

ALIPLAST sp. Z o.o.

TEST REPORT

TEST REPORT ISSUED TO

Aliplast sp. Z o.o.
Waclawa Moritza 3
20-276 Lublin
Poland

SPECIFICATION

ASTM E283, ASTM E547, ASTM E331, ASTM E330

EVALUATION PROPERTIES

Air Leakage, Water Penetration Resistance & Uniform Load

PRODUCT SERIES & TYPE

MC Wall – Fixed Window Wall Combination

REPORT NUMBER

103682459COQ-001G

ISSUE DATE

18-July-2019

PAGES

35

DOCUMENT CONTROL NUMBER

GFT-OP-10b (13-March-2017)
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TEST REPORT FOR ALIPLAST sp. Z o.o.

Report No.: 103682459COQ-001G

Date: 18-July-2019

CONCLUSION

The MC Wall – Fixed Window Wall Combination System, submitted by Aliplast sp. Z o.o., tested and described within this report, achieved the overall performance requirements as noted in Section 1 of this report, when tested to the standard test methods of ASTM E283, ASTM E547, ASTM E331 and ASTM E330.

For INTERTEK B&C:

| | | | |
|----------------------|---|---------------------|--|
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| DATE: | 18-July-2019 | DATE: | 18-July-2019 |

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SECTION 1
SUMMARY OF RESULTS

A test procedure and summary of results completed on the MC Wall – Fixed Window Wall Combination are as shown below:

| Test | Result | |
|---|--|--|
| ASTM E283 - Air Leakage Test at 75 Pa, L/s*m ² (cfm/ft ²) | <u>Infiltration</u> 0.05 (0.01) | <u>Exfiltration</u> 0.02 (0.01) |
| ASTM E283 - Air Leakage Test at 300 Pa, L/s*m ² (cfm/ft ²) | <u>Infiltration</u> 0.11 (0.02) | <u>Exfiltration</u> 0.07 (0.01) |
| ASTM E547 - Static Water Penetration Test at 720 Pa | PASS | |
| ASTM E331 - Static Water Penetration Test at 720 Pa | PASS | |
| ASTM E330 - Structural – 100% of Design +3360 Pa / -3360 Pa | <u>Deflection – mm (in.)</u> | |
| | <u>Positive Windload</u> 18.52 (0.73) | <u>Negative Windload</u> 18.29 (0.72) |
| ASTM E330 - Structural – 150% of Design +5040 Pa / -5040 Pa | PASS | |

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SECTION 2

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SECTION 3
OBJECTIVE

Intertek Testing Services NA Ltd. (Intertek) has conducted testing for **Aliplast sp. Z o.o.** (Aliplast) on a 3050 mm (120.1”) x 2950 mm (116.1”) MC Wall – Fixed Window Wall Combination System. Testing was conducted in accordance with following standard / specification:

- ASTM E283-04(2012) “Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Differences Across the Specimen”
- ASTM E547-00(2016) “Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference”
- ASTM E331-00(2016) “Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference”
- ASTM E330/E330M-14 “Standard Test Method for Structural Performance of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference”

This evaluation was started on March 11, 2019 and completed on March 12, 2019.

SECTION 4
SAMPLE ASSEMBLY AND DESCRIPTION

| | |
|---------------------------------|--|
| Manufacturer Information | Aliplast sp. Z o.o. Waclawa Moritza 3 20-276 Lublin Poland |
| Model Name | <ul style="list-style-type: none"> • MC Wall – Fixed Window Wall Combination |
| Installation | <ul style="list-style-type: none"> • Test Buck: Welded steel box frame, made from 4x pieces of 4” x 4” x 3/16” steel box beam. A wood frame made from nominal 2x12 spf was used around the perimeter of the steel box frame, secured with #12 x 3” Tek screws approximately 254-304 mm (10”-12”) o.c. <ul style="list-style-type: none"> • Specimen to Buck: <ul style="list-style-type: none"> • The sample was secured to steel plates welded to the box frame in 4x locations along each the head and sill, at each jamb and vertical mullion end location. Each location was secured to the steel plates with 4x 3/8” x 1-1/4” bolts. • An aluminum plate is secured to aluminum shear blocks inserted into the jambs and vertical mullions, with 4x #10 x 1-1/2” flat-head screws. This aluminum plate is then secured to the steel plate, which was welded to the steel box frame, with 2x 3/8” x 1-1/4” bolts with washer. • A metal flashing is used around the entire exterior perimeter, except at the bracket ends. Flashing is secured to the steel box frame with #10 x 3” Tek screws, and to the sample with #10 x 1” screws. Sealed on both sides with |

| | |
|------------------------------|--|
| | <p>silicone.</p> <ul style="list-style-type: none"> Flashing and fabric membrane were used around the exterior of the sample with silicone, including over the installation brackets, to seal the exterior of the sample. Flashing was used with silicone to seal the interior side of the rough opening. |
| Size | <ul style="list-style-type: none"> Overall Size: <ul style="list-style-type: none"> Width: 3050 mm (120.1") Height: 2950 mm (116.1") Fixed Window 1 Size: <ul style="list-style-type: none"> Width: 1052 mm (41.4") Height: 2950 mm (116.1") Fixed Window 2 Size: <ul style="list-style-type: none"> Width: 1325 mm (52.2") Height: 2052 mm (80.8") Fixed Window 3 Size: <ul style="list-style-type: none"> Width: 1325 mm (52.2") Height: 898 mm (35.4") Fixed Window 4 Size: <ul style="list-style-type: none"> Width: 673 mm (26.5") Height: 2052 mm (80.8") Fixed Window 5 Size: <ul style="list-style-type: none"> Width: 673 mm (26.5") Height: 898 mm (35.4") |
| Frame | <ul style="list-style-type: none"> Material: Aluminum <ul style="list-style-type: none"> Reinforcement: None. Full length jambs. The head and sill are 3x pieces, joining the jambs and vertical mullions. <ul style="list-style-type: none"> Corners: Butt joined with 2x aluminum shear blocks secured to the jamb. The shear blocks were secured with 4x and 2x #10 x 5/8" pan-head screws. The joining frame profile slides over the shear blocks, and is then secured to one of the shear blocks with 2x #10 x 5/8" pan-head screws. 2x stainless steel dowels, approximately 76 mm (2-1/2") long were slid into the screw chases of the joining frame. A gasket is used at the end of the head and sill profiles to seal it to the joining jamb. A black plastic profile was used along the jambs to space out the rough opening size of the frame to support the non-glass side of the pressure plate. |
| Vertical Mullion (2x) | <ul style="list-style-type: none"> Integral mullion – Aluminum. <ul style="list-style-type: none"> Reinforcement: None. Each secured to the head and sill frame profile with the use of 2x aluminum shear blocks. The shear blocks were secured to the vertical mullion with 4x and 2x #10 x |

| | |
|---------------------------------------|---|
| | <p>5/8" pan-head screws. The head and sill profile slides over the shear blocks, and is then secured to one of the shear blocks with 2x #10 x 5/8" pan-head screws. 2x stainless steel dowels, approximately 76 mm (2-1/2") long were slid into the screw chases of the joining profile.</p> <ul style="list-style-type: none"> • A gasket is used at the end of the head and sill to seal it to the joining frame profile. |
| <p>Horizontal Mullion (2x)</p> | <ul style="list-style-type: none"> • Integral mullion – Aluminum • Reinforcement: None. • Each secured to the vertical mullion and jamb profile with the use of 2x aluminum shear blocks. The shear blocks were secured to the vertical mullion and jamb with 4x and 2x #10 x 5/8" pan-head screws. The horizontal mullion profile slides over the shear blocks, and is then secured to one of the shear blocks with 2x #10 x 5/8" pan-head screws. 2x stainless steel dowels, approximately 76 mm (3") long for the jambs, and 152 mm (6") for the vertical to horizontal mullion joints, were slid into the screw chases of the horizontal. • A gasket is used at the end of the head and sill to seal it to the joining frame profile. |
| <p>Fixed Window (5x)</p> | |
| <p>Drainage</p> | <ul style="list-style-type: none"> • The horizontal pressure plates at the bottom of each glazing unit have 25 mm (1") x 5 mm (0.20") slots to provide drainage. The narrow windows have 2x slots, the wide windows have 4x slots. Evenly spaced, approximately 102 mm (4") from the ends. • The horizontal pressure plate beauty caps, at the bottom of each glazing unit have 25 mm (1") x 5 mm (0.20") slots to provide drainage. The narrow windows have 2x slots, the wide windows have 3x slots. Evenly spaced, approximately 152 mm (6") from the ends, and mid-span. |
| <p>Glazing (5x)</p> | <ul style="list-style-type: none"> • IGU specification (2x top units and 1x narrow bottom unit): <ul style="list-style-type: none"> • 6 mm annealed / 4 mm tempered with a Warm-Edge Spacer (Chromatech Ultra, Black 9004), sealed together using Hot melt butyl. • Overall thickness, 26 mm (~1.0") • IGU specification (2x large bottom units): <ul style="list-style-type: none"> • 6 mm annealed / 6 mm tempered with a Warm-Edge Spacer (Chromatech Ultra, Black 9004), sealed together using Hot melt butyl. • Overall thickness, 28 mm (~1.0") • Glazing Blocks: 2x aluminum angle profile setting block carriers are adhered to the sill or horizontal mullion, centered approximately 152 mm (6") from the edge of glass. Each aluminum setting block carrier had a plastic setting block set on it, approximately 102 mm (4") x 32 mm (1-1/4") x 1 mm (0.04"). • Laid-in, exterior glazed on top of glazing gaskets, applied continuous along the jambs and vertical mullion, butt joined to the length of a different gasket along the horizontal mullions, head and sill. |

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| | |
|-----------------|---|
| | <ul style="list-style-type: none">• A foam profile is used around the entire perimeter of each sealed unit, behind the pressure plate.• Glazing Stops: Pressure plates are used continuous along the verticals, and along the top and bottom of each glass unit. Secured with #12 x 1-3/4" screws, spaced approximately 152 mm (6") – 305 mm (12"), and each end is fit with an end dam gasket. A pressure plate beauty cap is snapped over the length of each pressure plate. |
| Drawings | <ul style="list-style-type: none">• Copy of drawings supplied by Aliplast sp. Z o.o. included in Appendix A. |

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SECTION 5

TESTING AND EVALUATION METHODS

AIR LEAKAGE RESISTANCE

The Air Leakage Resistance test was performed in accordance with ASTM E283-04(2012), “*Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen*”. Air infiltration and exfiltration tests were performed using test pressures of 75 Pa (1.57 psf) and 300 Pa (6.27 psf). The maximum air leakage rate was calculated and reported.

WATER PENETRATION RESISTANCE – ASTM E547

A four-cycle Water Penetration Resistance test was performed in accordance with ASTM E547-00(2016) “*Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference*” (ASTM E547). The test was performed using the specified pressure differential and a water spray rate of at least 204 L/m² per hour (5.0 U.S. gal/ft² per hour). Each cycle consisted of five minutes with the pressure applied and one minute with the pressure released, during which the water spray was continuously applied.

WATER PENETRATION RESISTANCE – ASTM E331

The Static Water Penetration Resistance Test was performed in accordance with ASTM E331-00(2016) “*Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference*” (ASTM E331). The test was performed using the specified pressure differential and a water spray rate of at least 204 L/m² per hour (5.0 U.S. gal/ft² per hour). Duration of the test was 15 minutes, during which the water spray and air pressure were continuously applied.

UNIFORM LOAD DEFLECTION

The Uniform Load Deflection tests were conducted in accordance with ASTM E330/E330M-14 “*Standard Test Method for Structural Performance of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference*” (ASTM E330), Procedure A. The tests were performed in both the positive and negative directions. After a 60 second preload (50% of the test load), followed by 1 minute with the pressure released, the tests were conducted at the specified test pressure for a period of 60 seconds. Deflections were measured at the mid-span and at the ends. The end deflections were averaged and subtracted from the mid-span deflection (to eliminate deflections caused by movement at the ends of the structural supporting members).

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UNIFORM LOAD STRUCTURAL

The Uniform Load Structural tests were conducted in accordance with ASTM E330/E330M-14 “Standard Test Method for Structural Performance of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference” (ASTM E330), Procedure A. After a 60 second preload (50% of test load), followed by 1 minute with the pressure released, the sample was subjected to a Uniform Load Structural test using a specified test pressure for a time of 60 seconds. The test was performed in both the positive and negative directions. After the test loads were released, the permanent deflections were recorded and the specimen was inspected for failure or permanent deformation of any part of the system that would cause any operational malfunction.

SECTION 6

TEST EQUIPMENT

Equipment used during testing is listed as follows:

| Test | Equipment | Intertek ID# |
|--|-----------------------------------|--------------|
| Air Leakage Resistance, Water Penetration Resistance, and Uniform Load Deflection / Structural | Fenestration Testing Control Unit | 60650 |
| | Water spray assembly | 60651 |
| | | 60652 |
| | | 60653 |
| | 20" Line Gauge | 60673 |
| | | 64928 |
| | | 64926 |

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SECTION 7**RESULTS AND OBSERVATIONS****AIR LEAKAGE RESISTANCE**

Air test data is indicated in the following table:

| Property | Area m ² (ft ²) | Infiltration Rate L/s*m ² (cfm/ft ²) | Exfiltration Rate L/s*m ² (cfm/ft ²) |
|---------------------------|---|--|--|
| Overall Assembly @ 75 Pa | 9.00 (96.85) | 0.05 (0.01) | 0.03 (0.00) |
| Overall Assembly @ 300 Pa | 9.00 (96.85) | 0.11 (0.02) | 0.07 (0.01) |

WATER PENETRATION RESISTANCE – ASTM E547

During the 24-minute test period, using a pressure differential of 720 Pa (15.0 psf), there was no water leakage observed. The system **met** the 720 Pa Water Penetration performance requirements.

WATER PENETRATION RESISTANCE – ASTM E331

During the 15-minute test period, using a pressure differential of 720 Pa (15.0 psf), there was no water leakage observed. The system **met** the 720 Pa Static Water Penetration performance requirements.

UNIFORM LOAD – DEFLECTION & STRUCTURALVertical Mullion Deflection Data:

Vertical Mullion span, L = 2890 mm (113.78")

| Test Pressure, Pa (psf) | Deflection Measurements, mm (in.) | | | |
|----------------------------|-----------------------------------|-------------|--------------|-------------|
| | Positive | | Negative | |
| | Deflection | Residual | Deflection | Residual |
| 3360 (70.2) | 18.52 (0.73) | 0.60 (0.02) | 18.29 (0.72) | 0.25 (0.01) |
| 5040 (105.3) | n/a | 0.81 (0.03) | n/a | 0.58 (0.02) |

Horizontal Mullion Deflection Data:

Horizontal Mullion span, L = 1275 mm (50.20")

| Test Pressure, Pa (psf) | Deflection Measurements, mm (in.) | | | |
|----------------------------|-----------------------------------|-------------|-------------|-------------|
| | Positive | | Negative | |
| | Deflection | Residual | Deflection | Residual |
| 3360 (70.2) | 0.61 (0.02) | 0.05 (0.00) | 1.36 (0.05) | 0.05 (0.00) |
| 5040 (105.3) | n/a | 0.06 (0.00) | n/a | 0.01 (0.00) |

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SECTION 8 CONCLUSION

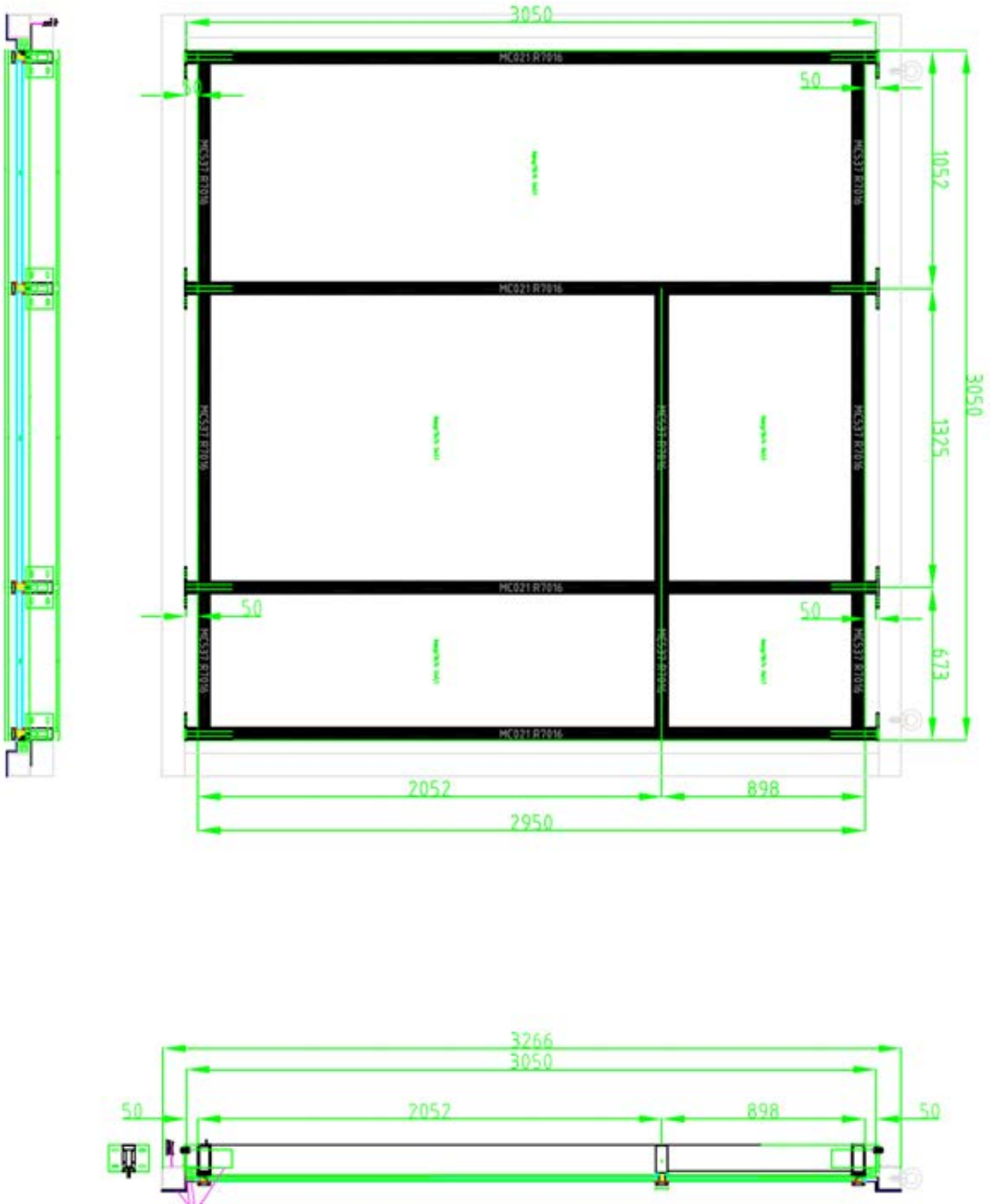
The MC Wall – Fixed Window Wall Combination System, submitted by Aliplast sp. Z o.o., tested and described within this report, achieved the overall performance requirements as noted in Section 1 of this report, when tested to the standard test methods of ASTM E283, ASTM E547, ASTM E331 and ASTM E330.

SECTION 9

APPENDIX A: DRAWINGS

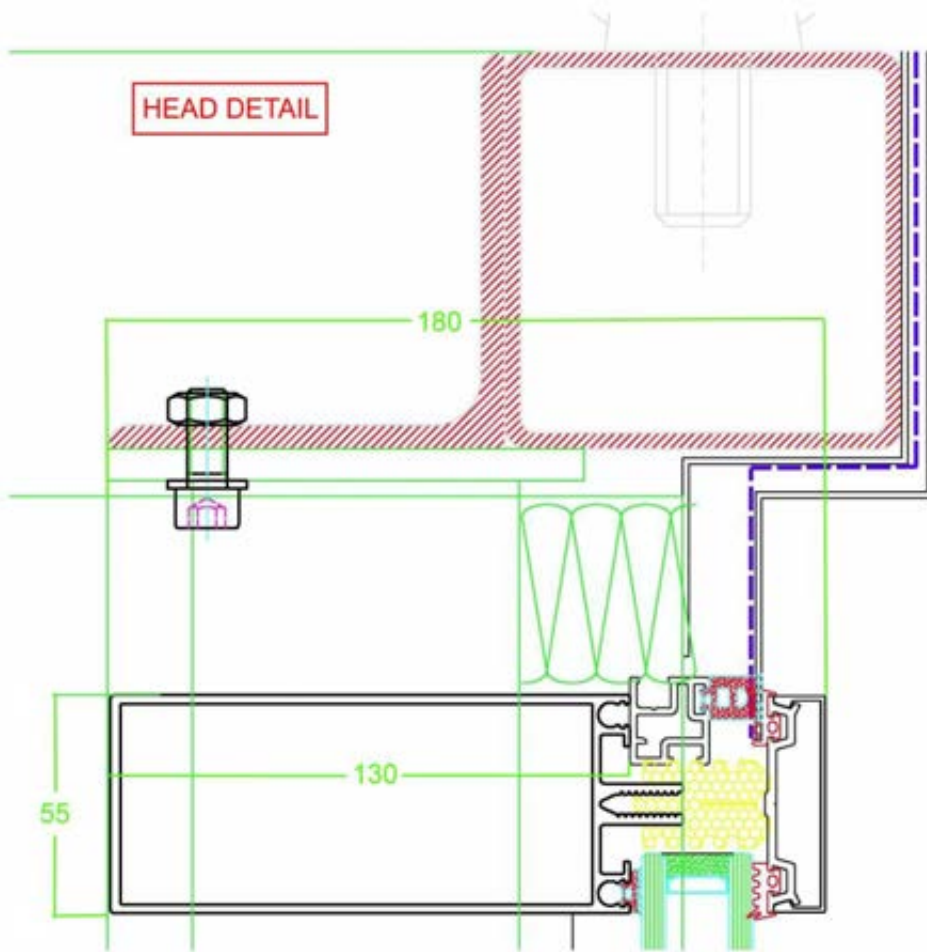
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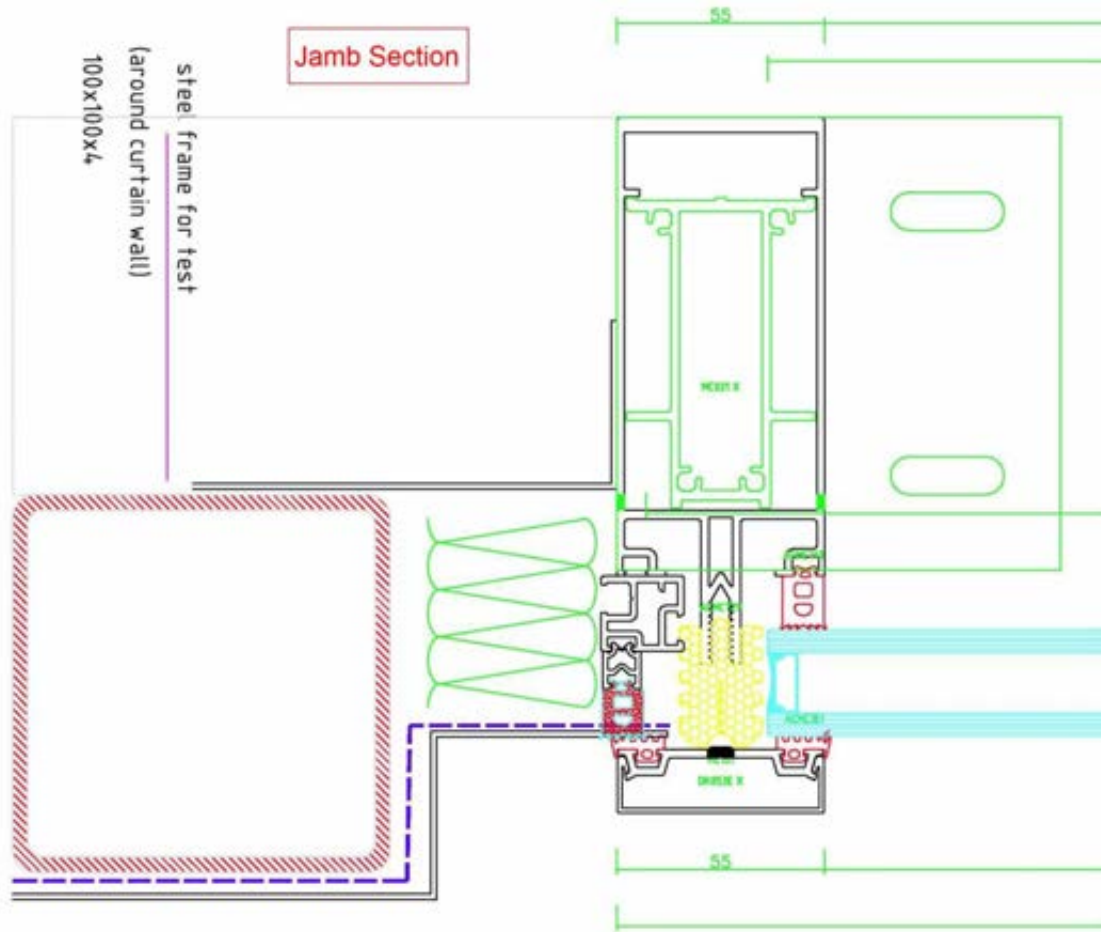
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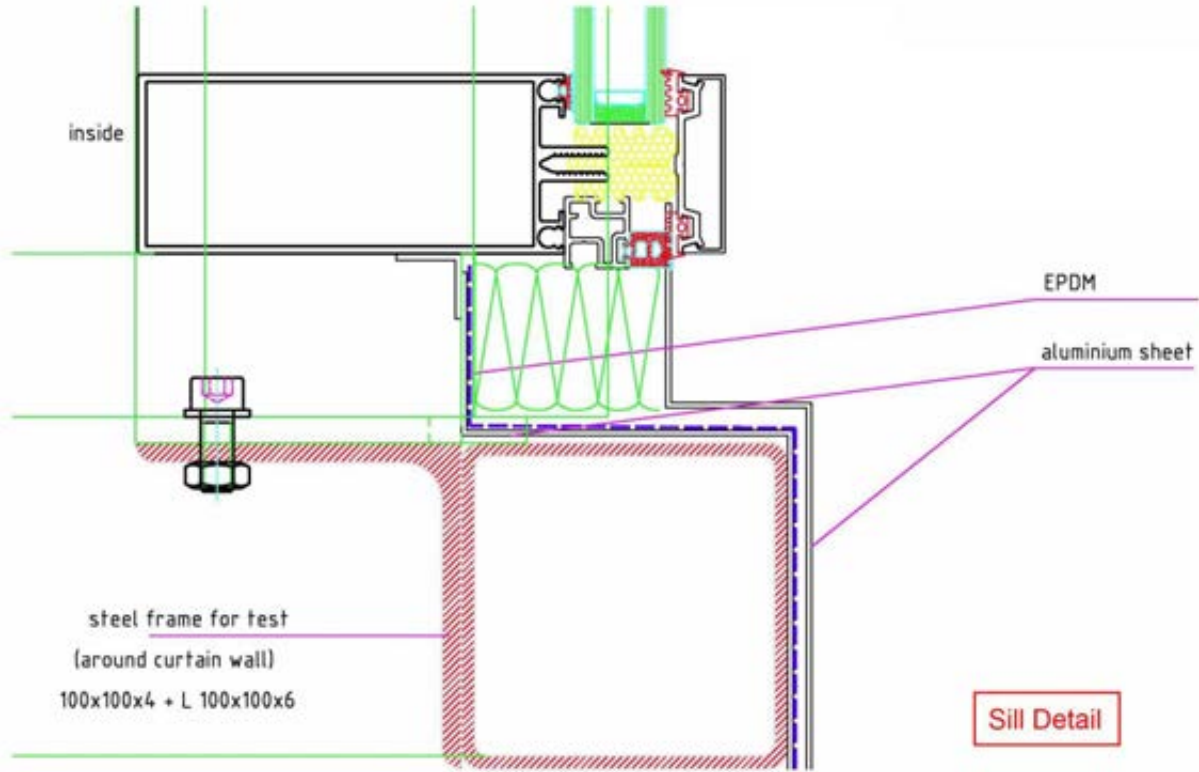
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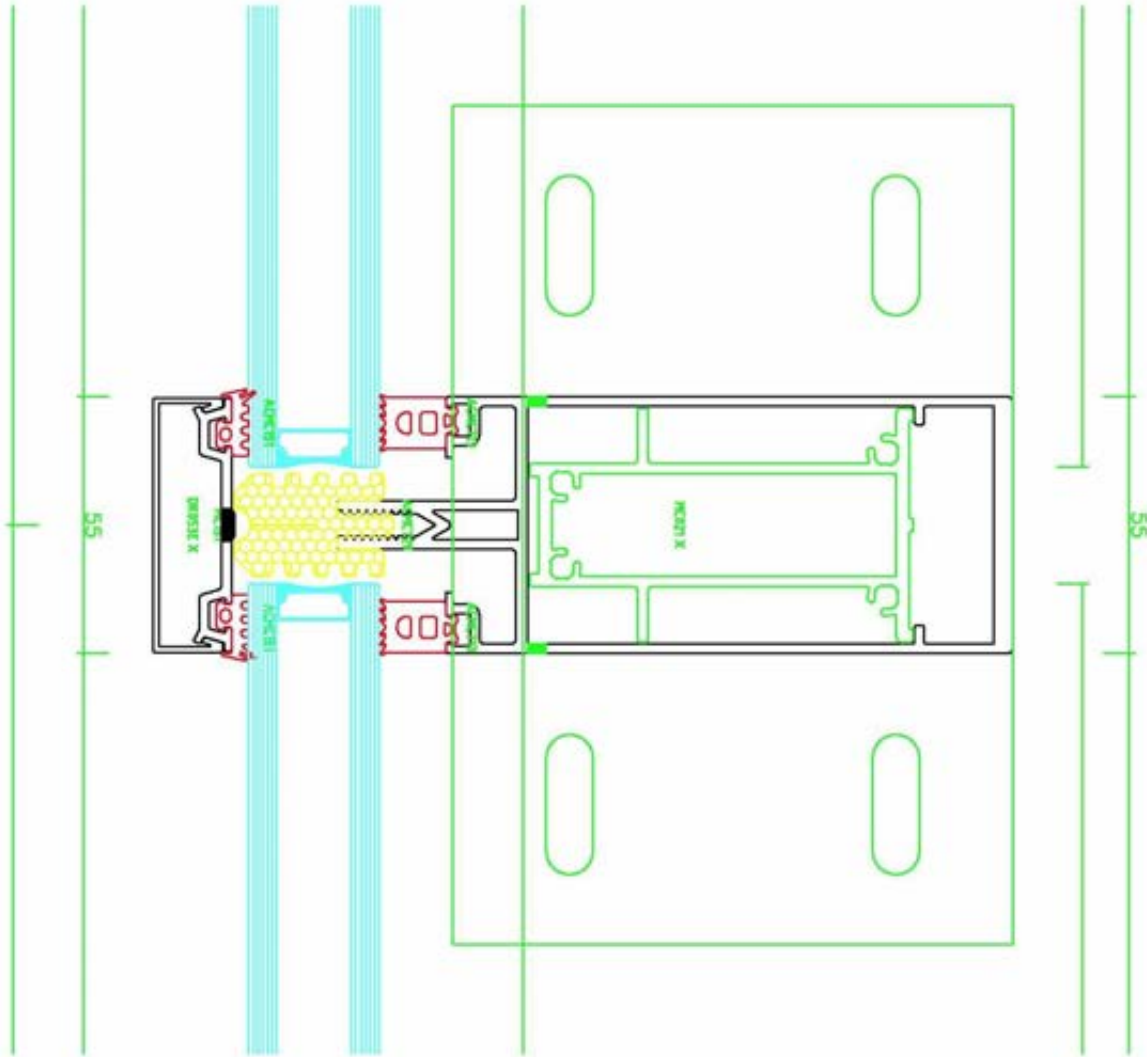
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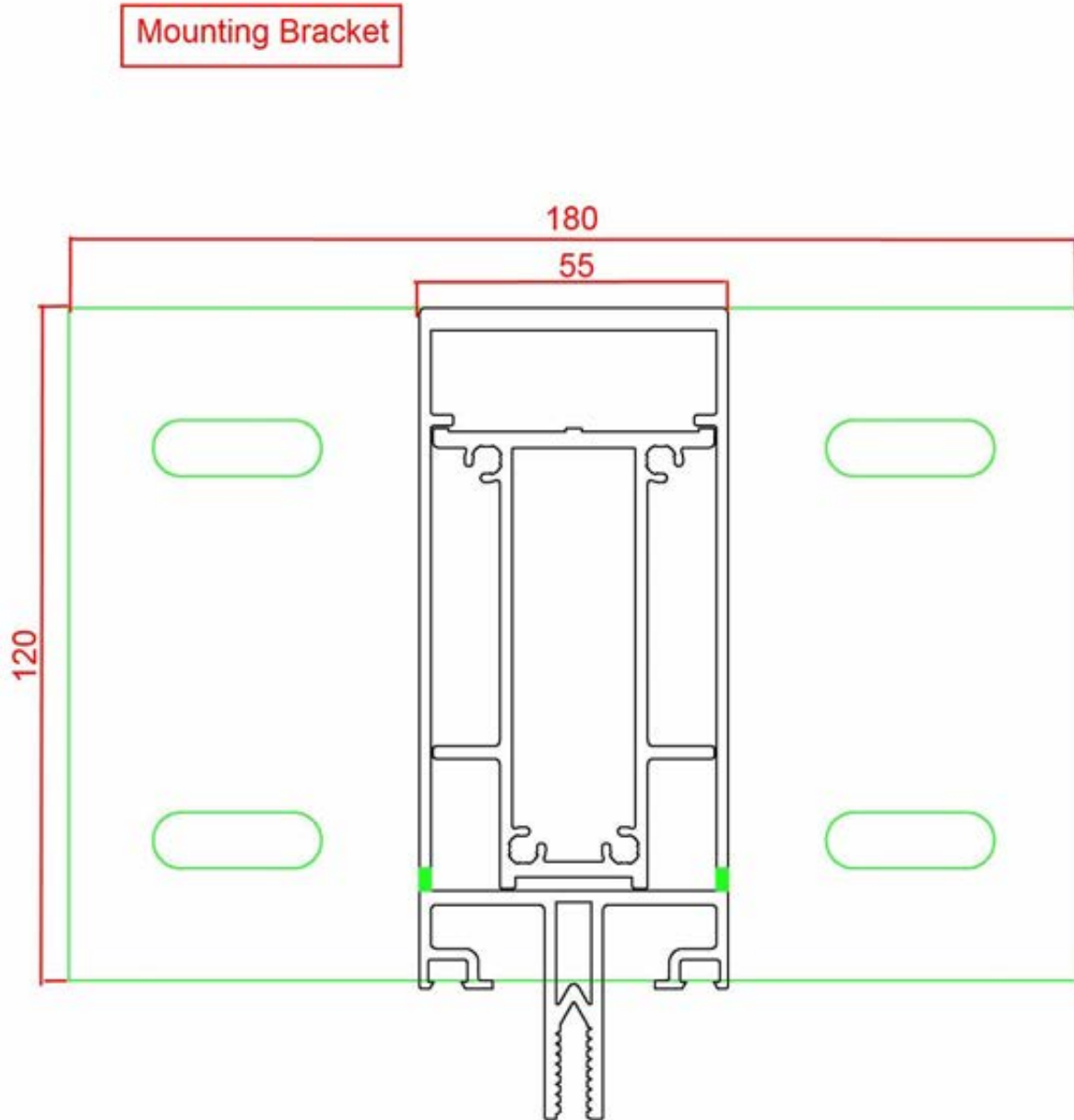
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Vertical Mullion Section

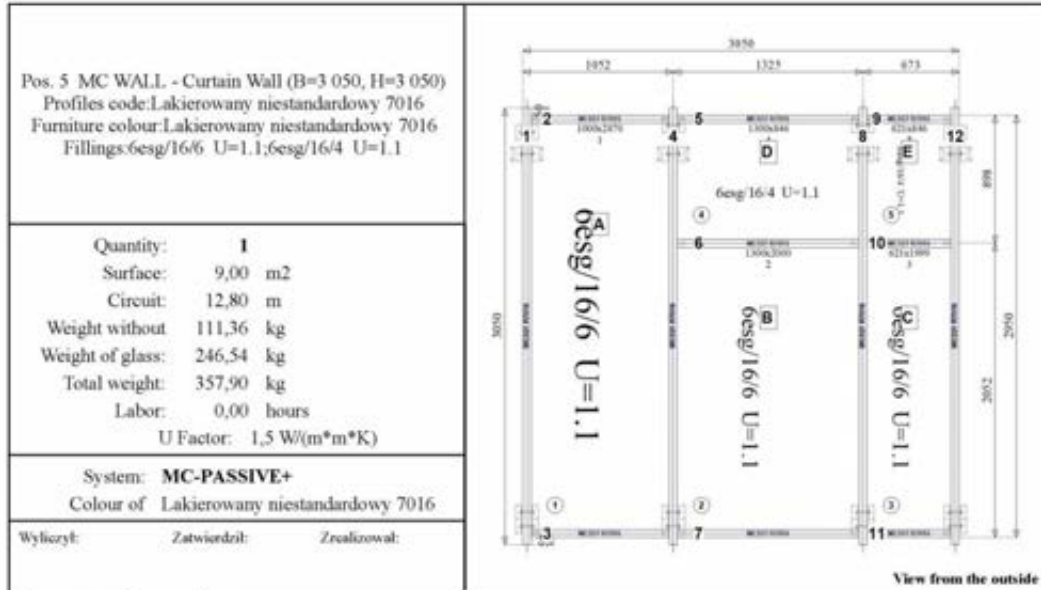
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Errors and warnings:

Więcej niż jedna stała podpora tym prześle

Profiles

| Code | Quantity | Dimensions | Location | Description |
|-------------|----------|------------|----------|------------------------------|
| MC021 R7016 | 4 pes | 3050 mm. | 1+4+8+12 | 1 |
| MC537 R7016 | 2 pes | 1008 mm. | 2..3 | HORIZONTAL TRANSOM 130.50 MM |
| | 3 pes | 1308 mm. | 5..7 | |
| | 3 pes | 629 mm. | 9..11 | |

Additional profiles

| Code | Quantity | Dimensions | Location | Description |
|--------------|----------|------------|----------|------------------------------------|
| DK052E R7016 | 2 pes | 969 mm. | 2..3 | COVERPROFILE 13MM |
| | 3 pes | 1269 mm. | 5..7 | |
| | 3 pes | 590 mm. | 9..11 | |
| DK053E R7016 | 4 pes | 3050 mm. | 1+4+8+12 | COVERPROFILE 15MM |
| MC006 | 12 pes | 50 mm. | 1+4+8+12 | Cover insulator pvc 10mm - ap661-a |
| | 2 pes | 3050 mm. | 1+12 | |
| MC007 | 12 pes | 50 mm. | 1+4+8+12 | Additional pvc profile 20x22mm, |
| | 2 pes | 3050 mm. | 1+12 | |
| | 2 pes | 1008 mm. | 2..3 | |
| | 2 pes | 1308 mm. | 5+7 | |
| | 2 pes | 629 mm. | 9+11 | |
| MC009 | 12 pes | 50 mm. | 1+4+8+12 | Insulator pvc |
| | 2 pes | 3050 mm. | 1+12 | |
| | 2 pes | 1008 mm. | 2..3 | |
| | 2 pes | 1308 mm. | 5+7 | |
| | 2 pes | 629 mm. | 9+11 | |
| MC151 | 4 pes | 3050 mm. | 1+4+8+12 | Sub-profile |
| | 2 pes | 961 mm. | 2..3 | |

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| Code | Quantity | Dimensions | Location | Description |
|-------|----------|------------|----------|-------------|
| MC151 | 3 pcs | 1261 mm. | 5..7 | Sub-profile |
| | 3 pcs | 582 mm. | 9..11 | |

Seals

| Code | Quantity | Dimensions | Location | Description |
|---------|----------|------------|--------------|---------------------|
| ACMC151 | 39,27 m | | 1..12 | GASKET FOR MC-Wall |
| ACMC703 | 5,89 m | | ... many ... | Inside gasket 3 mm |
| ACMC705 | 3,87 m | | 5..6+9..10 | Inside gasket 5 mm |
| ACMC706 | 12,59 m | | ... many ... | Inside gasket 6 mm |
| ACMC713 | 13,56 m | | 1+4+8+12 | Inside gasket 13 mm |
| ACMC715 | 3,26 m | | 4+8+12 | Inside gasket 15 mm |

Accessories

| Code | Quantity | Dimensions | Location | Description |
|-----------|-----------|------------|--------------|--|
| ACMC031 | 16 pcs. | | 1..12 | Friction piece 55 mm |
| ACMC161 | 16 pcs. | | ... many ... | End part for sub profile MC151 and MC160 |
| ACMC231 | 10 pcs. | | ... many ... | Glazing support 37mm |
| ACMC2581T | 4 pcs. | | 1+4+8+12 | Alu fitting for mullion |
| ACMC2582T | 4 pcs. | | 1+4+8+12 | |
| ACMC631 | 16 pcs. | | ... many ... | Tightening for mullion transom |
| ACMC632 | 16 pcs. | | 1..12 | Bracket for transom |
| ACMC634C | 16 pcs. | | 1..12 | |
| ACMC641 | 4 pcs. | | 1+4+8+12 | Accompanying water |
| ACMC649 | 48 pcs. | | 1+4+8+12 | Vent support |
| ACMC650 | 24 pcs. | | 1+4+8+12 | Sleeve s 10 with thread m8 |
| ACMC729 | 9,86 pcs. | | 1..12 | Insulator XPE 22mm |
| ACMC844 | 4 pcs. | | 4+8 | Connection mullion MC019 & MC021 |
| ACMC864 | 2 pcs. | | 1+12 | |
| ACMC884 | 2 pcs. | | 1+12 | |
| M4.8x16 | 96 pcs. | | 1..12 | SCREW M4.8x16 DIN 7981 |
| M6.3x45 | 89 pcs. | | 1..12 | Screw m6.3x45 din 7981 torx |
| M8x25 | 48 pcs. | | 1+4+8+12 | Screw m8x30 din 7991 |

Glazing and plates

| Code | Quantity | Dimensions | Location | Description |
|-----------------|----------|-------------------------|----------|-----------------|
| 6esg/16/4 U=1.1 | 1 pcs. | 1 300mm x 846mm 1,1m2 | 4 | 6esg/16/4 U=1.1 |
| | 1 pcs. | 621mm x 846mm 0,5m2 | 5 | |
| 6esg/16/6 U=1.1 | 1 pcs. | 1 000mm x 2 870mm 2,9m2 | 1 | 6esg/16/6 U=1.1 |
| | 1 pcs. | 1 300mm x 2 000mm 2,6m2 | 2 | |
| | 1 pcs. | 621mm x 1 999mm 1,2m2 | 3 | |

SECTION 10

APPENDIX B: PHOTOGRAPHS

(10 Pages)

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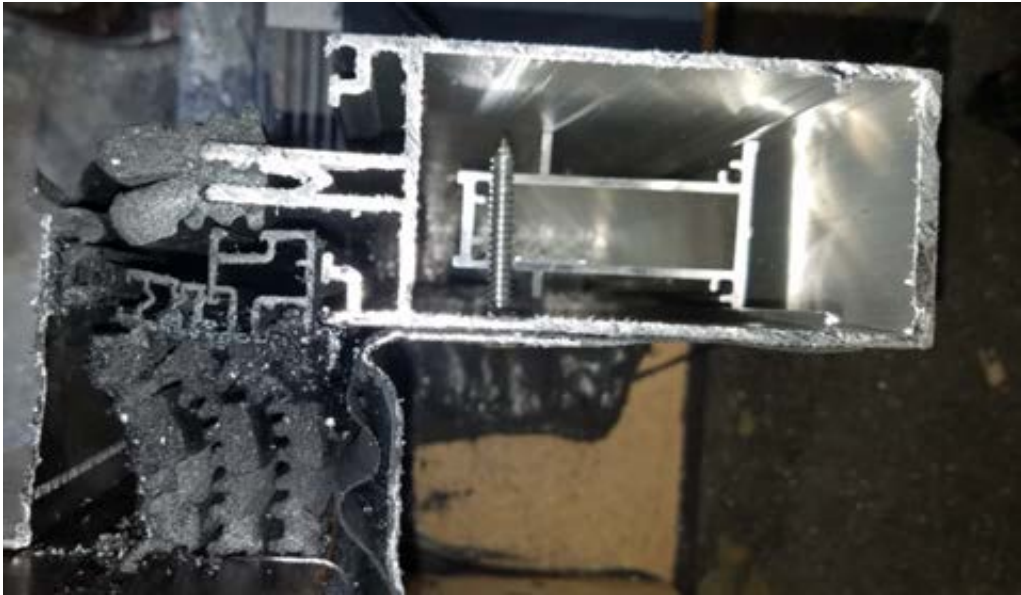
MC Wall – Façade window wall system – Interior



MC Wall – Façade window wall system – Exterior

***Note – Picture taken with poly in place during the air leakage test**

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Jamb assembly



Sill assembly profile

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Install flashing on the interior



Installation bracket covered with fabric membrane

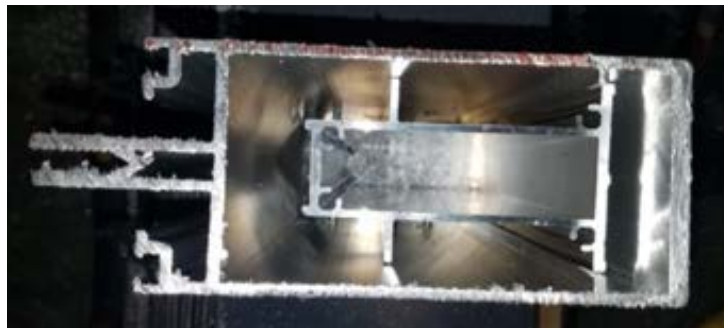


Installation bolts into bracket

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Installation bracket and aluminum plate attached to mullion bottom



Aluminum insert inside vertical mullion



2x aluminum shear blocks

Date: 18-July-2019



2x aluminum shear blocks and 2x stainless steel dowels



Jamb to horizontal mullion corner joint



Vertical mullion to horizontal mullion joints

Date: 18-July-2019



Pressure plate profile



Pressure plate junction between horizontal and vertical

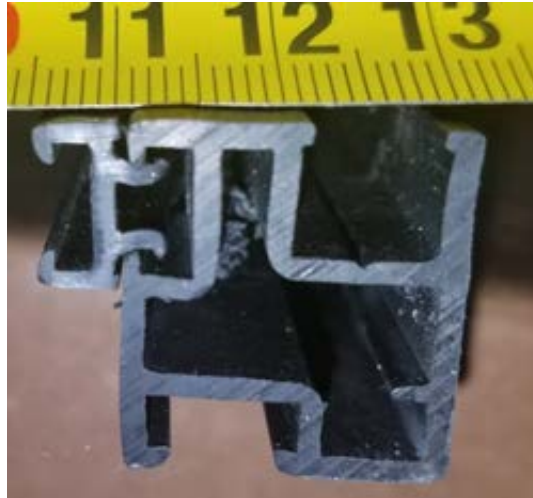


Pressure plate end dam gasket

Date: 18-July-2019



Beauty cap profile



Spacer profile used to support the RO side pressure plates



Foam used around the sealed units

Date: 18-July-2019



Foam profile



Drain slot in the pressure plate



Drain slot in the pressure plate beauty cap

Benchmark and Non-standard Test Report: Report must be reproduced in its entirety

Date: 18-July-2019



Glazing gasket for pressure plate side



Glazing gasket for the horizontal frame and mullions



Glazing gasket for the vertical frame and mullions

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Setting block and aluminum carrier

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SECTION 11

APPENDIX C: REVISION TABLE

(1 Page)

Date: 18-July-2019

| Revision Table | | | | |
|----------------|---------|---------------------|------------|----------|
| Date | Section | Description | Technician | Reviewer |
| 18-July-2019 | --- | Original Issue Date | --- | --- |