National Fenestration Rating Council Incorporated

NFRC 103-2007

Verification Program for Thermophysical Property Data

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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 rating system is reinforced by a product certification program under which ratings determined by NFRC accredited laboratories are reviewed and authorized by NFRC licensed independent certification and inspection agencies (IAs) as conforming to NFRC requirements. Under the certification program, fenestration manufacturers may label products using an NFRC certification mark to indicate these ratings.

This document is a supplement to NFRC 101 and it lists additional information necessary for the establishment of effective procedures for determining and approving thermophysical properties of materials.

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

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1. INTRODUCTION

The NFRC rating procedures rely on NFRC approved computer simulation programs for calculating total fenestration thermal performance indices. Fenestration performance calculations are determined by algorithms documented in ISO15099, NFRC 100, NFRC 200, NFRC 300, and NFRC 500, by the test procedures given in NFRC 101, NFRC 102, NFRC 201, and NFRC 400, and by a database of thermophysical properties given in NFRC 101 that includes the thermal conductivities, longwave IR emissivities and solar absorptances of opaque materials.

A verification program is outlined in this document to provide uniform and credible thermophysical property data into the NFRC approved material libraries.

2. PROGRAM REQUIREMENTS

2.1 GENERAL

All general requirements for the thermophysical property data determination are listed in NFRC 101.

The generic thermophysical properties shall be listed in the material library of the NFRC-approved software tool(s). Manufacturer-specific thermophysical properties shall be listed through the user-defined section of the material library, and shall be marked by a unique flag indicating NFRC approval (e.g., similar to the pound sign in solar-optical properties of glazing layers).

2.2 INTERLABORATORY COMPARISONS (ILC)

All submitters of thermophysical property data (or their representatives) shall have successfully participated in an NFRC Interlaboratory Comparison (ILC) of the appropriate material property. NFRC shall sponsor an ILC a minimum of once every two (2) years, but preferably once each year. New submitters have the right to measure the most recent ILC sample and to qualify if the measured data is within 10% of the mean of the ILC results, or 0.003 W/(m•K) [0.02 Btu•in/(hr•ft^2•°F][0.002 Btu/(hr•ft•°F)] whichever is greater. NFRC shall keep ILC data private and shall publish only the standard deviation and number of outliers, without disclosing the mean of the ILC measurements for at least one (1) year or until the next scheduled ILC completion.

2.3 NFRC THERMOPHYSICAL PROPERTIES SUBCOMMITTEE

The NFRC Thermophysical Properties Subcommittee shall serve to:

- Review and screen submitted thermophysical data for obvious errors

- Coordinate the peer review process
- Handle challenge requests
- Coordinate and participate in ILC tests

If resources are not available at NFRC to complete some or all of the above tasks, NFRC has the option to subcontract any or all of the tasks to an outside agency.

2.4 SAMPLE SELECTION AND STORAGE

2.4.1 Proprietary Materials

A minimum of three samples shall be measured and the mean value reported. Samples that were tested shall be stored at the laboratory where the testing was conducted. The samples shall be stored for a minimum of two (2) years to allow for challenges. If a manufacturer wishes to test new samples due to a change in manufacturing process, new samples shall be submitted and the old samples shall be destroyed immediately after the new values are approved. All of the requirements of Sections 2.5 and 2.6 shall be met.

2.4.2 Generic Materials

If a material is deemed generic, sample submission may be waived and the NFRC Thermophysical Properties Subcommittee shall make a determination subject to the peer review process if the submitted data is sufficient for its inclusion in the generic database. All of the requirements of Sections 2.5 and 2.6 shall be met.

If an interested party disagrees with a published generic thermophysical property, the interested party may request, in writing, a literature review of the documented material. In such a case, a minimum of three approved reference documents shall be consulted and the Peer Review Group shall determine the approved documented value.

2.5 DATA SUBMITTAL

2.5.1 Proprietary Materials

All thermophysical property data submitted for use in the NFRC Materials Library shall be submitted to NFRC Staff using an approved submission form and signed by a representative of the submitter verifying that measurements were made in accordance with NFRC 101. The approved submission form shall be maintained on the NFRC website for access by prospective submitters. Manufacturers shall make a recommendation as to whether the material shall be considered new or generic per the following guidelines:

- Any material, either previously undocumented or a modification of an existing material with a conductivity that differs from the existing

material value by more than 10%, shall be submitted as a new material Guidelines for determining if a material is deemed generic can be found in Section 2.5.2.

- Small differences in material formulation can be neglected. However, the manufacturer is ultimately responsible for the appropriateness of this determination (i.e., material property does not differ by more than 10%)

- Manufacturers may group new materials with the material from the same category provided that its conductivity is lower and that the difference in conductivity does not exceed 20%.

2.5.2 Generic Materials

If the requested material property is deemed to be generic, its thermophysical properties can be determined from the approved list of references in Table B2 of NFRC 101 and subject to peer review (Section 2.6). Submitted data shall include the material's name and physical properties as shown in the approved source as well as the name of the approved source. If the material property is not listed in one of approved references in Table B2 of NFRC 101, three proposed references shall be consulted and value proposed, subject to peer review. Submitted data shall include the material's name and physical properties as shown in the selected source.

Data submitters shall propose whether the submitted generic property is deemed to belong to basic (Tables A1 and A2 in NFRC 101) or extended set (Table B1 of NFRC 101), subject to approval by Thermophysical Properties Subcommittee. Approved generic data shall be placed in the appropriate table, upon approval.

For both basic generic and extended generic materials, engineered wood assemblies such as edge-glued, finger jointed, or laminated wood made up of more than one wood type, and where the relative proportion of glue and resin to that of wood is small (i.e., less than 5 percent), the thermal conductivity of the wood component with the highest conductivity from the materials sources listed in NFRC 101 Appendix A (Basic Set of Generic Materials) or Appendix B (Extended Set of Generic Materials) shall be used.

2.6 DATA PEER REVIEW

2.6.1 Peer Review Group

The Peer Review Group shall include any or all parties submitting thermophysical property data and all fenestration material manufacturers. All participants shall be permitted to question any data submitted. In the case of questionable data, the challenge procedure shall be followed.

2.6.2 Proprietary Materials

All thermophysical property data shall be submitted to NFRC staff for initial review. The initial review process shall last no more than 7 days (5 business days) after the measured data has been submitted. In the initial review process, data shall be checked for conspicuous errors, discontinuity, noise, suspicious results and completeness of the file. In the case that an initial review discovers deficiencies in format or content, the data shall be returned to the submitter with adequate explanation of items or formats that need to be addressed. The submitter may resubmit data at any time, after which the initial review period restarts.

After the data passes initial review, the data shall be sent to the Peer Review Group. The peer review process shall last no more than 21 days (15 business days) from the date the data was submitted to the Peer Review Group, or shall not last more than 28 days (20 business days) from the date that NFRC had received the manufacturer submittal.

2.6.3 Generic Materials

For generic materials, the initial review process shall last no more than 2 days after the proposed values, either measured or selected from literature, according to Section 2.5, have been submitted. In the initial review process, data shall be checked for completeness of the file.

After the data passes initial review, the data shall be sent to the Peer Review Group. All participants shall be permitted to question any data submitted. In the case of questionable data, the Peer Review Group shall attempt to resolve the dispute and recommend resolution. If the submitter does not agree with the resolution, the challenge procedure shall be followed. The peer review process for generic materials shall last no more than 7 days from the date the data was received by the Peer Review Group, who shall notify NFRC upon receipt of data.

2.6.4 Participation of New Laboratories

After the Thermophysical Properties Subcommittee (TPPS) has completed its initial review, if the submitting laboratory has not previously submitted data, it shall be regarded as a new, *first time* submitter and shall be required to participate in an Interlaboratory Comparison (ILC). The TPPS shall review the credentials and data supplied by the new laboratory and, within 14 days (10 business days), inform the new laboratory of its decision. If the new laboratory meets requirements in Section 2.2, the original sample data shall be forwarded to the Peer Review Group. If the new laboratory does not satisfy the requirements of Section 2.2, the TPPS shall work with the laboratory until issues are resolved or the laboratory withdraws their request to become an approved laboratory. Upon receiving approval, the new laboratory shall submit a new 3-sample dataset to NFRC.

2.7 CHALLENGE PROCEDURE

Thermophysical property data may be challenged by any party at any time during the peer review period. Any challenge shall be submitted in writing using the NFRC approved form(s) and shall be submitted to the NFRC Thermophysical Properties Subcommittee. The NFRC approved form shall be made available on the NFRC web site and should also be available by other means (i.e., email, telephone request, fax, etc.). Proprietary material test samples subject to the challenge procedure shall be retested at the laboratory chosen by the Thermophysical Properties Subcommittee. The same three samples originally submitted by the manufacturer of the material shall be re-tested using the applicable procedure(s) in Section 5 of NFRC 101. During the period of the challenge procedure, the data shall be considered under investigation and shall not be published until the challenge procedure is complete. The challenge procedure shall not last more than 30 days (22 business days) from the date the challenge request is received by the NFRC Thermophysical Properties Subcommittee.

The data from the retest shall be compared to the data from the original test. If the retest value of any individual sample, or the average of the retest values, differs from the average of the original test values by more than 10% of the average of the retest values, or 0.003 W/(m•K) [0.02 Btu•in./(hr•ft^2•°F] [0.002 Btu/(hr•ft•°F)] whichever is greater, the original data shall be deemed invalid. The manufacturer shall be given the option of repeating the whole testing procedure at a laboratory chosen by the Thermophysical Properties Subcommittee.

All costs associated with the challenge procedure shall be normally covered by NFRC, unless the Board of Directors' or the Executive Committee determines that the challenge is without merit. In this case, the challenger shall be advised that the challenge is not successful (i.e., the original data is deemed valid), and all costs associated with the challenge procedure shall be the responsibility of the challenger.

Thermophysical property data may be challenged by any party at any time after the data has been published by NFRC. The same challenge procedure outlined above shall apply, except that existing and published data shall remain valid for the duration of the challenge procedure.

NFRC shall send a formal letter to the submitter notifying them of the results of the challenge.

2.8 APPEALS PROCEDURE

The submitter of test data deemed invalid per the challenge procedure shall have the option of submitting an appeal to the NFRC Board of Directors. In this event, the laboratory chosen by the Thermophysical Properties Subcommittee shall repeat the measurement(s) in the presence of a submitter representative. In addition to the three samples submitted for verification, the

reference samples shall also be measured to positively establish the accuracy of the measurement instrumentation. The results of the repeated measurements shall be considered final. Arbitration of the disputes may be requested in writing to the NFRC Board of Directors.

NFRC shall send a formal letter to the submitter notifying them of the results of the appeal. The results of the appeal shall be final.

2.9 ACCEPTANCE PROCESS

All submitters (and their representatives) that have followed the procedure outlined in Sections 2.1 through 2.6 above shall receive a formal reply letter from NFRC (or its delegated representative) stating that the representative data for each product has been accepted into the NFRC Thermophysical Properties Data Library for use in determining NFRC ratings on fenestration products.

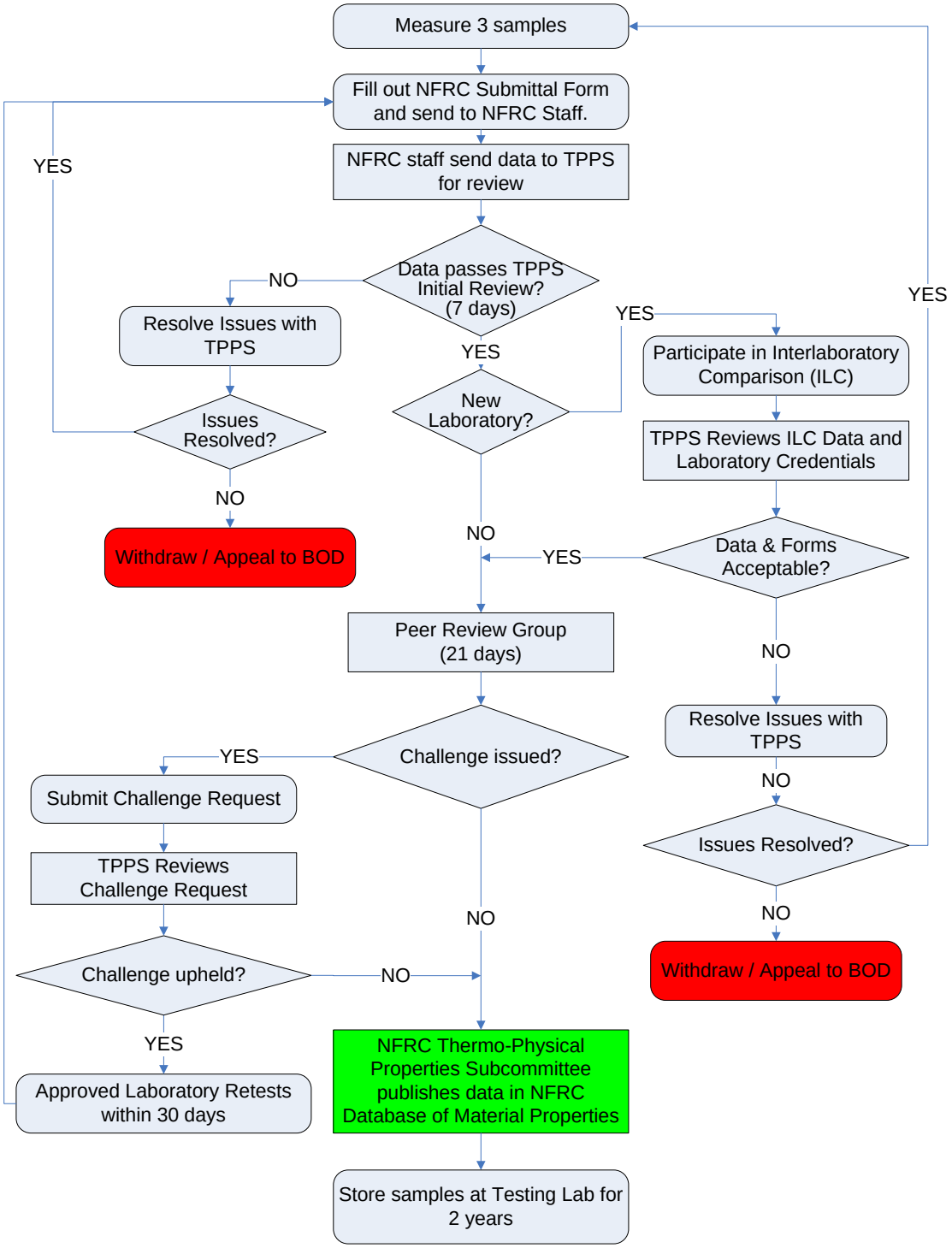
2.10 DATA PUBLICATION

After the data has been approved and accepted by NFRC the data shall be published in the database of user-specific thermophysical properties. NFRC shall issue a bulletin with the notification that the new data has been approved for use in the NFRC certification process within 48 hours (excluding weekends and holidays) of approval and shall post the data on the NFRC web site so that program participants can easily access this database. The bulletin shall be sent to all NFRC members, all members of the Peer Review Group, and any other interested party that requests in writing to be included in these notifications. The database update process shall not take more than two (2) weeks (10 business days). The published data is valid indefinitely unless successfully challenged, voluntarily withdrawn or replaced by the submitter. NFRC shall retain on file all data submissions.

2.11 WITHDRAWAL OF ACCEPTANCE

The submitter of thermophysical property data shall have the option of withdrawing the material from the approved NFRC material library after which date any existing records for that material shall be deleted from the NFRC approved list and shall not be used in any future simulation work. Any existing simulations done with the material whose data has been withdrawn or whose data has been changed shall remain valid until the next fenestration product certification renewal date.

Flow Chart of the Thermophysical Data Verification Process for Proprietary Materials



Flow Chart of the Thermophysical Data Verification Process for Generic Materials