

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

(Revised)

**Rendered to:
CUSTOM VINYL PRODUCTS, LLC**

**SERIES/MODEL:
SH46 Single Hung**

Report Number: D9544.10-116-45
Original Report Date: 06/25/15
Revised Report Date: 04/15/16

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

(Revised)

Rendered to:
CUSTOM VINYL PRODUCTS, LLC
260 Enterprise Drive
Newport News, Virginia 23603

Report Number: D9544.10-116-45
Simulation Date: 07/16/14
Original Report Date: 06/25/15
Revised Report Date: 04/15/16

Project Summary:

Architectural Testing, Inc., an Intertek Company (Intertek-ATI) 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

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

Standards:

ANSI/NFRC 100-2014: Procedure for Determining Fenestration Product U-Factors
ANSI/NFRC 200-2014: Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence
NFRC 500-2014: Procedure for Determining Fenestration Product Condensation Resistance Values

Software:

Frame and Edge Modeling: THERM 7.4.3
Center-of-Glass Modeling: WINDOW 7.4.8
Total Product Calculations: WINDOW 7.4.8
Spectral Data Library: IGDB 45.0

Simulations Specimen Description:

Series/Model: SH46 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

Modeling Assumptions/Technical Interpretations:

- 1) To prevent air infiltration, tape was applied to all interior sash crack locations.
- 2) The nailing fin was not modeled because it was deemed removable by the manufacturer.
- 3) Dividers were not modeled per ANSI/NFRC 100-2014, Section 4.2.4.1.D.ii.

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 7.4.8. 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 | 0.004611 | 0.007408 | 0.010047 |
| SHGC1 | 0.806804 | 0.723831 | 0.645540 |
| VT0 | 0.000000 | 0.000000 | 0.000000 |
| VT1 | 0.802192 | 0.716423 | 0.635493 |

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

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

Validation Matrix:

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

| <i>Product Line</i> | <i>Report Number</i> |
|---------------------|----------------------|
| SH46 Single Hung | D9544.04-116-45 |
| SS46 Single Slider | D9546.04-116-45 |

Spacer Option Description

| <i>Spacer Type</i> | <i>Sealant</i> | | <i>Code</i> |
|-------------------------|----------------|------------------|-------------|
| | <i>Primary</i> | <i>Secondary</i> | |
| Cardinal XL Edge Spacer | PIB | Silicone | SS-D |

Grid Option Description

| <i>Grid Size</i> | <i>Grid Type</i> | <i>Grid Pattern</i> |
|------------------|-------------------------------------|---------------------|
| 3/16" x 5/8" | Aluminum Rectangular Grid (Painted) | NFRC Standard |
| 3/16" x 13/16" | Aluminum Rectangular Grid (Painted) | NFRC Standard |
| 5.5mm x 18mm | Aluminum Contour Grid (Painted) | NFRC Standard |
| 5.5mm x 25mm | Aluminum Contour Grid (Painted) | NFRC Standard |
| 1/8" SDL | | |

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 |

Edge-of-Glass Construction

| <i>Interior Condition</i> | Rigid PVC Glazing Bead Against Glass |
|---------------------------|--|
| <i>Exterior Condition</i> | Silicone Sealant Between Rigid PVC Frame and Glass |

Weatherstripping

| <i>Type</i> | <i>Quantity</i> | <i>Location</i> |
|-----------------------|-----------------|-----------------|
| Finpile | 2 Rows | Jamb Stiles |
| Finpile | 1 Row | Lock Rail |
| Foam-filled Bulb Seal | 1 Row | Bottom Rail |

Frame/Sash Materials Finish

| <i>Interior</i> | Vinyl |
|-----------------|-------|
| <i>Exterior</i> | Vinyl |

NFRC 100/200/500 Summary Sheet

SH46 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 | E270 / ARG90 / CLR (2MM/2MM) - 3/4" IG | | | | | | | | | | | |
| | 0.087 | 0.563 | 0.087 | | | | | ARG90 | 0.037(#2) | CL | SS-D | N,G,S |
| | U-Factor 0.31 | | | SHGC (N / <1) 0.30 / 0.27 | | | | | VT (N / <1) 0.57 / 0.51 | | CR 59 | |
| 2 | E366 / ARG90 / CLR (2MM/2MM) - 3/4" IG | | | | | | | | | | | |
| | 0.087 | 0.563 | 0.087 | | | | | ARG90 | 0.022(#2) | CL | SS-D | N,G,S |
| | U-Factor 0.30 | | | SHGC (N / <1) 0.22 / 0.20 | | | | | VT (N / <1) 0.53 / 0.47 | | CR 59 | |
| 3 | E270 / ARG90 / CLR (3MM/3MM) - 3/4" IG | | | | | | | | | | | |
| | 0.118 | 0.500 | 0.118 | | | | | ARG90 | 0.037(#2) | CL | SS-D | N,G,S |
| | U-Factor 0.30 | | | SHGC (N / <1) 0.30 / 0.27 | | | | | VT (N / <1) 0.56 / 0.50 | | CR 56 | |
| 4 | E366 / ARG90 / CLR (3MM/3MM) - 3/4" IG | | | | | | | | | | | |
| | 0.117 | 0.500 | 0.118 | | | | | ARG90 | 0.022(#2) | CL | SS-D | N,G,S |
| | U-Factor 0.30 | | | SHGC (N / <1) 0.22 / 0.20 | | | | | VT (N / <1) 0.52 / 0.46 | | CR 59 | |
| 5 | E366 / ARG90 / i89 (2MM/2MM) - 3/4" IG | | | | | | | | | | | |
| | 0.087 | 0.563 | 0.087 | | | | | ARG90 | 0.022(#2) / 0.149(#4) | CL | SS-D | N,G,S |
| | U-Factor 0.26 | | | SHGC (N / <1) 0.22 / 0.20 | | | | | VT (N / <1) 0.51 / 0.46 | | CR 47 | |
| 6 | E366 / ARG90 / i89 (3MM/3MM) - 3/4" IG | | | | | | | | | | | |
| | 0.117 | 0.500 | 0.117 | | | | | ARG90 | 0.022(#2) / 0.149(#4) | CL | SS-D | N,G,S |
| | U-Factor 0.25 | | | SHGC (N / <1) 0.22 / 0.20 | | | | | VT (N / <1) 0.51 / 0.45 | | CR 47 | |
| 7 | E270 / ARG90 / CLR (2MM/2MM) - 5/8" IG | | | | | | | | | | | |
| | 0.087 | 0.438 | 0.087 | | | | | ARG90 | 0.037(#2) | CL | SS-D | N,S |
| | U-Factor 0.30 | | | SHGC (N / <1) 0.30 / 0.27 | | | | | VT (N / <1) 0.57 / 0.51 | | CR 58 | |
| 8 | E270 / ARG90 / CLR (2MM/2MM) - 5/8" IG | | | | | | | | | | | |
| | 0.087 | 0.438 | 0.087 | | | | | ARG90 | 0.037(#2) | CL | SS-D | G |
| | U-Factor 0.31 | | | SHGC (<1) 0.27 | | | | | VT (<1) 0.51 | | CR 58 | |

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.

Intertek-ATI is an NFRC accredited simulation laboratory and all simulations were conducted in full compliance with NFRC approved procedures and specifications. The values included in this report are not considered in compliance with ANSI/NFRC 100, ANSI/NFRC 200, and/or NFRC 500 unless the associated validation test requirements have been satisfied, as applicable.

This report is reissued in the name of Custom Vinyl Products, LLC through written authorization of Veka Inc., to whom the original report was rendered. The original Veka Inc. report number is D9544.01-116-45.

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 16, 2018.

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 Intertek-ATI

For INTERTEK-ATI:

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D9544.10-116-45

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix A: Drawings and Bills of Material (14)

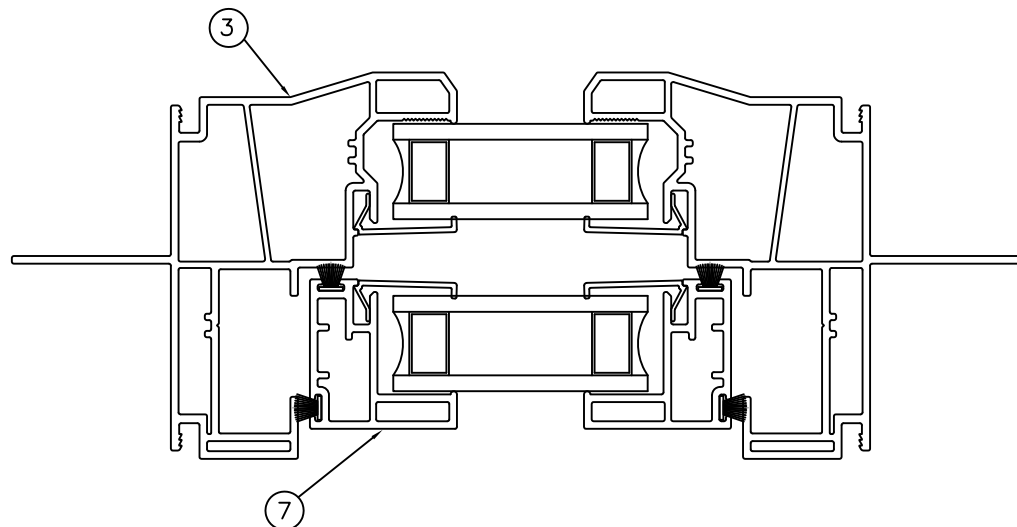
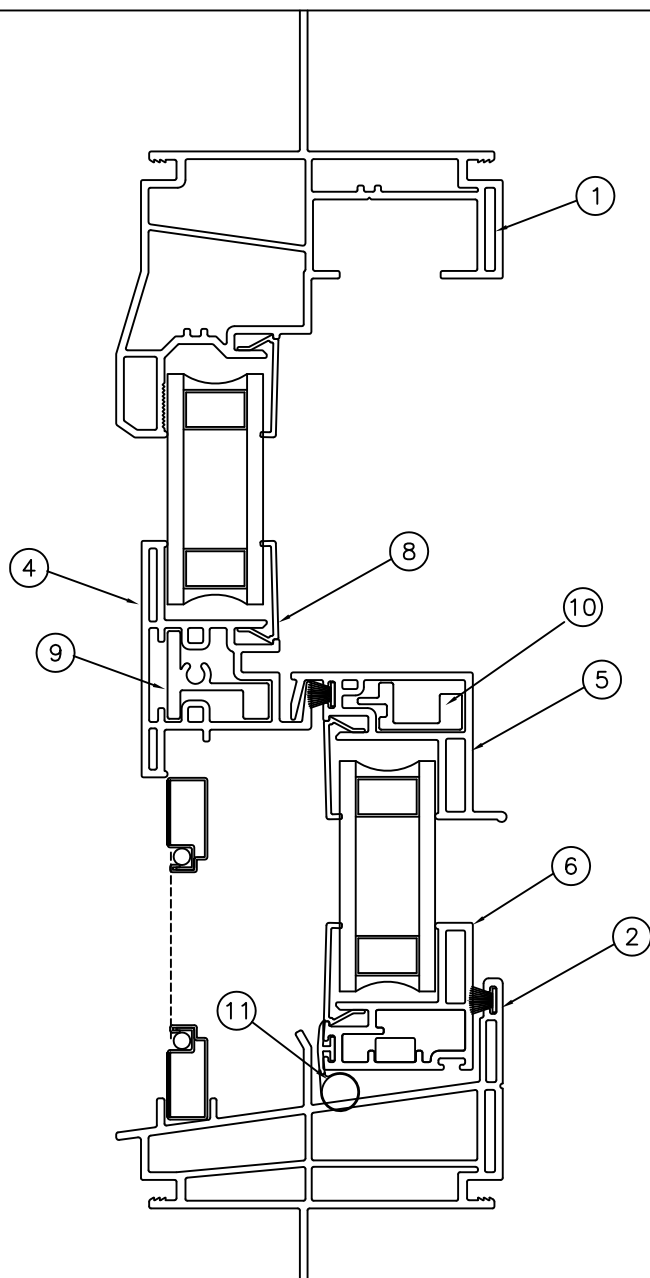
Revision Log

| <u>Rev. #</u> | <u>Date</u> | <u>Page(s)</u> | <u>Revision(s)</u> |
|----------------------|--------------------|-----------------------|--|
| .01R0 | 07/18/14 | All | Original Report Issued to Veka Inc. |
| .04R0 | 06/25/15 | All | Report Reissued to Custom Vinyl Products, LLC. |
| .04R1 | 08/27/15 | Page 4 | Corrected Boundary Conditions for Option #1. |
| .10R0 | 03/09/16 | Page 4 | Added Option #7 |
| .10R1 | 04/15/16 | Page 4 | Corrected Frame in Head Model, Removed Reinforcement in Stile, Added Option #8 |

All drawings and Bills of Material used to simulate this product are enclosed in this Appendix
Some drawings may be omitted at the extruder's request.

Appendix A

D9544.10-116-45



VINYL & ALUMINUM EXTRUSIONS

- | | | | |
|----------|------------------|------------------|--------------------|
| ① SH4601 | FRAME HEAD | ⑦ V-705 | SASH STILE |
| ② SH4603 | FRAME SILL | ⑧ BV162 | GLAZING BEAD |
| ③ SH4601 | FRAME JAMB | ⑨ S-046 | M.R. REINFORCEMENT |
| ④ V-706 | MEETING RAIL | ⑩ S-047 | SASH REINFORCEMENT |
| ⑤ V-704 | SASH LOCK RAIL | ⑪ AMESBURY 32684 | BULB SEAL |
| ⑥ V-705 | SASH BOTTOM RAIL | | |



VEKA INC.
100 VEKA DRIVE
FOMBELL, PA 16123

SINGLE HUNG SH46WW

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|--|------|----------------|-----|-----------|
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| B | | UPDATED SH4603 | BJF | 18 MAY 10 |
| A | | UPDATED SH4601 | BJF | 13 NOV 08 |
| REV | ECN. | CHANGE | BY | DATE |
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|--------|-------|-------|--------|---------|
| B-SIZE | BY | BJF | DATE | 4/29/04 |
| FULL | SCALE | DWG # | SH46WW | |