NFRC 102-2004 THERMAL PERFORMANCE
TEST REPORT
(Revised)

Rendered to:

CORAL ARCHITECTURAL PRODUCTS

SERIES/MODEL: PW251 Aluminum Storefront System
TYPE: Glazed Wall Systems (Site-built)

<table>
<thead>
<tr>
<th>Summary of Results</th>
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<tr>
<td>Standardized Thermal Transmittance (U-Factor)</td>
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<td>Unit Size</td>
</tr>
<tr>
<td>Layer 1</td>
</tr>
<tr>
<td>Gap 1</td>
</tr>
<tr>
<td>Layer 2</td>
</tr>
</tbody>
</table>

Reference must be made to Report No. 88820.01-116-46, dated 01/29/09 for complete test specimen description and data.
NFRC 102-2004 THERMAL PERFORMANCE TEST REPORT
(Revised)

Rendered to:

CORAL ARCHITECTURAL PRODUCTS
3010 Rice Mine Road
Tuscaloosa, Alabama 35406

Test Sample Submitted by: Client

Test Sample Submitted for:

Test Sample Identification:

**Series/Model:** PW251 Aluminum Storefront System

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

**Overall Size:** 78-3/4" x 78-3/4" (2000 mm x 2000 mm) (Model Size)

**NFRC Standard Size:** 78.7" x 78.7" (2000 mm wide x 2000 mm high)

Test Procedure: U-factor tests were performed in a Guarded Hot Box in accordance with NFRC 102-2004, *Test Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems.*

Test Results Summary:

Standardized U-factor ($U_{st}$): 0.41 Btu/hr·ft²·F  CTS Method
Test Sample Description:

<table>
<thead>
<tr>
<th>CONSTRUCTION</th>
<th>Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size (in.)</td>
<td>78-3/4&quot; x 78-3/4&quot;</td>
</tr>
<tr>
<td>Daylight Opening</td>
<td>35-5/8&quot; x 73-7/8&quot; (x2)</td>
</tr>
<tr>
<td>CORNERS</td>
<td>Butted</td>
</tr>
<tr>
<td>Fasteners</td>
<td>Screws</td>
</tr>
<tr>
<td>Sealant</td>
<td>Yes</td>
</tr>
<tr>
<td>MATERIAL</td>
<td>AU (0.16&quot;)</td>
</tr>
<tr>
<td>Color Exterior</td>
<td>Gray</td>
</tr>
<tr>
<td>Finish Exterior</td>
<td>Anodized</td>
</tr>
<tr>
<td>Color Interior</td>
<td>Gray</td>
</tr>
<tr>
<td>Finish Interior</td>
<td>Anodized</td>
</tr>
<tr>
<td>GLAZING METHOD</td>
<td>Exterior pressure plate</td>
</tr>
</tbody>
</table>

Glazing Information:

<table>
<thead>
<tr>
<th>Layer 1</th>
<th>1/4&quot; Solar Cool Gray Tempered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gap 1</td>
<td>0.47&quot; Gap, Super Spacer (ZF-S), Air-Filled*</td>
</tr>
<tr>
<td>Layer 2</td>
<td>1/4&quot; AGC TiAC 40 (e=0.040*, #3) Tempered</td>
</tr>
<tr>
<td>Gas Fill Method</td>
<td>Single-Probe Timed*</td>
</tr>
</tbody>
</table>

*Stated per Client/Manufacturer
N/A Non-Applicable
See Description Table Abbreviations
**Test Sample Description:** (Continued)

<table>
<thead>
<tr>
<th>COMPONENTS</th>
<th>Type</th>
<th>Quantity</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEATHERSTRIP</td>
<td>EPDM Gasket</td>
<td>3 Rows</td>
<td>Exterior pressure plates</td>
</tr>
<tr>
<td></td>
<td>EPDM Gasket</td>
<td>1 Row</td>
<td>Interior and exterior glazing perimeters</td>
</tr>
<tr>
<td>HARDWARE</td>
<td>Aluminum pressure plates</td>
<td>7</td>
<td>Three vertical, four horizontal at exterior jambs, head and sill</td>
</tr>
<tr>
<td></td>
<td>Aluminum pressure plate cap</td>
<td>7</td>
<td>Three vertical, four horizontal at pressure plates</td>
</tr>
<tr>
<td></td>
<td>Aluminum trim cap</td>
<td>4</td>
<td>Interior head and sill</td>
</tr>
<tr>
<td>DRAINAGE</td>
<td>No visible weeps</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Thermal Transmittance (U-factor)

Measured Test Data

Heat Flows
1. Total Measured Input into Metering Box (Q_{in}) 1428.02 Btu/hr
2. Surround Panel Heat Flow (Q_{sp}) 47.26 Btu/hr
3. Surround Panel Thickness 8.00 inches
4. Surround Panel Conductance 0.0264 Btu/hr·ft²·F
5. Metering Box Wall Heat Flow (Q_{mb}) 53.09 Btu/hr
6. EMF vs Heat Flow Equation (equivalent information) 0.0202*EMF + -0.038
7. Flanking Loss Heat Flow (Q_{fl}) 17.90 Btu/hr
8. Net Specimen Heat Loss (Q_{s}) 1309.77 Btu/hr

Areas
1. Test Specimen Projected Area (A_{p}) 43.07 ft²
2. Test Specimen Interior Total (3-D) Surface Area (A_{h}) 66.49 ft²
3. Test Specimen Exterior Total (3-D) Surface Area (A_{e}) 50.89 ft²
4. Metering Box Opening Area (A_{mb}) 69.44 ft²
5. Metering Box Baffle Area (A_{b1}) 60.74 ft²
6. Surround Panel Interior Exposed Area (A_{sp}) 26.37 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 71.25 F
4. Metering Room Average Relative Humidity 5.02 %
5. Measured Cold Side Wind Velocity (Perpendicular Flow) 17.07 mph
6. Measured Static Pressure Difference Across Test Specimen 0.00" ± 0.04"H₂O

Results
1. Thermal Transmittance of Test Specimen (U_{s}) 0.43 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. **Emittance of Glass** \((e_t)\)  
   - Value: 0.84

2. **Warm Side Baffle Emittance** \((e_0)\)  
   - Value: 0.92

3. **Equivalent Warm Side Surface Temperature**  
   - Value: 48.26°F

4. **Equivalent Cold Side Surface Temperature**  
   - Value: 5.11°F

5. **Warm Side Baffle Surface Temperature**  
   - Value: 69.25°F

6. **Measured Warm Side Surface Conductance** \((h_t)\)  
   - Value: 1.41 Btu/hr·ft\(^2\)·F

7. **Measured Cold Side Surface Conductance** \((h_c)\)  
   - Value: 5.52 Btu/hr·ft\(^2\)·F

8. **Test Specimen Thermal Conductance** \((C_s)\)  
   - Value: 0.70 Btu/hr·ft\(^2\)·F

9. **Convection Coefficient** \((K_c)\)  
   - Value: 0.32 Btu/(hr·ft\(^2\)·F\(^{0.25}\))

10. **Radiative Test Specimen Heat Flow** \((Q_{r1})\)  
    - Value: 675.44 Btu/hr

11. **Conductive Test Specimen Heat Flow** \((Q_{c1})\)  
    - Value: 634.33 Btu/hr

12. **Radiative Heat Flux of Test Specimen** \((q_{r1})\)  
    - Value: 15.68 Btu/hr·ft\(^2\)·F

13. **Convective Heat Flux of Test Specimen** \((q_{c1})\)  
    - Value: 14.73 Btu/hr·ft\(^2\)·F

14. **Standardized Warm Side Surface Conductance** \((h_{stw})\)  
    - Value: 1.21 Btu/hr·ft\(^2\)·F

15. **Standardized Cold Side Surface Conductance** \((h_{stc})\)  
    - Value: 5.28 Btu/hr·ft\(^2\)·F

16. **Standardized Thermal Transmittance** \((U_{st})\)  
    - Value: 0.41 Btu/hr·ft\(^2\)·F

## Test Duration

1. The environmental systems were started at 15:50 hours, 01/25/09.

2. The test parameters were considered stable for two consecutive four hour test periods from 23:49 hours, 01/25/09 to 07:49 hours, 01/26/09.

3. The thermal performance test results were derived from 03:49 hours, 01/26/09 to 07:49 hours, 01/26/09.

The reported Standardized Thermal Transmittance \((U_{st})\) was determined using CTS Method, per Section 8.2(A) of NFRC 102.
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.

A calibration of the Architectural Testing Inc. 'thermal test chamber' (ICN 000001) in York, Pennsylvania was conducted in April 2008 in accordance with Architectural Testing Inc. calibration procedure.

"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 may be expected from field installations due to not accounting for solar radiation, air leakage effects, and the thermal bridge effects that may occur due to the specific design and construction of the fenestration system opening. Therefore, it should be recognized 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."

"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."

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.

ANSI/NCSL Z540-2-1997 type B uncertainty for this test was 1.66%.
Detailed drawings, data sheets, representative samples of the test specimens, a copy of this report, or other pertinent project documentation will be retained by Architectural Testing, Inc. until 1/26/2013. At the end of this retention period such materials shall be discarded without notice and the service life of this report by Architectural Testing, Inc. will expire.

Results obtained are tested values and were secured by using the designated test methods. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. 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. It is the exclusive property of the client so named herein and relates only to the specimen(s) tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC.

Tested By: 

Ryan P. Moser
Technician

Reviewed By: 

Shon W. Einsig
Senior Technician
Individual-In-Responsible-Charge

RPM:kmm
88820.01-116-46

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

Appendix-A: Description Table Abbreviations (1)
Appendix-B: Submittal Form and Drawings (1)
## Revision Log

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<td>.01R0</td>
<td>01/27/09</td>
<td>All</td>
<td>Original Report Issue. Work requested by David Welch of Coral Architectural Products</td>
</tr>
<tr>
<td>.01R1</td>
<td>01/28/09</td>
<td>Cover, 2</td>
<td>Changed Gas Fill from Argon to Air Filled.</td>
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This report produced from controlled document template ATI 00025, revised 10/08/08.
## Appendix A: Description Table Abbreviations

### CODE Frame / Sash Types
- **AI**: Aluminum w/ Vinyl Inserts (Caps)
- **AL**: Aluminum
- **AP**: Aluminum w/ Thermal Breaks - Partial
- **AS**: Aluminum w/ Steel Reinforcement
- **A1**: Aluminum w/ Thermal Breaks - All Members (> 0.21")
- **A2**: Aluminum Thermally Improved - All Members (0.062" - 0.209")
- **AV**: Aluminum / Vinyl Composite
- **AW**: Aluminum-clad Wood
- **FG**: Fiberglass
- **PA**: ABS Plastic w/ All Members Reinforced
- **PC**: ABS Plastic-clad Aluminum
- **PF**: ABS Plastic w/ Foam-filled Insulation
- **PH**: ABS Plastic w/ Horizontal Members Reinforced
- **PI**: Plastic w/ Reinforcement - Interlock
- **PL**: ABS Plastic
- **PP**: ABS Plastic w/ Reinforcement - Partial
- **PV**: ABS Plastic w/ Vertical Members Reinforced
- **PW**: ABS Plastic-clad Wood
- **ST**: Steel
- **VA**: Vinyl w/ All Members Reinforced
- **VC**: Vinyl-clad Aluminum
- **VF**: Vinyl w/ Foam-filled Insulation
- **VH**: Vinyl w/ Horizontal Members Reinforced
- **VI**: Vinyl w/ Reinforcement - Interlock
- **VP**: Vinyl w/ Reinforcement - Partial
- **VV**: Vinyl w/ Vertical Members Reinforced
- **VW**: Vinyl-clad Wood
- **VY**: Vinyl
- **WA**: Aluminum / Wood composite
- **WD**: Wood
- **VV**: Vinyl / Wood composite
- **WF**: Fiberglass/Wood Combination
- **WC**: Composite/Wood Composite (Shaped vinyl/wood composite members)
- **CW**: Copper Clad Wood
- **CO**: Vinyl/Wood Composite Material

### CODE spacer Types (See sealant)
- **A1**: Aluminum
- **A2**: Aluminum (Thermally-broken)
- **A3**: Aluminum-reinforced Polymer
- **A4**: Aluminum / Wood
- **A5**: Aluminum-reinforced Butyl (Swiggle)
- **A6**: Aluminum / Foam / Aluminum
- **A7**: Aluminum U-shaped
- **A8**: Aluminum-Butyl (Corrugated) (Durascal)
- **ER**: EPDM Reinforced Butyl
- **FG**: Fiberglass
- **GL**: Glass
- **OF**: Organic Foam
- **P1**: Duralite
- **PU**: Polyurethane Foam
- **SU**: Stainless Steel, U-shaped
- **CU**: Coated Steel, U-shaped (Intercept)
- **S2**: Steel (Thermally-broken)
- **S3**: Steel / Foam / Steel
- **S5**: Steel-reinforced Butyl
- **S6**: Steel U-channel w/ Thermal Cap
- **SS**: Stainless Steel
- **CS**: Coated Steel
- **TB**: Thermoplastic
- **WD**: Wood
- **ZE**: Elastomeric Silicone Foam
- **ZF**: Silicone Foam
- **SZ**: Silicone / Steel
- **N**: Not Applicable
- **TS**: Thermo-plastic w/ stainless steel substrate

### CODE Tint Codes
- **AZ**: Azurite
- **BL**: Blue
- **BZ**: Bronze
- **CL**: Clear
- **EV**: Evergreen
- **GD**: Gold
- **GR**: Green
- **GY**: Gray
- **LY**: Low-e Coating
- **OL**: Other (use comment field)
- **RC**: Solar or Reflective Coating
- **RG**: Roller Shades between glazing
- **RS**: Silver (reflective coating)
- **SF**: Suspended Polyester Film
- **SR**: Silver
- **BG**: Blinds between the Glazing
- **DV**: Dynamic Glazing-Variable
- **DY**: Dynamic Glazing-NonVariable

### CODE Gap Fill Codes
- **AIR**: Air
- **AR2**: Argon/Krypton Mixture
- **AR3**: Argon / Krypton / Air
- **ARG**: Argon / Air
- **CO2**: Carbon Dioxide
- **KRY**: Krypton/Air
- **SF6**: Sulfur Hexafluoride
- **X2**: Xenon/Krypton/Air
- **XEN**: Xenon/Air
- **N**: Not Applicable

### CODE Door Type
- **EM**: Embossed
- **FL**: Flush
- **LF**: Full Lite
- **LH**: 1/2 - Lite
- **LQ**: 1/4 - Lite
- **LT**: 3/4 - Lite
- **RP**: Raised Panel

### CODE Skin
- **AL**: Aluminum
- **FG**: Fiberglass
- **GS**: Galvanized Steel
- **ST**: Steel
- **WD**: Wood
- **VY**: Vinyl

### CODE Panel
- **FG**: Fiberglass
- **PL**: Plastic
- **WP**: Wood - Plywood
- **WS**: Wood - Solid
- **VY**: Vinyl

### CODE Sub-Structure
- **GS**: Galvanized Steel
- **ST**: Steel
- **WD**: Wood
- **VY**: Vinyl

### CODE Core Fill
- **CH**: Cellular - Honeycomb
- **EP**: Expanded Polystyrene
- **PU**: Polyurethane
- **WP**: Wood - Plywood
- **WS**: Wood - Solid
- **XP**: Extruded Polystyrene

### CODE Spacer Sealant
- **D**: Dual Seal Spacer System
- **S**: Single Seal Spacer System

### CODE Grid Description
- **N**: No Muntins
- **G**: Grids between glass
- **S**: Simulated Divided Lites
- **T**: True Muntins

### CODE Grid Size Codes
- **Blank for no grids**: 0.75
- **Grids < 1’’**: 1.5
- **Grids >= 1”**:

### CODE Thermal Breaks
- **F**: Foam
- **U**: Urethane
- **V**: Vinyl
- **FB**: Fiberglass
- **O**: Other
- **AB**: ABS
- **NE**: Neoprene
- **AI**: Air
- **N**: Not Applicable
- **P**: Polynamide
Appendix B: Submittal Form and Drawings
Architectural Testing

Test sample complies with these details. Deviations are noted.

THERMAL TEST REPORT
DRAWINGS FOR PW251 CURTAIN WALL SYSTEM
FRAMING DETAILS