



# National Fenestration Rating Council Incorporated

NFRC 701.09-2012<sub>[E0A0]</sub>

NFRC Testing Laboratory Accreditation Requirements

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## ***FOREWORD***

The National Fenestration Rating Council, Incorporated (NFRC) develops and operates a uniform rating system for energy and energy-related performance of fenestration and fenestration attachment 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, and 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 and fenestration attachment 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 and fenestration attachment 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 programs (Certification Programs) 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)

and through the Certification Programs 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 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, 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 that has been licensed by NFRC in accordance with the requirements of the NFRC 702. NFRC-licensed IAs 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) and may 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).

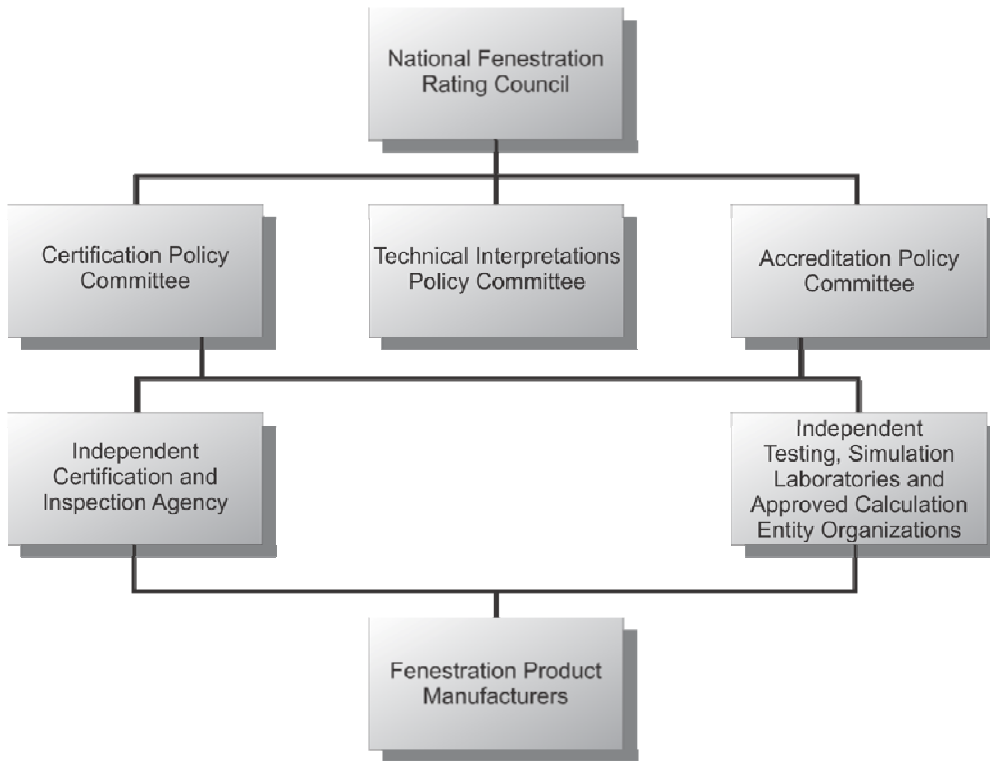
Products that are labeled with the NFRC Temporary and Permanent Label, or products that are listed on an NFRC Label Certificate in accordance with NFRC requirements, are considered to be NFRC-certified. NFRC maintains a Certified Products Directory (CPD), listing product lines and individual products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

NFRC manages the Rating System and regulates the PCP, LAP, and 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.

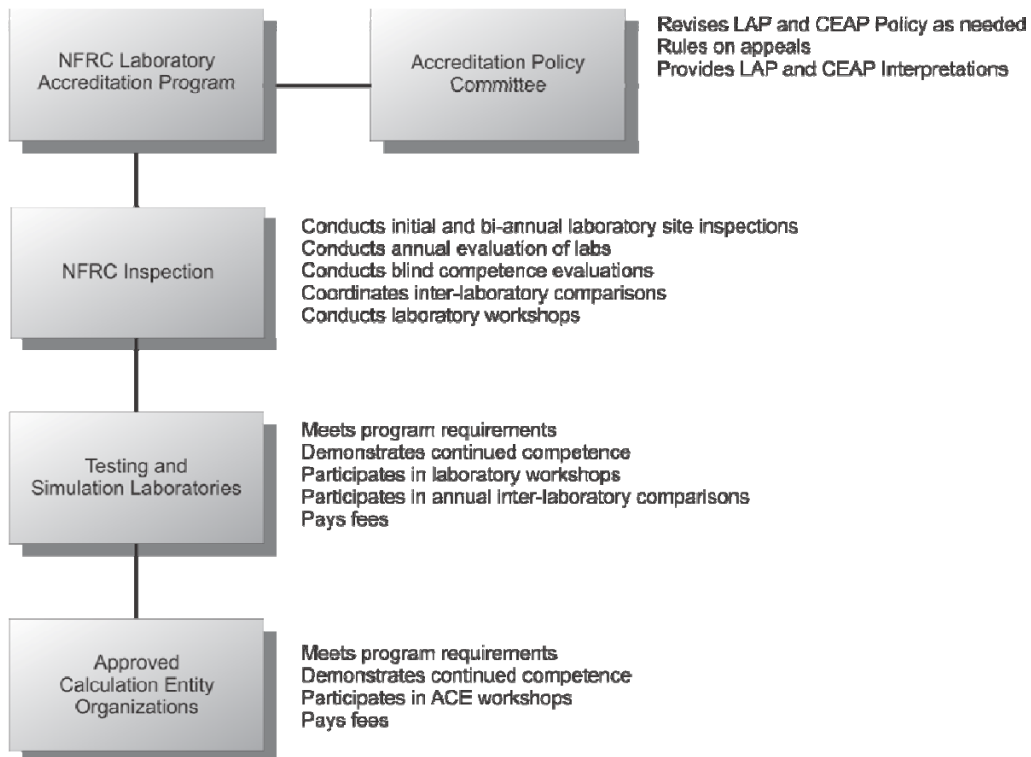
NFRC owns all rights in and to each of the NFRC 700, NFRC 701, NFRC 702, NFRC 705, NFRC 707, NFRC 708 and each procedure, which is a component of the Rating System, as well as each of its registration marks, trade names, and other intellectual property.

The structure of the NFRC programs 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.

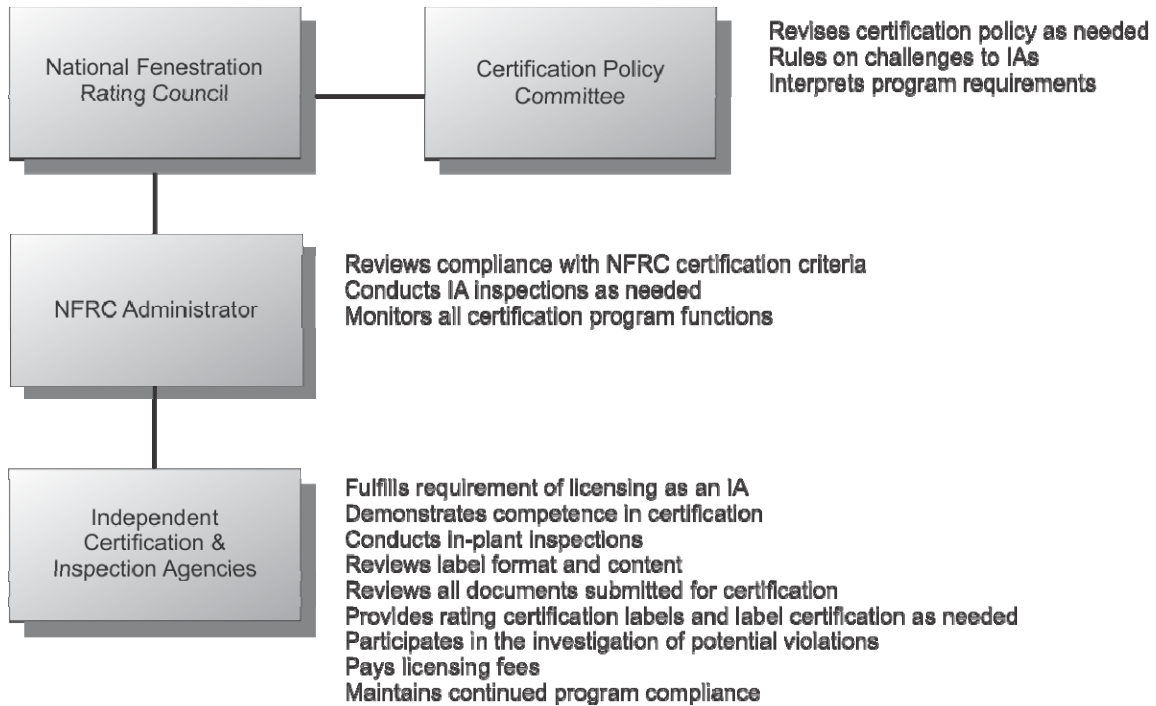
**Figure 1**



**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-related 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.

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



## Table of Contents

<b>Forward</b>		<b>ii</b>
<b>Disclaimer</b>		<b>vi</b>
<b>1. Initial Review for Testing Laboratory Accreditation</b>		<b>1</b>
1.1	SCOPE	1
1.2	APPLICATION FOR ACCREDITATION	1
1.3	ACCREDITATION EVALUATION	1
1.3.1	General Requirements	1
1.3.2	Pre-Inspection	2
1.3.3	Inspection	2
1.3.4	Post-Inspection	3
1.4	TECHNICAL EVALUATION	4
1.5	TESTING LABORATORY EQUIPMENT AND OPERATIONS MANUAL REQUIREMENTS	4
1.5.1	Minimum Equipment Requirements	4
1.5.2	NFRC 102, NFRC 201, and NFRC 500 Testing Equipment and Operations Manual Requirements	4 4
	Minimum Calibration Requirements	6
1.5.3	NFRC 400 Testing Laboratory Equipment and Operations Manual Requirements	6 6 6
	Minimum Calibration Requirements	7
1.5.4	Air Leakage testing at a Manufacturing Facility	7
1.5.5	Adequacy	8
1.6	TESTING LABORATORY QUALITY CONTROL PROGRAM AND QUALITY MANUAL REQUIREMENTS	8 8
1.6.1	Adequacy	8
1.7	TESTING LABORATORY RECORD KEEPING REQUIREMENTS	8
1.7.1	Maintaining of Records	8
1.7.2	Processing of Specimens	9
1.7.3	Adequacy	10

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# 1. INITIAL REVIEW FOR TESTING LABORATORY ACCREDITATION

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## 1.1 Scope

A testing laboratory seeking initial NFRC accreditation shall be evaluated by the NFRC Inspector in accordance with the following:

## 1.2 Application for Accreditation

Those seeking NFRC accreditation to provide testing services as described in NFRC 102: Procedure for Determining Fenestration Product Thermal Properties (Currently Limited to U-Factors) and/or NFRC 500: Procedure for Determining Fenestration Product Condensation Resistance Rating and/or NFRC 400: Procedure for Determining Fenestration Product Air Leakage and/or or NFRC 201: Interim Standard Test Method for Measuring the Solar Heat Gain Coefficient of Fenestration Systems using Calorimetry Hot Box Method and shall complete the Testing Application NFRC 701.02.

## 1.3 Accreditation Evaluation

Upon receipt by NFRC of an initial application and required application fees from a laboratory desiring accreditation to NFRC 102, NFRC 201, and NFRC 400 and any other of the Rating Procedures for which a testing laboratory wishes to issue test reports for use in connection with the Certification Program a laboratory accreditation competence evaluation and initial on-site visit shall be scheduled and conducted by the NFRC Inspector. An examination and verification of compliance with, or the ability to meet, the following requirements:

### 1.3.1 General Requirements

- A. All NFRC Accredited Laboratories shall be licensed by NFRC
- B. All NFRC Accredited Testing Laboratories shall meet the independence requirements in Section 3.1 of the NFRC 701.
- C. All NFRC Accredited Testing Laboratories shall meet the competency requirements in Section 3.2 of the NFRC 701.
- D. The person(s) designated in the application as the proposed individual(s)-in-responsible charge shall meet the requirements in Section 3.2 of the NFRC 701.
- E. All NFRC-licensed Testing Laboratories shall be required to demonstrate their competence in understanding the NFRC-approved thermal performance procedures for which they provide ratings, as they may be amended or interpreted or otherwise modified from time to time. This also applies to new thermal performance procedures as they become approved by NFRC (See Section 3, Section 4, Section 5 and Section 6 of NFRC 701).
- F. Test equipment adequacy (Section 1.5)
- G. Laboratory quality control system (Section 1.6)

- H. Laboratory record keeping system (Section 1.7)
- I. Ability to produce reports consistent with the appropriate LAP language, NFRC document, and / or supplemental documents
- J. On-Site Inspection
  - i. On-Site inspection of NFRC simulation laboratories is a component of the NFRC Laboratory Accreditation Program and is mandatory for the initial assessment. The activities associated with the inspections are intended to assist the testing laboratory in making the necessary inspection preparations are listed in Section 1.3.2, Section 1.3.3, and Section 1.3.4.

### **1.3.2 Pre-Inspection**

NFRC will contact you to:

- A. Arrange appropriate dates and times for the pre-accreditation inspection
- B. Identify the inspector(s)
- C. Identify the specific product to be performed per Section 1.4
- D. Provide specific information that will be evaluated in the form of a testing laboratory checklist

NFRC may require access to the following types of information:

- A. Facility and equipment used to perform test
- B. Organization of Laboratory Operation
- C. Personnel
- D. Testing records and record keeping system
- E. Quality Control Manual
- F. Testing Operations Manual
- G. Laboratory Independence

### **1.3.3 Inspection**

On the day of the inspection, several activities are scheduled.

Entrance Briefing – The inspection team will hold a brief preliminary meeting with the senior staff covering:

- A. NFRC Laboratory Accreditation Program Requirements
- B. Objectives of the on-site inspection;
- C. The accredited services to be demonstrated
- D. Agenda of the inspection

Personnel – Employees involved in NFRC-accredited services must be identified and available for interviews with the NFRC Inspector. At least one Individual-in-Responsible-Charge, who is considered

appropriate laboratory staff, shall be present and available at the time of the inspection.

Facilities and Equipment – A Testing Laboratory staff representative will be asked to conduct the inspection team on a brief tour of the facilities identifying all equipment, record keeping associated with NFRC-accredited services and key personnel.

Inspection – The following points will be assessed in the inspection:

- A. Independence of the laboratory
- B. Competence of personnel
- C. Adequacy of facilities and equipment
- D. Adequacy of operating and quality control procedures
- E. Adequacy of records and record keeping
- F. Ability to perform the accredited services

Inspectors may offer advice and make suggestions on the operations. All mandatory actions will be presented as such at the exit briefing.

NFRC Inspectors will discuss any administrative, managerial and/or financial matters with appropriate laboratory management.

In Camera Meeting – The inspection team will meet together to consolidate their findings for presentation to the appropriate laboratory staff.

Exit Briefing – The findings of the inspection team will be presented to the appropriate laboratory staff. The following points will be covered:

- A. NFRC Inspector will provide all mandatory action items before accreditation or re-accreditation in writing.
  - i. Mandatory (required) action items may be added or removed by the Accreditation Policy Committee (APC) during their review of the NFRC Inspector's assessment report.
- B. Recommended action items
- C. Suggestions for improvement of laboratory operations

#### **1.3.4 Post-Inspection**

Reference Section 5.5.2 of NFRC 701 – All Laboratories (Initial Review) Inspection Report

- A. Compliance within the criteria of the LAP and all mandatory action items may result in a recommendation by the NFRC Inspector that the laboratory be accredited or reaccredited. Refer to Section 5.6 of NFRC 701 for granting accreditation and Section 5.7 of NFRC 701 for Denial of Accreditation.

## **1.4 Technical Evaluation**

Technical evaluation of NFRC testing laboratories is a component of the NFRC Laboratory Accreditation Program. The following activities associated with this evaluation are intended to assist the testing laboratory in submitting the necessary information to NFRC.

- A. Arrange to have the testing laboratory submit the appropriate data files, drawings, reports, and other information necessary to perform the technical evaluation.
- B. The staff competence and equipment evaluation for testing laboratories requires that the applicant conduct at least one test to each standard for which the laboratory is accredited or for which accreditation is sought (NFRC 102, NFRC 201, NFRC 400, or NFRC 500) during the inspection of a fenestration product or specimen selected by the NFRC Inspector. See NFRC 701, section 6.2.4.C for in-house testing requirements.

## **1.5 Testing Laboratory Equipment and Operations Manual Requirements**

### **1.5.1 Minimum Equipment Requirements**

Each NFRC-accredited testing laboratory shall maintain such equipment as is necessary to complete testing according to NFRC 102, NFRC 201, or NFRC 400. Equipment used for determining NFRC fenestration performance ratings shall be of a quality necessary to meet the accuracy, precision and calibration requirements set forth in the respective NFRC Procedures NFRC 102, NFRC 201, or NFRC 400. NFRC shall conduct such inspections as may be necessary in order to ensure that the testing laboratory equipment shall meet these requirements. NFRC shall be notified not later than 30 calendar days after any changes in equipment used by the laboratory to perform NFRC-accredited services.

### **1.5.2 NFRC 102, NFRC 201, and NFRC 500**

#### **Testing Equipment and Operations Manual Requirements**

- A. Each testing laboratory shall have a testing operation manual (as applicable) which shall describe the test equipment and provide instructions for operating the equipment and performing tests in accordance with the NFRC 102 NFRC 201, and NFRC 500.
- B. The testing operations manual shall include the following equipment information for U-factor, Condensation Resistance and Solar Heat Gain Coefficient testing:
- C. Schematic of test apparatus design and operation
- D. Size and configuration of metering box(es), guard box(es), cold box(es) and hot box(es)
- E. Details of specific construction--walls, floors and ceilings, including all insulation materials and framing materials

- F. Listing of related equipment such as heaters, baffles, infrared radiation shields, air circulating fans, temperature control point(s), surface and air temperature measurement locations, temperature averaging areas and temperature measurement devices and techniques
- G. Details of surround panel construction, including materials used, thickness, calibration records indicating the tested thermal conductivity and the surround panel heat loss calculations procedure
- H. Type of dynamic wind generator (vane axial, belt driven), baffles, diffusers and air flow diagrams
- I. Description of wind velocity measurement system
- J. Description and capacity of the metering chamber heating system including electrical schematics
- K. Description and capacity of refrigeration system including schematics
- L. Description of power supply to control heaters (wattage type)
- M. Description of power measurement system (watt meter, power supply, or other)
- N. Description of temperature control sensors and equipment (individual point, parallel averaging, location and type)
- O. Details of pressure balancing system and pressure difference measurement equipment
- P. Details of relative humidity measurement and control equipment
- Q. Description of irradiance measurement system (SHGC only)
- R. Description of fluid flow measurement systems (SHGC only)
- S. The testing operations manual shall include, but not be limited to, the following operational information for U-factor, Condensation Resistance, and Solar Heat Gain Coefficient:
- T. Calibration procedures for the test apparatus and equipment used in the test apparatus
- U. Analysis procedures used to generate calibration results from raw data, including a documented example of the analysis of one calibration run. Include the calibration record from the thermal conductivity measurement of the CTS core.
- V. Specimen pre-conditioning requirements
- W. Specimen installation procedures
- X. Procedures for conducting fenestration product tests pursuant to the NFRC 102: (Thermal Testing) and/or NFRC 201: (SHGC Calorimeter Testing) and/or; NFRC 500: (Condensation Resistance)

- Y. Analysis procedures used to generate final test results from raw data, including documented example of the analysis performed of one test run using all standardization procedures
- Z. Procedures for determining thermal equilibrium (the time to reach and maintain steady-state) and test completion
- AA. Procedures for determining when recalibration is necessary
- BB. Calibration records for all equipment pertinent to fenestration product testing pursuant to the NFRC Test Procedure:
- CC. Procedures for conducting internal laboratory audits to ensure testing accuracy
- DD. A copy of an actual NFRC 102, NFRC 201, and/or NFRC 500 test report.

### **Minimum Calibration Requirements**

- EE. Each testing laboratory shall perform an annual calibration of its thermal test chamber or calorimetry hot box with the appropriately sized surround panel and Calibration Transfer Standard (CTS) as designated in the appropriate NFRC test procedure. The CTS's used for U-factor tests shall represent the range of sizes of fenestration products that will be tested in that thermal chamber or calorimetry hot box. One CTS panel test shall be conducted 6 months after each annual calibration. CTS panels for use with NFRC 201 shall comply with the requirements as stipulated in the NFRC 201 test procedure.
- FF. All instruments used for NFRC testing shall be calibrated annually, unless the manufacturer's specifications for the instrument require calibration at more frequent intervals. It is recommended that the instrument calibration be performed during the same time period as the annual calibration.
- GG. All instruments and materials used (where applicable) for NFRC testing shall have an individual record of calibration and calibration sticker. The calibration records shall identify the instrument model number, serial number, the method of calibration, the date and signature of the calibrator. In-house calibration shall be traceable to primary standards and be well documented.

### **1.5.3 NFRC 400**

#### **Testing Laboratory Equipment and Operations Manual Requirements**

Each testing laboratory shall have a testing operation manual (as applicable) which shall describe the test equipment and provide instructions for operating the equipment and performing tests in accordance with the NFRC 400.

- A. The testing operations manual shall include the following equipment information:

- B. Schematic of test apparatus design and operation
- C. Description of air leakage measurement equipment
- D. Details of the pressure measuring equipment
- E. Details of the equipment used to measure laboratory ambient temperature, and barometric pressure

#### **Minimum Calibration Requirements**

- F. Each air leakage-testing laboratory shall perform periodic checks of its air leakage testing equipment to ensure proper operation. A maximum period between checks of six months is required. Note, if more than six months passes between tests, the equipment shall be rechecked before each test.
- G. Each test apparatus, and if necessary, the individual components of the apparatus, used for NFRC air leakage testing per NFRC 400 shall undergo full calibration annually, unless the manufacturer specifies for the instrument, and/or component, requires calibration at more frequent intervals.
- H. All instruments used for NFRC air leakage testing shall have an individual record of calibration and calibration sticker. The calibration records shall identify the instrument model number, serial number, and the method of calibration, the date and signature of the calibrator. In-house calibration shall be traceable to primary standards and be well documented.
- I. All calibration measurements shall meet or exceed the requirements as stipulated in Section 9 of ASTM E 283. Calibration or other ASTM documents are referenced in ASTM E 283.
- J. For laboratories testing at a manufacturer's facility, the accredited laboratory shall confirm the calibration of the test facility prior to conducting air leakage tests for NFRC usage. The accredited laboratory shall be responsible for determining that the manufacturer's test facilities meet the accuracy requirements for NFRC air leakage laboratories.

#### **1.5.4 Air Leakage testing at a Manufacturing Facility**

Requirements for NFRC-accredited Laboratories conducting air leakage tests at a manufacturer's facilities.

- A. All tests shall be witnessed, in person, by the accredited laboratory's representative; and;
- B. The air leakage test report provided by the accredited laboratory shall include the same information for test equipment specification as for those conducted in the accredited laboratories' own facility.

### 1.5.5 Adequacy

The adequacy of a testing laboratory's equipment and operations manual shall be determined in connection the annual review (see Section 6.2 of NFRC 701).

## 1.6 Testing Laboratory Quality Control program and Quality Manual Requirements

Each accredited laboratory shall have and maintain an internal quality control program, which meets the criteria of this section. The program shall be set forth in either a stand-alone manual or the simulation operations manual. The manual may be electronic or hard-copy, or a combination of both.

Accessibility and organization of the manual shall be demonstrated upon laboratory inspection. The manual shall contain at a minimum the following:

The manual shall include, but not be limited to, the following:

- A. Copies of all current NFRC test methods, procedures, technical and LAP interpretations, user manuals, and instructions
- B. Methodology for ensuring accuracy, precision and consistency of such test methods and procedures
- C. Equipment calibration procedures, in the case of a testing laboratory
- D. Methods for ensuring personnel competence
- E. Procedures for correcting quality deficiencies

**[Note:** Any of the aforementioned items that have been documented in the operations manual need not be duplicated in the Quality Control Manual.]

The manual shall be made available to the NFRC Inspector at any time and shall be available to laboratory staff at all times.

### 1.6.1 Adequacy

The adequacy of the quality control program and quality control manual shall be determined in connection with the annual review (see Section 6.2 of NFRC 701).

## 1.7 Testing Laboratory Record Keeping Requirements

### 1.7.1 Maintaining of Records

Each accredited laboratory shall maintain a system of record keeping that will allow for verification and/or reconstruction by NFRC of any test or simulation report.

- A. The record keeping system shall provide retention of original specimen data, observations and notes, calculations and derived results and other pertinent data. Testing laboratory equipment shall be capable of recording and storing test data at least every five minutes throughout the steady-state test period. This data shall include temperatures; heat flows and any other data listed in applicable test methods.
  - i. Each accredited laboratory shall keep all records and reports confidential and in locked or sealed files in a

secure location with its access limited to specified employees.

- ii. Each accredited laboratory shall make its records and files available for review by NFRC at any time during customary business hours.
- iii. Records, including final reports and relevant data, shall be retained for a period of at least four years from date of issuance.
- iv. Each accredited laboratory shall keep all records when testing at a manufacturer's facility.

### **1.7.2 Processing of Specimens**

The Testing Laboratories follow the following guidelines for accepting and processing test specimens at the laboratory.

- A. The testing laboratory shall maintain records documenting the condition of the test specimen upon its arrival at the testing facility.
- B. The testing laboratory shall notify the manufacturer in writing if the product arrives damaged (i.e. broken glass, damaged frame/sash components, etc.). The test laboratory shall request in writing a replacement of the test specimen be sent, if necessary.
- C. As an additional requirement to requirements in NFRC 102, the testing laboratory shall measure and report the initial glazing deflection upon arrival at the testing facility. If the glazing is found to be concave (collapsed) or convex (over-filled), documentation as to the condition and the extent of deflection from the designed overall IG thickness shall be reported. If the product is a prototype or initial validation product, the test laboratory shall request in writing from the manufacturer the course of action to take in regards to the IG unit(s) condition. A copy of these transactions shall be submitted with the final test reports to the manufacturer's IA for their records. The following guidelines describe the glazing conditions for which documentation is necessary:
  - i. For IG units 1/2" or less, deflection of 1/8" or greater
  - ii. For IG units greater than 1/2", deflection of 1/4" or greater
  - iii. Any over-fill shall be reported
- D. An accredited testing laboratory shall retain, in a safe and protected location, each whole fenestration product tested or representative corner and cross sections of all the fenestration product components for a period not less than 2-1/2 years after the date a test report is first issued by the laboratory. The date of issuance shall be the first date of submittal to the IA.

**[Note:** It is recommended that a laboratory retain test samples for a minimum of four years.]

- E. Test laboratories shall retain the following additional information described in Appendix D: Required information for thermal transmittance test (U-factor and Condensation Resistance):
- i. Sealing and pressure balance technique employed during testing
  - ii. Total window U-factor, both measured ( $U_s$ ) and standardized ( $U_{st}$ )
  - iii. Interior and exterior surface conductance calculated from measurements
  - iv. Surface to surface total conductance
  - v. Glass deflection and effective gap width during testing
  - vi. Warm side and cold side area-weighted frame surface temperatures
  - vii. Warm side and cold side area-weighted edge-of-glass surface temperatures
  - viii. Warm side and cold side area-weighted center-of-glass surface temperatures
  - ix. Warm side and cold side product surface temperature instrumentation scheme and when applicable the area assigned to each sensor, and the average temperature of each sensor that was used to calculate the final results and
  - x. Values for  $CR_f$ ,  $CR_{eog}$  and  $CR_{cog}$ . (vi through x when applicable)

### 1.7.3 Adequacy

The adequacy of a testing laboratory's record keeping shall be determined in connection the annual review (see Section 6.2 of NFRC 701).