

with $q_{k,h}$: uniform horizontal linear load applied at the level of 1000 mm of the railing⁵
 $Q_{kh,1}$: horizontal point load for the local verification at the 1000 mm of the railing³
 $Q_{kh,2}$: horizontal point load for the location verification under protection height, applied to the most unfavourable position
*: These tests were not carried out as the uppermost boundary conditions are more decisive

Conclusion

The tested balustrade (Aluminco profile type E, with a 1212.4 DG 41 toughened) meets the requirements of **prNBN B03-004** for *spaces that can accommodate upright crowds (horizontal distance between balustrades ≤ 2 m)* w.r.t. uniform horizontal linear and concentrated static loads

- in Ultimate Limit States
- without wind load

The tested balustrade (Aluminco profile type C, with a 1010.2 DG 41) meets the requirements of **prNBN B03-004** for *residential buildings* w.r.t. the uniform horizontal linear static loads

- in Serviceability Limit States
- with wind class 3

The tested balustrade (Aluminco profile type E, with a 1010.2 DG 41) meets the requirements of **prNBN B03-004** for *office buildings* w.r.t. the uniform horizontal linear static loads

- in Serviceability Limit States
- with wind class 1

The tested balustrade (Aluminco profile type E, with a 1010.2 DG 41) meets the requirements of **prNBN B03-004** for *residential buildings* w.r.t. the uniform horizontal linear and concentrated static loads

- in Ultimate Limit States
- with wind class 3

The tested balustrade (Aluminco profile type E, with a 1010.4 DG 41) meets the requirements of **prNBN B03-004** for *office buildings* w.r.t. the uniform horizontal linear and concentrated static loads

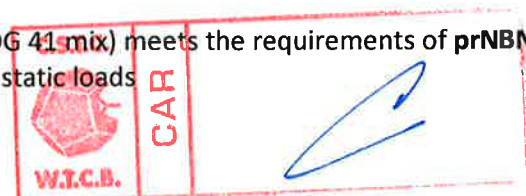
- in Serviceability Limit States
- without wind

The tested balustrade (Aluminco profile type E, with a 1010.4 DG 41) meets the requirements of **NBN B03-004** for *office buildings* w.r.t. the uniform horizontal linear and concentrated static loads

- in Ultimate Limit States
- without wind

The tested balustrade (Aluminco profile type E, with a 1212.4 DG 41 mix) meets the requirements of **prNBN B03-004** for *office buildings* w.r.t. the uniform horizontal linear static loads

⁵From the uppermost level of the profile foot



- in Serviceability Limit States
- with wind class 2

The tested balustrade (Aluminco profile type E, with a 1212.4 DG 41 mix) meets the requirements of **NBN B03-004** for *office buildings* w.r.t. the uniform horizontal linear and concentrated static loads

- in Ultimate Limit States
- with wind class 2

The tested balustrade (Aluminco profile type E, with a 1212.4 DG 41) meets the requirements of **NBN B03-004** for *office buildings* w.r.t. the uniform horizontal linear and concentrated static loads

- in Serviceability Limit States and Ultimate Limit States
- with wind class 3

The tested balustrade (Aluminco profile type E, with a 1212.4 DG 41) meets the requirements of **prNBN B03-004** for *office buildings* w.r.t. the uniform horizontal linear and concentrated static loads

- in Serviceability Limit States
- with wind class 5

The tested balustrade (Aluminco profile type E, with an 1212.4 DG 41) meets the requirements of **NBN B03-004** for *office buildings* w.r.t. the uniform horizontal linear and concentrated static loads

- in Ultimate Limit States
- with wind class 5

4.3.2 DYNAMIC TESTS

The results of the impact test are summarized in *Table 7*.

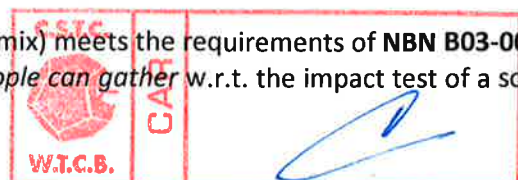
| Balustrade | Drop height (mm) | Impact point | Comments |
|---------------------------|------------------|--|---|
| Model B with 88.4 mix | 300 | 110 cm from the ground, in the corner of the glass panel | OK, meets the criteria presented in § 3 |
| Model E with 1212.4 mix | 450 | 110 cm from the ground, in the corner of the glass panel | OK, meets the criteria presented in § 3 |
| | 700 | 110 cm from the ground, in the corner of the glass panel | OK, meets the criteria presented in § 3 |
| Model E with 1212.4 DG 41 | 700 | 110 cm from the ground, in the corner of the glass panel | OK, meets the criteria presented in § 3 |

Table 7: Results of the soft body impact test

Conclusion

The tested balustrade (Aluminco profile type E, with a 1010.2 DG 41) meets the requirements of **NBN B03-004** for *residential buildings* and *office buildings* w.r.t. the impact test of a soft heavy body.

The tested balustrade (Aluminco profile type E, with a 1212.4 mix) meets the requirements of **NBN B03-004** for *residential buildings, office buildings and spaces where people can gather* w.r.t. the impact test of a soft heavy body.



The tested balustrade (Aluminco profile type E, with a 1212.4 DG 41) meets the requirements of **NBN B03-004** for residential buildings, office buildings and spaces where people can gather w.r.t. the impact test of a soft heavy body.

5 CONCLUSION

The following table provides an overview of the balustrades that meet the requirements of NBN B 03-004 for specific use with respect to the uniform horizontal linear and concentrated static loads and the impact test of a soft heavy body.

| Profile types | Glazing types | Static tests (horizontal loads) | | | | Impact test |
|---------------|------------------------|--|-------------------------------------|--|--------------|------------------------------------|
| | | Usage boundary conditions | | Uppermost boundary conditions | | |
| | | Uniform linear | Concentrated | Uniform linear | Concentrated | |
| Model B | 88.4 mix float | Residential buildings, without wind | Residential buildings, without wind | Residential buildings, without wind | / | Residential buildings |
| Model C | 88.2 DG 41 float | / | / | / | / | / |
| Model E | 1212.4 DG 41 toughened | / | / | Spaces that can accommodate upright crowds (horizontal distance between balustrades ≤ 2 m), without wind load | | / |
| Model E | 1010.2 DG 41 float | Residential buildings, wind class 3 Offices, wind class 1 | / | Residential buildings, wind class 3 Offices, wind class 1 | | Residential buildings and offices. |
| Model E | 1010.4 mix float | Residential buildings and offices, wind class 5 | | Residential buildings and offices, wind class 5 | | spaces where people can gather |
| Model E | 1212.4 mix float | Residential buildings, wind class 3 Offices, wind class 1 | / | Residential buildings, wind class 3 Offices, wind class 1 | | Residential buildings and offices. |
| Model E | 1212.4 DG 41 float | Residential buildings and offices, wind class 5 | | Residential buildings and offices, wind class 5 | | spaces where people can gather |

By comparison and for the same type of profiles, one can expect that a toughened glass would have at least the same performance as a float glass of the same composition and dimensions.

6 LIST OF APPENDIXES

Appendix 1: Detail drawings of the various profiles

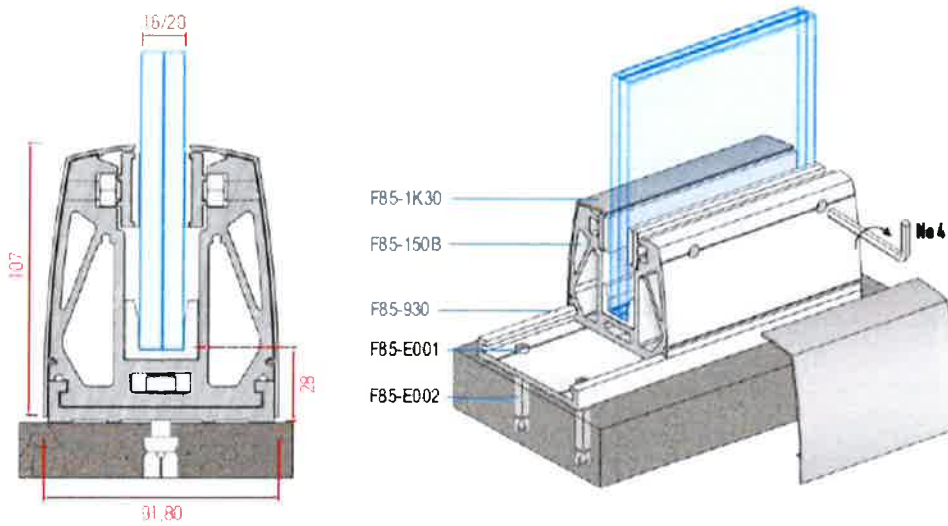


Appendix 1: Detail drawings of the various profiles

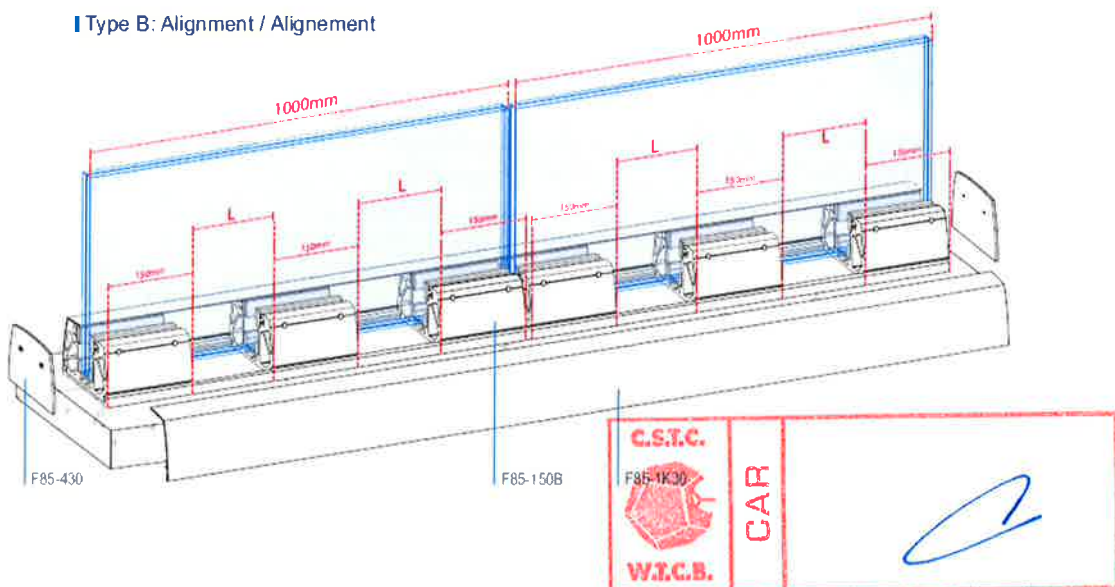
Crystal line Type B



Glas ondersteund systeem in opbouw
Système de base apparente supportant le vitrage
(pose à la française)

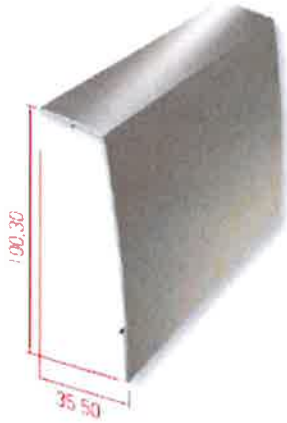


I Type B: Alignment / Aligement



Crystal line Type B (cont'd)

Profiles & Accessories / Profilés & Accessoires


 Base cover
 Cache de la base

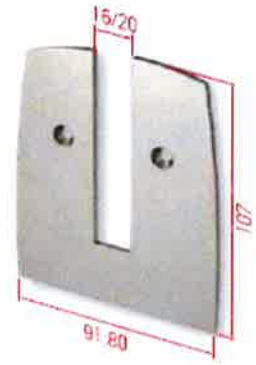
| | |
|-------------------|-----------------|
| Code | F85-1K30 |
| Weight / Poids | 545 gr/m |
| Length / Longueur | 6 m |


 Base guide
 Rail de la base

| | |
|-------------------|----------------|
| Code | F85-930 |
| Weight / Poids | 1565 gr/m |
| Length / Longueur | 6 m |


 Cap
 Capuchon

| | |
|----------------------|----------------|
| Code | F85-430 |
| Package Emballage | 20 pcs. |


 Cap
 Capuchon

| | |
|----------------------|--|
| Code | F85-430L (16mm) F85-430M (20mm) |
| Package Emballage | 20 pcs |

Glass supporting base / Base supportant le vitrage

Bases include screws, gaskets and pressure plates.
 Les bases incluent des vis, des joints et des plaquettes de pression.


 For glass 16mm*
 Pour vitrage 16mm*

| | |
|----------------------|--------------------|
| Code | F85-150B/16 |
| Package Emballage | 12 pcs |

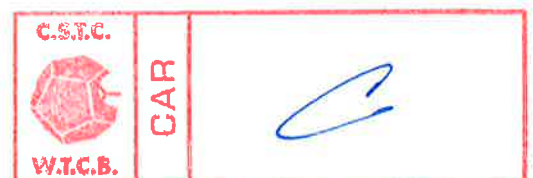

 For glass 20mm
 Pour vitrage 20mm

| | |
|----------------------|--------------------|
| Code | F85-150B/20 |
| Package Emballage | 12 pcs. |

* in case of using a 16mm glass cover gasket is compulsory.
 En cas de fixation d'un vitrage de 16mm, le joint des caches est indispensable.


 Cover gasket
 Joint des caches

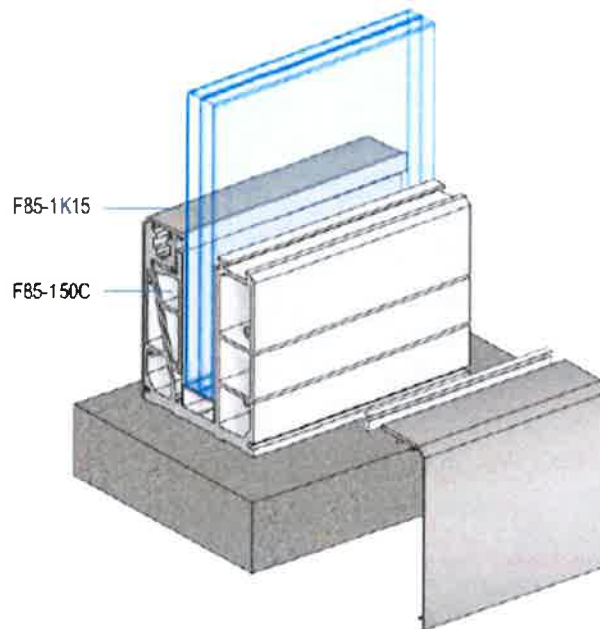
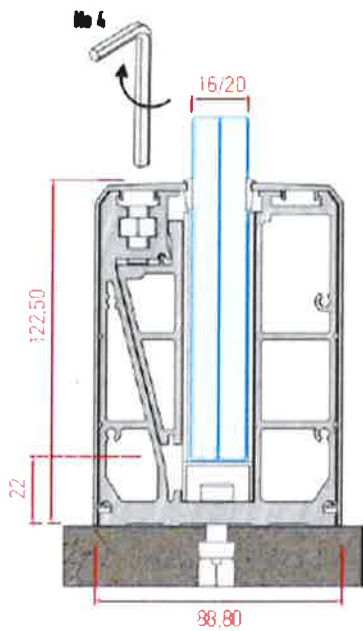
| | |
|--------------------|----------------|
| Code | F85-434 |
| Length Longueur | 250 m |



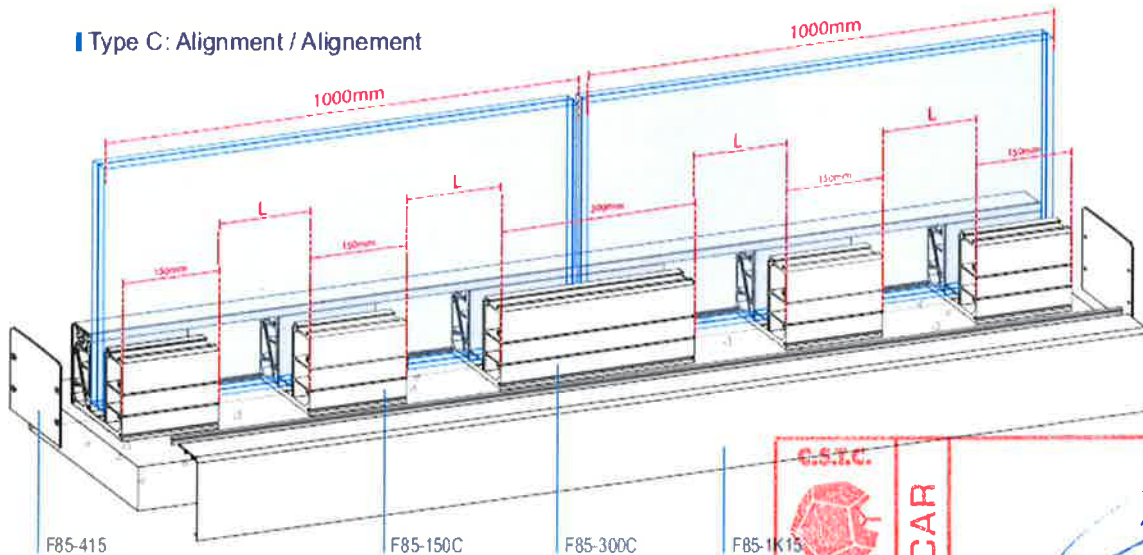
Crystal line Type C

Type C

Glas ondersteund systeem in opbouw
Système de base apparente supportant le vitrage
 (pose à la française)

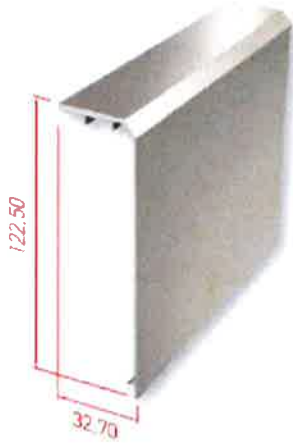


Type C: Alignment / Aligement



Crystal line Type C (cont'd)

Profiles & Accessories / Profilés & Accessoires



Base cover
Cache de la base

| | |
|-------------------|-----------------|
| Code | F85-1K15 |
| Weight / Poids | 696 gr/m |
| Length / Longueur | 6 m |



Cap
Capuchon

| | |
|----------------------|----------------|
| Code | F85-415 |
| Package Emballage | 20 pcs. |



Cap
Capuchon

| | |
|----------------------|--|
| Code | F85-415L (16mm) F85-415M (20mm) |
| Package Emballage | 20 pcs. |

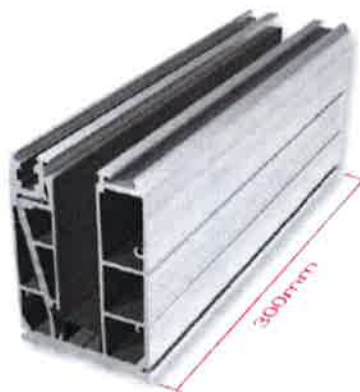
Glass supporting base / Base supportant le vitrage

Bases include screws and gaskets. Type C bases are used in both in-floor and on-floor systems.

Les bases incluent des vis et joints. Les bases de Type C sont utilisées en apparent aussi bien qu'en encastré.



| | |
|----------------------|---|
| Code | F85-150C/16* F85-150C/20** |
| Package Emballage | 12 pcs. |



| | |
|----------------------|---|
| Code | F85-300C/16* F85-300C/20** |
| Package Emballage | 6 pcs. |

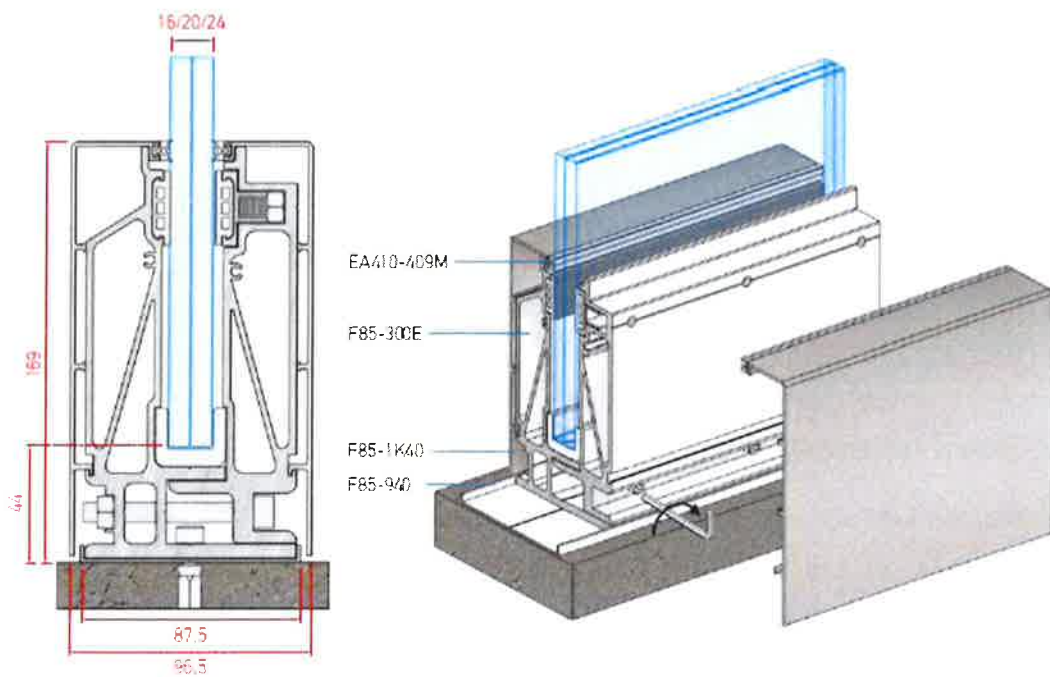
* For glass 16mm / Pour vitrage 16mm
** For glass 20mm / Pour vitrage 20mm



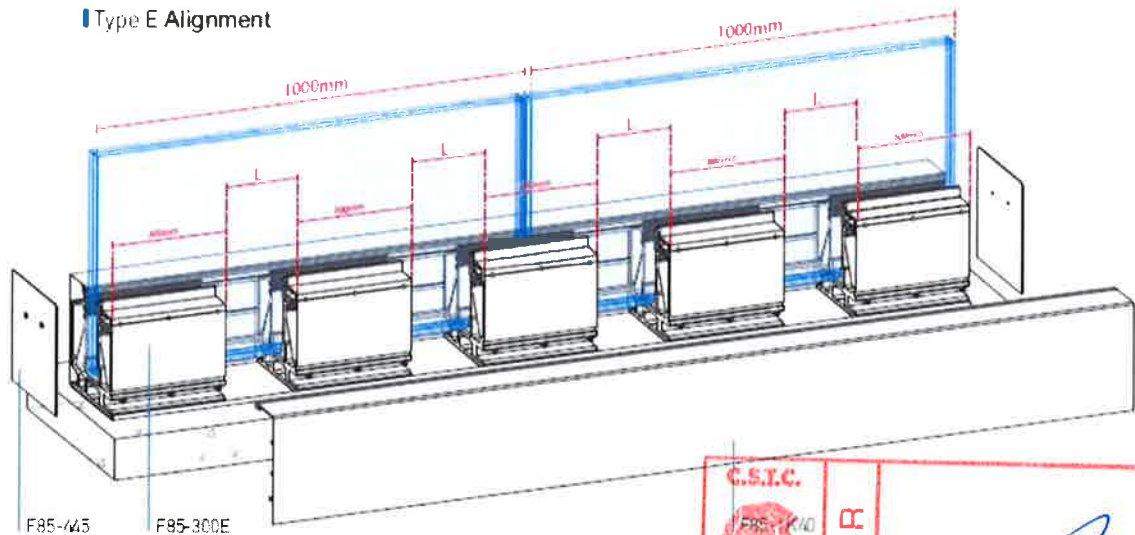
Crystal line Type E

Type E

Glas ondersteund systeem in opbouw
Système de base apparente supportant le vitrage
(pose à la française)

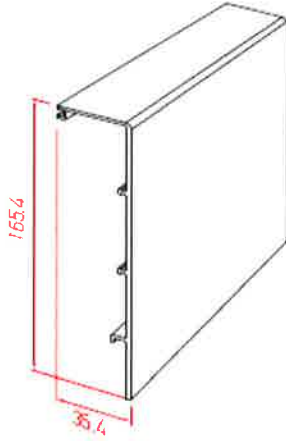


Type E Alignment



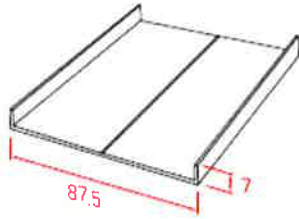
Crystal line Type E (cont'd)

Profiles & Accessories



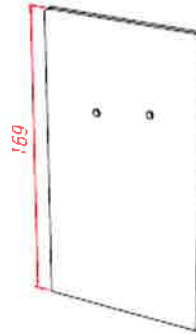
Base Cover

Code **F85-1K40**



Base Rail

Code **F85-940**



Cover

Code **F85-445/16** (16mm)
F85-445/20 (20mm)
F85-445/24 (24mm)

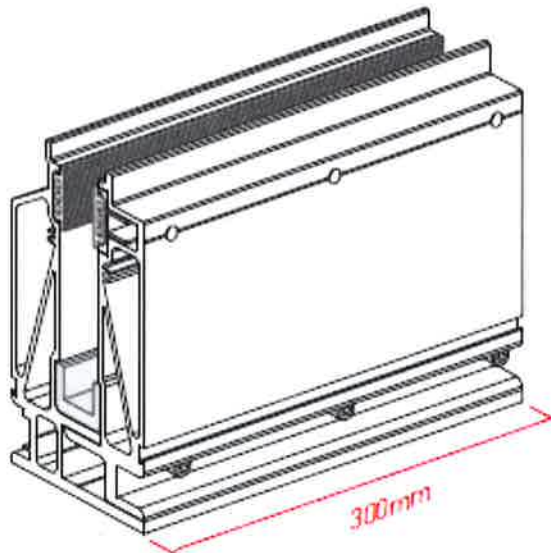


Glass Gasket

Code **EA410-409M**

Glass supporting base

Bases include screws, gaskets and pressure plates.



Code **F85-300E/16** (16mm*) *For glass 16mm
F85-300E/20 (20mm**) ** For glass 20mm
F85-300E/24 (24mm***) ***For glass 24mm

