



National Fenestration Rating Council Incorporated

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FenStar Verification Testing Procedure Laboratory Guidelines

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FOREWORD

The FenStar™ Certification Program is the formal name of the Environmental Protection Agency (EPA)-recognized certification program that performs third-party conformity assessment activities for window, door and skylight products. Products are submitted for ENERGY STAR® certification after ratings have been certified by the NFRC Product Certification Program (PCP). Window, door and skylight products that are evaluated to meet ENERGY STAR requirements are officially certified as ENERGY STAR by the FenStar Certification Program.

The FenStar Certification Program is operated by the National Fenestration Rating Council Incorporated (NFRC). NFRC developed and operates a uniform rating system for energy and energy-related performance of windows, doors, and skylights. The FenStar Certification Program is available only to active licensees in the NFRC Product Certification Program (PCP).

Through the FenStar Certification Program, manufacturers shall demonstrate their products meet all applicable ENERGY STAR performance parameters prior to being labeled as ENERGY STAR certified. Further, the partner shall demonstrate, through verification testing, the product continues to meet the ENERGY STAR requirements to maintain its ENERGY STAR certification through The FenStar Certification Program.

If there are changes that affect the performance of the product with respect to the relevant ENERGY STAR program requirements, the partner shall report these changes to The FenStar Operations Staff.

Manufacturers authorize the FenStar Operations Staff to share the results of any relevant testing or product review with the EPA.

NFRC, specifically the FenStar Certification Program, is a certification body operating to the ISO/IEC 17065 standard.

The following referenced documents are indispensable for the application of The FenStar Certification Program. The latest edition of the referenced document (including any amendments) applies. These are not auditable standards and are used solely for guidance.

- [NFRC 700-2017: Product Certification Program](#). National Fenestration Rating Council: Greenbelt, MD; 2017. www.nfrc.org

- [ANSI/NFRC 100-2017: Procedure for Determining Fenestration Product U-factors.](#) National Fenestration Rating Council: Greenbelt, MD; 2017. www.nfrc.org
- [NFRC 102-2017: Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems.](#) National Fenestration Rating Council: Greenbelt, MD; 2017. www.nfrc.org
- [ANSI/NFRC 200-2017: Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.](#) National Fenestration Rating Council: Greenbelt, MD; 2017. www.nfrc.org
- [ANSI/NFRC 400-2017: Procedure for Determining Fenestration Product Air Leakage.](#) National Fenestration Rating Council: Greenbelt, MD; 2017. www.nfrc.org
- ASTM E283 – 04(2012): Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen. ASTM International, West Conshohocken, PA, 2006, DOI: 10.1520/E0283-04R12.
- ENERGY STAR Directives:
https://www.energystar.gov/index.cfm?c=third_party_certification.tpc_directives

To participate in the Certification Programs, 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, Solar Heat Gain Coefficient (SHGC), Visible Transmittance (VT), Air Leakage (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, 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 FenStar Certification Program evaluates products against the ENERGY STAR certification program requirements.

The FenStar Certification Program maintains a FenStar Program Certified Products Directory (FCPD), listing product lines and individual products selected by the Manufacturer/Responsible Party for which ENERGY STAR certification authorization has been granted.

NFRC owns all rights in and to all documents and procedures, which are a component of the FenStar Certification Program, as well as each of its registration marks, trade names, and other intellectual property.

For additional information on the roles of those entities associated with the NFRC PCP (IAs and laboratories, and operation of the IA Program and Accreditation Program), see the NFRC 700: Product Certification Program, NFRC 701: Laboratory Accreditation Program (LAP), and NFRC 702: Certification Agency Program (CAP) documents.

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DISCLAIMER

The use of the FenStar™ Certification Program as a Certification Body does not constitute a warranty by the NFRC or the FenStar Certification Program regarding the energy performance properties of windows, doors, and skylights. The rating indices are not an endorsement of, or recommendation for, any windows, doors, or skylights. The FenStar Certification Program is not a merchant in the business of selling windows, doors, or skylights, and therefore, cannot warrant products as to their merchantability or fitness for a particular use.

The FenStar Certification Program, therefore, disclaims any and all liability, including but not limited to, damages for personal or other injury, lost profits, lost savings or other consequential or incidental damages that may arise from or in connection with:

- A. services provided by, decisions made by, or reports issued or granted by any ENERGY STAR Partner;
- B. reliance on The FenStar Certification Program product description, specification, rating or test, whether appearing in a report, in a product Certificate of Authorization (CA) or a printed or electronic directory, or on a label; or
- C. the sale or use of The FenStar Certification Program certified windows, doors, or skylights.



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1. FENSTAR VERIFICATION TESTING PROCEDURE (FVTP) LABORATORY GUIDELINES

This document provides a guideline to the NFRC accredited laboratories to assist them during the FVTP testing process. The responsibilities and expectations of the laboratory and verification testing procedures are outlined in the document below.

It is important for FenStar Operations Staff (“staff”) 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 FVTP.

1.1 Initial Contact from FenStar

Staff shall contact the laboratory when an order confirmation is received from the manufacturer. Staff shall provide the laboratory with the following information:

- A. Name of product Manufacturer
- B. Anticipated date of the product’s arrival
- C. The CPD Number and manufacturer product name
- D. The product’s operator type
- E. If applicable, the simulation report number
- F. FVTP Tracking # (study number)

Within two (2) business days after initial contact from staff, the laboratory will provide a tentative test date for the product. Verification testing shall be scheduled per normal business practices.

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

1.2 Receipt of Verification Test Product

Upon receipt of FVTP test specimen the laboratory shall contact staff within two (2) business days of receipt and determine if the test product is undamaged and shall provide the following information:

- A. Pictures of visibly-observable damage to the product that would render it untestable.
- B. Product Type
- C. Product Line and full CPD number
- D. Number of lites
- E. Lite thicknesses
- F. Gap width(s)
- G. Gas fill (if applicable; include photo of reader)
- H. Low-e locations (Include photo of reader)

- I. Spacer type
- J. Confirm the NFRC temporary label, permanent label, and ENERGY STAR label are applied.
- K. Verify if the installation instructions are included with the product.
- L. The following information regarding the labels shall be provided to NFRC:
 - i. A clear, close-up photo of the NFRC temporary label, ENERGY STAR label, and additional certification body labels.
 - ii. A photo of the overall unit showing the labels as displayed on the product.
 - iii. A photo of the permanent label and description of the location.

1.2.1 Verification Testing Approved or Denied

Upon review of the check-in information provided by the test laboratory, FenStar Staff shall determine if the product is approved for testing.

1.2.2 Product is Not Acceptable for Testing

If staff determines the product is not acceptable for testing, the following shall occur.

- A. Staff will contact the manufacturer representative to gather more details.
- B. If the issue requires a new product according to the FS-1100 Section 7, the manufacturer representative shall confirm with staff the order date, manufacture date, ship date, and arrival date of the new product within five (5) business days.
- C. Staff will provide the laboratory with the details of the replacement product per Section 1.1.
- D. If a new product is not required, the manufacturer representative shall provide all relevant information to staff within five (5) business days

Examples of issues which do not require a new unit to be sent and the corresponding FVTP actions can be found in the FS-1100, Section 7.

NOTE: Test specimens that are received with signs of visibly-observable damage shall be photographed at the lab and submitted to staff for review.

1.2.3 Determines the Product is Acceptable for Testing

If FenStar staff determines the product is approved for testing staff shall communicate the approval to the laboratory. The laboratory shall provide staff with a confirmed scheduled test date within five (5) business days from the date of receiving the approval.

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. A single-hung's upper fixed lite and lower sash glazing areas). Record this value on the FVTP report form at the check-in, prior to the unit entering the thermal chamber, and as soon as possible after the thermal test is completed.
- D. The gas fill percentage of each unit, whether it is filled with gas or air, should also be taken prior to the unit entering the thermal chamber, and as soon as possible after the thermal test is completed and recorded on the FVTP report form.
- E. 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 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.
- F. 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 the lite may be deflected enough at that location to skew the results. Therefore, the thermocouple shall be attached half-way between the edge and center-of glass, and a minimum distance of 5 inches or 127mm from the glass edge.

- G. Conduct physical tests of whole product test specimens in accordance with NFRC 102.
- H. Check glazing deflection during the test before complete chamber 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.
- I. When applicable, verify the gas fill content during the test before complete shut-down.
- J. Thermal testing shall be conducted no later than fifteen (15) business days after the scheduled test date. The lab shall notify staff when the scheduled test date cannot be met.
- K. After completion of the thermal test, the following in the FVTP report form shall be completed and submitted to staff within five (5) business days:
 - i. Check-In: Test Specimen Information Section
 - ii. Check-In: Measurements Section
 - iii. Thermal Verification Test Section
 - iv. For products that fail to validate per section 4.2 of FS-1100, the “Unsuccessful Validation” tab which shall include the appropriate photographs.
- L. The results of the thermal test will dictate the next steps in testing:
 - i. If the thermal test results are within tolerances per Section 4.2 of FS-1100, the laboratory shall notify staff and proceed with the Component Evaluation (CE).
 - ii. If the thermal test results are not within tolerances per Section 4.2 of FS-1100, the laboratory notify staff of the failure to validate ENERGY STAR, and await further instruction.
- M. If verification testing U-factor results are outside of the established tolerances, staff will notify the licensee and EPA of the potentially unsuccessful test. The laboratory will await instruction from staff regarding coordination of the licensee inspection of the intact unit if requested. The licensee shall follow the process in FS-1100, Section 4.4.1 *Potential Unsuccessful Test* and will either inspect the intact unit or continue with verification testing. Any inspection shall be conducted under laboratory supervision.
- N. After completion of the CE in accordance with Section 3.2.2 of FS-1100, the following in the FVTP report form shall be completed and submitted to staff within five (5) business days:
 - i. Section 1.3.J
 - ii. Component Evaluation Section
 - iii. “Pictures” tab
 - iv. If applicable, “Profiles out of Tolerance” tab

- v. If applicable, the “Licensee Inspection” tab.
- O. The laboratory shall participate in the investigation of potential violations / prohibited activities upon request.

1.4 FVTP Report Form Thermal Verification Test Section

The FVTP report form shall be used by all laboratories as part of the FVTP process. A full report per NFRC 701.04 is not required. Every cell of FVTP report form 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. FVTP Study # will be provided by staff. Do not submit report form without this study number unless pre-approved by staff.
- B. NFRC CPD # can be located on NFRC temporary label. If no label is present, it is required that staff is notified immediately as per Section 1.2;
- C. Indicate on the report form if test specimen is testable. If not, notify staff immediately and enter comments on the report form in the Check-In: Test Specimen Information Section describing why the test specimen cannot be tested;
- D. Does the test specimen have a nail flange?
 - i. Note that some units may also come with other appendages that may need to be removed to match the simulated product line. These other types 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 Fill shall be attempted to be obtained to record a percentage of gas concentration. In the event the laboratory is not able to determine gap fill, due to test method or equipment limitations, the reason for omission must be reported.

- 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 FVTP Report Form Component Evaluation Section

If the verification testing laboratory is also the original simulation laboratory, original simulation drawings may be used to conduct the CE Section. If the laboratory is not the original simulation laboratory, original simulation drawings to be used for the component evaluation will be provided by staff.

The Component Evaluation shall be conducted in the following manner:

- 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 FS-1100. 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 be reported using the NFRC CPD Code Listing under "Verify Spacer System" on the FVTP report form. 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:

- 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 (de-bridged 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 FVTP 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 staff.
- E. The FVTP report form shall be signed and dated by an APC approved signatory identified as the Individual-in-Responsible-Charge (IRC).