**NFRC 102-2014 THERMAL PERFORMANCE**
**TEST REPORT**

**Rendered to:**

**CR LAURENCE CO., INC.**

**SERIES/MODEL: ENTICE Window Wall**
**TYPE: Glazed Wall Systems (Site-built)**

| Summary of Results | | | |
|---|---|---|---|
| **Standardized Thermal Transmittance (U-Factor)** | | | 0.41 |
| **Unit Size:** | | 78-3/4" x 79" (2000 mm x 2007 mm) (Model Size) | |
| **Layer 1:** | 1/4" | Clear | |
| **Gap:** | 0.54" | A1-D: Aluminum Spacer | 100% Air** |
| **Layer 2:** | 1/4" | PPG Solarban 70XL (e=0.018**, #3) | |

Reference must be made to Report No. E8225.01-301-46, dated 11/13/15 for complete test specimen description and data.

# NFRC 102-2014 THERMAL PERFORMANCE TEST REPORT

Rendered to:

CR LAURENCE CO., INC.
2100 E 38th St
Vernon, California 90058

Report Number: E8225.01-301-46
Test Date: 10/11/15
Report Date: 11/13/15

**Test Sample Identification**:

**Series/Model**: ENTICE Window Wall

**Type**: Glazed Wall Systems (Site-built)

**Overall Size**: 78-3/4" x 79" (2000 mm x 2007 mm) (Model Size)
**NFRC Standard Size:** 78.7" x 78.7" (2000 mm wide x 2000 mm high)

**Test Sample Submitted by:** Client

**Test Sample Submitted for:** Validation for Initial Certification (Production Line Unit) & Plant Qualification

**Test Procedure**: U-factor tests were performed in a Guarded Hot Box in accordance with NFRC 102-2014, *Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems* .

**Test Results Summary**:

Standardized U-factor ($U_{st}$): 0.41 Btu/hr·ft$^2$·F (CTS Method)

**Test Sample Description**:

**Frame:**

| | | | |
|---|---|---|---|
| **Material:** | AT (0.38"): Aluminum with Thermal Breaks - All Members - Skip & Debridge* | | |
| **Size:** | 78-3/4" x 79" (Model Size) | | |
| **Daylight Opening:** | 36-1/4" x 70" (x2) | **Glazing Method:** | Pocket |
| **Exterior Color:** | Mill Finish | **Exterior Finish:** | Mill Finish |
| **Interior Color:** | Mill Finish | **Interior Finish:** | Mill Finish |
| **Corner Joinery:** | Square Cut / No Fasteners / Unsealed | | |

**Glazing Information:**

| | | | |
|---|---|---|---|
| **Layer 1:** | 1/4" | Clear | |
| **Gap:** | 0.54" | A1-D: Aluminum Spacer | 100% Air** |
| **Layer 2:** | 1/4" | PPG Solarban 70XL (e=0.018**, #3) | |
| **Gas Fill Method:** | N/A** | | |

**See Drawings in Appendix D for Skip/Debridge Measurements*
***Stated per Client/Manufacturer*
*N/A Non-Applicable*

**Test Sample Description:** (Continued)

**Weatherstripping**:

| Description | Quantity | Location |
|---|---|---|
| No weatherstripping. | | |
| | | |
| | | |
| | | |
| | | |

**Hardware**:

| Description | Quantity | Location |
|---|---|---|
| No hardware. | | |
| | | |
| | | |
| | | |
| | | |

**Drainage**:

| Drainage Method | Size | Quantity | Location |
|---|---|---|---|
| No visible weeps. | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# Thermal Transmittance (U-factor)

## Measured Test Data

### Heat Flows

| | | |
|---|---|---|
| 1. Total Measured Input into Metering Box ($Q_{total}$) | 1463.85 | Btu/hr |
| 2. Surround Panel Heat Flow ($Q_{sp}$) | 81.93 | Btu/hr |
| 3. Surround Panel Thickness | 4.00 | inches |
| 4. Surround Panel Conductance | 0.0463 | Btu/hr·ft²·F |
| 5. Metering Box Wall Heat Flow ($Q_{mb}$) | 14.72 | Btu/hr |
| 6. EMF vs Heat Flow Equation (equivalent information) | 0.0218*EMF + 0.000 | |
| 7. Flanking Loss Heat Flow ($Q_{fl}$) | 34.37 | Btu/hr |
| 8. Net Specimen Heat Loss ($Q_s$) | 1332.84 | Btu/hr |

### Areas

| | | |
|---|---|---|
| 1. Test Specimen Projected Area ($A_s$) | 43.20 | ft² |
| 2. Test Specimen Interior Total (3-D) Surface Area ($A_h$) | 44.14 | ft² |
| 3. Test Specimen Exterior Total (3-D) Surface Area ($A_c$) | 44.14 | ft² |
| 4. Metering Box Opening Area ($A_{mb}$) | 69.44 | ft² |
| 5. Metering Box Baffle Area ($A_{bl}$) | 60.56 | ft² |
| 6. Surround Panel Interior Exposed Area ($A_{sp}$) | 26.24 | ft² |

### Test Conditions

| | | |
|---|---|---|
| 1. Average Metering Room Air Temperature ($t_h$) | 69.80 | F |
| 2. Average Cold Side Air Temperature ($t_c$) | -0.40 | F |
| 3. Average Guard/Environmental Air Temperature | 74.00 | F |
| 4. Metering Room Average Relative Humidity | 12.60 | % |
| 5. Metering Room Maximum Relative Humidity | 12.92 | % |
| 6. Metering Room Minimum Relative Humidity | 12.26 | % |
| 7. Measured Cold Side Wind Velocity (Perpendicular Flow) | 12.66 | mph |
| 8. Measured Warm Side Wind Velocity (Parallel Flow) | 0.04 | mph |
| 9. Measured Static Pressure Difference Across Test Specimen | 0.00" ± 0.04" | $H_2O$ |

### Average Surface Temperatures

| | | |
|---|---|---|
| 1. Metering Room Surround Panel | 67.15 | F |
| 2. Cold Side Surround Panel | -0.29 | F |

### Results

| | | |
|---|---|---|
| 1. Thermal Transmittance of Test Specimen ($U_s$) | 0.44 | Btu/hr·ft²·F |
| 2. Standardized Thermal Transmittance of Test Specimen ($U_{st}$) | 0.41 | Btu/hr·ft²·F |

# Thermal Transmittance (U-factor)

## Calculated Test Data

### CTS Method

| | | |
|---|---|---|
| 1. Warm Side Emittance of Glass ($e_1$) | 0.84 | |
| 2. Cold Side Emittance of Glass | 0.84 | |
| 3. Warm Side Frame Emittance* | 0.05 | |
| 4. Cold Side Frame Emittance* | 0.05 | |
| 5. Warm Side Sash/Panel/Vent Emittance* | N/A | |
| 6. Cold Side Sash/Panel/Vent Emittance* | N/A | |
| 7. Warm Side Baffle Emittance ($e_{b1}$) | 0.92 | |
| 8. Cold Side Baffle Emittance ($e_{b2}$) | N/A | |
| 9. Equivalent Warm Side Surface Temperature | 48.00 | F |
| 10. Equivalent Cold Side Surface Temperature | 5.00 | F |
| 11. Warm Side Baffle Surface Temperature | 69.87 | F |
| 12. Cold Side Baffle Surface Temperature | N/A | F |
| 13. Measured Warm Side Surface Conductance ($h_h$) | 1.42 | Btu/hr·ft$^2$·F |
| 14. Measured Cold Side Surface Conductance ($h_c$) | 5.71 | Btu/hr·ft$^2$·F |
| 15. Test Specimen Thermal Conductance ($C_s$) | 0.72 | Btu/hr·ft$^2$·F |
| 16. Convection Coefficient ($K_c$) | 0.31 | Btu/(hr·ft$^2$·F$^{1.25}$) |
| 17. Radiative Test Specimen Heat Flow ($Q_{r1}$) | 706.74 | Btu/hr |
| 18. Conductive Test Specimen Heat Flow ($Q_{c1}$) | 626.10 | Btu/hr |
| 19. Radiative Heat Flux of Test Specimen ($q_{r1}$) | 16.36 | Btu/hr·ft$^2$·F |
| 20. Convective Heat Flux of Test Specimen ($q_{c1}$) | 14.49 | Btu/hr·ft$^2$·F |
| 21. Standardized Warm Side Surface Conductance ($h_{sth}$) | 1.21 | Btu/hr·ft$^2$·F |
| 22. Standardized Cold Side Surface Conductance ($h_{stc}$) | 5.28 | Btu/hr·ft$^2$·F |
| 23. Standardized Thermal Transmittance ($U_{st}$) | 0.41 | Btu/hr·ft$^2$·F |

### Test Duration

1. The environmental systems were started at 13:55 hours, 10/10/15.
2. The test parameters were considered stable for two consecutive four hour test periods from 02:53 hours, 10/11/15 to 10:53 hours, 10/11/15.
3. The thermal performance test results were derived from 06:53 hours, 10/11/15 to 10:53 hours, 10/11/15.

The reported Standardized Thermal Transmittance (Ust) was determined using CTS Method, per Section 8.2(A) of NFRC 102.

**Stated per NFRC 101*

**Glazing Deflection**:

| | Left Glazing | Right Glazing |
|---|---|---|
| Edge Gap Width | 0.54" | 0.54" |
| Estimated center gap width upon receipt of specimen in laboratory (after stabilization) | 0.48" | 0.49" |
| Center gap width at laboratory ambient conditions on day of testing | 0.48" | 0.49" |
| Center gap width at test conditions | 0.40" | 0.43" |

*Glass collapse determined using a digital glass and air space meter*

The sample was inspected for the formation of frost or condensation, which may influence the surface temperature measurements. The sample showed no evidence of condensation/frost at the conclusion of the test.

"This test method does not include procedures to determine the heat flow due to either air movement through the specimen or solar radiation effects. As a consequence, the thermal transmittance results obtained do not reflect performances which are expected from field installations due to not accounting for solar radiation, air leakage effects, and the thermal bridge effects that have the potential to occur due to the specific design and construction of the fenestration system opening. The latter can only be determined by in-situ measurements. Therefore, it is important to recognize that the thermal transmittance results obtained from this test method are for ideal laboratory conditions and should only be used for fenestration product comparisons and as input to thermal performance analyses which also include solar, air leakage and thermal bridge effects."

The test sample was installed in a vertical orientation, the exterior of the specimen was exposed to the cold side. The direction of heat transfer was from the interior (warm side) to the exterior (cold side) of the specimen. The ratings were rounded in accordance to NFRC 601, NFRC Unit and Measurement Policy. The data acquisition frequency is 5 minutes.

ANSI/NCSL Z540-2-1997 type B uncertainty for this test was 1.67%.

Required annual calibrations for the Architectural Testing Inc., an Intertek company ("Intertek-ATI"), 'thermal test chamber' (ICN 004287) in Fresno, California were last conducted in April 2015 in accordance with Intertek-ATI calibration procedure. A CTS Calibration verification was performed August 2015. A Metering Box Wall Transducer and Surround Panel Flanking Loss Characterization was performed June 2015.

"Ratings included in this report are for submittal to an NFRC licensed IA for certification purposes and are not meant to be used for labeling purposes. Only those values identified on a valid Certification Authorization Report (CAR) are to be used for labeling purposes."

Intertek-ATI will service this report for the entire test record retention period. Test records that are retained such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation will be retained by Intertek-ATI for the entire test record retention period. The test record retention end date for this report is October 11, 2019.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimen tested. This report may not be reproduced, except in full, without the written approval of Intertek-ATI.

For INTERTEK-ATI

Tested By:

Digitally Signed by: William Smeds

William Simon Smeds
Technician

Reviewed By:

Digitally Signed by:Kenny C. White

Kenny C. White
Laboratory Manager
Individual-In-Responsible-Charge

WSS:ss
E8225.01-301-46

Attachments (pages): This report is complete only when all attachments listed are included.

- Appendix-A: CTS Calibration Data (1)
- Appendix-B: Surround Panel Wiring Diagram (1)
- Appendix-C: Baffle Wiring Diagram (1)
- Appendix-D: Submittal Form and Drawings (12)

ACCREDITED

Intertek-ATI is accredited by the International Accreditation Service (IAS) under the specific test methods listed under lab code TL-144, in accordance with the recognized International Standard ISO/IEC 17025:2005. The laboratory's accreditation or test report in no way constitutes or implies product certification, approval, or endorsement by IAS.

## Revision Log

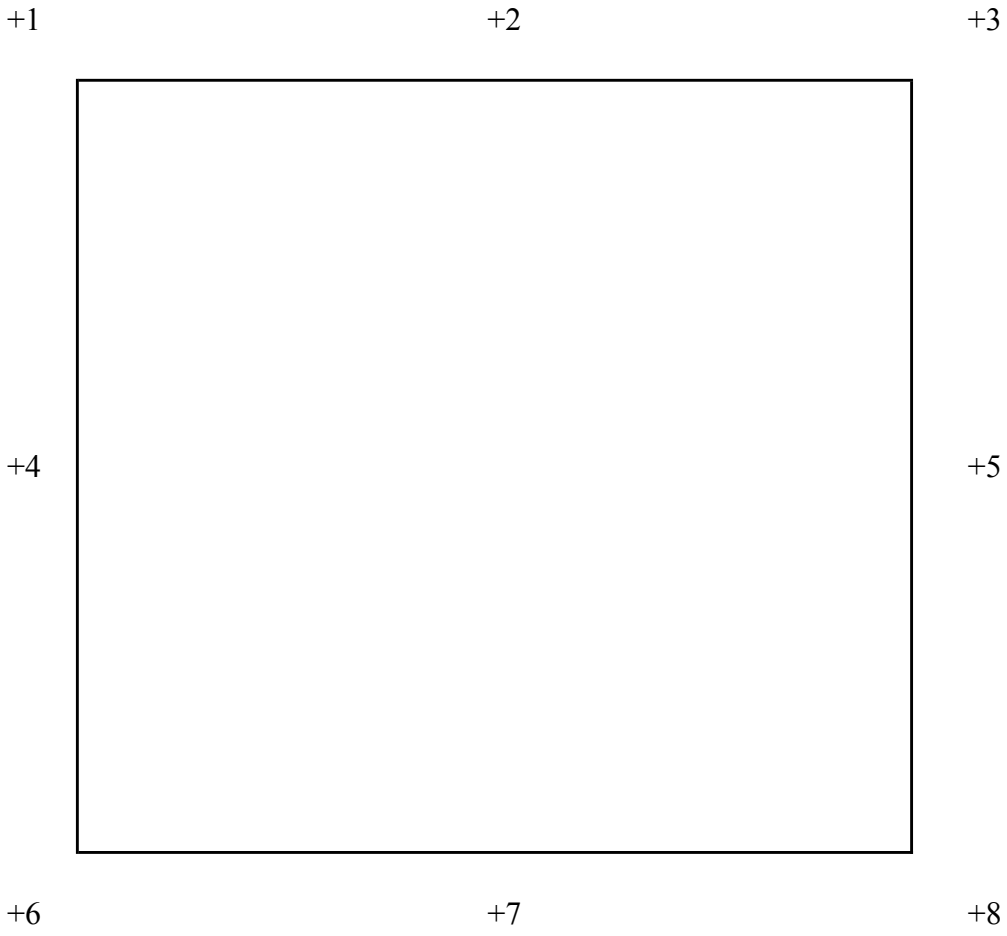
| Rev. # | Date | Page(s) | Revision(s) |
|---|---|---|---|
| 0 | 11/13/15 | All | Original Report Issue. Work requested by Mr. Gyu-Hyeon Kim of CR Laurence Co., Inc. |

This report produced from controlled document template ATI 00025(a), revised 03/14/2013.

# Appendix A: CTS Calibration Data

| | | | |
|---|---|---|---|
| 1. | CTS Test Date | 07/16/15 | |
| 2. | CTS Size | 43.06 | $ft^2$ |
| 3. | CTS Glass/Core Conductance | 0.40 | $Btu/hr \cdot ft^2 \cdot F$ |
| 4. | Warm Side Air Temperature | 69.78 | F |
| 5. | Cold Side Air Temperature | -0.37 | F |
| 6. | Warm Side Average Surface Temperature | 54.68 | F |
| 7. | Cold Side Average Surface Temperature | 3.23 | F |
| 8. | Convection Coefficient ($K_c$) | 0.31 | $Btu/(hr \cdot ft^2 \cdot F^{1.25})$ |
| 9. | Measured Cold Side Surface Conductance ($h_c$) | 5.71 | $Btu/hr \cdot ft^2 \cdot F$ |
| 10. | Measured Thermal Transmittance | 0.31 | $Btu/hr \cdot ft^2 \cdot F$ |

## Appendix B: Surround Panel Wiring Diagram



## Appendix C: Baffle Wiring Diagram

| | | | | | |
|---|---|---|---|---|---|
| +1 | +2 | +3 | +4 | +5 | +6 |
| +7 | +8 | +9 | +10 | +11 | +12 |
| +13 | +14 | +15 | +16 | +17 | +18 |
| +19 | +20 | +21 | +22 | +23 | +24 |
| +25 | +26 | +27 | +28 | +29 | +30 |

# Appendix D: Submittal Form and Drawings

# NFRC Product Certification Program

# Submittal Form for Test Samples

National Fenestration Rating Council®

For use by Manufacturers, Lineal Suppliers and Fabricators

1. Information on Production of the Test Sample (complete ALL fields):

Manufacturer: CRL - US Aluminum Date of sample manufacture: 10/5/2015

Plant Address where manufactured: 2100 E 38th St.

City: Vernon State: California Zip Code: 90058

Name of IA: Associated Laboratories Inc. Phone: (214)565-1094 Fax:

2. Product Information (complete APPLICABLE fields):

Existing Product Line ID (CPD) No.: Product/Operator Type (Table 4-3 of NFRC 100): Window Wall

Series/Model: Entice Window Wall

3. Test sample is being submitted for (select ONE):

a. ☐ Validation for Initial Certification (prototype only) no plant qualification

b. ☒ Validation for Initial Certification or Recertification (production line unit) & plant qualification

c. ☐ Plant Qualification Only (production line unit)

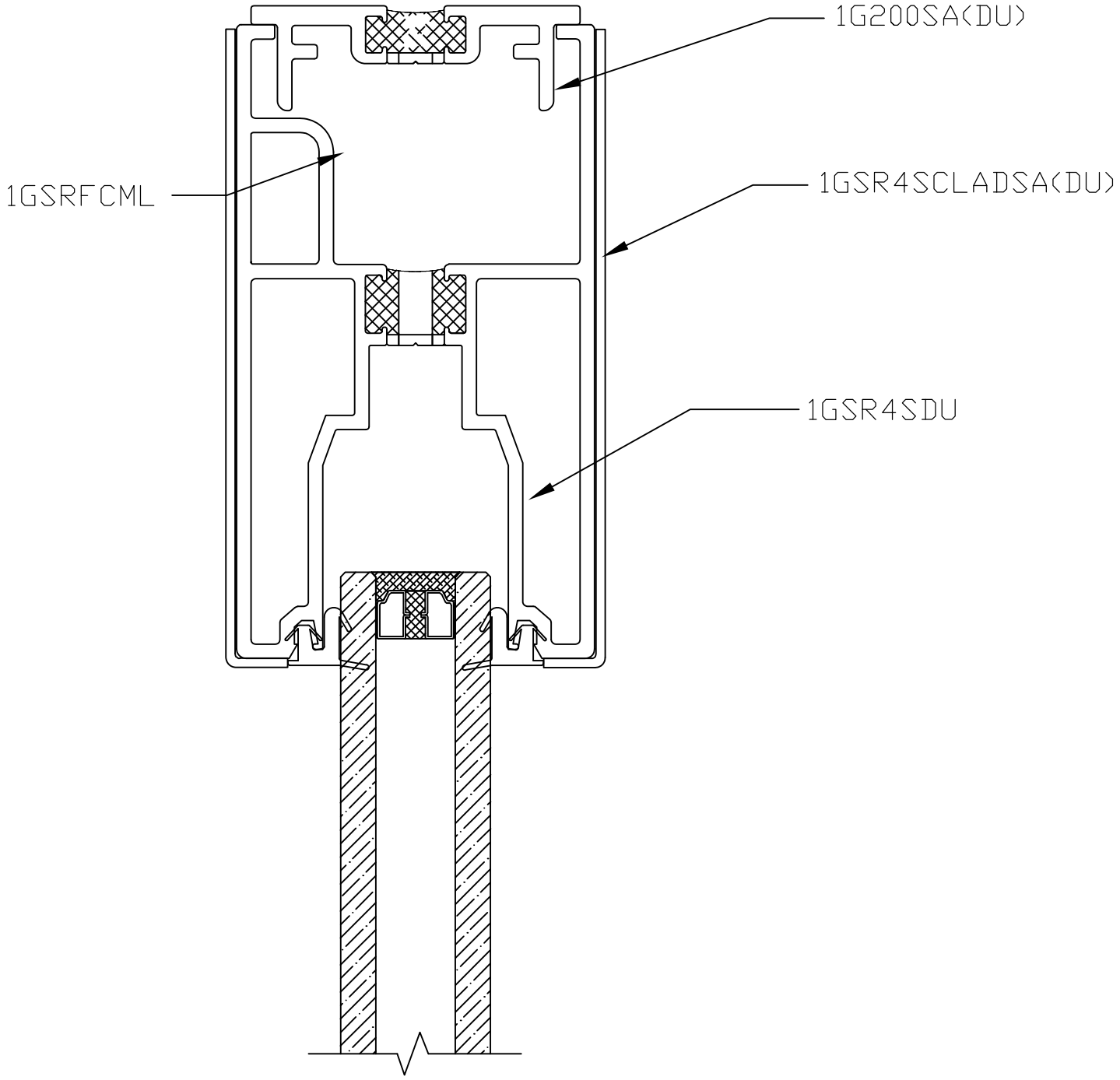
d. ☐ Test Only Alternative (production line unit) & plant qualification

I, Gyu Hyeon Kim, as the designated agent for CRL - US Aluminum do hereby attest that the foregoing information is true to the best of my information, knowledge, and belief. Further, if the unit is identified in Section 3 as a production line unit, I hereby authorize the NFRC-accredited testing laboratory to send a copy of the test report to the IA identified above for plant qualification purposes pursuant to the NFRC Product Certification Program.

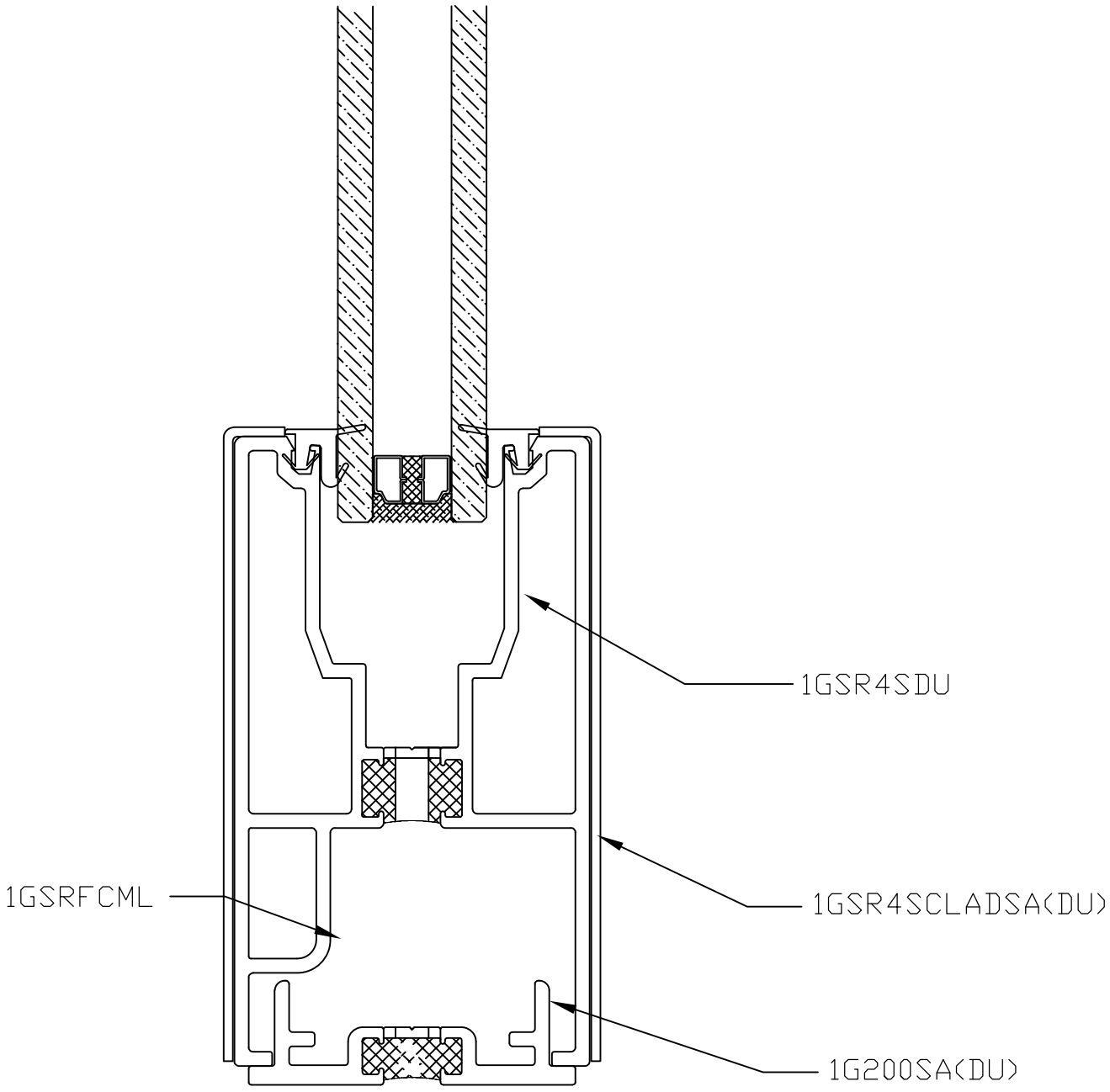
Signature: Date: 10/12/2015

## For Laboratory Use Only

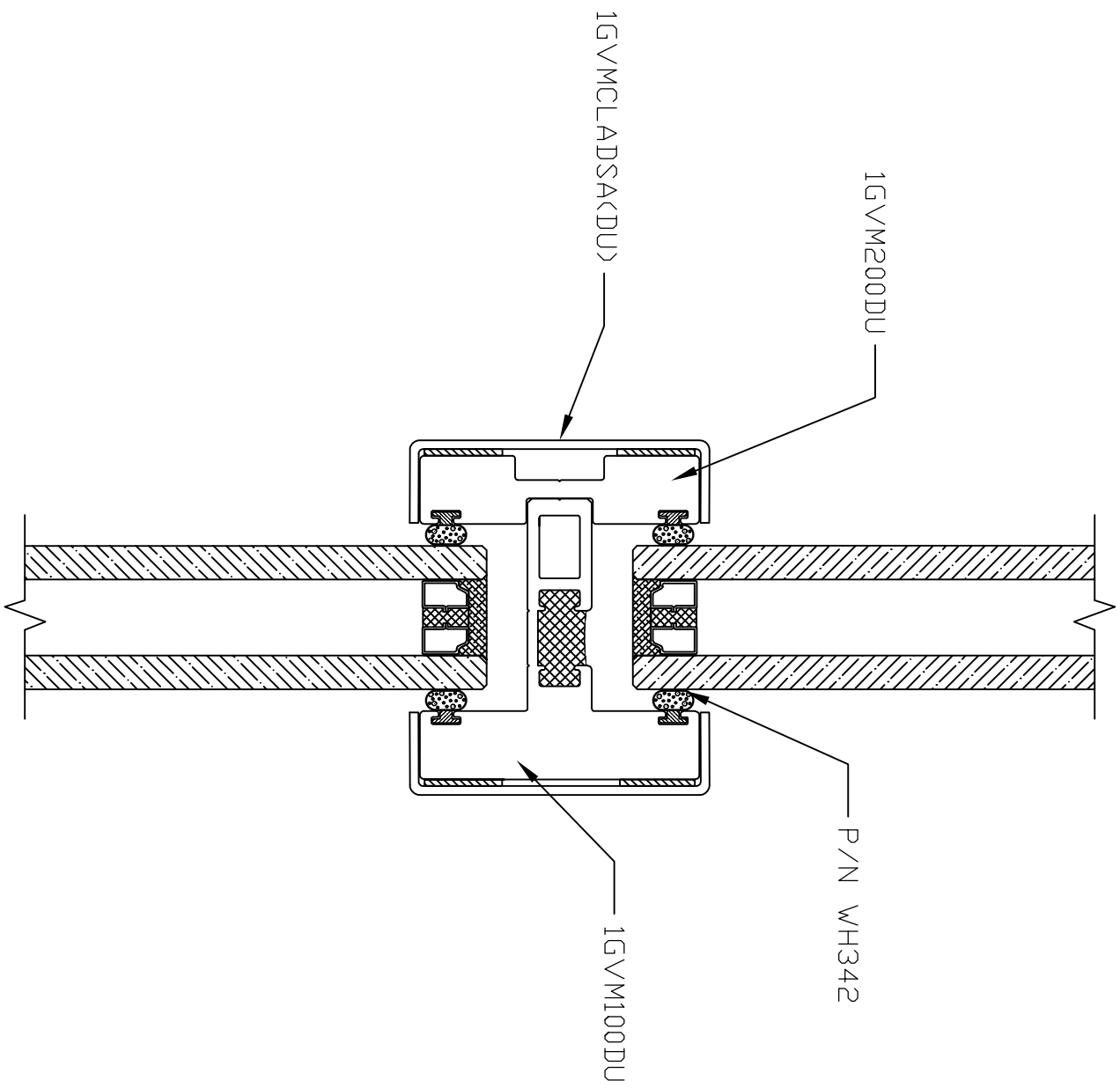
1. Laboratory: INTERTEK-ATI
2. Date Sample Received: 10/8/15 Test Report #: E8225.01-301-46
3. Date Sample Tested: 10/11/15 By: William Smeds
4. Modifications made: NONE




# ENTICE WINDOW WALL HEAD ALUMINUM CLAD




# ENTICE WINDOW WALL
# SILL
# ALUMINUM CLAD




# ENTICE WINDOW WALL
# VERT. MULLION
# ALUMINUM CLAD