

# PHIUS Verified Window Performance Data Program Application & Instructions

Passive House Institute US (PHIUS) developed the voluntary Verified Window Performance Data Program to make verified performance data for windows, doors, and skylights readily available to passive building practitioners. Manufacturers who have their window component performance data verified by PHIUS are able to better position their products in the marketplace by providing practitioners with the information they need to specify high-performance products in their projects. Manufacturers seeking this verification supply the required product and testing data to PHIUS, from which a custom performance data set is generated.

Verified products receive a program-specific PHIUS product performance data verification mark upon completion of the verification process. The verified product performance values are then published to the [PHIUS Verified Window Performance Database](#) on the PHIUS website. These verified performance values are also periodically released in database files suitable for import to the WUFI® Passive building simulation modeling tool.

# 1. Program Overview

The PHIUS Verified Window Performance Data Program is a voluntary program intended to verify the accuracy and appropriateness of the energy performance data for windows and their components needed to accurately model passive building energy balances. For best accuracy in building energy modeling, window performance data (e.g. U-values) are needed at the component level, that is, for the frame and glass separately, so that the performance of the windows can be calculated for the exact sizes and configurations planned in the project. The verification process follows the appropriate window simulation protocols and conditions for high-performance windows, doors, and skylights.

Two options are available when selecting the calculation protocol:

- Orange Path: Based on EN standards, this protocol calculates center-of-glass U-value per EN 673, center-of-glass solar gain per EN 410, and frame/spacer performance per EN 10077-2.
- Blue Path: Based on NFRC standards, this protocol generates calculations per ISO 15099.

In addition to the calculations required for the Orange Path and Blue Path protocols, the following information is also calculated:

- Climate-zone-dependent center-of-glass U-value
  - PHIUS can support the Manufacturer with using WINDOW software to calculate climate-dependent center-of-glass properties upon request.
- Whole-window U-value for a standard size unit

To pursue the Blue Path data verification method, [contacting a qualified NFRC simulator](#) is the first step. To pursue the Orange Path, please contact Graham Wright, Senior Scientist and Product Program Manager, at [graham@passivehouse.us](mailto:graham@passivehouse.us).

Regardless of which calculation protocol is selected, the resulting verified performance data labels have the same format and include the following information:

- Frame U-value
- Linear bridge coefficient for the spacer/edge-of-glass effect
- Center-of-glass U-value
- Center-of-glass solar heat gain coefficient (SHGC)

The differences between the two calculation protocols are that for the Blue Path the data are taken from the Lawrence Berkley National Laboratory (LBNL) THERM and WINDOW files that are minimally modified from NFRC standards instead of recalculated per CEN standards as with the Orange Path. This entails converting the extra heat loss from NFRC's 2.5-inch-wide edge-

of-glass area into an equivalent linear coefficient. Manufacturers who have already (or are currently pursuing) an NFRC rating should select the Blue Path in order to save time and money by avoiding additional calculation costs. By selecting the Orange Path, Manufacturers receive compatible/comparable ratings to the values typically assigned to imported European windows. Both protocols support passive building practitioners with the component-level window data they need to perform building energy modeling.

The color difference on the data label (Blue Path and Orange Path) are used to indicate that the CEN and NFRC methods are not strictly comparable for comparison shopping purposes due to subtle calculation method differences between the two protocols. However, for building energy modeling and PHIUS+ certification purposes both data sources are considered valid.

## 1.1 Data Verification Protocol

### 1.1.1 Orange Path

1. The Manufacturer works with the PHIUS Program Manager to determine the scope of work, after which PHIUS develops the quoted cost for the job (not-to-exceed estimate, current pricing information is available upon request). The Agreement is then executed and PHIUS invoices the Manufacturer for the down payment.
2. The Program Manager assigns an independent third-party calculation provider/simulator, licensed and trained through PHIUS, to perform the necessary calculations and simulations.
3. A Reviewer performs a review and spot check of the calculations and informs the Simulator of any required corrections. The Program Manager may act as the Reviewer or delegate this task to another Simulator.
4. Once confirmed by the Reviewer, the results are sent to PHIUS for final review. Once approved, the results are shared with the Manufacturer and PHIUS invoices the Manufacturer for final payment.
5. The PHIUS product performance data verification mark is awarded and the values are published in the [PHIUS Verified Window Performance Database](#).

### 1.1.2 Blue Path

1. The Manufacturer contacts an NFRC-accredited Simulation Laboratory with a Certified Simulator on staff who has been trained to do the PHIUS conversion and is licensed to use the software to produce Blue mode PHIUS data labels. A list of qualified simulators can be found on the [Find a Qualified Blue Path Simulator](#) page.
2. The Manufacturer works with the PHIUS Program Manager to determine the scope of work, after which PHIUS develops the quoted cost for the job. PHIUS works with the NFRC Simulator to determine the scope of the job and pricing to produce the

- calculations. The calculation and inspection work proceeds per NFRC standard practice.
3. PHIUS will provide support information to the Manufacturer to facilitate using WINDOW to calculate climate-dependent center-of-glass properties upon request.
  4. The NFRC-accredited Simulation Laboratory sends converted THERM and WINDOW files to PHIUS for inspection. The inspection may be performed by PHIUS or by a PHIUS-trained NFRC Inspection Agency.
  5. The NFRC-accredited Simulation Laboratory sends the PHIUS data labels, THERM files, and WINDOW database to the Manufacturer.
  6. The NFRC-accredited Simulation Laboratory sends the label-producing PHIUS workbooks to PHIUS.
  7. The Manufacturer contacts PHIUS to identify which products are to be listed on the PHIUS website and pays the respective listing fee.
  8. The PHIUS product performance data verification mark is awarded and the values are published to the [PHIUS Verified Window Performance Database](#).

## 2. Program Submittal Requirements and Prerequisites

### 2.1 Requirements for Orange Path Verification

Since the calculations for Orange Path Verification are done using THERM and WINDOW software, the individual glass layers must be listed in the International Glazing Database (IGDB) that comes with WINDOW. If the product(s) have current NFRC ratings and the Manufacturer can obtain the THERM (.thm) or WINDOW (.mdb) files from the NFRC-accredited Simulation Laboratory, these can serve as cost-saving starting points.

#### 2.1.1 Manufacturer Deliverables (required for price quote)

- Number of unique glazing systems. Omit from the count those glazing systems for which a current pre-existing NFRC WINDOW glazing system library file is available. Due to the way the recommendation criteria work, it is recommended to have at least one high-gain and one low-gain glazing (see Appendix A).
  - # Glazing Systems =
- Number of one-lite products, such as fixed, awning, or tilt-turn. Each frame-glass-spacer combination, or NFRC “group leader”, constitutes a product. Refer to the NFRC 100 clause 4.2.4 for grouping rules.
  - # One-Lite Products =
- Number of two-lite products, such as double-hung or sliding door.
  - # Two-Lite Products =
- Number of unique frame cross-sections to be newly modeled. For example, head, sill, and jamb all using the same extrusion count as one, but meeting rails count separately. Omit from the count any frame cross-sections for which current pre-existing NFRC THERM files are available. Count cross-sections for multi-chamber vinyl or fiberglass frames separately from other frame types.
  - # New Multi-Chamber Vinyl or Fiberglass Frame Cross-Sections =
  - # New Wood or Other Material Frame Cross-Sections =
- Number of spacers (spacer-edge-seal-assemblies) to be newly modeled. Omit from the count any spacers which are represented in current pre-existing THERM files being submitted, and any listed in the table of pre-modeled spacers below.

Pre-Modeled Spacers
Cardinal XL Edge
Cardinal Endur
Chromatech Ultra F
Intercept Ultra Standard Dual Seal
Quanex Duralite
Quanex Duraseal
Quanex Tri-Seal Premium Plus
Quanex Super Spacer
Swisspacer Ultimate
Swisspacer V
Technoform TGI NA
Thermix

- # New Spacers =
- Number of installation situations to be pre-calculated. Each situation consists of a product-wall combination, that is, the pricing covers calculation for sill, jamb, and head.
- # Installation Situations to be Pre-Calculated =

### 2.1.2 Manufacturer Deliverables (required for execution)

- List of desired frame/spacer/glazing combinations. Please fill out the order matrix sheet included in a separate Excel workbook available from PHIUS.
- Dimensioned drawings of window and window components showing all cross-sections and with materials clearly indicated (e.g. by different patterns).
- The thermophysical properties of materials used are obtained from appendices A, B, and C in NFRC 101.
  - Pre-existing THERM files from NFRC simulators are acceptable for documentation of material properties, but such files do not suffice alone for documentation of the cross-section geometry.
  - Manufacturer agrees to respond to any requests for clarification, such as to the continuity or intermittency of pictured elements in the direction “into the page”.

The Manufacturer may choose the preferred option(s) for supporting the calculation of window installation thermal bridge coefficients (“psi-install”). These offer different

degrees of technical data disclosure and are not mutually exclusive. Please check at least one box below:

- Option A: Allow PHIUS to publish/disclose the PHIUS-verified THERM models for use by third parties (CPHCs) for custom generation of psi-install values. (preferred option)
- Option B: Offer psi-install calculations as an in-house technical support service.
- Option C: Similar to Option B, but outsourced to PHIUS. PHIUS may assign psi-install jobs to its qualified Simulators, or, in connection with a building certification project, to certification staff.

### 2.1.3 Manufacturer Deliverables (optional)

Please check all that apply:

- Pre-existing THERM files or NFRC WINDOW files
- ASTM E-283 airtightness test results
- Desired psi-install option calculations and drawings to scale of the install details in section and plan. Psi-install calculation results, including install details, will be published to the PHIUS database in addition to the window's other verified performance values.

## 2.2 Requirements for Blue Path Verification

### 2.2.1 Manufacturer Deliverables (required for execution)

The Manufacturer may choose the preferred option(s) for supporting the calculation of window installation thermal bridge coefficients ("psi-install"). These offer different degrees of technical data disclosure and are not mutually exclusive. Please check at least one box below:

- Option A: Not applicable to Blue Path.
- Option B: Offer psi-install calculations as an in-house technical support service.
- Option C: Similar to Option B, but outsourced to PHIUS. PHIUS may assign psi-install jobs to its qualified Simulators, or, in connection with a building certification project, to certification staff.

## 2.2.2 Manufacturer Deliverables (optional)

Please check all that apply:

- ASTM E-283 airtightness test results
- Desired psi-install option calculations and drawings to scale of the install details in section and plan. Psi-install calculation results, including install details, will be published to the PHIUS database in addition to the window's other verified performance values. Manufacturer must provide PHIUS with the necessary THERM models of the frame cross-sections.



### 3. Verification Process

Once this Agreement is executed and PHIUS has received down payment from the Manufacturer, the verification process proceeds as follows for the Orange Path and Blue Path calculations methods accordingly.

#### 3.1 Verification Process for Orange Path Calculation

1. PHIUS Program Manager assigns job to a Simulator.
  - Simulators receive jobs “in rotation”. Turns may be skipped, but the Program Manager may require a Simulator to take a job.
  - The Simulator performs window calculations and/or psi-install calculations within a specified timeframe and reports THERM files and auxiliary calculation spreadsheets to PHIUS. The Simulator communicates requests for clarification as needed to the Program Manager.
  - If the deadline passes and the required information has not been received from the Simulator, PHIUS may assign the task to another provider!
2. Program Manager assigns Reviewer for window calculations.
3. Reviewer checks window calculations, communicates feedback to Simulator, and captures any protocol issues in the process.
4. Accepted results from the Reviewer (if other than the Program Manager) are then submitted back to the Program Manager for final review, issuing of certificate, and publishing of the results.
5. PHIUS invoices Manufacturer for balance of payment and listing fee.

The review period for the licensed window simulator and the second peer reviewer is 5 weeks from the date of complete receipt of all required documentation and clarifications under Section 2, acceptance of the not-to-exceed estimate, and receipt of down payment. Once PHIUS receives the results back from the simulation and review process, senior research staff will review the data again within two weeks of receipt and issue a final notification of the results to the Manufacturer, which will be sent out via e-mail.

Manufacturers can request a review of possible contested results. PHIUS will consider the request and make a final determination after one week. No further appeal is possible after the Manufacturer has been informed about the decision. Any legal challenge of the verification result is excluded.

#### 3.2 Verification Process for Blue Path Calculation

Upon receipt by PHIUS of:

- Calculation workbooks from the NFRC Simulator,
  - Inspection notice from IA or WINDOW and THERM files to be inspected from NFRC Simulator,
  - Notice from Manufacturer as to products to be listed, and
  - Execution of this Agreement,
  - The verification process for the Blue Path Calculation proceeds as follows.
1. Program Manager reviews any WINDOW and THERM files to be inspected.
  2. If the scope of the job includes pre-calculation of installation situations, the PHIUS Program Manager assigns the job to a Simulator.

- Simulators receive jobs “in rotation”. Turns may be skipped, but the Program Manager may require a Simulator to take a job.
  - The Simulator performs psi-install calculations within a specified timeframe and reports THERM files and auxiliary calculation spreadsheets to PHIUS. The Simulator communicates requests for clarification as needed to the Program Manager.
  - If the deadline passes and the required information has not been received from the Simulator, PHIUS may assign the task to another provider!
3. Program Manager assigns Reviewer for psi-install calculations.
  4. Reviewer checks psi-install calculations, communicates feedback to Simulator, and captures any protocol issues in the process.
  5. Accepted results from the Reviewer (if other than the Program Manager) are then submitted back to the Program Manager for final review, issuing of certificate, and publishing of the results.
  6. PHIUS invoices Manufacturer for balance of payment and listing fee.

#### 4. PHIUS Verified Product Performance Data Program Manufacturer Privileges / Obligations

- The manufacturer, specific product details, and verified product performance data values will be listed in the [PHIUS Verified Window Performance Database](#) on the PHIUS website. Optionally, the THERM files for psi-install calculation support and ASTM E-283 test data may also be published.
- PHIUS will deliver the following custom calculated window values to the Manufacturer: Ucg, SHGC, U-frame, frame widths, psi-spacer, and if elected the psi-install values for the number of specified varying installations.
- The validity of the verified data and duration of the listing in the online PHIUS database continues for a period of two years or until the Manufacturer makes any changes to the design/composition of the product, whichever comes first, after which the verification designation automatically expires. If no changes are made to the design/composition of the product after two years, the certification can be renewed for an additional two-year period for the nominal fee of \$500.00. If any changes are made to the design/composition of the product, it must be re-verified.
- Manufacturers who are sponsors of Passive House Alliance US (PHAUS) will receive a discount on the verification fee based upon the listed membership benefits for their respective sponsorship level.
- Subject to the terms of a separate written license, the Manufacturer may use the program-specific PHIUS product performance data verification mark graphic in conjunction with the specific product and verified product performance data only.
  - The Manufacturer will be granted access to the verification mark logo according to use guidelines issued by PHIUS to designate the PHIUS Verified Product Performance Data status.
  - The verification of performance data is product specific. The data verification mark is not transferable to other products of the same manufacturer.
  - The term “PHIUS Verified” is not to be used standing alone, but must always be accompanied by at least one piece of performance data, such as “PHIUS-recommended for Climate Zone 4”, “PHIUS-rated  $U \leq 0.18$ , or

“PHIUS frame/spacer grade B”.

- PHIUS reserves the right to terminate and revoke the PHIUS Verified Product Performance Data Certificate and all rights of use of the data verification mark graphic if the Manufacturer:
  - Falsely represented their product data in the marketplace, documents submitted with the application, or any material misrepresentation made by the Manufacturer; or
  - Submitted falsified information to obtain the certification for a product; or
  - Promotes products as having obtained PHIUS Verified Window Performance Data evaluation while they have not.

The program Registrant agrees that by signing this application form he/she has read and agrees to the terms of the “PHIUS Verified Window Performance Data Program Application Instructions”. The Registrant agrees to acknowledge, accept, and abide by PHIUS verification determination procedures. PHIUS reserves the right to update or change the requirements of this program at any time.

# Application to Verify the Performance Data of a Fenestration Product

Please complete the following fields below:	
Manufacturer*	←
Product Name*	←
Representative Contact Person*	←
Street Address*	←
City, State, ZIP*	←
Phone*	←
E-mail* <small>Business email address for Representative Contact Person of Manufacturer required</small>	←
Please attach Required Documentation (refer to Section 2)	
Attached	Yes <input type="checkbox"/> No <input type="checkbox"/>
Website URL	http://
PHAUS Sponsor	Yes <input type="checkbox"/> No <input type="checkbox"/> ←
I have read and agree to the terms of the "PHIUS Verified Product Performance Data Program" instructions.	
<p>Signature* _____</p> <p><i>Type "X" to indicate an electronic signature</i></p> <p>Date* _____</p>	

\* Required field

← This information may be published in the online [PHIUS Verified Window Performance Database](#)

## Appendix A. Data Verification Criteria

ASHRAE/IECC/DOE North American Climate Zone	Overall installed window U-value Btu/h.ft <sup>2</sup> .F	Center-of-glass U-value Btu/h.ft <sup>2</sup> .F	SHGC - South	SHGC - North, East, West
8	≤0.11	≤0.10	≥0.50	Any
7	≤0.12	≤0.11	≥0.50	Any
6	≤0.13	≤0.12	≥0.50	Any
5	≤0.14	≤0.13	≥0.50	Any
4	≤0.15	≤0.14	≥0.50	≤0.40
Marine North	≤0.16	≤0.15	≥0.50	≤0.40
Marine South	≤0.22	≤0.20	≤0.50	≤0.30
3	≤0.18	≤0.16	≤0.50	≤0.30
2 West	≤0.18	≤0.16	≤0.30	≤0.30
2 East	≤0.20	≤0.18	≤0.30	≤0.30