



National Fenestration Rating Council Incorporated

NFRC 713.02-2013_[DRAFT]

NFRC Independent Verification Program Laboratory Guidelines

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FOREWORD

The National Fenestration Rating Council, Incorporated (NFRC) has developed and operates a uniform rating system for energy and energy-related performance of fenestration products. The Rating System determines the U-factor, Solar Heat Gain Coefficient (SHGC) and Visible Transmittance (VT) of a product, which are mandatory ratings for labeling NFRC certified products, are mandatory ratings for inclusion on label certificates, and are supplemented by procedures for voluntary ratings of products for Air Leakage (AL), and Condensation Resistance. Together, these rating procedures, as set forth in documents published by NFRC, are known as the NFRC Rating System.

The NFRC Rating System employs computer simulation and physical testing by NFRC-accredited laboratories to establish energy and related performance ratings for fenestration product types. The NFRC Rating System is reinforced by a certification program under which NFRC-licensed responsible parties claiming NFRC product certification shall label and certify fenestration products to indicate those energy and related performance ratings, provided the ratings are authorized for certification by an NFRC-licensed certification and Inspection Agency (IA).

The requirements of the rating, certification, and labeling program (Certification Program) are set forth in the most recent versions of the following as amended, updated, or interpreted from time to time:

- NFRC 700 Product Certification Program (PCP).
- NFRC 705 Component Modeling Approach (CMA), Product Certification Program (CMA-PCP).

Through the Certification Program and the most recent versions of its companion programs as amended, updated, or interpreted from time to time:

- The laboratory accreditation program (Accreditation Program), as set forth in the NFRC 701 Laboratory Accreditation Program (LAP).
- The IA licensing program (IA Program), as set forth in NFRC 702 Certification Agency Program (CAP).
- The CMA Approved Calculation Entity (ACE) licensing program (ACE Program), as set forth in the NFRC 708 Calculation Entity Approval Program (CEAP).

NFRC intends to ensure the integrity and uniformity of NFRC ratings, certification, and labeling by ensuring that responsible parties, testing and simulation laboratories, and IAs

adhere to strict NFRC requirements.

In order to participate in the Certification Program, a Manufacturer/Responsible Party shall rate a product whose energy and energy-related performance characteristics are to be certified in accordance with mandatory NFRC rating procedures. At present, a Manufacturer/Responsible Party may elect to rate products for U-factor, SHGC, VT, AL, Condensation Resistance, or any other procedure adopted by NFRC, and to include those ratings on the NFRC temporary label affixed to its products, or on the NFRC Label Certificate. U-factor, SHGC and VT, AL, and Condensation Resistance rating reports shall be obtained from a laboratory that has been accredited by NFRC in accordance with the requirements of the NFRC 701.

The rating shall then be reviewed by an IA which has been licensed by NFRC in accordance with the requirements of the NFRC 702. NFRC-licensed IAs also review label format and content, conduct in-plant inspections for quality assurance in accordance with the requirements of the NFRC 702, and issue a product Certification Authorization Report (CAR), or approve for issuance an NFRC Label Certificate for site-built or CMA products and attachment products. The IA is also responsible for the investigation of potential violations (prohibited activities) as set forth in the NFRC 707 Compliance and Monitoring Program (CAMP).

Ratings for products that are labeled with the NFRC Temporary and Permanent Label, or products that are listed on an NFRC Label Certificate in accordance with NFRC requirements, are considered to be NFRC-certified. NFRC maintains a Certified Products Directory (CPD), listing product lines and individual products selected by the manufacturer/responsible party for which certification authorization has been granted.

NFRC manages the Rating System and regulates the Product Certification Program (PCP), Laboratory Accreditation Program (LAP) and Certification Agency Program (CAP) in accordance with the NFRC 700 (PCP), the NFRC 701 (LAP), the NFRC 702 (CAP), the NFRC 705 (CMA-PCP), and the NFRC 708 (CEAP) procedures, and conducts compliance activities under all these programs as well as the NFRC 707 (CAMP). NFRC continues to develop the Rating System and each of the programs.

NFRC owns all rights in and to each of the NFRC 700, NFRC 701, NFRC 702, NFRC 705, NFRC 707, NFRC 708 and each procedure, which is a component of the Rating System, as well as each of its registration marks, trade names, and other intellectual property.

The structure of the NFRC program and relationships among participants are shown in Figure 1, Figure 2, and Figure 3. For additional information on the roles of the IAs and laboratories and operation of the IA Program and Accreditation Program, see the NFRC 700 (PCP), NFRC 701 (LAP), and NFRC 702 (CAP) respectively.

Figure 1

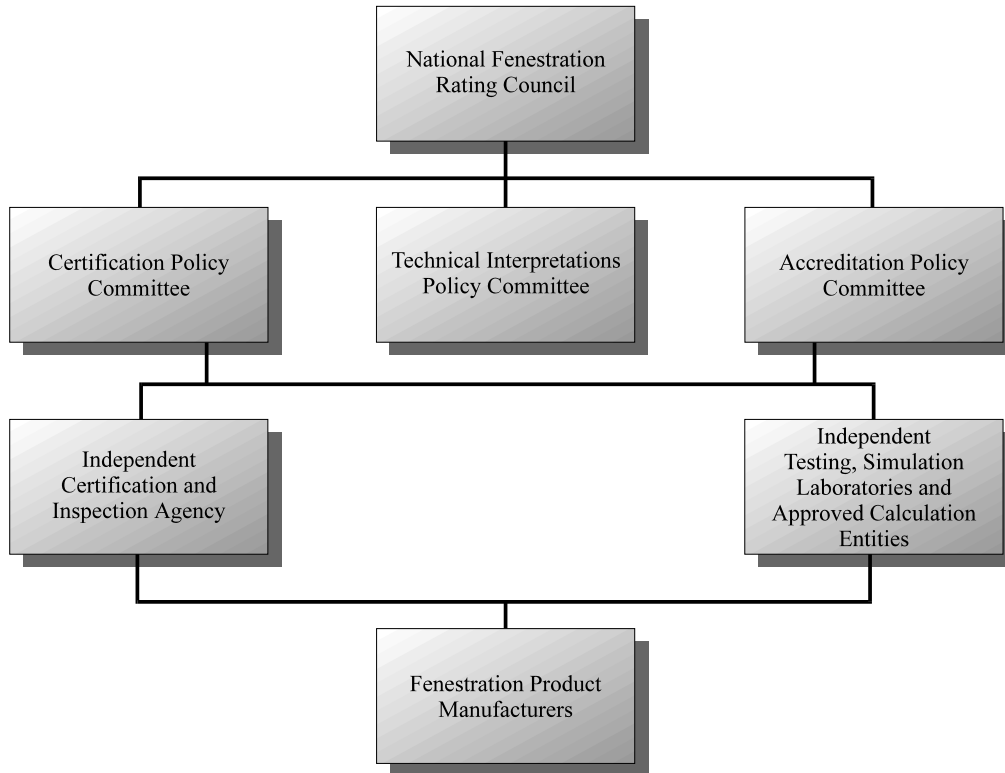


Figure 2

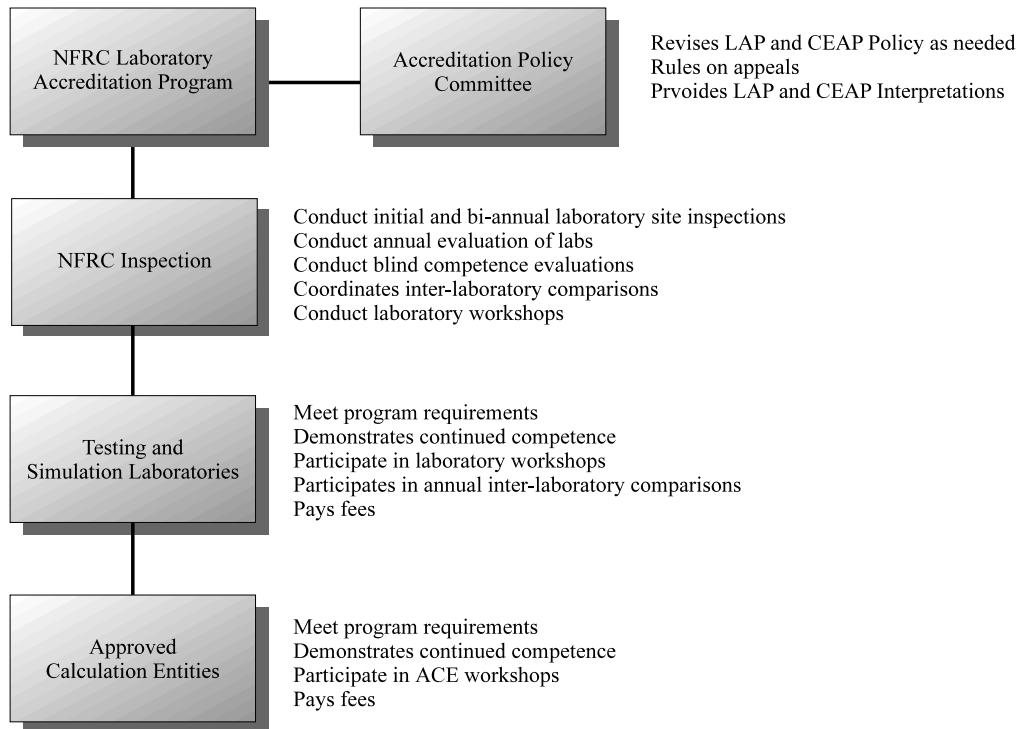
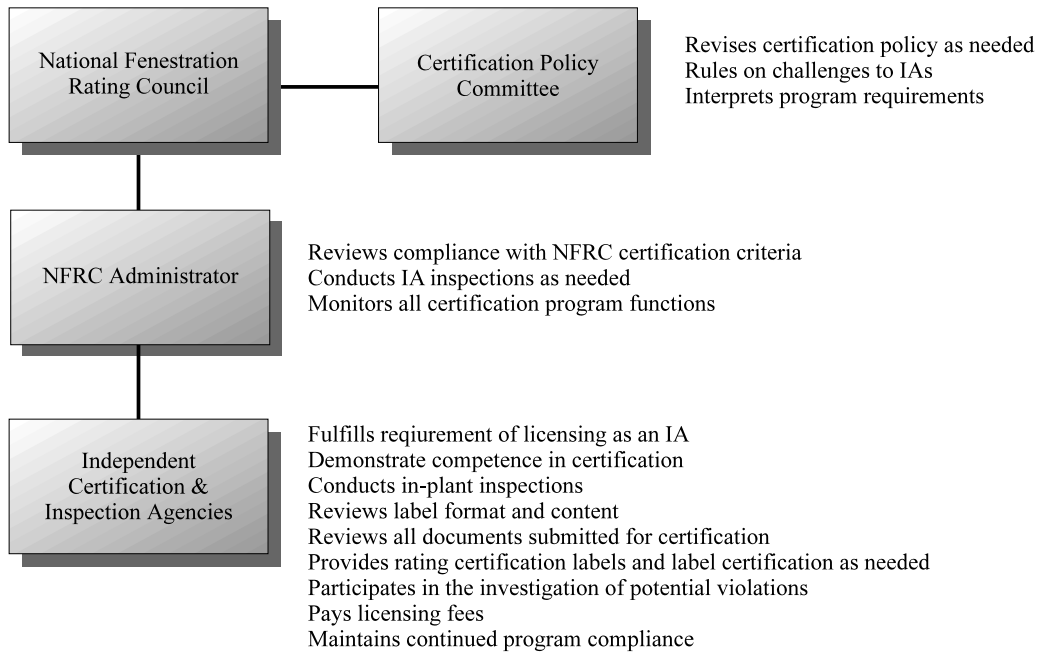


Figure 3



Questions on the use of this procedure should be addressed to:

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DISCLAIMER

NFRC certification is the authorized act of a Manufacturer/Responsible Party in: (a) labeling a fenestration or related attachment product with an NFRC Permanent Label and NFRC Temporary Label, or (b) generating a site built or CMA label certificate, either of which bears one or more energy performance ratings reported by NFRC-accredited simulation and testing laboratories and authorized for certification by an NFRC-licensed IA. Each of these participants acts independently to report, authorize certification, and certify the energy-related ratings of fenestration and related attachment products.

NFRC does not certify a product and certification does not constitute a warranty of NFRC regarding any characteristic of a fenestration or fenestration-related attachment product. Certification is not an endorsement of or recommendation for any product or product line or any attribute of a product or product line. NFRC is not a merchant in the business of selling fenestration products or fenestration-related products, and therefore cannot warrant products as to their merchantability or fitness for a particular use.

NFRC THEREFORE DISCLAIMS ANY AND ALL LIABILITY THAT MAY ARISE FROM OR IN CONNECTION WITH SERVICES PROVIDED BY, DECISIONS MADE BY OR REPORTS OR CERTIFICATIONS ISSUED OR GRANTED BY ANY NFRC-ACCREDITED LABORATORY, NFRC-LICENSED IA OR ANY PRODUCT MANUFACTURER/ RESPONSIBLE PARTY; RELIANCE ON ANY NFRC PRODUCT DESCRIPTION, SPECIFICATION, RATING, TEST OR CERTIFICATION, WHETHER APPEARING IN A REPORT, A PRODUCT CERTIFICATION AUTHORIZATION OR A PRINTED OR ELECTRONIC DIRECTORY, OR ON A LABEL, OR ON A LABEL CERTIFICATE; OR THE SALE OR USE OF ANY NFRC-RATED OR CERTIFIED PRODUCT OR PRODUCT LINE; INCLUDING BUT NOT LIMITED TO DAMAGES FOR PERSONAL OR OTHER INJURY, LOST PROFITS, LOST SAVINGS OR OTHER CONSEQUENTIAL OR INCIDENTAL DAMAGES.

NFRC program participants are required to indemnify NFRC from and against such liability.



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1. IVP LABORATORY GUIDELINES

This document provides a guideline to the NFRC accredited laboratories to assist them during the Independent Verification Program (IVP) testing process. The responsibilities and expectations of the laboratory and verification testing procedures are outlined in the document below along with an IVP report reference.

It is important for NFRC and the laboratory to keep the lines of communication open and providing information is essential to make sure that all entities participating in the verification test can meet their roles as part of the IVP.

1.1 Initial Contact from NFRC

Upon receipt of an order confirmation, staff will contact the laboratory and provide the following information:

- A. A description of the product to include the following:
 - i. CPD Number;
 - ii. Product type
 - iii. Product line
 - iv. Number of panes
 - v. Spacer Type
 - vi. Pane Thickness
 - vii. Low-E locations
 - viii. Gap Width.
- B. The products expected ship and arrival date.
- C. IVP Study #

Within two (2) business days, the laboratory will provide an expected test date for the product.

NOTE: If there are any unexpected delays with the production or shipping of the product, staff will notify the laboratory immediately.

1.2 Receipt of Verification Test Product

- A. Upon receipt of IVP test specimen the laboratory shall contact staff within two (2) business days of receipt and determine if the product is in testable condition by checking the following:
 - i. No observed damage to the product. If damage is found, provide photographs and description of damage to staff for review.
 - ii. The correct individual product option was manufactured and meets the criteria listed in Section 1.1.A with the following exceptions:

- (a) The laboratory will provide their educated assessment of the spacer type.
 - (b) The laboratory will provide their best estimation of the gap width
 - (c) The laboratory will provide their best estimation for the pane thickness.
 - (d) NOTE: When measuring for gap width and pane thickness, ensure the measurement is taken at the edge of glass.
- iii. The NFRC temporary label and ENERGY STAR label are applied
- B. If product is found unacceptable for testing;
 - i. Staff will contact the manufacturer representative to order the new product within five (5) business days.
 - ii. Staff will provide the laboratory details per Section 1.1.A. of the new product.
- C. If product is acceptable for testing, the laboratory shall provide staff with a scheduled test date within two (2) business days.

1.3 Verification Testing

The following is the process to perform a verification test:

- A. Laboratories are not allowed to modify products upon arrival.
- B. Products are required to be placed in ambient room conditions for a minimum of 48 hours prior to testing. After the 48 hour period, obtain the glazing deflection of any insulating glass units (IGUs).
- C. Glazing deflection shall be measured at the edge-of-glass and center-of-glass. The center-of-glass shall not automatically be measured at the centerline point of the vision area. Whatever device is used to measure the glazing deflection, it is required to traverse the device along the glass surface until the greatest deflection is observed. All sash and/or fixed vision areas shall be measured (e.g. single-hung's upper fixed lite and lower sash glazing areas). Record this value in the IVP Testing Report form.
- D. When a product with any type of nail flange, stucco-fins, brickmoulding, etc. is selected for verification, the lab is required to contact staff to determine if any of the appendages are to be removed.
 - i. Upon approval from NFRC staff:
 - (a) If the designated laboratory is the original simulation laboratory, the laboratory shall verify the presence of nail flange, stucco-fins, brickmoulding, etc. in the original simulation drawings.

- (b) If the designate laboratory is not the original simulation laboratory, the laboratory shall contact staff to acquire verification of presence of nail flange, stucco-fins, brickmoulding, etc. in the original simulation drawings.
- E. Prior to conducting the NFRC 102 test, it is required to attach a minimum of one thermocouple to each of the interior glazing surfaces of the sash and/or vision area to measure the interior glass temperature. This temperature will be used to compare to the simulated results of the same fenestration product, so it is critical that the thermocouple is securely attached. The thermocouple shall not be located at the exact centerline of the vision area for that may be deflected enough to skew the results. Therefore, the thermocouple will be attached half-way between the edge (including divider edge) and center-of glass, and a minimum distance of 5 inches or 127mm from the glass edge.
- F. Conduct physical tests of whole product test specimens in accordance with NFRC 102.
- G. Check glazing deflection during the test before complete shut-down. It is understood that many chambers cannot be entered during the test so the deflection measurement shall occur immediately (within 5 minutes) after shut-down and recorded. See Section A1.1.E for obtaining glazing deflection results.
- H. Testing shall be conducted within thirty (30) business days upon receipt of tests specimen.
- I. The report form shall be submitted to NFRC staff within five (5) business days of the thermal evaluation.
- J. Only after approval by staff, the laboratory shall conduct Component Evaluation (CE) of a thermal test specimen. It is required the specimen is analyzed in accordance with Section 3.2.2 of NFRC 713 and report results in NFRC IVP Testing Report Form.
- K. The CE report form shall be submitted to staff within five (5) business days of component evaluation.
 - i. If the verification testing laboratory is also the original simulation laboratory, original simulation drawings may be used to conduct the component evaluation.
 - ii. If the laboratory is not the original simulation laboratory, original simulation drawings to be used for the component evaluation may be obtained by contacting staff.
- L. The laboratory shall participate in the investigation of potential violations (prohibited activities) as set forth in the NFRC Compliance and Monitoring Program (NFRC 707).

1.4 NFRC IVP Thermal Test Report

The testing report form shall be used by all laboratories as part of the IVP process. A full report per NFRC 701.04 is not required. A sample illustration

of the IVP Testing Report is shown in Figure 1 and every cell shall be filled in with a response/result, unless not applicable for the test specimen received. Most of the requested information is self-explanatory but the list below states some of the items that may prompt clarifications:

- A. IVP Order # will be provided by the NFRC. Do not submit form without this number unless pre-approved by NFRC Staff.
- B. NFRC CPD # can be located on NFRC temporary label. If no label is present, it is required to notify staff immediately;
- C. Indicate on form if test specimen is in testable condition (Section 1.2.). If not, notify staff immediately and enter comments on the form why the test specimen cannot be tested;
- D. Indicate on the form if test specimen included a nail flange or other appendage:
 - i. Other appendages that may need to be removed to match the simulated product line may include, but not limited to: stucco bars, J-channels, brickmoulding, screen tracks, decorate pieces, etc.
 - ii. If any of the above does come with the test specimen, it is required that staff is contacted before proceeding with removal of the appendage.
- E. The product type, frame type, and sash type shall be reported using the NFRC CPD Code Listing.
- F. The IG Profile is the measurement of the glazing deflection. This deflection measurement is not required for non-insulating glass units (e.g. storm window to prime window gap). Glazing deflection shall be measured at its greatest deflection and shall be performed as noted in Section 1.3.C.
- G. Average center-of-glass (COG) temperature is required to help with troubleshooting verification failures. Any test conducted without this measurement will require the laboratory to re-test the specimen. Location of the thermocouple(s) to obtain the COG temperature shall be determined by adhering per Section 1.3.E.
- H. IG Gap Gas Fill shall be attempted to be obtained to record a percentage of gas concentration. The value is not required on the IVP Testing Report form but shall be recorded in each laboratory's records.
 - i. Gap fill contents can be determined using:
 - (a) ASTM E2649-09 - Standard Test Method for Determining Argon Concentration in Sealed Insulating Glass Units Using Spark Emission Spectroscopy;
 - (b) ASTM E2269 - Standard Test Method for Determining Argon Concentration in Sealed Insulating Glass Units using Gas Chromatography; or
 - ii. Other approved equivalent methodology.

1.5 IVP Component Evaluation Report

Once staff has indicated the laboratory may proceed with destruction of the test specimen, then and only then can the next steps be conducted.

- A. The component evaluation of the framing and glazing shall proceed by cutting the appropriate number of corner samples from the test specimen. Based on operator type, the number of corner samples can be ascertained by reviewing section 3.2.2 of NFRC 713. The corner samples shall be carefully cut so as not to lose the reinforcement material and its orientation. If a cross-sectional cut includes loose reinforcement, a recommended method to retain its position is to tape over the exposed section or photograph it.
- B. The spacer system shall not be reported using the NFRC CPD Code Listing. The reporting of the spacer is to be recorded on the IVP Reporting form under "Verify Spacer System." The following shall be indicated:
 - i. Orientation (i.e., to ensure spacer was not placed upside down) and for any significant offset from bottom of glazing.
 - ii. Material types of the spacer (excluding sealants) shall be reported, such as, but not limited to, plastic, foam, stainless steel, mild steel, and aluminum.

NOTE: Ascertaining if a metal spacer is aluminum or steel, steel will attract a magnet. Since stainless steel and aluminum are both non-magnetic, a grinding wheel can be used to determine that the spacer is aluminum spacer for it will not spark when carefully applied to the wheel. Use appropriate eye safety protection!
 - iii. Presence of desiccant shall be reported.
 - iv. Sealants configuration shall be reported, whether single or dual.
- C. IG gap thickness and pane thickness shall be determined after the product has been de-constructed for the component evaluation.
- D. When reviewing the corner samples against the drawing package for the frame verification, it is required to conduct the following:
- E. The product samples shall be verified in the following manner:
 - i. The base profile(s) of the product sample extrusion must match the extrusion drawing. (i.e. internal air cavities, structural components, reinforcement, internal legs, etc. are the same)
 - ii. The overall dimensions (width and height) of the sample profile(s) should be checked to the physical dimensions stated on the profile drawings. In addition, other dimensions deemed critical should also be checked. Dimensional tolerances stated on the drawings should be used to indicate compliance.

- iii. Where possible, the bill of materials will be checked against the product tested to be certain that the type of material indicated on the drawings is the same type of material being used on the test specimen.
 - iv. Any thermal break should be checked and verified for the effective distance (debridged width or effective width) between the inboard and outboard sides of the component containing the thermal break.
 - v. If the test product drawing(s) do not verify that the product tested is the same as indicated on the drawings, the test laboratory shall indicate this on the IVP Testing Report form by listing the profile name, drawing or part numbers, and enter comments on what was observed to be the apparent differences from the drawings.
 - vi. Photograph all profiles and provide to NFRC Staff.
- F. The IVP Testing Report form shall be signed and dated by an APC approved signatory identified as the Individual-in-Responsible-Charge (IRC).

2. IVP LABORATORY THERMAL REPORT FORM



NFRC IVP Verification Testing Report

Laboratory:	ABC Thermal Labs	Technician:	George Technician		
Address:	123 Window Test Lane	City:	Baltimore	State:	MD
Country:	US	Zip Code:	55555		

Test Specimen Information

Date Received:	March XX, 2013	Date Tested:	March XX, 2013
IVP Tracking #:	XXXXXX	NFRC CPD #:	X-XX-XXXX
Did the test specimen arrive in acceptable testing condition?	Yes	X	No

Note: Test specimen is required to be placed in ambient room conditions for a minimum of 48 hours prior to testing.

Comments:

Did the test specimen with NFRC temporary label?	Yes	X	No
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Note: If test specimen arrives with no label, contact NFRC staff for further direction.

Comments:

Does the test specimen have a nail flange? If so, contact NFRC before removal.

Nail flange was removed per NFRC direction (Select One):	Yes	X	No	N/A
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Test Specimen Size: 1200mm x 1500mm

Product Type: Fixed
Frame/Sash Type: VY

Thermal Verification Test

IG Profile (prior to testing)	Sash 1	Sash 2
Edge Gap Width:	0.53"	NA
Center Gap Width:	0.52"	NA
Gap Difference:	0.01"	NA
IG Profile (post testing)	Sash 1	Sash 2
Edge Gap Width:	0.51"	NA
Center Gap Width:	0.44"	NA
Gap Difference:	0.07"	NA

Avg. COG Interior Surface Temperature: 53.1 F

Standardized U-factor, Us: 0.30 Labeled U-factor: 0.29

Tested U-factor, Ust: 0.31

Glazing Components

Component	Measurement	Method for Determination	Comments
<i>Sash / Vent 1</i>			
Overall IG	0.75"	Glass Check XXXX	
Dimensions	na		no sash - fixed lite
Daylight Opening	42.25" x 51"		
Low-E Locations (Surfaces)	#2	Glass Check XXXX	
Pane Thicknesses	3.1 mm	caliper	
Gap Thicknesses	0.52"	caliper	
Spacer System	same as gap		
<i>Sash / Vent 2</i>			
Overall IG	na		
Dimensions	na		
Daylight Opening	na		
Low-E Locations (Surfaces)	na		
Pane Thicknesses	na		
Gap Thicknesses	na		
Spacer System	na		

3. IVP COMPONENT EVALUATION REPORT FORM

Component Evaluation		
Date of Frame Verification:	March xx, 2013	
Frame Verification (list profiles that are only outside of tolerance)		
Profile Name	Drawing #	Comments
sill frame	XXX-XX	one web wall thickness was measured at 0.063" but drawing listed the wall as 0.040".
Submit drawings marked outside of tolerance to NFRC along with report.		
Verify Spacer System:	Orientation true. Material of spacer was mill-finish aluminum and was dual-sealed. Desiccant present (bead form).	
Comments:		
Additional Instructions:	Include photos of all temporary and permanent NFRC labels, ENERGY STAR® labels, and unique markings on the test specimen in the submitted report to NFRC staff. Cut-up should occur only after NFRC staff approval. After cut-up, include photos of each unique cross section on an additional page. Note: Be careful not to dislodge reinforcements. Replace if necessary. Be mindful of correct orientation during placement.	
By checking this box, we hereby confirm that all profiles of the product have been verified from the details provided by NFRC.		

Signature (IRC)

Date