AAMA 1503-09 THERMAL PERFORMANCE
TEST REPORT

Rendered to:

CR LAURENCE CO., INC.

SERIES/MODEL: 2202/2202SG Curtain Wall
TYPE: Glazed Wall Systems (Site-built)

Summary of Results			
Thermal Transmittance (U-Factor)			0.43
Condensation Resistance Factor - Frame (CRF_f)			71
Condensation Resistance Factor - Glass (CRF_g)			65
Unit Size:		78-3/4" x 78-3/4"	
Layer 1:	1/4"	Clear	
Gap:	0.50"	A1-D: Aluminum Spacer	100% Air*
Layer 2:	1/4"	PPG Solarban 70XL (e=0.018*, #3)	

Reference must be made to Report No. E6203.02-301-46, dated 07/25/15 for complete test specimen description and data.

AAMA 1503-09 THERMAL PERFORMANCE TEST REPORT

Rendered to:

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

Report Number:	E6203.02-301-46
Test Date:	07/09/15
Report Date:	07/25/15

Test Sample Identification:

Series/Model: 2202/2202SG Curtain Wall

Type: Glazed Wall Systems (Site-built)

Test Sample Submitted by: Client

Test Procedure: The condensation resistance factor (CRF) and thermal transmittance (U) were determined in accordance with AAMA 1503-09, *Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections*

1. Average warm side ambient temperature	69.79 F
2. Average cold side ambient temperature	-0.41 F
3. 15 mph dynamic wind applied to test specimen exterior.	
4. 0.0" $\pm$0.04" static pressure drop across specimen.	

Test Results Summary:

1. Condensation resistance factor - Frame (CRF_f)	71
Condensation resistance factor - Glass (CRF_g)	65
2. Thermal transmittance due to conduction (U)	0.43
(U-factors expressed in Btu/hr·ft^2·F)	

Test Sample Description:

Frame:

Material:	AT (0.25"): Aluminum with Thermal Breaks - All Members		
Size:	78-3/4" x 78-3/4"		
Daylight Opening:	36" x 74-1/2" (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:	0.50"	A1-D: Aluminum Spacer	100% Air*
Layer 2:	1/4"	PPG Solarban 70XL (e=0.018*, #3)	
Gas Fill Method:		N/A*	
Desiccant:		Yes	

**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.			

Test Duration:

1. The environmental systems were started at 11:59 hours, 07/08/15.

2. The thermal performance test results were derived from 03:01 hours, 07/09/15 to 07:01 hours, 07/09/15.

Condensation Resistance Factor (CRF):

The following information, condensed from the test data, was used to determine the condensation resistance factor:

T_h	=	Warm side ambient air temperature	69.79 F
T_c	=	Cold side ambient air temperature	-0.41 F
FT_p	=	Average of pre-specified frame temperatures (14)	49.86 F
FT_r	=	Average of roving thermocouples (4)	42.93 F
W	=	$[(FT_p - FT_r) / (FT_p - (T_c + 10))] \times 0.40$	0.069
FT	=	$FT_p(1-W) + W (FT_r)$ = Frame Temperature	49.38 F
GT	=	Glass Temperature	44.89 F
CRF_g	=	Condensation resistance factor – Glass	65
		$CRF_g = (GT - T_c) / (T_h - T_c) \times 100$	
CRF_f	=	Condensation resistance factor – Frame	71
		$CRF_f = (FT - T_c) / (T_h - T_c) \times 100$	

The CRF number was determined to be 65 (on the size as reported). When reviewing this test data, it should be noted that the glass temperature (GT) was colder than the frame temperature (FT) therefore controlling the CRF number. Refer to the 'CRF Report' page and the 'Thermocouple Location Diagram' page of this report.

Thermal Transmittance (U_c):

T_h	=	Average warm side ambient temperature	69.79	F
T_c	=	Average cold side ambient temperature	-0.41	F
P	=	Static pressure difference across test specimen 15 mph dynamic perpendicular wind at exterior	0.00	psf
Nominal sample area			43.07	ft^2
Total measured input to calorimeter			1411.26	Btu/hr
Calorimeter correction			100.67	Btu/hr
Net specimen heat loss			1310.59	Btu/hr
U	=	Thermal Transmittance	0.43	$Btu/hr \cdot ft^2 \cdot F$

Glazing Deflection:

	Left Glazing	Right Glazing
Edge Gap Width	0.50"	0.50"
Estimated center gap width upon receipt of specimen in laboratory (after stabilization)	0.53"	0.55"
Center gap width at laboratory ambient conditions on day of testing	0.53"	0.55"
Center gap width at test conditions	0.48"	0.46"

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.

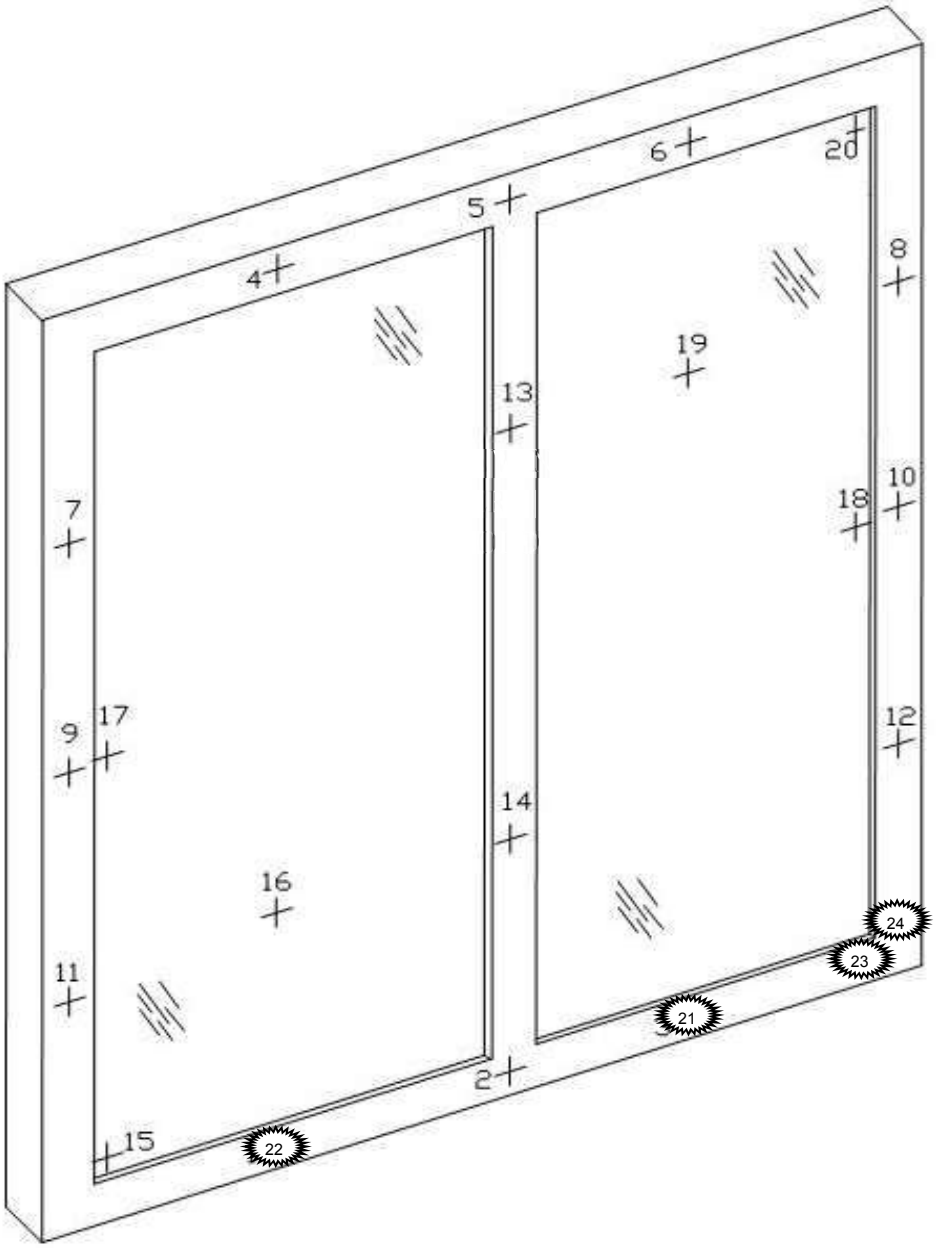
Prior to testing the specimen was sealed with silicone on the interior side and checked for air infiltration per Section 9.3.4.

Required annual calibrations for the Architectural Testing, Inc., a subsidiary of Intertek (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 March 2015. A Metering Box Wall Transducer and Surround Panel Flanking Loss Characterization was performed June 2015.

CRF Report

Time:	05:00	05:30	06:00	06:30	07:01	AVERAGE
Pre-specified Thermocouples - Frame						
1	43.39	43.36	43.34	43.36	43.31	43.35
2	47.26	47.25	47.28	47.28	47.18	47.25
3	43.48	43.44	43.51	43.52	43.41	43.47
4	52.64	52.66	52.64	52.63	52.56	52.63
5	54.96	54.98	54.95	54.98	54.93	54.96
6	51.76	51.78	51.74	51.76	51.67	51.74
7	52.21	52.23	52.23	52.21	52.14	52.20
8	50.10	50.12	50.08	50.08	50.03	50.08
9	50.15	50.17	50.15	50.16	50.09	50.15
10	49.27	49.24	49.26	49.26	49.16	49.24
11	47.71	47.67	47.67	47.68	47.61	47.67
12	46.68	46.66	46.66	46.68	46.60	46.66
13	56.55	56.53	56.50	56.52	56.46	56.51
14	52.18	52.21	52.10	52.15	52.15	52.16
FT_P	49.88	49.88	49.87	49.88	49.81	49.86
Pre-specified Thermocouples - Glass						
15	31.32	31.33	31.29	31.28	31.24	31.29
16	54.82	54.86	54.90	54.83	54.85	54.85
17	45.62	45.65	45.58	45.59	45.58	45.60
18	40.30	40.29	40.30	40.30	40.26	40.29
19	55.60	55.57	55.52	55.59	55.54	55.56
20	41.73	41.71	41.77	41.71	41.65	41.71
GT	44.90	44.90	44.89	44.88	44.85	44.89
Cold Point (Roving) Thermocouples						
21	43.48	43.44	43.51	43.52	43.41	43.47
22	43.39	43.36	43.34	43.36	43.31	43.35
23	42.42	42.40	42.40	42.42	42.34	42.40
24	41.64	41.66	42.36	42.86	44.06	42.52
FT_R	42.73	42.72	42.90	43.04	43.28	42.93
W	0.07	0.07	0.07	0.07	0.06	0.07
FT	49.37	49.37	49.38	49.41	49.38	49.38
Warm Side - Room Ambient Air Temperature						
	69.81	69.82	69.80	69.78	69.74	69.79
Cold Side - Room Ambient Air Temperature						
	-0.38	-0.46	-0.39	-0.39	-0.44	-0.41
CRF_f	71	71	71	71	71	71
CRF_g	65	65	65	65	65	65

Thermocouple Location Diagram



Cold Point Locations

21. 43.47
22. 43.35
23. 42.40
24. 42.52

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 July 09, 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

Digitally Signed by: William Smeds

William Simon Smeds
Technician

Digitally Signed by:Kenny C. White

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

WSS:ms
E6203.02-301-46

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix-A: 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	07/25/15	All	Original Report Issue. Work requested by Mr. Gyu-Hyeon Kim of CR Laurence Co., Inc.

Appendix A: Drawings

BILL OF MATERIAL			
P/N	DESCRIPTION	QTY	
	FRAME EXTRUSION		
PT20411	MULLION		
CW26411	SSG TUBULAR MULLION		
CW23399	P-BAR		
CW20111	F-CAP		
	ACCESSARY		
NP420			
NP430			
SP250			
ST242			
ST198			
AC204			
MS222			
RG635			
SB240			
HD475			
SB221			
WD220			
	GLAZING		
(A)	1" INSULATED GLASS ⅛ CLR.TEMPERED ½ ALUM.MILL.SPACER,AIR ⅛ PPG.SB70XL,LOW-E#3,SILICONE	2	37 1 1/16" x 75 3/4"
	TEST REQUIREMENT		

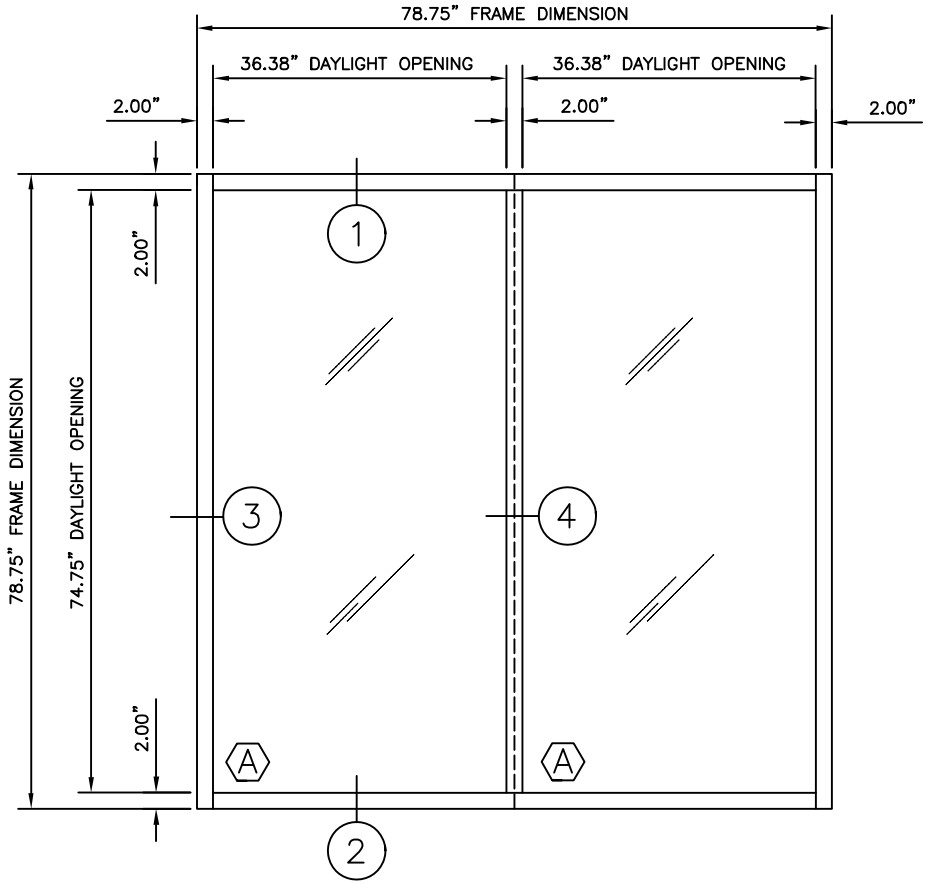
NFRC 102

ONE 2100/2200 CURTAIN WALL
MEASURING 78 ¾" x 78 ¾"

NOTE: PTCXXXXXX ENG-GK

Intertek Architectural Testing
Report #: E6203-301-46
Date: 7/17/2015
Verified by:

MU2015-083-01



REV.	DESCRIPTION	DATE	BY

C.R. LAURENCE CO., INC.
CRL MANUFACTURING
2100 E. 38TH STREET
LOS ANGELES, CA 90058

DRAWN BY: GHK
DATE: 2.6.14
SCALE: ¾"=1'-0"

TITLE:
NFRC FRAMING PRODUCT VALIDATION ELEVATION
PRODUCT: 2202/2202SG SERIES CURTAIN WALL

DRAWING NO.
MU2015-083-01

Sheet No. 1 of 3 Sheets

VALIDATION OPTION

MU2015-083-01

Intertek Architectural Testing

Report #: E6203-301-46
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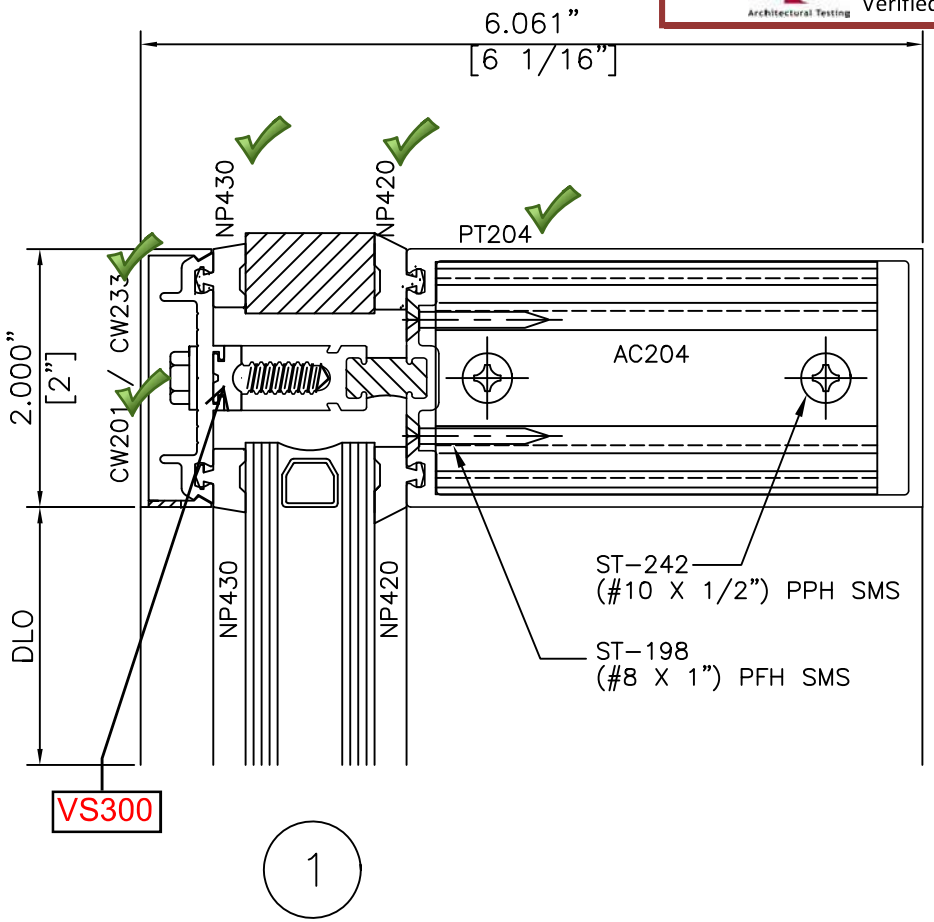
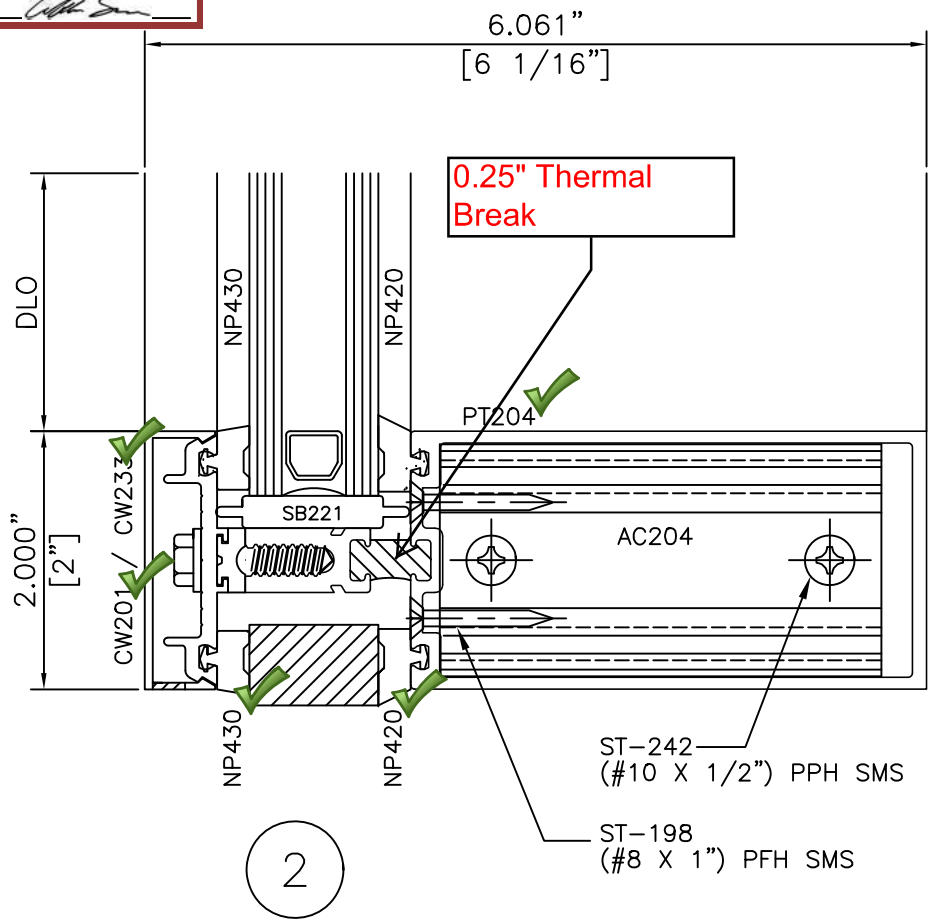
Verified by:





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C.R. LAURENCE CO., INC.
CRL MANUFACTURING
2100 E. 38TH STREET
LOS ANGELES, CA 90058

DRAWN BY: GHK
DATE: 2.6.14
SCALE: FULL

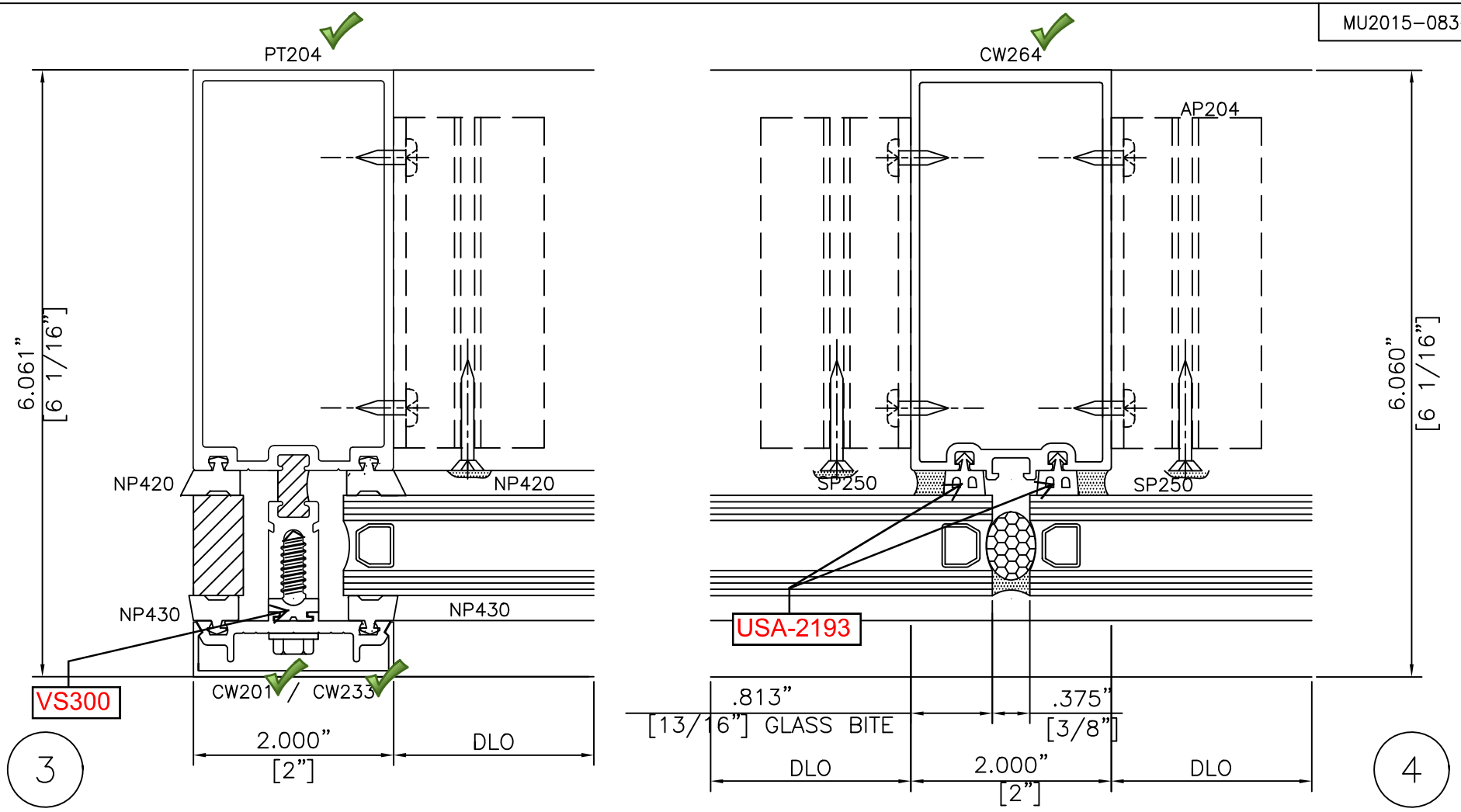
TITLE: NFRC FRAMING PRODUCT VALIDATION
HORIZONTAL SECTION
PRODUCT: 2202/2202SG SERIES CURTAIN WALL

DRAWING NO. MU2015-083-01

Sheet No. 2 of 3 Sheets

VALIDATION OPTION

MU2015-083-01



Intertek Architectural Testing

Report #: E6203-301-46

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Verified by:

REV.	DESCRIPTION	DATE	BY

C.R. LAURENCE CO., INC.
CRL MANUFACTURING
2100 E. 38TH STREET
LOS ANGELES, CA 90058

DRAWN BY: GHK

DATE: 2.6.14

SCALE: FULL

TITLE: NFRC FRAMING PRODUCT VALIDATION
VERTICAL SECTION
PRODUCT: 2202/2202SG SERIES CURTAIN WALL

DRAWING NO. MU2015-083-01

Sheet No. 3 of 3 Sheets

VALIDATION OPTION