National Fenestration Rating Council Incorporated

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NFRC Simulation Reporting 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

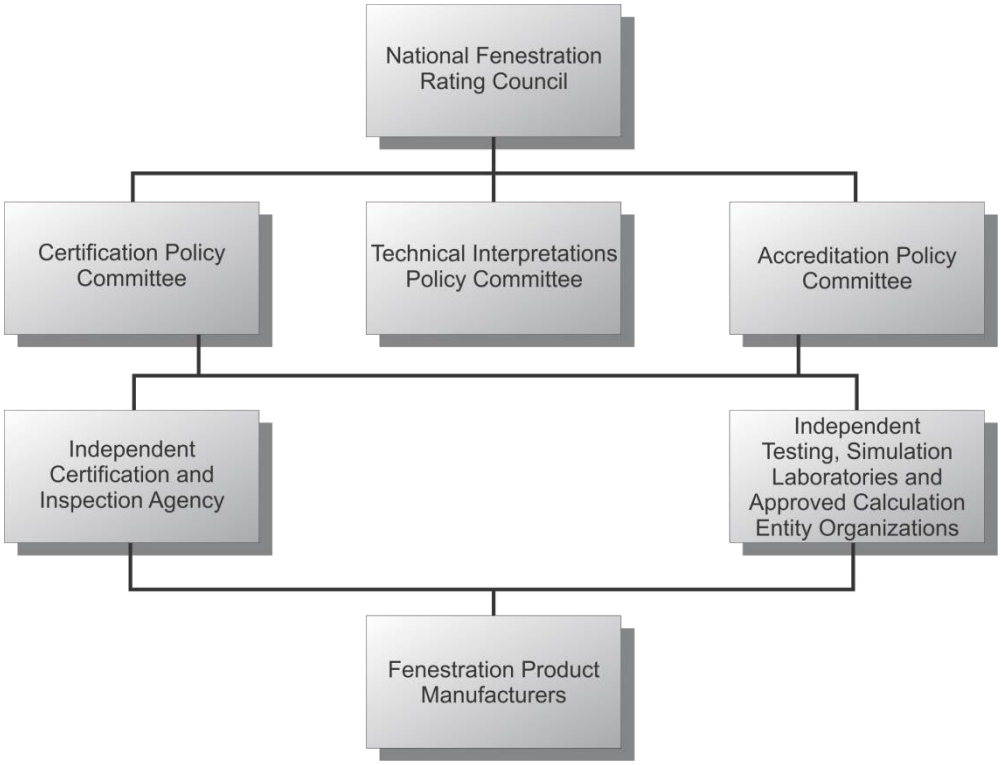


Figure 2

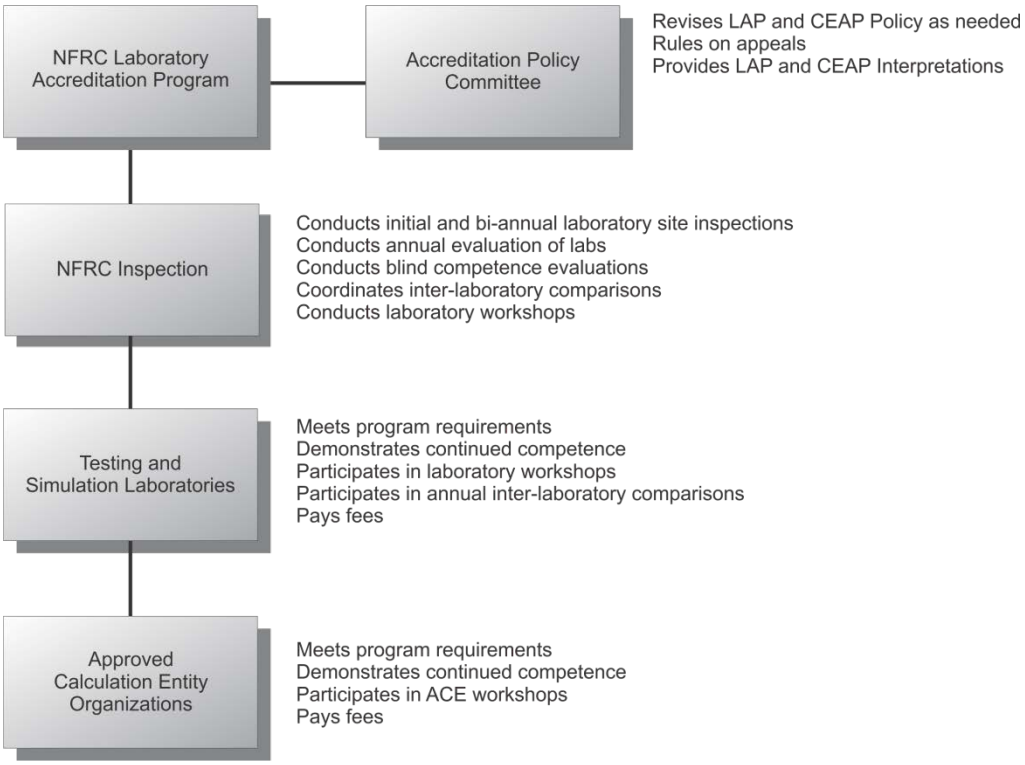
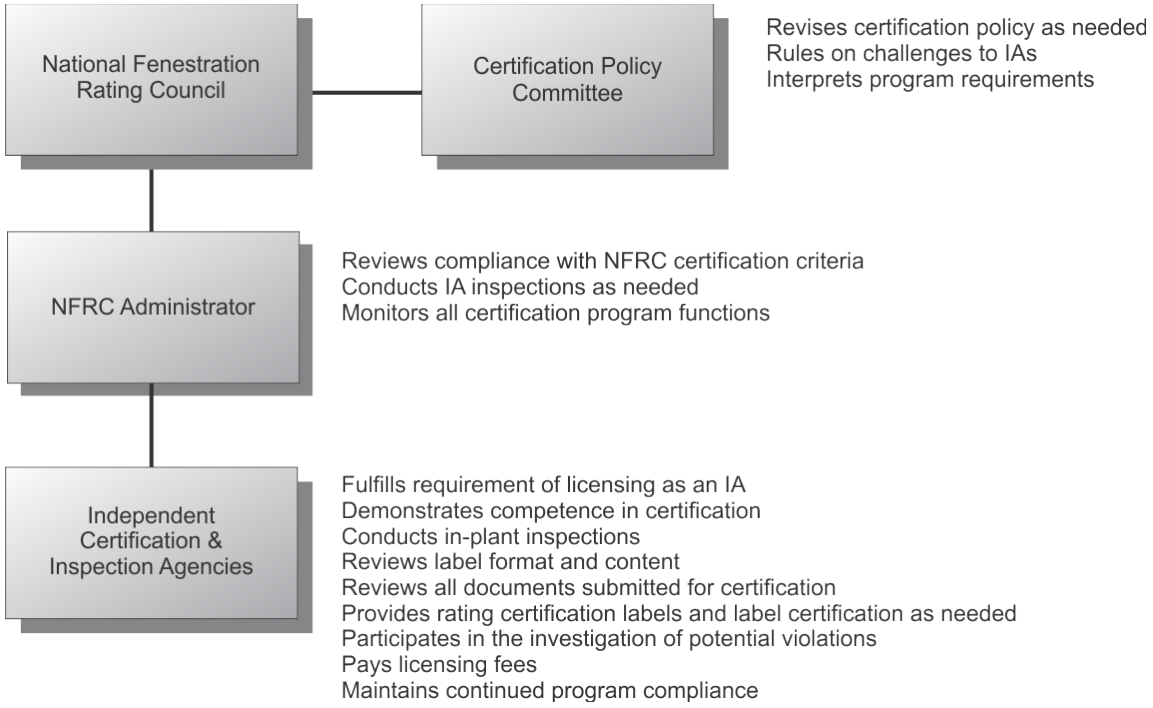


Figure 3



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.

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. MANDATORY REPORTING REQUIREMENTS FOR SIMULATION LABORATORIES

1.1 Simulation Laboratory Reporting Requirements for NFRC 100, NFRC 200, NFRC 303, NFRC 304, and NFRC 500

NOTE: For products seeking certification in accordance with the requirements set forth in the NFRC 705 - Component Modeling Approach (CMA) refer to Section 1.1.2.

1.1.1 Reporting Requirements for NFRC 700 - Product Certification Program

Laboratories shall issue a unique simulation report for each distinct Product Line and/or product type as defined in NFRC 100. The report shall be issued to the fenestration product manufacturer for whom the NFRC simulation was conducted.

A. The simulation report and the representative electronic upload data spreadsheet 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 simulation folder or report.

C. The simulation laboratory shall include in the report ~~the drawings and bill of materials~~a drawing package supplied by the manufacturer. The drawing package shall consist of:

i. Assembly view(s) of the whole product for both the horizontal and vertical cross-sections;

ii. Individual profile drawings that identify the part name, part number (or other means of traceability), dimensions, material type, and finish (if it is a metal part). Parts include all dividers and reinforcement. Individual part drawings shall be permitted to omit the material type and/or finish if they are noted on the Bill of Materials (BOM);

~~C.~~iii. Bill of Materials (BOM) that lists, at a minimum, the part name, part number and material. The assembly view shall be permitted to serve as the BOM if it includes the part number which clearly identifies the individual part

with an arrow to the respective part or other clear identification for traceability.

D. The package of ~~extrusion drawings, bill of materials, and assembly~~ drawings shall be authenticated by the simulation laboratory. The Authentication shall be indicated by the laboratory stamp bearing the unique simulation report number. The simulation laboratory shall stamp all the ~~bill of materials and individual~~contents in the drawing~~s~~ package to indicate that they are representative of the materials, ~~and~~ profiles, dividers, reinforcement, and spacer systems used in ~~modeling~~ the product line.

The simulation report shall include the following:

E. Name, address and phone number of the laboratory

F. Simulation 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 simulations were conducted in full compliance with NFRC requirements

J. NFRC Procedures and the editions under which the report was submitted (i.e. NFRC 100-~~2004~~2010)

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

i. Manufacturer and model number

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

~~iii. Assembly, bill of materials and parts drawings (i.e., frame, sash, glazing, hardware, etc.); including frame sections and part drawings with dimensions~~

~~iv.~~iii. Individual product glazing characteristics (i.e. thickness, coatings, emissivities and surfaces, tints, etc.)

a) A detailed description of any glass layer created in accordance with NFRC 303 and NFRC 304 to include the applicable information: glass, film, laminate, and interlayer.

b) Air space characteristics including gap width, gas fill, gas type, design and/or measured gas concentration and filling technique

c) Spacers – materials and sealants~~construction~~, as identified with a dimensioned drawing placement with respect to the glazing system.

d) Shading system material, placement, dynamic capability (such as retractable or not by roller, pull cord, etc.), geometry (e.g. thickness and other characteristics) necessary to explain its use

~~d)~~e) Grilles – materials, placement and pattern, if different from the default pattern in the currently approved software

iv. Materials used for framing and ~~,~~ sash, including finish of all metal materials;

~~e)~~v. Materials for edge-of-glass ~~window~~ construction, weather-stripping (types and locations) ~~and finish~~;

~~f)~~vi. All continuous hardware included in the models

~~g)~~vii. Solar absorbance of dividers and frames used for simulation if other than the default values. Deemed to be satisfied by inclusion in the NFRC Upload spreadsheet

L. Simulation results (where applicable), including:

i. Frame "heights" as defined in the most current version of the NFRC Simulation manual

ii. Calculated areas for frame, edge-of-glazing, center-of-glazing, divider, edge-of-divider, door core, lite-frame, edge-of-lite, center-of-lite, panel and edge-of-panel

iii. Area-weighted total fenestration product U-factor

a) Calculated U-factors for frame, edge-of-glazing, center-of-glazing, divider, edge-of-divider; door core, lite-frame, edge-of-lite, center-of-lite, panel, and edge-of-panel (unless not applicable) and may be submitted using data files.

iv. Area-weighted total fenestration product solar heat gain coefficient (SHGC)

v. Center-of-glazing solar heat gain coefficient ($SHGC_{cog}$)

vi. Area-weighted total fenestration product Visible Transmittance (VT)

vii. Center-of-glazing visible transmittance (VT_{cog})

viii. Individual spacer models (if applicable)

ix. Optical property values other than the default values listed in the programs used for the simulations

~~x. Material thermal conductivity property values other than the values listed in NFRC 101 Appendix A.~~

~~xi. Any changes to default boundary conditions~~

~~xii.~~x. Groupings details (if applicable)

~~xiii.~~xi. Reference product used in attachment simulation (if applicable)

[***Note***: Items listed in "i" through "vii" are deemed to be satisfied by submitting simulation and data files from the currently approved NFRC simulation programs unless the simulation area weighting is not done with NFRC approved software.]

M. All NFRC-approved software data files and calculations used in simulation on diskette, CD or electronic format

N. Any additional comments or data deemed important in the understanding or review of the report (e.g., any modeling assumptions)

O. Description of the product(s) meeting the validation criteria and the simulated results for those product(s) based on the actual specimen size (if different from the standard NFRC sizes). This requirement is satisfied by submission of the NFRC upload spreadsheet.

P. Identification of each individual product within a Product Line, as defined for NFRC Certification. This requirement is satisfied by submission of the NFRC upload spreadsheet

Q. Name and signature of the individual performing the simulations.

R. Name and signature of simulator-in-responsible-charge accepting the responsibility for the technical accuracy of a simulation report.

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

T. A statement that the report relates only to the fenestration products simulated.

U. A statement that rounding is per NFRC 601, *NFRC Unit and Measurement Policy*.

V. Any report that is revised or updated after the initial issue date of the original report for submission to an IA shall have any and all revisions properly identified in the report. Acceptable methods to identify revisions are, but not limited to the following: bold; highlight; note section; tracking form; or a numbering system. The report shall also include the initial report date, revised report date, and identification in the title that the report is revised, and any updated drawing(s) or information.

W. The NFRC required U-Factor, SHGC, VT, Condensation Resistance matrices and/or summary report requirement is deemed to be satisfied by uploading the currently approved Upload Spreadsheet. A hard copy of the matrix is not required.

X. A table of the 0 and 1 Solar Heat Gain Coefficient and Visible Transmission SHGC/VT 0 & 1 values for no dividers, dividers < 25.4mm (1") and dividers ≥ 25.4mm (1"). This requirement is satisfied by submission of the NFRC upload spreadsheet. This does not apply to attachment products.

Y. The following statement shall be included in the report: "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."

Z. If Condensation Resistance is calculated and reported, then the following statement shall be included in the report: "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."

AA. NFRC simulation laboratories shall, as part of the simulation report, upload the *NFRC Upload Spreadsheet* to the NFRC database. The values in the *NFRC Upload Spreadsheet* shall be consistent with any values reported in the submitted NFRC simulation test report. The *NFRC Upload Spreadsheet* must be in MS Excel® format and values must not be linked to other workbooks.

BB. If the report, in its entirety, is submitted in electronic format, it shall include and comply with all the requirements of a written report. Electronic reports shall be password protected to

prevent unauthorized modification. Reports prepared in this manner shall be considered equal substitutes to printed (hard) copies. If the electronic file format venue is used, the laboratory shall be responsible for maintaining a back-up copy.

1.1.2 Reporting Requirements for NFRC 705 - Component Modeling Approach (CMA) Product Certification Program

These reporting requirements are for compliance with the CMA Program referencing Section 5.9 of NFRC 100 and Section 5.9 of NFRC 200.

Upon approval from the component 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 simulation folder or report.

The CMA report shall include the following:

A. Name, address and phone number of the laboratory

B. Simulation date

C. Name and address of the client

D. Serial number, report number or other appropriate means of identifying the report

E. A statement that the simulations were conducted in full compliance with NFRC requirements

F. NFRC simulation laboratories shall, as part of the simulation report, send separately the component data configured in CMAST to the CMAST web server for acceptance by an NFRC licensed IA, and include the following in the simulation report:

   i. CMAST Server ID and corresponding component name of each component (frame or spacer) modeled in THERM and imported into CMAST.

   ii. CMAST Server ID and U-Factor of the validation option configured in CMAST

   iii. CMAST Server ID of any built laminate or applied film glass layer option imported from Optics.

G. For spacer component reports only, identification of the spacer component approval path, Path II or III. (Path II shall identify seal configuration as either single-seal or dual-seal)

H. NFRC Procedures and the editions under which the report was submitted (i.e. NFRC 100-2010)

I. Detailed written description of the component(s) including (where applicable):

i. Manufacturer

ii. Framing Product Line name of frame component(s)

iii. Series name of spacer component(s)

iv. Groupings details

v. Authenticated parts drawings, with the following information included on the drawing(s): Dimensions, Material, and Finish.

vi. The Authentication shall be indicated by the laboratory stamp bearing the unique simulation report number. The simulation laboratory shall stamp the bill of materials and individual drawings to indicate that they are representative of the materials and profiles used in modeling the product.

J. A detailed description of any glass layer created in accordance with NFRC 303 and NFRC 304 to include the applicable information: glass, film, laminate, and interlayer.

K. Spacers – materials and sealant(s), as identified with a dimensioned and authenticated drawing (See 1.1.2.I.v for authentication of drawings).

L. Simulation results (where applicable):

i. For Frame Component(s) approvals:

a) Frame height(s), or the Projected Frame Dimension (PFD) of each component submitted

b) U_f and U_e of each frame component from the THERM runs for the results of the Low Glazing with Low Spacer (LL), Low Glazing with High Spacer (LH), High Glazing with Low Spacer (HL), and High Glazing with High Spacer (HH). For frame components without a spacer system, report U_f and U_e results of the Low Glazing (L) and High Glazing (H).

ii. For Spacer Component approvals:

a) Spacer heights,

b) Spacer widths,

c) Spacer conductivity (k_{eff}), only for Path II.

iii. For built laminates and applied films in Optics5 for determination of optical properties, the calculated values of T_{sol}, R_{sol1}, R_{sol2}, T_{vis}, R_{vis1}, R_{vis2}, T_{ir}, $emiss_1$, and $emiss_2$.

iv. Total product U-factors for validation of frame components

v. Material thermal conductivity property values other than the values listed in NFRC 101 Appendix A.

[***Note:*** Reporting requirements for items L.i through L.iv are deemed to be satisfied when submitting the component data for approval to the CMAST web server]

M. All NFRC-approved software data files and calculations used in simulation on diskette, CD or electronic format

N. Any additional comments or data deemed important in the understanding or review of the report (e.g., any modeling assumptions)

O. Description of the product (frame component, spacer-edge seal-assembly, and glazing) meeting the validation criteria and the simulated results for that product based on the actual specimen size (if different from the standard NFRC sizes). This reporting requirement is not satisfied by submitting the validation for review via CMAST.

P. Name and signature of the individual performing the simulations.

Q. Name and signature of simulator-in-responsible-charge accepting the responsibility for the technical accuracy of a simulation report.

R. A statement that the report relates only to the fenestration component(s) simulated.

S. A statement that rounding is per NFRC 601, *NFRC Unit and Measurement Policy*.

T. Any report that is revised or updated after the initial issue date of the original report for submission to an IA shall have any and all revisions properly identified in the report. Acceptable methods to identify revisions are, but not limited to the following: bold; highlight; note section; tracking form; or a numbering system. The report shall also include the initial report date, revised report date, and identification in the title that the report is revised, and any updated drawing(s) or information.

U. The following statement shall be included in the report: "Component 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 approved and identified on a valid CMA Label Certificate are to be used for labeling purposes."

V. If the report, in its entirety, is submitted in electronic format, it shall include and comply with all the requirements of a written report. Electronic reports shall be password protected to prevent unauthorized modification. Reports prepared in this manner shall be considered equal substitutes to printed (hard) copies. If the electronic file format venue is used, the laboratory shall be responsible for maintaining a back-up copy.