Intertek | Architectural Testing

NFRC 102-2014 THERMAL PERFORMANCE
TEST REPORT

Rendered to:

C.R. LAURENCE CO., INC.

SERIES/MODEL: 45X - High Performance Dual Thermally Broken Storefront
TYPE: Glazed Wall Systems (Site-built)

Summary of Results			
Standardized Thermal Transmittance (U-Factor)			0.30
Unit Size:		78-3/4" x 78-3/4" (2000 mm x 2000 mm) (Model Size)	
Layer 1:	1/4"	PPG Solarban z75 (e=0.018*, #2)	
Gap 1:	0.53"	TS-D: Technoform TGI Wave Spacer	90% Argon*
Layer 2:	1/4"	Clear	

Reference must be made to Report No. F4786.04-116-46, dated 04/27/16 for complete test specimen description and data.

Intertek | Architectural Testing

NFRC 102-2014 THERMAL PERFORMANCE TEST REPORT

Rendered to:

C.R. LAURENCE CO., INC.
2503 E. Vernon Avenue
Los Angeles, California 90058-1826

Report Number: F4786.04-116-46
Test Date: 03/11/16
Report Date: 04/27/16

Test Sample Identification:

Series/Model: 45X - High Performance Dual Thermally Broken Storefront

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 Sample Submitted by: Oldcastle BuildingEnvelope - Terrell, Texas

Test Sample Submitted for: Validation for Initial Certification (Production Line Unit) no Plant Qualification

This report is a reissue of the original Report No. F4786.01-116-46. This report is reissued in the name of C.R. Laurence Co., Inc. through written authorization of Oldcastle BuildingEnvelope.

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}): 0.30 Btu/hr·ft^2·F (CTS Method)

Test Sample Description:

Frame:

Material:	AT (0.22"): Aluminum with Thermal Breaks - All Members		
Size:	78-3/4" x 78-3/4" (Model Size)		
Daylight Opening:	36-3/8" x 74-3/4" (x2)	**Glazing Method:**	Exterior
Exterior Color:	Clear	**Exterior Finish:**	Anodized
Interior Color:	Clear	**Interior Finish:**	Anodized
Corner Joinery:	Square Cut / Screws / Sealed		

Glazing Information:

Layer 1:	1/4"	PPG Solarban z75 (e=0.018*, #2)	
Gap 1:	0.53"	TS-D: Technoform TGI Wave Spacer	90% Argon*
Layer 2:	1/4"	Clear	
Gas Fill Method:		Single-Probe Method*	

**Stated per Client/Manufacturer*
N/A Non-Applicable

Test Sample Description: (Continued)

Weatherstripping:

Description	Quantity	Location
FG-1133 gasket	1 row	Interior and exterior glazing perimeter

Hardware:

Description	Quantity	Location
Aluminum glass stop	2	Exterior sill
AT (1.38") vertical filler	3	Verticals

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})	995.67	Btu/hr
2. Surround Panel Heat Flow (Q_{sp})	51.24	Btu/hr
3. Surround Panel Thickness	8.00	inches
4. Surround Panel Conductance	0.0236	Btu/hr·ft^2·F
5. Metering Box Wall Heat Flow (Q_{mb})	11.71	Btu/hr
6. EMF vs Heat Flow Equation (equivalent information)	0.0116*EMF + -0.102	
7. Flanking Loss Heat Flow (Q_{fl})	7.59	Btu/hr
8. Net Specimen Heat Loss (Q_s)	925.13	Btu/hr

Areas

1. Test Specimen Projected Area (A_s)	43.07	ft^2
2. Test Specimen Interior Total (3-D) Surface Area (A_h)	48.61	ft^2
3. Test Specimen Exterior Total (3-D) Surface Area (A_c)	48.61	ft^2
4. Metering Box Opening Area (A_{mb})	75.11	ft^2
5. Metering Box Baffle Area (A_{bl})	70.84	ft^2
6. Surround Panel Interior Exposed Area (A_{sp})	32.04	ft^2

Test Conditions

1. Average Metering Room Air Temperature (t_h)	69.80	F
2. Average Cold Side Air Temperature (t_c)	-0.41	F
3. Average Guard/Environmental Air Temperature	71.26	F
4. Metering Room Average Relative Humidity	2.14	%
5. Metering Room Maximum Relative Humidity	2.26	%
6. Metering Room Minimum Relative Humidity	2.09	%
7. Measured Cold Side Wind Velocity (Perpendicular Flow)	12.66	mph
8. Measured Warm Side Wind Velocity (Parallel Flow)	NA	mph
9. Measured Static Pressure Difference Across Test Specimen	0.00" ± 0.04"	H_2O

Average Surface Temperatures

1. Metering Room Surround Panel	68.18	F
2. Cold Side Surround Panel	0.35	F

Results

1. Thermal Transmittance of Test Specimen (U_s)	0.31	Btu/hr·ft^2·F
2. Standardized Thermal Transmittance of Test Specimen (U_{st})	0.30	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	54.10	F
10.	Equivalent Cold Side Surface Temperature	3.91	F
11.	Warm Side Baffle Surface Temperature	68.79	F
12.	Cold Side Baffle Surface Temperature	N/A	F
13.	Measured Warm Side Surface Conductance (h_h)	1.37	Btu/hr·ft^2·F
14.	Measured Cold Side Surface Conductance (h_c)	4.97	Btu/hr·ft^2·F
15.	Test Specimen Thermal Conductance (C_s)	0.43	Btu/hr·ft^2·F
16.	Convection Coefficient (K_c)	0.33	Btu/(hr·ft^2·F$^{1.25}$)
17.	Radiative Test Specimen Heat Flow (Q_{r1})	480.21	Btu/hr
18.	Conductive Test Specimen Heat Flow (Q_{c1})	444.92	Btu/hr
19.	Radiative Heat Flux of Test Specimen (q_{r1})	11.15	Btu/hr·ft^2·F
20.	Convective Heat Flux of Test Specimen (q_{c1})	10.33	Btu/hr·ft^2·F
21.	Standardized Warm Side Surface Conductance (h_{sth})	1.19	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})	0.30	Btu/hr·ft^2·F

Test Duration

1. The environmental systems were started at 17:48 hours, 03/10/16.
2. The test parameters were considered stable for two consecutive four hour test periods from 22:04 hours, 03/10/16 to 06:04 hours, 03/11/16.
3. The thermal performance test results were derived from 02:04 hours, 03/11/16 to 06:04 hours, 03/11/16.

The reported Standardized Thermal Transmittance (Ust) was determined using CTS Method, per Section 9.2(A) of NFRC 102.

**Stated per NFRC 101*

Glazing Deflection:

	Left Glazing	Right Glazing
Edge Gap Width	0.53"	0.53"
Estimated center gap width upon receipt of specimen in laboratory (after stabilization)	0.47"	0.50"
Center gap width at laboratory ambient conditions on day of testing	0.47"	0.50"
Center gap width at test conditions	0.41"	0.41"

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.

Required annual calibrations for the Architectural Testing Inc., an Intertek company ("Intertek-ATI"), 'thermal test chamber' (ICN 000001) in York, Pennsylvania were last conducted in May 2015 in accordance with Intertek-ATI calibration procedure. A CTS Calibration verification was performed June 2015. A Metering Box Wall Transducer and Surround Panel Flanking Loss Characterization was performed July 2015.

This report is a reissue of the original Report No. F4786.01-116-46. This report is reissued in the name of C.R. Laurence Co., Inc. through written authorization of Oldcastle BuildingEnvelope.

"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 March 11, 2020.

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: Ryan P. Moser

Ryan P. Moser
Senior Technician

Reviewed By:

Digitally Signed by: Shon W. Einsig

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

RPM:kmm
F4786.04-116-46

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 (13)

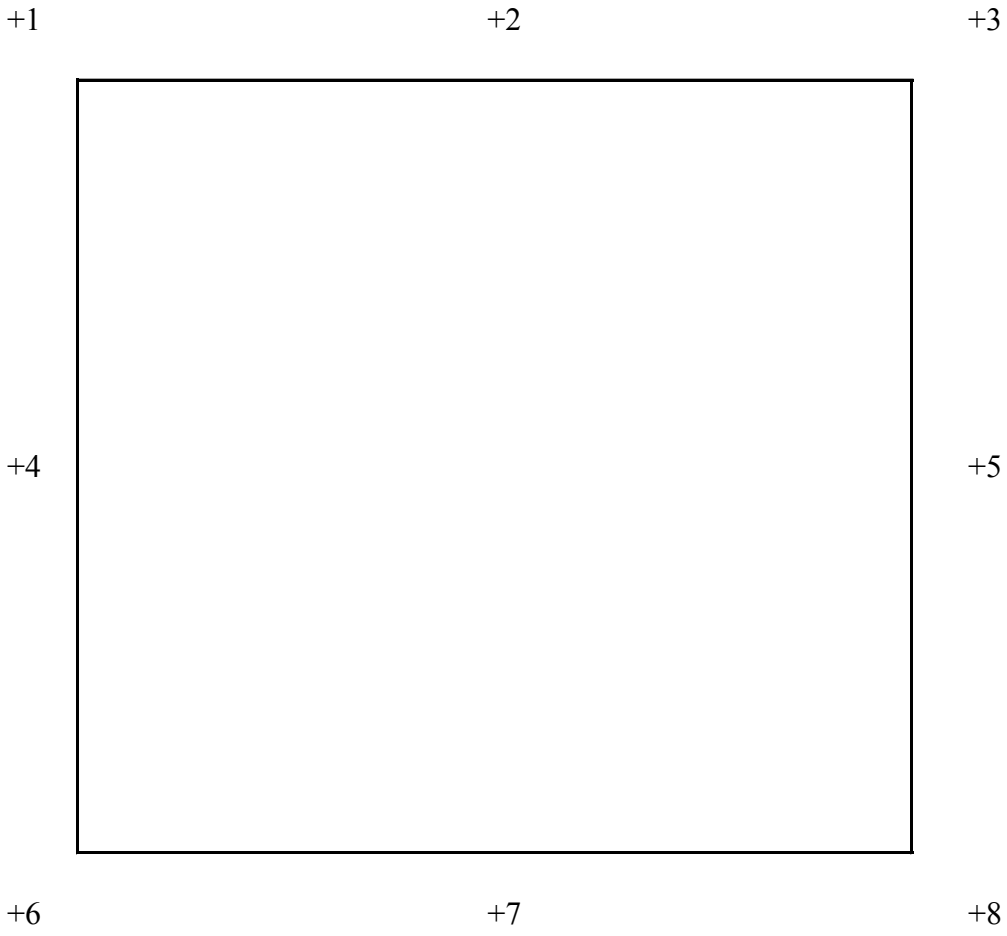
Revision Log

Rev. #	Date	Page(s)	Revision(s)
.04R0	04/27/16	All	Original Report Issue - Reissue of Report No. F4786.01-116-46 in the name of C.R. Laurence Co., Inc.

Appendix A: CTS Calibration Data

1.	CTS Test Date	05/11/14	
2.	CTS Size	43.06	ft^2
3.	CTS Glass/Core Conductance	0.42	$Btu/hr \cdot ft^2 \cdot F$
4.	Warm Side Air Temperature	69.80	F
5.	Cold Side Air Temperature	-0.39	F
6.	Warm Side Average Surface Temperature	54.35	F
7.	Cold Side Average Surface Temperature	3.88	F
8.	Convection Coefficient (K_c)	0.33	$Btu/(hr \cdot ft^2 \cdot F^{1.25})$
9.	Measured Cold Side Surface Conductance (h_c)	4.97	$Btu/hr \cdot ft^2 \cdot F$
10.	Measured Thermal Transmittance	0.30	$Btu/hr \cdot ft^2 \cdot F$

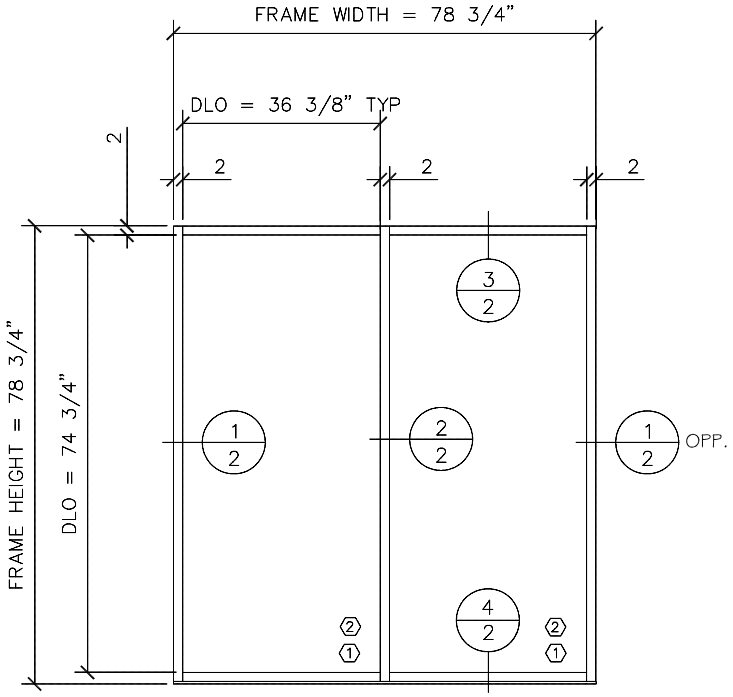
Appendix B: Surround Panel Wiring Diagram



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



TWO REQUIRED THUS
ONE (1) W/GLASS 1
ONE (1) W/GLASS 2

BILL OF MATERIAL

QTY	PART NO.	DESCRIPTION	LENGTH		NOTES
		EXTRUSIONS			
6	45XVA	Vertical/Jamb	78 3/4"	.	.
2	45XVE	Intermediate Vertical Filler	78 3/4"	.	.
4	45XVE	Head Horizontal	36 3/8"	.	.
4	45XHB	Sill Horizontal		.	.
4	45XHD	Glass Stop	36 3/8"	.	.
		ACCESSORIES			
8	45A3220	SETTING BLOCK	.	.	.
16	45ASF8	#14 X 1" SCREW	.	.	.
.	45A1133	GASKET	.	.	.

GLAZING CHART

SYM	QTY	DESCRIPTION
1	2	37 1/4" X 75 5/8", 1" CLEAR (1/4" CLR TEMP-1/2" ALUM SPCR-1/4" CLR TEMP)
2	2	37 1/4" X 75 5/8", 1" LOW E (1/4" TEMP SUNGLASS-1/2" TECHNOFORM SPCR-1/4" CLR TEMP)

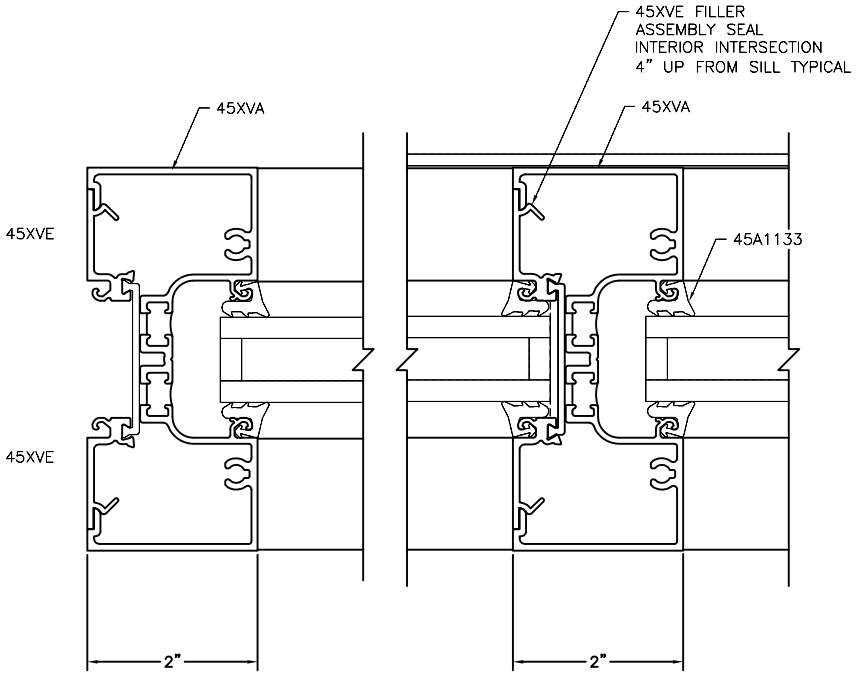
REVISIONS

C.R.LAURENCE CO.
ARCHITECTURAL PRODUCTS
2100 E. 38TH Street, Los Angeles, CA 90058
www.crlaurence.com

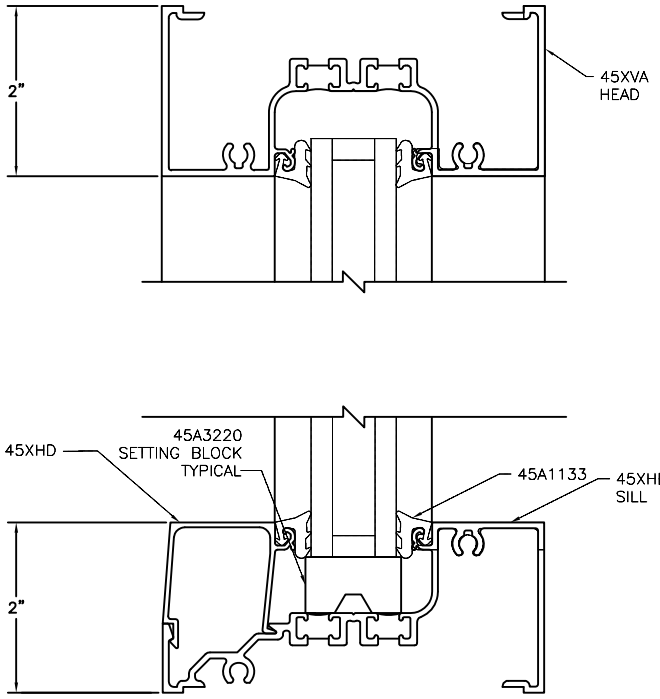
Job Name: CRL/US Aluminum ARCTICFRONT Series 45X–High Performance Dual Thermally Broken Storefront

Glazing Contractor:

DATE: 11/19/2015
DRAWN BY: GDO
CHECKED BY: XX
SCALE: AS SHOWN
JOB #:



1 2



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REVISIONS

C.R.LAURENCE CO.
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2100 E. 38TH Street, Los Angeles, CA 90058
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Job Name: CRL/US Aluminum ARCTICFRONT Series 45X–High Performance Dual Thermally Broken Storefront

Glazing Contractor:

DATE: 11/19/2015
DRAWN BY: GDO
CHECKED BY: XX
SCALE: AS SHOWN
JOB #:

SHT 2 OF 2