

**NFRC U-FACTOR, SHGC, VT, &
CONDENSATION RESISTANCE
COMPUTER SIMULATION REPORT**

(Revised)

**Rendered to:
VEKA INC.**

**SERIES/MODEL:
SH93WW Tilt Single Hung**

Report Number: A3613.02-116-45
Original Report Date: 09/21/10
Expiration Date: 09/20/14
Revised Report Date: 11/11/10

**NFRC U-FACTOR, SHGC, VT, & CONDENSATION RESISTANCE
COMPUTER SIMULATION REPORT**

(Revised)

Rendered to:
VEKA INC.
100 Veka Drive
Fombell, PA 16123

Report Number: A3613.02-116-45
Simulation Date: 09/20/10
Original Report Date: 09/21/10
Expiration Date: 09/20/14
Revised Report Date: 11/11/10

Project Summary:

Architectural Testing, Inc. was contracted to perform U-Factor, Solar Heat Gain Coefficient, Visible Transmittance, and Condensation Resistance* computer simulations in accordance with the National Fenestration Rating Council (NFRC). The products were evaluated in full compliance with NFRC requirements to the standards listed below.

**NFRC's Condensation Resistance rating is NOT equivalent to a Condensation Resistance Factor (CRF) determined in accordance with AAMA 1503.*

Standards:

NFRC 100-2010: Procedure for Determining Fenestration Product U-Factors

NFRC 200-2010: Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

NFRC 500-2010: Procedure for Determining Fenestration Product Condensation Resistance Values

Software:

Frame and Edge Modeling: THERM 5.2.14
Center-of-Glass Modeling: WINDOW 5.2.17
Total Product Calculations: WINDOW 5.2.17
Spectral Data Library: 17.5

Simulations Specimen Description:

Series/Model: SH93WW Tilt Single Hung
Type: Vertical Slider , Single Hung
Frame Material: VI Vinyl w/ Reinforcement - Interlock
Sash Material: VI Vinyl w/ Reinforcement - Interlock
Standard Size: 1200mm x 1500mm

Technical Interpretations:

None

Modeling Assumptions:

- 1) To prevent air infiltration, tape was applied to all interior sash crack locations.
- 2) Options #1 & #2 were simulated with low density foam (EPS) in the meeting rails.
- 3) Options #3 - #8 were simulated with aluminum reinforcement in the meeting rails.

Specialty Products Table:

The specialty products method allow the manufacturer to determine the overall product SHGC and VT for any glazing option. The center of glass SHGC and/or VT must be determined using WINDOW 5.2. The method gives overall product SHGC and VT indexed on center of glass properties. All values used in the calculations are truncated to six decimal place precision.

	No Dividers	Dividers < 1	Dividers > 1
SHGC0	0.003663	0.006403	0.008986
SHGC1	0.780063	0.698526	0.621671
VT0	0.000000	0.000000	0.000000
VT1	0.776400	0.692123	0.612684

$$SHGC = SHGC0 + SHGCc (SHGC1 - SHGC0)$$

$$VT = VT0 + VTc (VT1 - VT0)$$

Validation Matrix:

The following products are part of a validation matrix. Only one is required for validation

<i>Product Line</i>	<i>Report Number</i>
None	-

Spacer Option Description

<i>Spacer Type</i>	<i>Sealant</i>		
	<i>Primary</i>	<i>Secondary</i>	<i>Desiccant</i>
GED Ultra Intercept Spacer	Butyl Rubber	Butyl Rubber	Yes

Grid Option Description

<i>Grid Size</i>	<i>Grid Type</i>	<i>Grid Pattern</i>
None		

Reinforcement Option Description

<i>Location</i>	<i>Material</i>
Interlock	Aluminum

Gas Filling Technique Description

<i>Fill Type</i>	<i>Method</i>
90% Argon	Single Probe Timed
90% Krypton	Dual Probe w/ Concentration Sensor

Edge-of-Glass Construction

<i>Interior Condition</i>	
	Foam weatherstrip between frame/sash leg and glass
<i>Exterior Condition</i>	
	PVC glazing bead against glass

Weatherstripping

<i>Type</i>	<i>Quantity</i>	<i>Location</i>
Finpile	3 rows	Operable stiles
Finpile	2 rows	Keeper stile, bottom rail
Finpile	1 row	Lock stile, sill
Hollow vinyl bulb gasket	1 row	Bottom rail

Frame/Sash Materials Finish

<i>Interior</i>	
	Vinyl
<i>Exterior</i>	
	Vinyl

**NFRC 100/200/500 Summary Sheet
SH93WW Tilt Single Hung**

ID	Pane Thickness 1	Gap Width 1	Pane Thickness 2	Gap Width 2	Pane Thickness 3	Gap Width 3	Pane Thickness 4	Gap Fill	Low-e (Surface#)	Tint	Spacer	Grid Type
	U-Factor			Solar Heat Gain Coefficient (SHGC) Grids (None / <1 / >=1)				Visible Transmittance (VT) Grids (None / <1 / >=1)			Condensation Resistance	
1	EPS FOAM: E366 / ARG / CL (DS/DS) 3/4"											
	0.117	0.500	0.117					ARG90	0.022(#2)	CL	SU-D	N
	U-Factor 0.28			SHGC (N) 0.21				VT (N) 0.50			CR 59	
2	EPS FOAM: E366 / ARG / CL / ARG / E366 (DS/DS/DS) 1-1/4"											
	0.117	0.438	0.117	0.438	0.117			ARG90	0.022(#2) / 0.022(#5)	CL	SU-D	N
	U-Factor 0.18			SHGC (N) 0.19				VT (N) 0.36			CR 71	
3	E366 / ARG / CL (DS/DS) 3/4"											
	0.117	0.500	0.117					ARG90	0.022(#2)	CL	SU-D	N
	U-Factor 0.28			SHGC (N) 0.21				VT (N) 0.50			CR 58	
4	E366 / ARG / CL / ARG / E366 (DS/DS/DS) 1"											
	0.117	0.313	0.117	0.313	0.117			ARG90	0.022(#2) / 0.022(#5)	CL	SU-D	N
	U-Factor 0.22			SHGC (N) 0.19				VT (N) 0.36			CR 53	
5	E366 / ARG / CL / ARG / E366 (DS/DS/DS) 1-1/4"											
	0.117	0.438	0.117	0.438	0.117			ARG90	0.022(#2) / 0.022(#5)	CL	SU-D	N
	U-Factor 0.19			SHGC (N) 0.19				VT (N) 0.36			CR 70	
6	E366 / KRY / CL / KRY / E366 (DS/DS/DS) 1-1/4"											
	0.117	0.438	0.117	0.438	0.117			KRY90	0.022(#2) / 0.022(#5)	CL	SU-D	N
	U-Factor 0.17			SHGC (N) 0.19				VT (N) 0.36			CR 71	
7	E366 / KRY / CL / KRY / CL / KRY / E366 (DS/DS/DS/DS) 1-3/8"											
	0.117	0.292	0.117	0.292	0.117	0.292	0.117	KRY90	0.022(#2) / 0.022(#7)	CL	SU-D	N
	U-Factor 0.17			SHGC (N) 0.17				VT (N) 0.33			CR 71	
8	E366 / KRY / CL / KRY / E366 / KRY / E366 (DS/DS/DS/DS) 1-3/8"											
	0.117	0.292	0.117	0.292	0.117	0.292	0.117	KRY90	0.022(#2) / 0.022(#5) / 0.022(#7)	CL	SU-D	N
	U-Factor 0.15			SHGC (N) 0.16				VT (N) 0.26			CR 71	
	E366 / KRY / E366 / KRY / CL / KRY / E366 (DS/DS/DS/DS) 1-3/8"											
	0.117	0.292	0.117	0.292	0.117	0.292	0.117	KRY90	0.022(#2) / 0.022(#4) / 0.022(#7)	CL	SU-D	N
	U-Factor 0.15			SHGC (N) 0.15				VT (N) 0.26			CR 71	

The Condensation Resistance results obtained from this procedure are for controlled laboratory conditions and do not include the effects of air movement through the specimen, solar radiation, and the thermal bridging that may occur due to the specific design and construction of the fenestration system opening.

Ratings values included in this report are for submittals to an NFRC-licensed IA and are not meant to be used directly for labeling purposes. Only those values identified on a valid Certification Authorization Report (CAR) by an NFRC accredited Inspection Agency (IA) are to be used for labeling purposes. The ratings values were rounded in accordance to NFRC 601, NFRC Unit and Measurement Policy.

Architectural Testing is an NFRC accredited simulation laboratory and all simulations were conducted in full compliance with NFRC approved procedures and specifications. The NFRC procedure requires that the computational results be verified through actual test results.

Detailed drawings, simulation data files, a copy of this report, or other pertinent project documentation will be retained by Architectural Testing, Inc. for a period of four years from the original test date. At the end of this retention period, such materials shall be discarded without notice and the service life of this report will expire. Results obtained are simulated 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. It is the exclusive property of the client so named herein and relates only to the product simulated. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC.:

SIMULATED BY:



Digitally Signed by: Eric Barilar

Eric A. Barilar
Simulation Technician

REVIEWED BY:



Digitally Signed by: Kristen L. Livelsberger

Kristen L. Livelsberger
Senior Simulation Technician
Simulator-In-Responsible-Charge

EAB:eab

A3613.02-116-45

Attachments (pages):

This report is complete only when all attachments listed are included.

Appendix A: Drawings and Bills of Material (14)

Revision Log

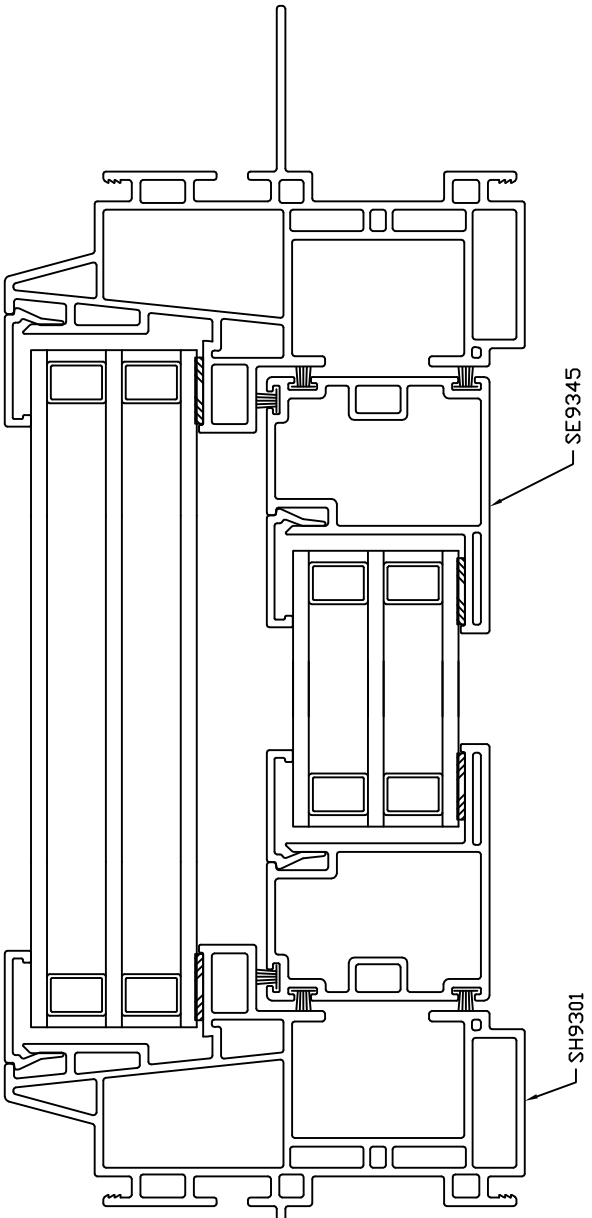
<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
.01R0	9/21/2010	All	Original report issue
.02R0	11/11/2010	All	Options #3-8 added



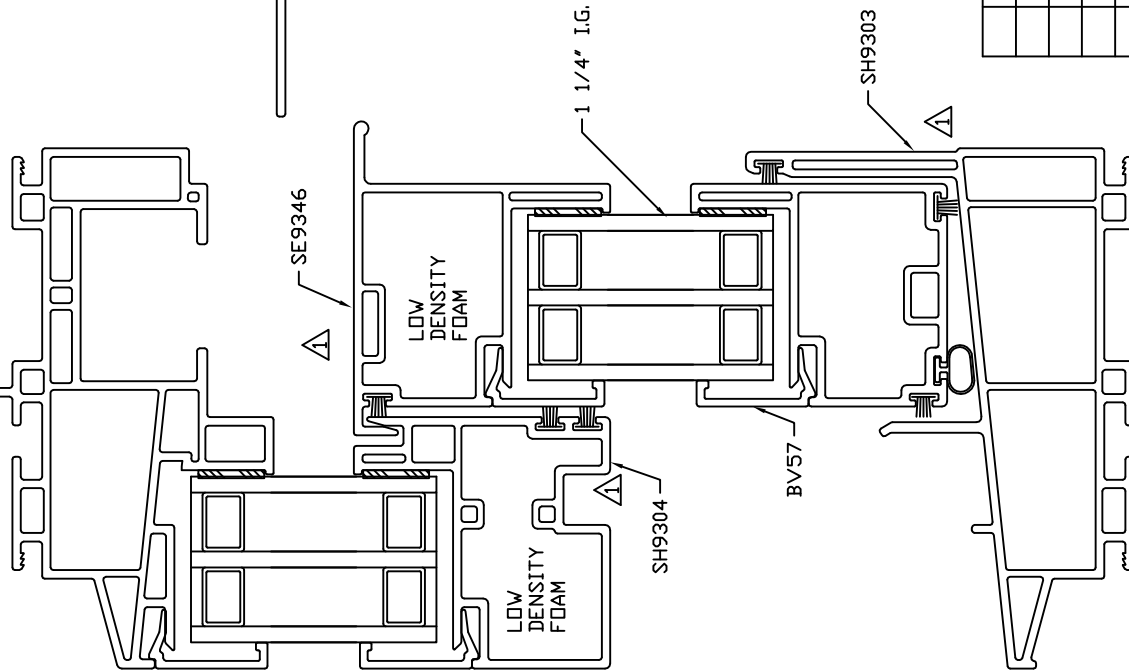
All drawings and Bills of Material used to simulate this product are enclosed in this Appendix

Appendix A

A3613.02-116-45



HORIZONTAL ASSEMBLY



VERTICAL ASSEMBLY

The information, design or data shown on this document or electronic media is the exclusive property of Veka Inc.. It is considered confidential and proprietary and is made available for limited use only. Its use or reproduction without the expressed written consent of Veka Inc. is prohibited.

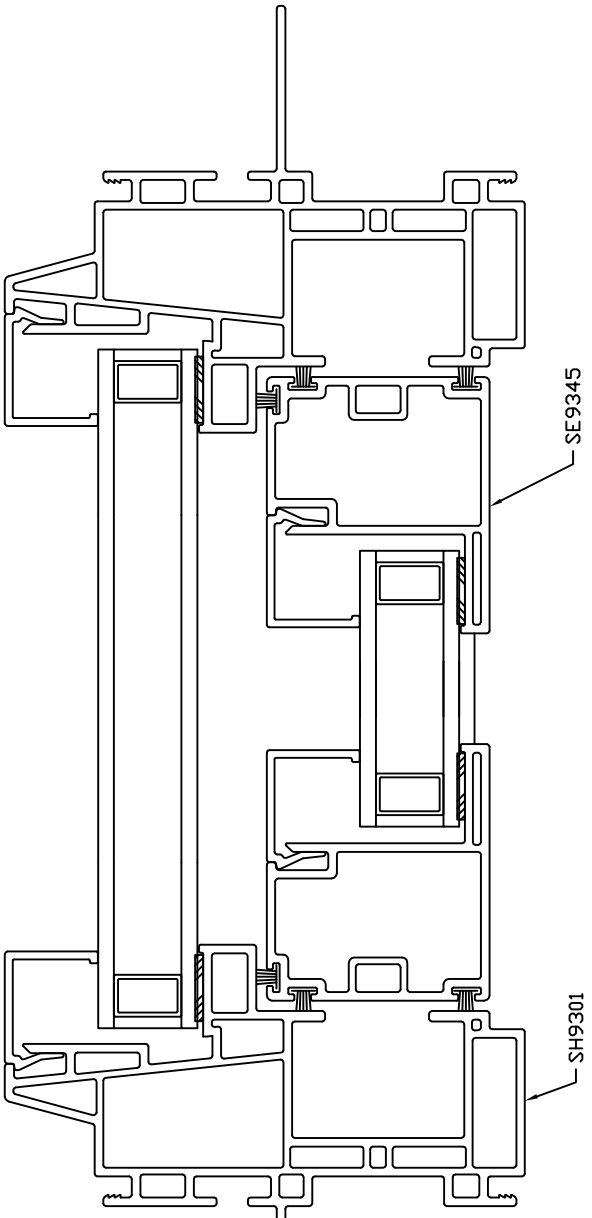


VEKA INC.
100 VEKA DRIVE
FOMBELL, PA 16123

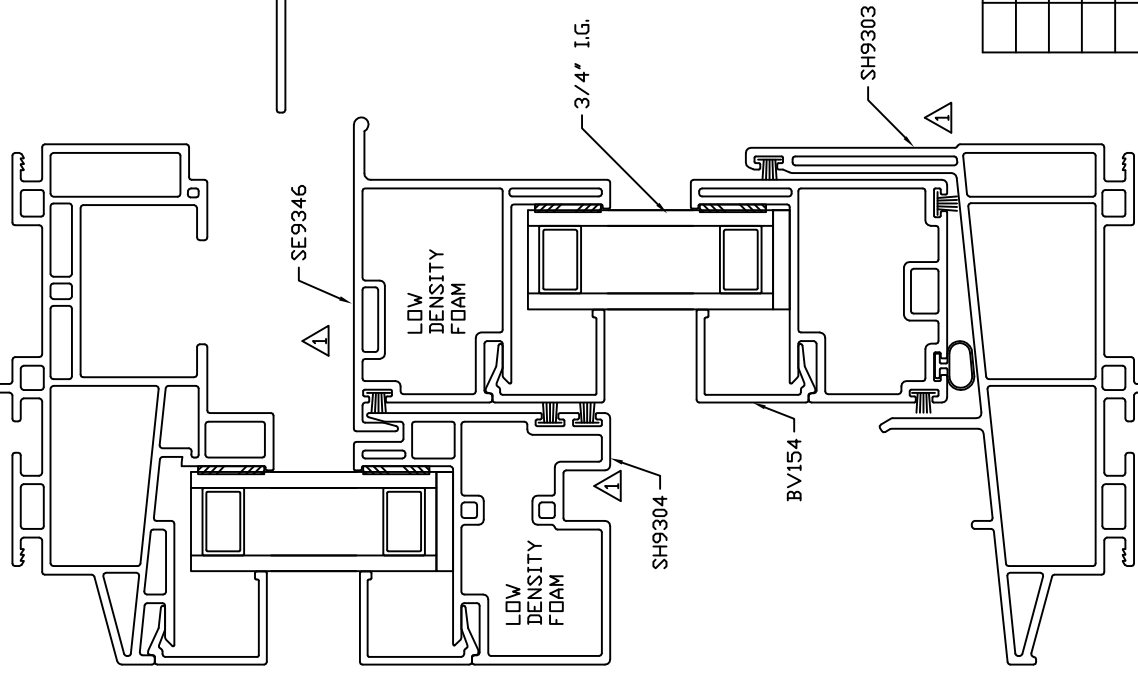
DRAWN: JMN	DATE: 31 MAR 10	SCALE: FULL
CHK'D:	DATE:	APPVD:
TITLE: R5 SINGLE HUNG (SH93WV)		DWG. # V-R5-3 c

ATI
Report # A3613-116-45
Date 11/10/2010
Simulator Eric Bakula

REVISIONS		DATE
1	REVISED FMR, LOCK RAIL & SILL	30 JUNE 2010



HORIZONTAL ASSEMBLY



VERTICAL ASSEMBLY

The information, design or data shown on this document or electronic media is the exclusive property of Veka Inc.. It is considered confidential and proprietary and is made available for limited use only. Its use or reproduction without the expressed written consent of Veka Inc. is prohibited.



VEKA INC.
100 VEKA DRIVE
FOMBELL, PA 16123

DRAWN: JMN	DATE: 31 MAR 10	SCALE: FULL
CHK'D:	DATE:	APPVD:
TITLE: R5 SINGLE HUNG (SH93WV)		DWG. # V-R5-3 c

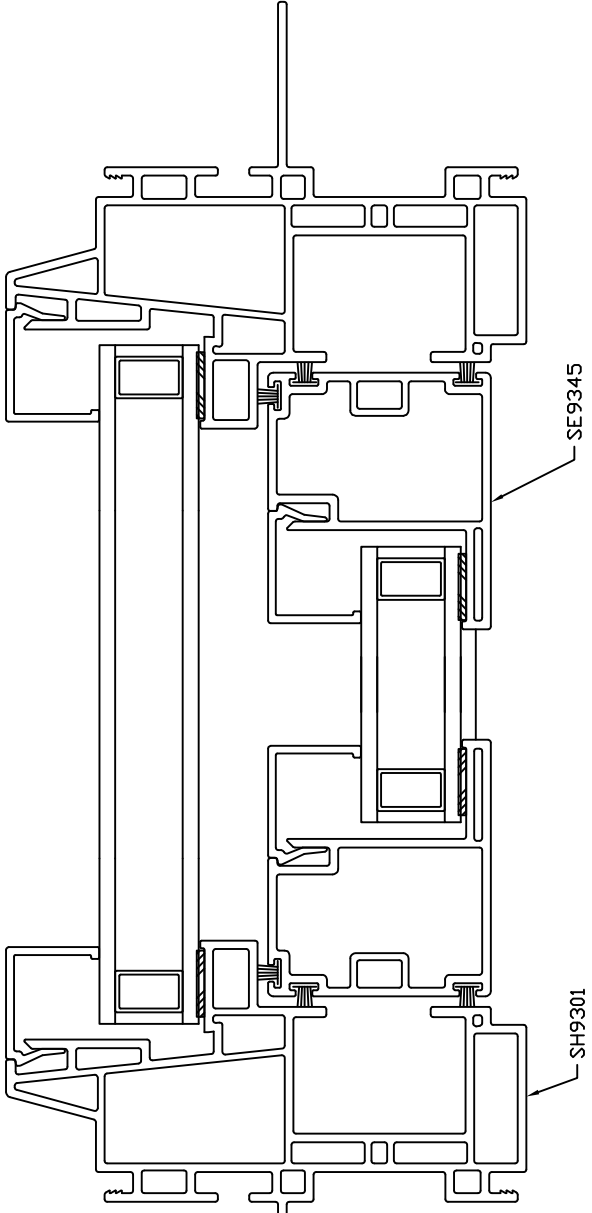
ATI

Report # A3613-116-45

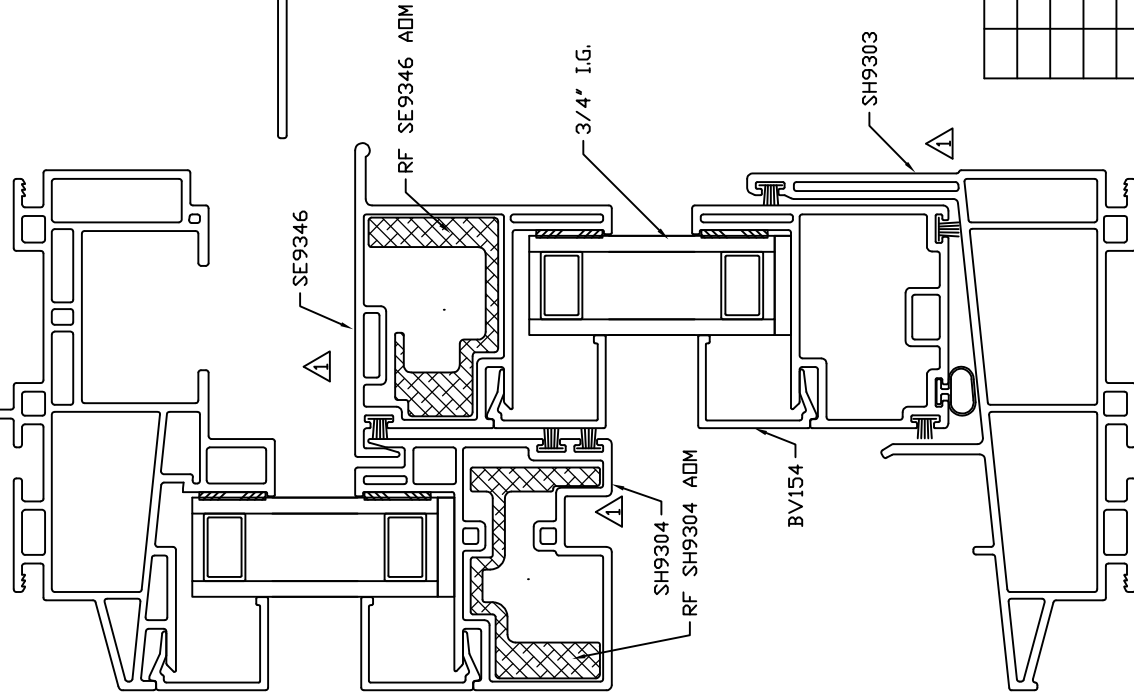
Date 11/10/2010

Simulator Eric Borthe

REVISIONS		DATE
1	REVISED FMR, LOCK RAIL & SILL	30 JUNE 2010



HORIZONTAL
ASSEMBLY



VERTICAL
ASSEMBLY

The information, design or data shown on this document or electronic media is the exclusive property of Veka Inc.. It is considered confidential and proprietary and is made available for limited use only. Its use or reproduction without the expressed written consent of Veka Inc. is prohibited.



VEKA INC.
100 VEKA DRIVE
FOMBELL, PA 16123

DRAWN: JMN	DATE: 31 MAR 10	SCALE: FULL
CHK'D:	DATE:	APPVD:
TITLE: R5 SINGLE HUNG (SH93W/W)		DWG. # V-R5-3 c

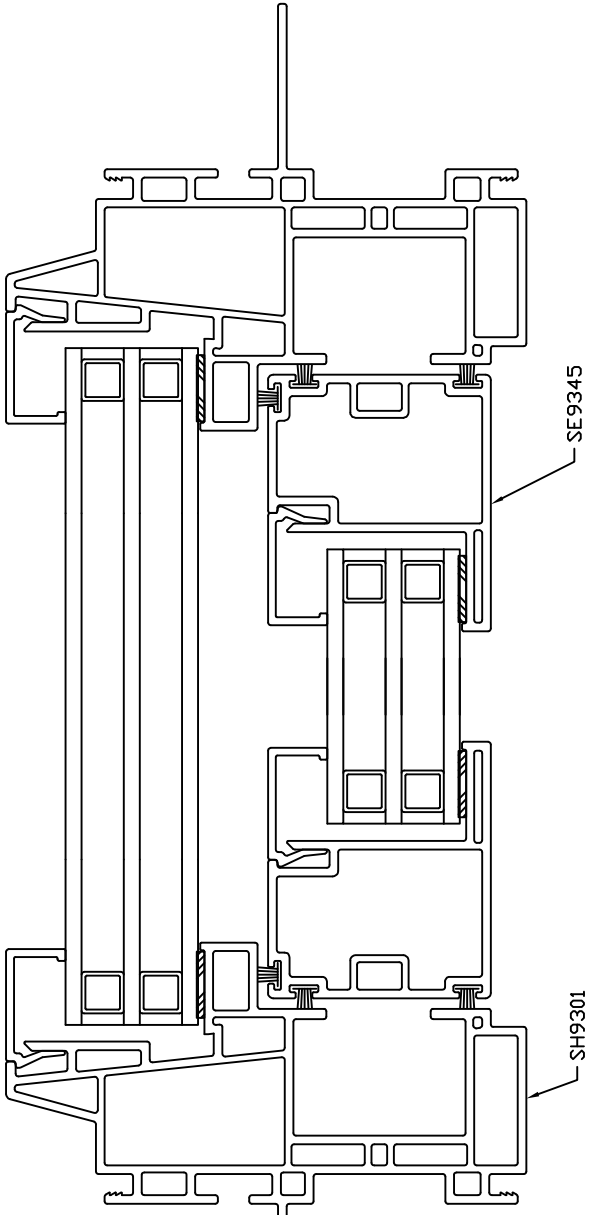
ATI

Report # A3613-116-45

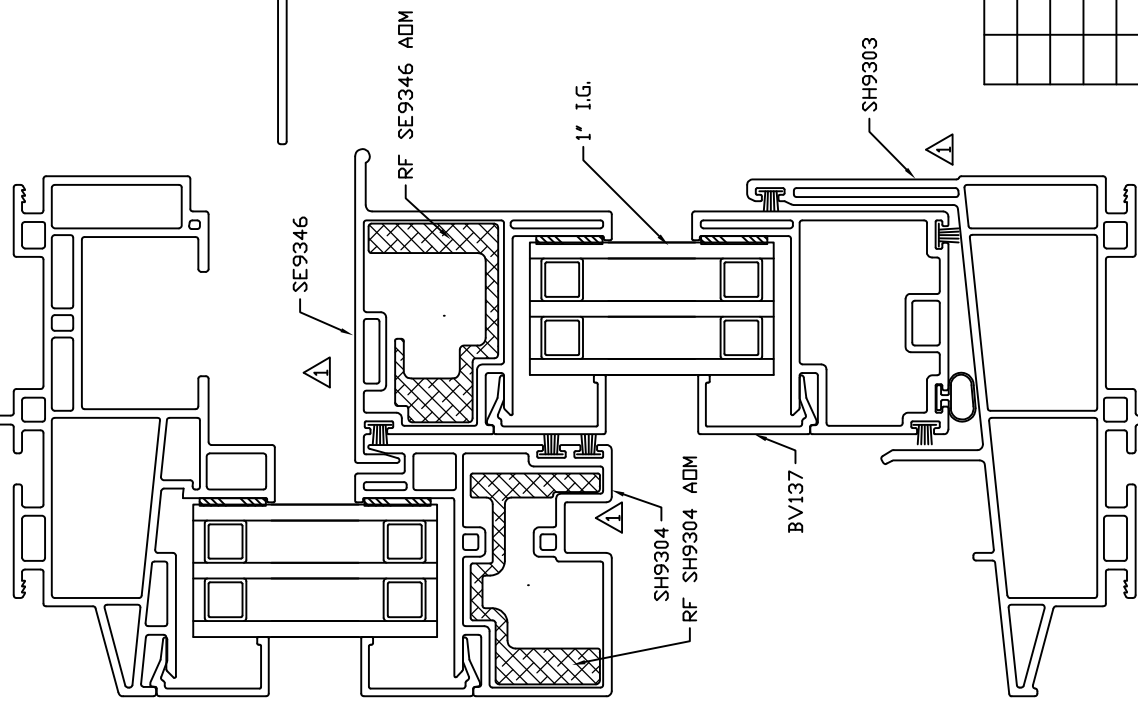
Date 11/10/2010

Simulator Eric Borzika

REVISIONS	DATE
1 REVISED FMR, LOCK RAIL & SILL	30 JUNE 2010



HORIZONTAL
ASSEMBLY



VERTICAL
ASSEMBLY

The information, design or data shown on this document or electronic media is the exclusive property of Veka Inc.. It is considered confidential and proprietary and is made available for limited use only. Its use or reproduction without the expressed written consent of Veka Inc. is prohibited.

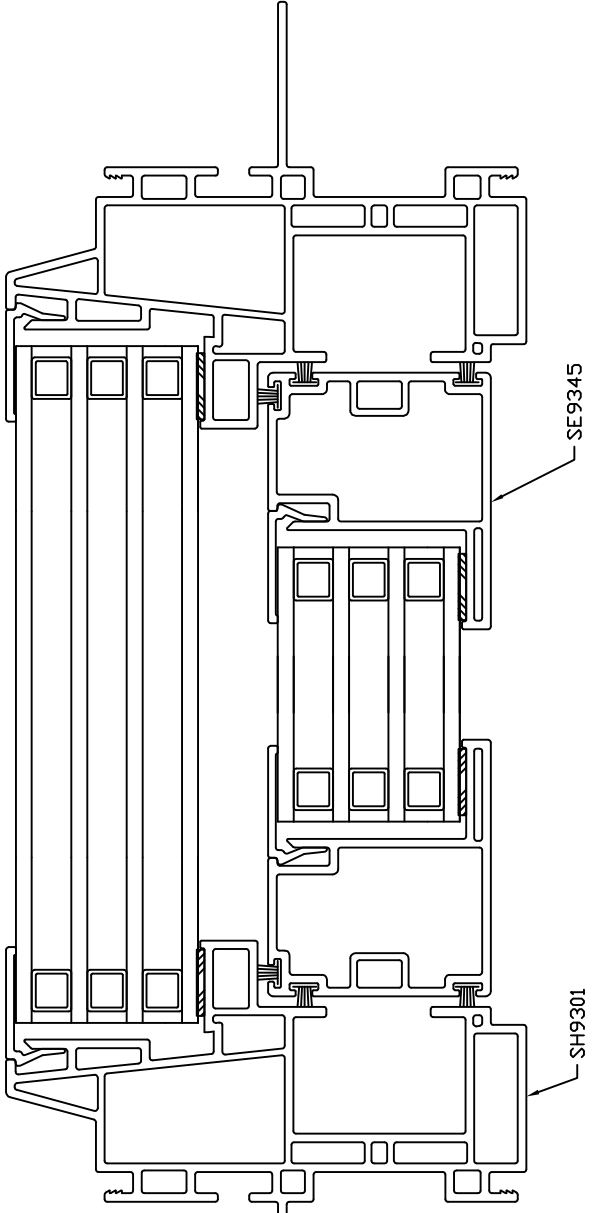


VEKA INC.
100 VEKA DRIVE
FOMBELL, PA 16123

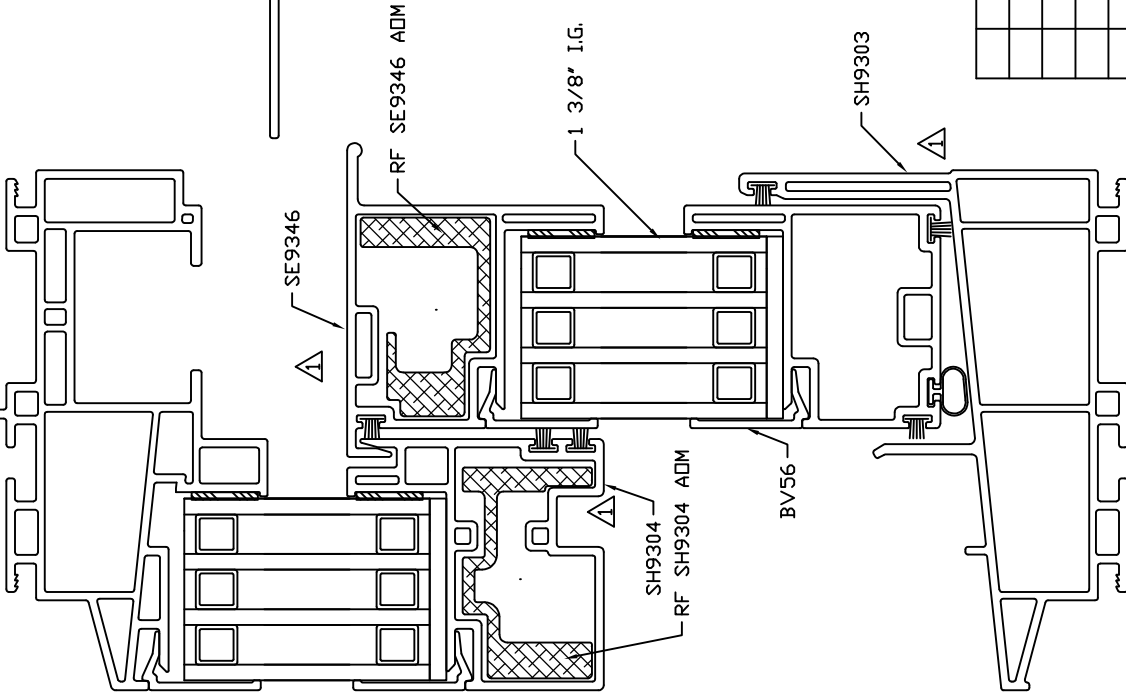
DRAWN: JMN	DATE: 31 MAR 10	SCALE: FULL
CHK'D:	DATE:	APPVD:
TITLE: R5 SINGLE HUNG (SH93W/W)		DWG. # V-R5-3 c

ATI
Report # A3613-116-45
Date 11/10/2010
Simulator Eric Boriska

REVISIONS	DATE
1 REVISED FMR, LOCK RAIL & SILL	30 JUNE 2010



HORIZONTAL ASSEMBLY



VERTICAL ASSEMBLY

The information, design or data shown on this document or electronic media is the exclusive property of Veka Inc.. It is considered confidential and proprietary and is made available for limited use only. Its use or reproduction without the expressed written consent of Veka Inc. is prohibited.

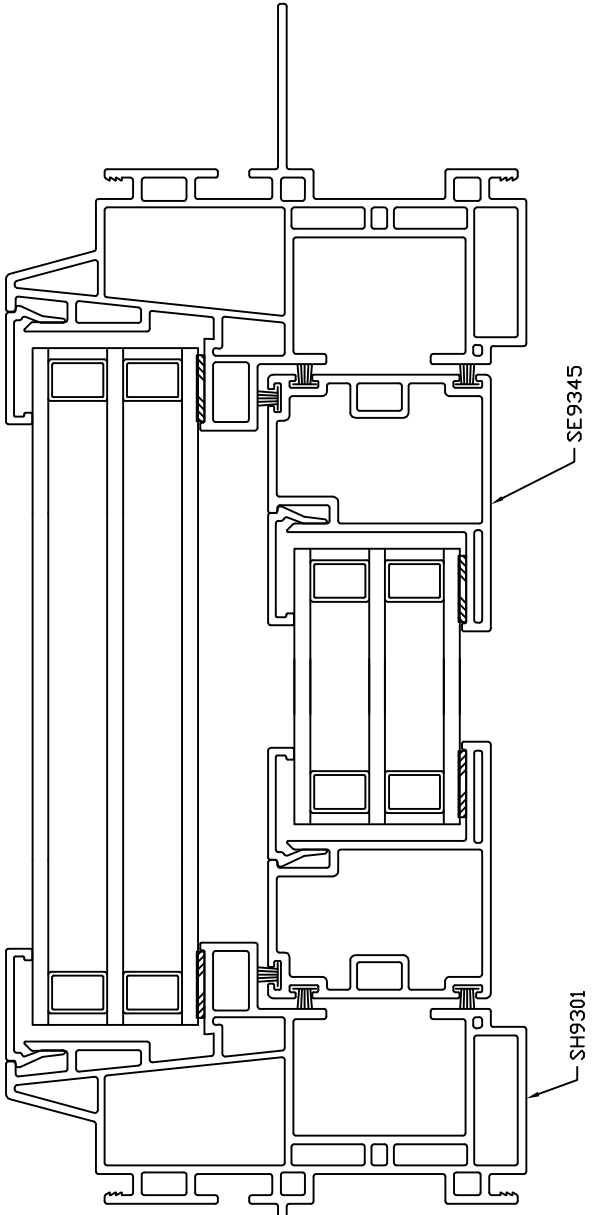


VEKA INC.
100 VEKA DRIVE
FOMBELL, PA 16123

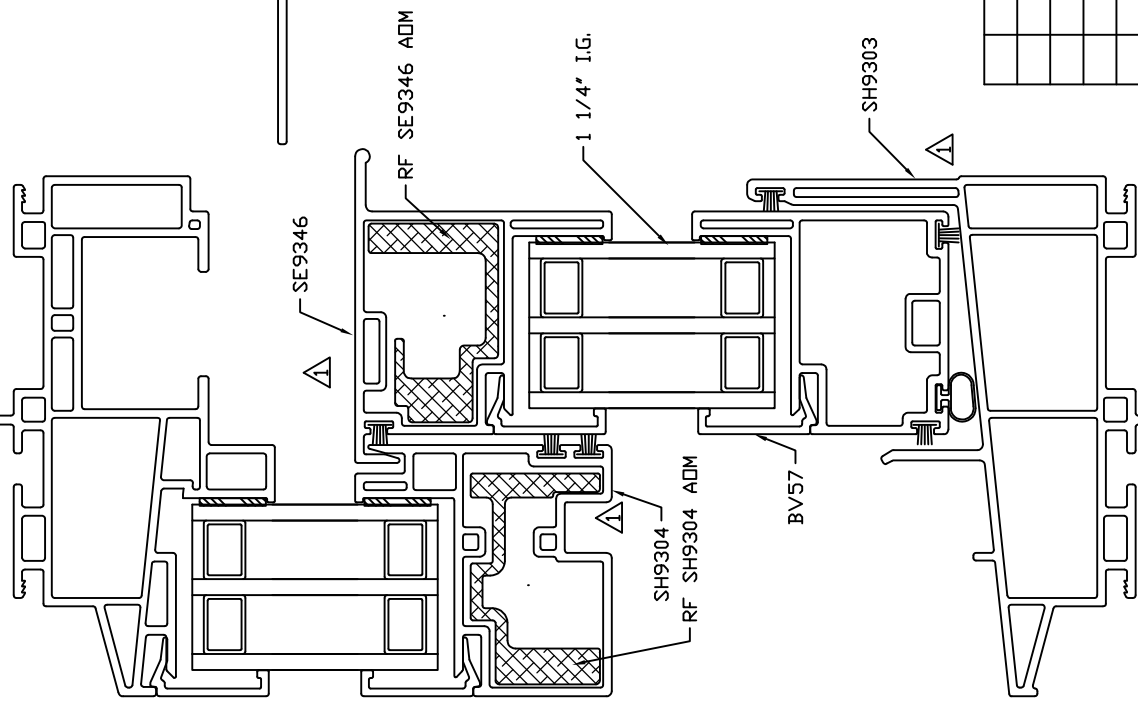
DRAWN: JMN	DATE: 31 MAR 10	SCALE: FULL
CHK'D:	DATE:	APPVD:
TITLE: R5 SINGLE HUNG (SH93W/W)		DWG. # V-R5-3 c

ATI
Report # A3613-116-45
Date 11/10/2010
Simulator Eric Borkala

REVISIONS	DATE
1 REVISED FMR, LOCK RAIL & SILL	30 JUNE 2010



HORIZONTAL
ASSEMBLY



VERTICAL
ASSEMBLY

The information, design or data shown on this document or electronic media is the exclusive property of Veka Inc.. It is considered confidential and proprietary and is made available for limited use only. Its use or reproduction without the expressed written consent of Veka Inc. is prohibited.



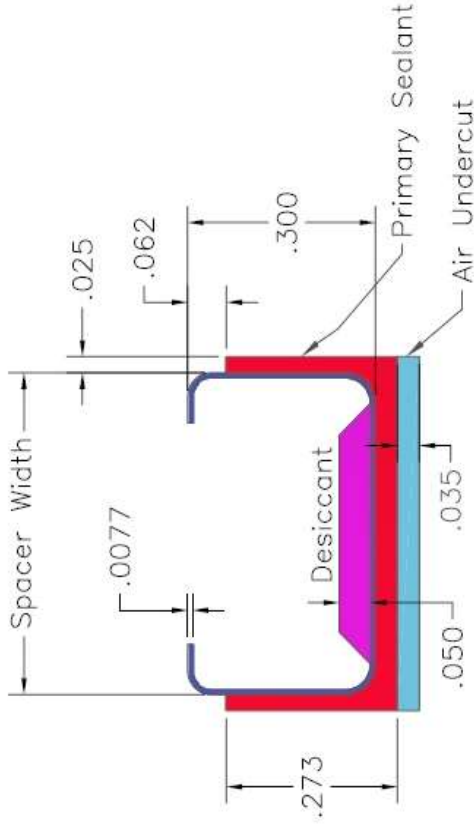
VEKA INC.
100 VEKA DRIVE
FOMBELL, PA 16123

DRAWN: JMN	DATE: 31 MAR 10	SCALE: FULL
CHK'D:	DATE:	APPVD:
TITLE: R5 SINGLE HUNG (SH93W/W)		DWG. # V-R5-3 c

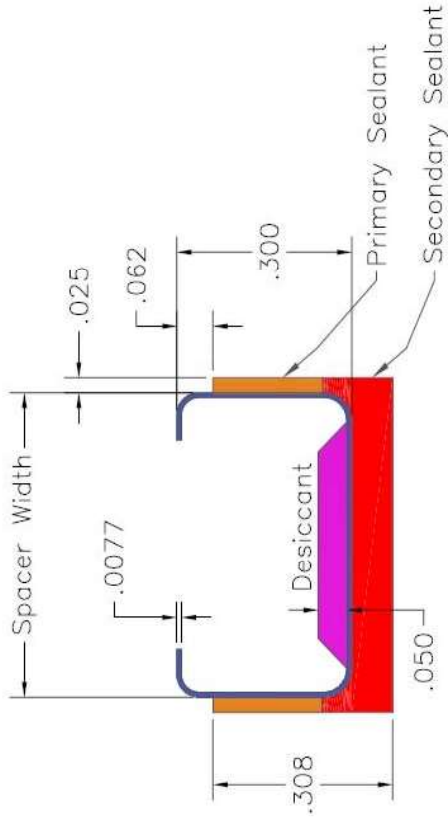
ATI
Report # A3613-116-45
Date 11/10/2010
Simulator *Eric Borzika*

REVISIONS	DATE
1 REVISED FMR, LOCK RAIL & SILL	30 JUNE 2010

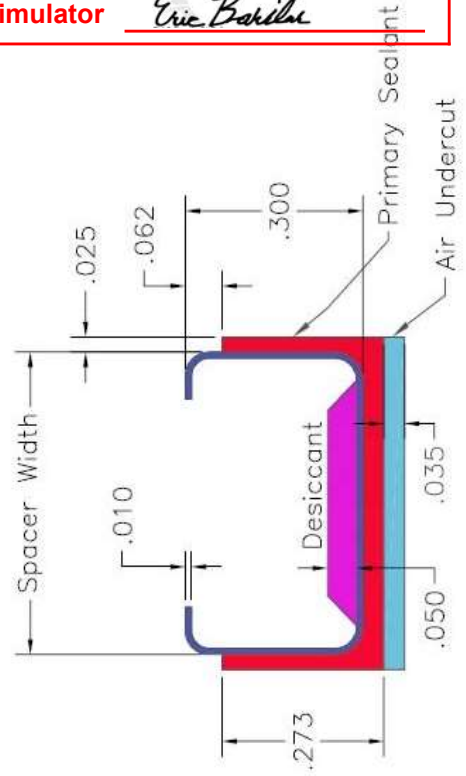
**Intercept® ULTRA Stainless Steel—Standard Profile
SINGLE SEAL**



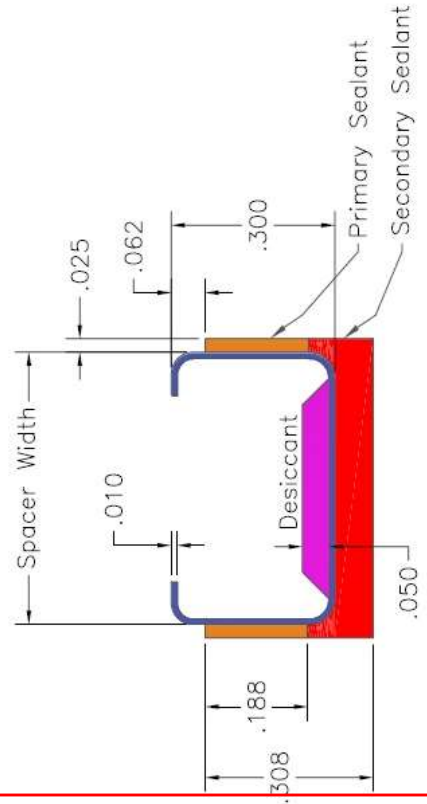
**Intercept® ULTRA Stainless Steel—Standard Profile
DUAL SEAL**



**Intercept® Blackline or Electrolytic Tin Plated Steel—Standard Profile
SINGLE SEAL**



**Intercept® Blackline or Electrolytic Tin Plated Steel—Standard Profile
DUAL SEAL**



ATI

Report # A3613-116-45

Date 11/10/2010

Simulator Eric Borish

Intercept® ULTRA Simulation Model

**For More Information,
Contact Your
GED Sales Manager**

GED Integrated Solutions
9280 Dutton Drive
Twinsburg, OH
44087-1967

Telephone: 330.963.5401
Fax: 330.963.0584
www.gedusa.com

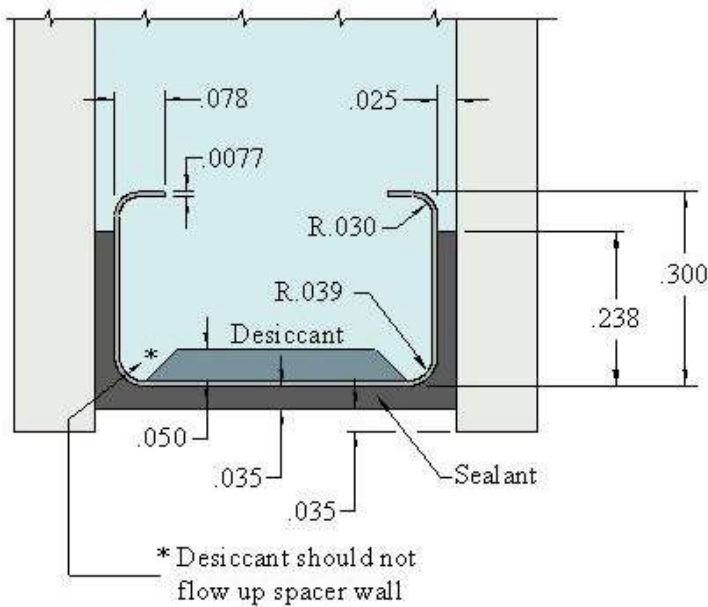
For THERM

- ✓ Spacer wall thickness: ULTRA material = 0.0077"
Blackline material = 0.0077"
- ✓ Thermal conductivity: ULTRA material = 13.63 W/m^oK
Blackline material = 13.63 W/m^oK
Desiccant = 0.29 W/m^oK
Sealant = 0.24 W/m^oK

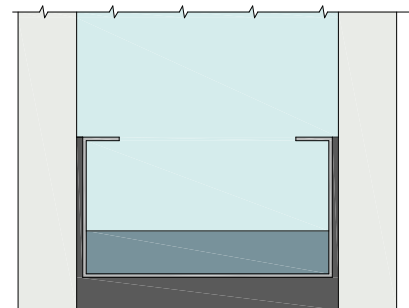
- ✓ Spacer should be below sight line
- ✓ All dimensions in inches

	ATI
Report #	<u>A3613-116-45</u>
Date	<u>11/10/2010</u>
Simulator	<u>Eric Barthe</u>

Accurate Geometry



Inaccurate Geometry



	Architectural Testing, Inc.
Report #	<u>A3613</u>
Date	<u>9/21/2010</u>
Simulator	<u>Eric Fisher</u>