National Fenestration Rating Council Incorporated

NFRC 701.05-2009 [E0A0]

NFRC 201 Solar Calorimeter Test Reporting Requirements

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FOREWORD

The National Fenestration Rating Council has developed a uniform national rating system for energy performance characteristics of fenestration products.

The NFRC 201 is a procedure developed by the National Fenestration Rating Council (NFRC) to meet the need for a uniform and accurate means for thermal and related performance ratings of fenestration systems. The Solar heat Gain Coefficient (SHGC) established by this procedure is determined at a fixed set of environmental conditions. Consequently, the performance ratings determined using these procedures may not be appropriate for directly determining seasonal energy performance.

Products that cannot be simulated use ratings based on physical testing.

This document is a supplemental document to the procedures regarding the reporting requirements providing the total product ratings for the NFRC 201 Solar Heat Gain Coefficient.

Each testing laboratory shall issue a test report to the fenestration product manufacturer for whom NFRC testing was conducted and, upon approval from the manufacturer, shall issue the same report to the manufacturer's IA.

In issuing reports for use in connection with the Certification Program, an NFRC-accredited testing laboratory shall comply with the NFRC Rating Procedure applicable to the energy performance characteristic to be rated. See the Glossary for the definition of Rating Procedure.

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

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1.1 Solar Calorimeter Testing Laboratory Reporting Requirements for NFRC 201

1.1.1 Solar Calorimeter Testing Laboratory Reporting Requirements

Testing laboratory shall issue a test report to the fenestration product manufacturer for whom NFRC testing was conducted and, upon approval from the manufacturer, shall issue the same report to the manufacturer's IA. Prior to the issuance of a final report, the test laboratory shall disassemble the test specimen in such a manner after testing in order to verify the description of the product in the test report. Test laboratories shall use the guidelines in Appendix A to verify the manufacturer's product drawings. Attachment films are exempt from the guidelines of verification in Appendix A, but not other fenestration attachment products.

A. The solar calorimeter test report and the representative electronic upload shall identify one distinct product line represented by one upload matrix with a unique report number.

B. Upon approval from the manufacturer (via written letter or electronic documentation), the same report shall be issued to the manufacturer's IA. The approval shall be included in the test folder or report.

C. The testing laboratory shall include with the report the package of extrusion drawings, bill of materials, and assembly view drawings that shall be authenticated by the testing laboratory. The authentication shall be indicated by the laboratory stamp bearing the unique testing report number on the bill of materials and drawings to indicate that they are representative of the materials and profiles of the product.

The test report shall include the following:

D. Name, address and phone number of the laboratory

E. Location (if different than the laboratory address) and identification of test equipment utilized

F. Test date

G. Name and address of the client

H. Serial number, report number or other appropriate means of identifying each individual product line report

I. A statement that the tests were conducted in full compliance with NFRC requirements

J. NFRC Procedures and the editions under which the report was submitted (i.e. NFRC 201-2004)

K. Drawing(s) and a detailed written description of the specimen including (where applicable):

[***Note***: some items listed may not be applicable in certain cases]:

i. Manufacturer and series or model number

ii. General description of product (i.e., operator type, size, framing type, glazing type, spacer type)

iii. Test Specimen size (reported in both SI and IP units)

iv. Bill of materials including vendor name and part numbers

v. Parts drawings (i.e., frame, sash, glazing, hardware, etc.)

vi. Physically measured parameters (sizes and thickness measured to 1 mm (1/32 inches); i.e., overall window dimensions, operable and/or fixed sash dimensions, glazing daylight openings, and door component parts)

vii. Glazing material(s), including thickness, coatings, and/or internal films (emissivity, as reported by the sample manufacturer) and their location (surface)

viii. Measured air space at the edge-of-glazing and design gas fill %concentration and type, as reported by the sample manufacturer

ix. Spacer materials and construction

x. Grille materials, placement and pattern

xi. Detailed description of the framing, sash, frame and sash corner/joint construction, glazing installation, weatherstripping (types and locations), drainage and finish

xii. All hardware, operator and other components

xiii. All descriptive items in the test report, which have not been measured or verified by the test lab, must be clearly indicated in the report.

Report the following information, where applicable, for the period in which the solar calorimeter is in steady-state conditions as defined by Section 7.4 of NFRC 201;

L. Description of surround panel and installation of test specimen

M. Date and the Local Time of the beginning and end of the test period

N. Description of the location of the solar calorimeter(s); and the foreground in view of the test specimen

O. Previous date of each calibration test specified in Section 5 of NFRC 201; including the wall heat flux calibration test, surround panel flanking loss calibration test, calibration transfer standard test, fluid flow rate instrumentation, pyranometer and fluid temperature difference instrumentation.

P. The average Solar Heat Gain Coefficient, SHGC, over a constant incident or profile angle; and the average incident angle, θ_E or average profile angle, ψ_E, of the incident solar irradiation (i.e., SHGC of 0.56 at a profile angle of 30 degrees).

Q. A graph of the measured Solar Heat Gain Coefficient, SHGC in relation to the incident angle, θ_E or profile angle, ψ_E, of the incident solar irradiation.

R. Range of solar calorimeter tilt and azimuth for the duration of the test; if the solar calorimeter moves over the duration of the test, describe the tracking system and strategy.

S. Average ambient barometric pressure

T. Average and extremes of exterior wind velocity and direction; and average and range of exterior surface heat transfer coefficient, $h_{h\text{-}sun}$, during the test

U. Diagrams documenting all surface temperature locations (i.e., absorber plate, surround panel, etc.) and corresponding temperatures at each location at the time of greatest solar irradiation. If the test specimen surface temperatures are

measured, include the average surface temperature of the test specimen on the weather side, t_2 and calorimeter side, t_1.

V. Diagrams documenting all air temperature locations (i.e., inside, t_h and outside, t_c, of solar calorimeter) and corresponding temperatures at each location at the time of greatest solar irradiation.

W. The average interior air temperature, t_c and exterior air temperature, t_h, measured during the test.

X. Inlet fluid temperature, outlet fluid temperature, flow rate of the fluid, f and heat extracted by the fluid heat extraction system, Q_{fluid}, measured at the time of greatest solar irradiation.

Y. Temperature difference across solar calorimeter walls and the heat flow associated with that temperature difference, Q_{walls}, at the time of maximum solar irradiation.

Z. The average standardized thermal transmittance, U_s; a description of the method used to determine the average standardized thermal transmittance; including the heat flow due to thermal transmittance effects, $Q_{U\text{-}Factor}$, at the time of maximum solar irradiation.

AA. The temperature of the interior surface, t_{sp1} and the exterior surface of the surround panel, t_{sp2}, measured at the time of maximum solar irradiation; including the heat flow through the surround panel, Q_{sp}.

BB. The heat added to the interior of the solar calorimeter by heaters, fans or pumps, Q_{AUX}, at the time of maximum solar irradiation.

CC. The calculated heat flow through the test specimen, Q_S, measured that the time of maximum solar irradiation.

DD. The maximum, minimum and average solar irradiation, E_S, measured over the duration of the test.

EE. The procedures used to estimate the uncertainties shall also be documented as an Annex to the report.

FF. Statement of experimental uncertainty associated with tests and data reduction when available. (See Section 9.2 of NFRC 201 for Uncertainty Estimation)

GG. The following statement shall be included in the test report directly after the above results are reported.

"This test method does not include separate procedures to determine the heat flows due to either air movement or nighttime U-factor effects. As a consequence, the SHGC results obtained do not reflect the overall performance which may be found in field installations due to temperature differences, wind, shading, air leakage effects and the thermal bridge effects specific to the design and construction of the fenestration system opening. Since there are a wide variety of fenestration system openings in residential, commercial and industrial buildings, it is not feasible to select a "typical" surround panel construction in which to mount the fenestration test specimen. The selection of a relatively high thermal resistance surround panel places the focus of the test on the thermal performance of the fenestration system alone. Therefore, it should be recognized that the thermal transmittance results obtained from this test method, for ideal laboratory conditions in a highly insulating surround panel, should only be used for fenestration product comparisons or as input to thermal performance analyses which also include thermal, air leakage and thermal bridge effects due to the surrounding building structure. To determine air leakage effects for windows and doors, refer to ASTM E 283. For thermal transmittance refer to ASTM C 1199."

HH. For Dynamic Glazing Products, reported data shall include ratings achieved at both the full ON and OFF or the full OPEN and CLOSED positions.

II. Any additional comments or data deemed important in the understanding or review of the report

JJ. Name and signature of individual conducting the test

KK. Name and signature of individual accepting responsibility for the technical accuracy of a test report

LL. A statement that the report shall not be reproduced, except in full, without the approval of the laboratory

MM. A statement that the report relates only to the fenestration products tested

NN. A drawing indicating the location of each specified thermocouple and the corresponding surface temperature (when applicable)

OO. A statement indicating whether the product tested was a prototype unit, production line unit or as a test-only option as identified by the manufacturer, and indicate whether the product was submitted for initial certification or re-certification. A copy of the Submittal Form for Test Samples shall be submitted with the test report. Refer to Appendix D of NFRC 700 for submittal form.

PP. Rounding of numerical values shall be per NFRC 601, *NFRC Unit and Measurement Policy*.

QQ. The following statement shall be included in the report: "Ratings included in this report are for submittal to an NFRC-licensed IA for certification purposes and are not meant to be used for labeling purposes. Only those values identified on a valid Certification Authorization Report (CAR) are to be used for labeling purposes."

RR. NFRC laboratories shall, as part of the report, upload the *NFRC Physical Testing CPD 2.0 Upload Sheet* to the NFRC database. The values in the *NFRC Physical Testing CPD 2.0 Upload Sheet* shall be consistent with any values in the NFRC report. The *NFRC Physical Testing CPD 2.0 Upload Sheet* must be in MS Excel® format and values must not be linked to other workbooks.

SS. The test lab may choose to provide an electronic copy of the report as long as the report, in its entirety, is submitted in electronic format, stored on a remote secure server accessible by the designated IA or mailed on electronic media.

[***Note***: Electronic reports shall be protected by password or other means to prevent unauthorized modification. Laboratories shall maintain a secured back-up copy.]

• APPENDIX A

GUIDELINES TO DETERMINE IF THE TEST SPECIMEN IS PROPERLY REPRESENTED BY THE MANUFACTURER'S PRODUCT DRAWINGS

1. The testing laboratory shall verify the test specimen to the drawings supplied by the manufacturer. This will be accomplished by comparing the physical samples of the product tested to the manufacturer's product drawings. The package of extrusion drawings, bill of materials, and fabrication drawings shall be authenticated by the testing laboratory's stamp referencing this data to the test report number or other test report identification. The testing laboratory's stamp or other mark on each individual drawing indicates that this drawing is representative of the material used in the tested sample. It also indicates, on the bill of materials and other data, in so far as it is possible to check, that the material used in the tested sample is that which was stated by the manufacturer.

2. The product samples should be verified in the following manner:

   a. The base profile of the product sample extrusion must match the extrusion drawing. (i.e. internal air cavities, structural components, reinforcement, internal legs, etc. are the same)

   b. The overall dimensions (width and height) of the sample profile 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.

   c. 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.

   d. 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.

   e. Where possible, check and indicate if the hardware described on the drawings and the bill of materials is the same type and is located in the same location as indicated on the assembly drawing.

3. The testing laboratory, by placing the stamp on a drawing, indicates that the drawing is representative of the test specimen.

4. 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 illustrate on the drawing(s) the apparent differences in the test report.