Architectural Testing

NFRC 102-2010 THERMAL PERFORMANCE TEST REPORT

Rendered to:

CR LAURENCE CO., INC.

SERIES/MODEL: BT525 - Window Wall
TYPE: Glazed Wall Systems (Site-built)

Summary of Results			
Standardized Thermal Transmittance (U-Factor)			0.38
Unit Size:		79-3/8" x 79-1/4" (2016 mm x 2013 mm) (Non-Standard Size)	
Layer 1:	1/4"	Clear	
Gap:	0.52"	A1-D: Aluminum Spacer	100% Air*
Layer 2:	1/4"	PPG Solarban 70XL (e=0.018*, #3)	

Reference must be made to Report No. C9659.01-301-46, dated 01/09/14 for complete test specimen description and data.

2524 E. Jensen Ave
Fresno, CA 93706
phone: 559-233-8705
fax: 717-764-4129
www.archtest.com

Architectural Testing

NFRC 102-2010 THERMAL PERFORMANCE TEST REPORT

Rendered to:

CR LAURENCE CO., INC.
2100 East 38th Street
Vernon, California 90058

Report Number:	C9659.01-301-46
Test Date:	12/29/13
Report Date:	01/09/14

Test Sample Identification:

Series/Model: BT525 - Window Wall

Type: Glazed Wall Systems (Site-built)

Overall Size: 79-3/8" x 79-1/4" (2016 mm x 2013 mm) (Non-Standard 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 (Prototype only) no Plant Qualification

Test Procedure: U-factor tests were performed in a Guarded Hot Box in accordance with NFRC 102-2010, *Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems* .

Test Results Summary:

Standardized U-factor (U_{st}): 0.38 Btu/hr·ft^2·F (CTS Method)

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Test Sample Description:

Frame:

Material:	AT (0.21"): Aluminum with Thermal Breaks - All Members		
Size:	79-3/8" x 79-1/4" (Non-Standard Size)		
Daylight Opening:	36" x 74" (x2)	**Glazing Method:**	Exterior
Exterior Color:	Grey	**Exterior Finish:**	Anodized
Interior Color:	Grey	**Interior Finish:**	Anodized
Corner Joinery:	Square Cut / Screws / Sealed		

Glazing Information:

Layer 1:	1/4"	Clear	
Gap:	0.52"	A1-D: Aluminum Spacer	100% Air*
Layer 2:	1/4"	PPG Solarban 70XL (e=0.018*, #3)	
Gas Fill Method:		N/A*	

**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})	1274.85	Btu/hr
2. Surround Panel Heat Flow (Q_{sp})	52.27	Btu/hr
3. Surround Panel Thickness	6.00	inches
4. Surround Panel Conductance	0.0296	Btu/hr·ft^2·F
5. Metering Box Wall Heat Flow (Q_{mb})	-4.97	Btu/hr
6. EMF vs Heat Flow Equation (equivalent information)	0.0218*EMF + 0.000	
7. Flanking Loss Heat Flow (Q_{fl})	20.53	Btu/hr
8. Net Specimen Heat Loss (Q_s)	1207.02	Btu/hr

Areas

1. Test Specimen Projected Area (A_s)	43.68	ft^2
2. Test Specimen Interior Total (3-D) Surface Area (A_h)	53.16	ft^2
3. Test Specimen Exterior Total (3-D) Surface Area (A_c)	44.14	ft^2
4. Metering Box Opening Area (A_{mb})	69.44	ft^2
5. Metering Box Baffle Area (A_{bl})	60.56	ft^2
6. Surround Panel Interior Exposed Area (A_{sp})	25.76	ft^2

Test Conditions

1. Average Metering Room Air Temperature (t_h)	69.44	F
2. Average Cold Side Air Temperature (t_c)	-0.45	F
3. Average Guard/Environmental Air Temperature	74.01	F
4. Metering Room Average Relative Humidity	14.23	%
5. Metering Room Maximum Relative Humidity	14.27	%
6. Metering Room Minimum Relative Humidity	14.17	%
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	68.50	F
2. Cold Side Surround Panel	0.03	F

Results

1. Thermal Transmittance of Test Specimen (U_s)	0.40	Btu/hr·ft^2·F
2. Standardized Thermal Transmittance of Test Specimen (U_{st})	0.38	Btu/hr·ft^2·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*	0.80	
4.	Cold Side Frame Emittance*	0.80	
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	49.99	F
10.	Equivalent Cold Side Surface Temperature	5.26	F
11.	Warm Side Baffle Surface Temperature	69.20	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)	4.84	Btu/hr·ft^2·F
15.	Test Specimen Thermal Conductance (C_s)	0.62	Btu/hr·ft^2·F
16.	Convection Coefficient (K_c)	0.32	Btu/(hr·ft^2·F$^{1.25}$)
17.	Radiative Test Specimen Heat Flow (Q_{r1})	629.98	Btu/hr
18.	Conductive Test Specimen Heat Flow (Q_{c1})	577.04	Btu/hr
19.	Radiative Heat Flux of Test Specimen (q_{r1})	14.42	Btu/hr·ft^2·F
20.	Convective Heat Flux of Test Specimen (q_{c1})	13.21	Btu/hr·ft^2·F
21.	Standardized Warm Side Surface Conductance (h_{sth})	1.20	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})	0.38	Btu/hr·ft^2·F

Test Duration

1. The environmental systems were started at 09:18 hours, 12/28/13.
2. The test parameters were considered stable for two consecutive four hour test periods from 06:12 hours, 12/29/13 to 14:12 hours, 12/29/13.
3. The thermal performance test results were derived from 10:12 hours, 12/29/13 to 14:12 hours, 12/29/13.

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	0.52"	0.52"
Estimated center gap width upon receipt of specimen in laboratory (after stabilization)	0.50"	0.55"
Center gap width at laboratory ambient conditions on day of testing	0.50"	0.55"
Center gap width at test conditions	0.41"	0.46"

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 1.56%.

Required annual calibrations for the Architectural Testing Inc. 'thermal test chamber' (ICN 004287) in Fresno, California were last conducted in May 2013 in accordance with Architectural Testing Inc. calibration procedure. A CTS Calibration verification was performed October 2013. A Metering Box Wall Transducer and Surround Panel Flanking Loss Characterization was performed May 2013.

"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."

Architectural Testing, Inc. 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 Architectural Testing, Inc. for the entire test record retention period. The test record retention end date for this report is January 09, 2018.

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 Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC.

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
C9659.01-301-46

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 (8)

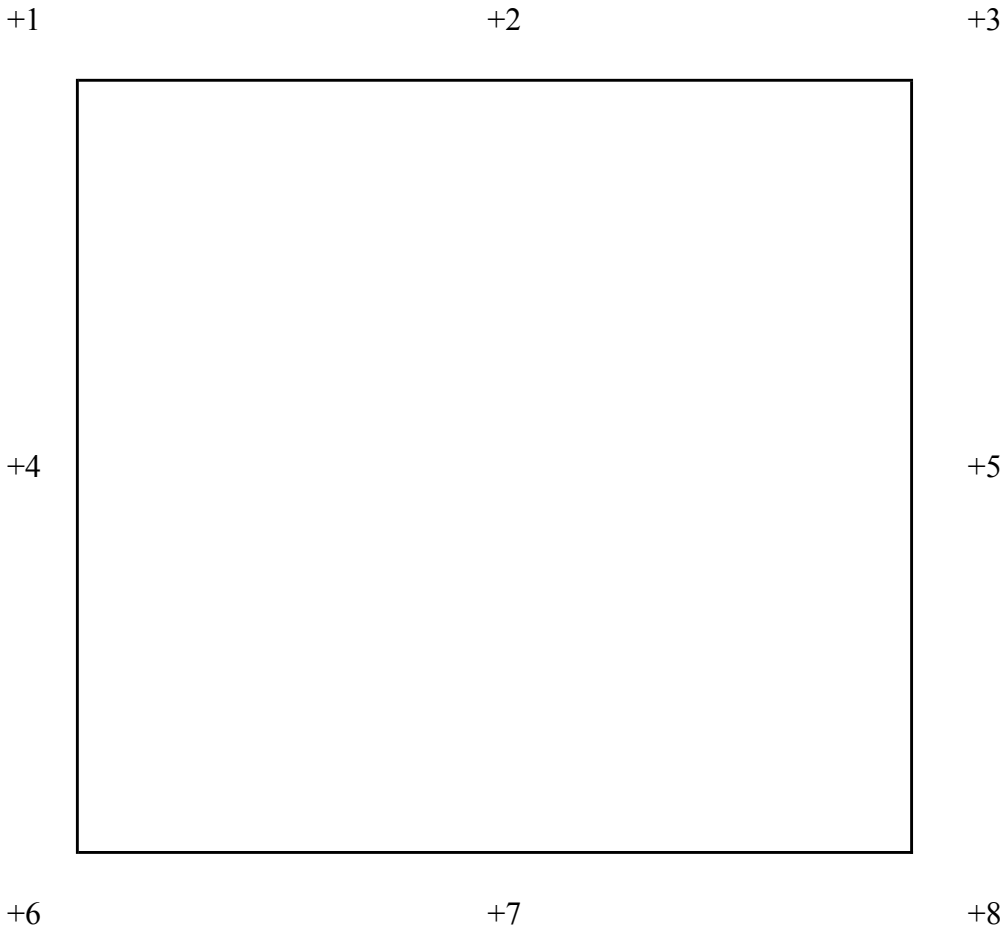
Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	01/09/14	All	Original Report Issue. Work requested by Mr. Brian Rutherford of CR Laurence Co., Inc.

Appendix A: CTS Calibration Data

1.	CTS Test Date	07/06/13	
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	69.80	F
5.	Cold Side Air Temperature	-0.15	F
6.	Warm Side Average Surface Temperature	55.01	F
7.	Cold Side Average Surface Temperature	4.06	F
8.	Convection Coefficient (K_c)	0.32	$Btu/(hr \cdot ft^2 \cdot F^{1.25})$
9.	Measured Cold Side Surface Conductance (h_c)	4.84	$Btu/hr \cdot ft^2 \cdot F$
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

For use by manufacturers, lineal suppliers and fabricators

National Fenestration Rating Council®

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

Manufacturer: C.R. LAURENCE CO., INC. Date of sample manufacture: DEC. 11, 2013

Plant Address where manufactured: 2100 E. 38TH ST.

City: LOS ANGELES State: CA Zip Code: 90058

Name of IA: ALI Phone: 214-565-0593 Fax: 214-565-1094

2. Product Information (complete ALL fields):

Product Line ID (CPD) No.: NEW Product/Operator Type (Table 4-3 of NFRC 100): CW/WW/SLOPED

Series/Model: BT 52.5 - 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 (production line unit) & plant qualification

c. ☐ Validation for Recertification (production line unit) & plant qualification

d. ☐ Plant Qualification Only (production line unit)

I, LEONARD WOOTEN, as the designated agent for C.R. LAURENCE CO., INC. 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: Leonard E. Wooten Date: 1-06-2014

FOR LABORATORY USE ONLY

1. Laboratory: Architectural Testing, Inc.
2. Date Sample Received: 12/19/13 File number ID: 96591.01-301-46
3. Date Sample Tested: 12/29/13 By: William Swedo
4. Modifications made: NONE
5. Reason for non-testing of sample unit: N/A

[*Note*: If the sample submitted can not be tested due to damage prior to testing, a new sample and new form shall be submitted to the testing laboratory. Both forms shall be submitted to the IA when the testing is completed.]

ID		Qty	Description	Material	Finish	Width		Height
		1	BT525 Window Wall			79.000	X	79.000
		2	1" Insulated Glass			77.931	X	20.378
			HORIZONTALS					
Part	Die	Qty	Description			**Length**		
BT568	T-31589	2	HEAD/SILL 5-1/4"	6063-T5 Aluminum w/ Polyurethane Thermal Break - Fully Debridged	Anodized	79.000		
BG566	T-31594	2	INSERT - HEAD/SILL 5-1/4"	6063-T5 Aluminum	Anodized	79.000		
BT768	T-31718	2	HEAD/SILL 6"	6063-T5 Aluminum w/ Polyurethane Thermal Break - Fully Debridged	Anodized	79.000		
BG766	T-31720	2	INSERT - HEAD/SILL 6"	6063-T5 Aluminum	Anodized	79.000		
BG334	T-31583	1	SETTING CHAIR FOR SILL	6063-T5 Aluminum	Anodized	4" each, 2 per lite		
			VERTICALS					
BG550	H-31590	1	VERT. MULLION 5-1/4"	6063-T5 Aluminum	Anodized	74.500		
BG650	H-31675	1	VERT. MULLION 6"	6063-T5 Aluminum	Anodized	74.500		
			ACCESSORIES					
NP225		4	GASKET	EPDM, 70 Shore A, Black		36.125		
SB334		4	SETTING BLOCK	EPDM, 90 Shore A, Black		4.000		
SP455		4	SPACER	EPDM, 70 Shore A, Black		74.500		

Architectural Testing, Inc.
Test sample complies with these details
deviations are noted

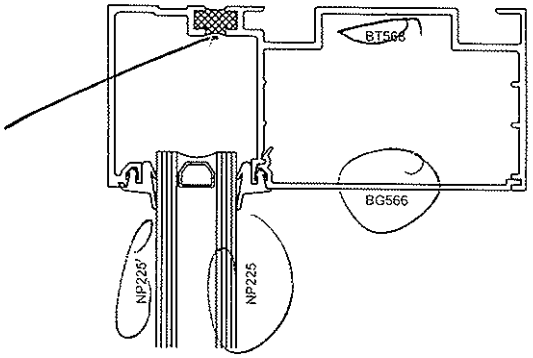
C 9659

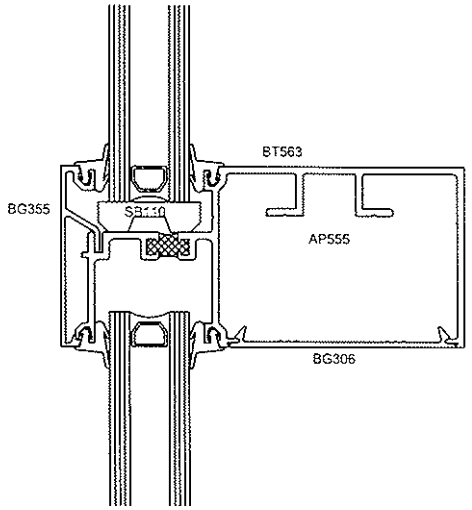
JAN 06 2014

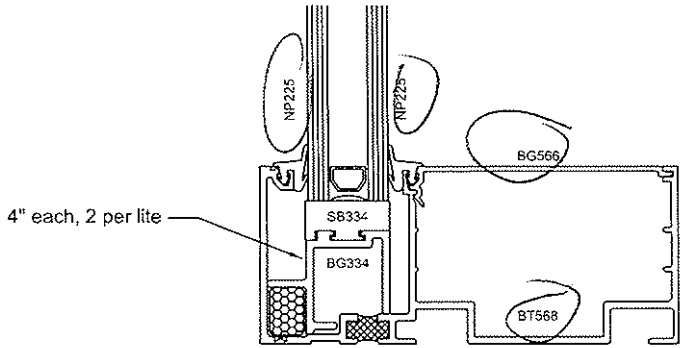
Report # Date

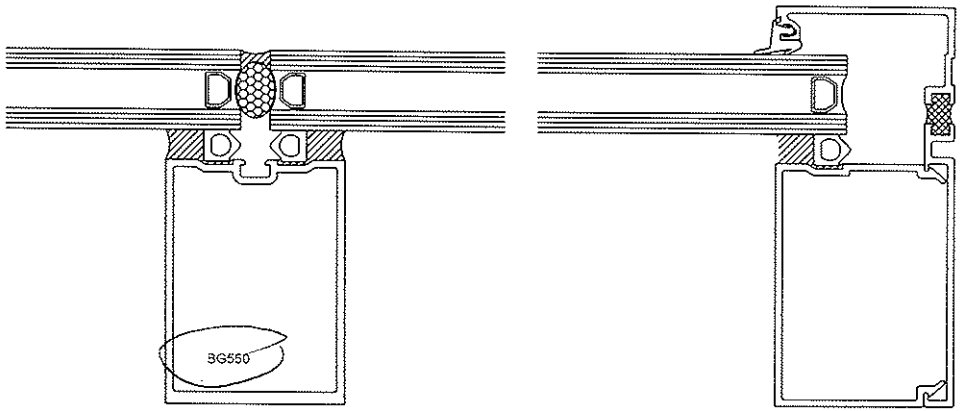
Tech

0.21" Thermal Break









Architectural Testing, Inc.
Test sample complies with these details
deviations are noted

C 9659

JAN 06 2014

Report # Tech

Date