

# ISSUES AND CHALLENGES OF ENERGY RATING OF FENESTRATION PRODUCTS

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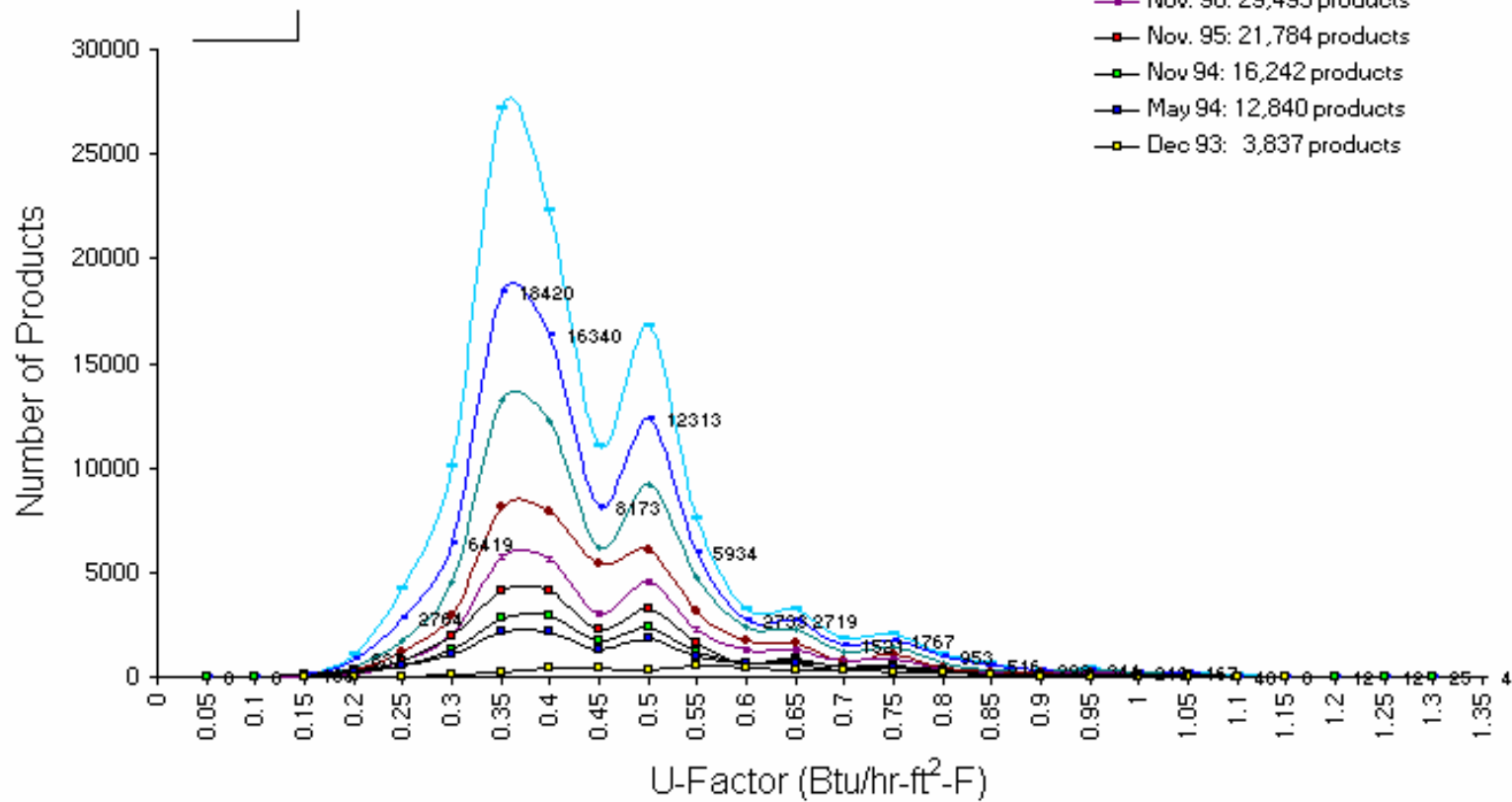
# CURRENT SYSTEM IN U.S.

- Energy rating exist for residential windows for 10+ years
- Energy rating for Non residential windows implemented by NFRC since 2000
- NFRC is independent organization that oversee energy ratings of fenestration systems in U.S.
- Current indices are:
  - U-factor
  - SHGC
  - VT
  - Air
- Planned for introduction in 2003:
  - CR (Condensation Resistance)
  - FR (Fading Resistance)

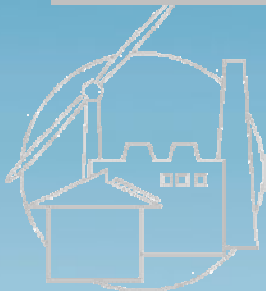
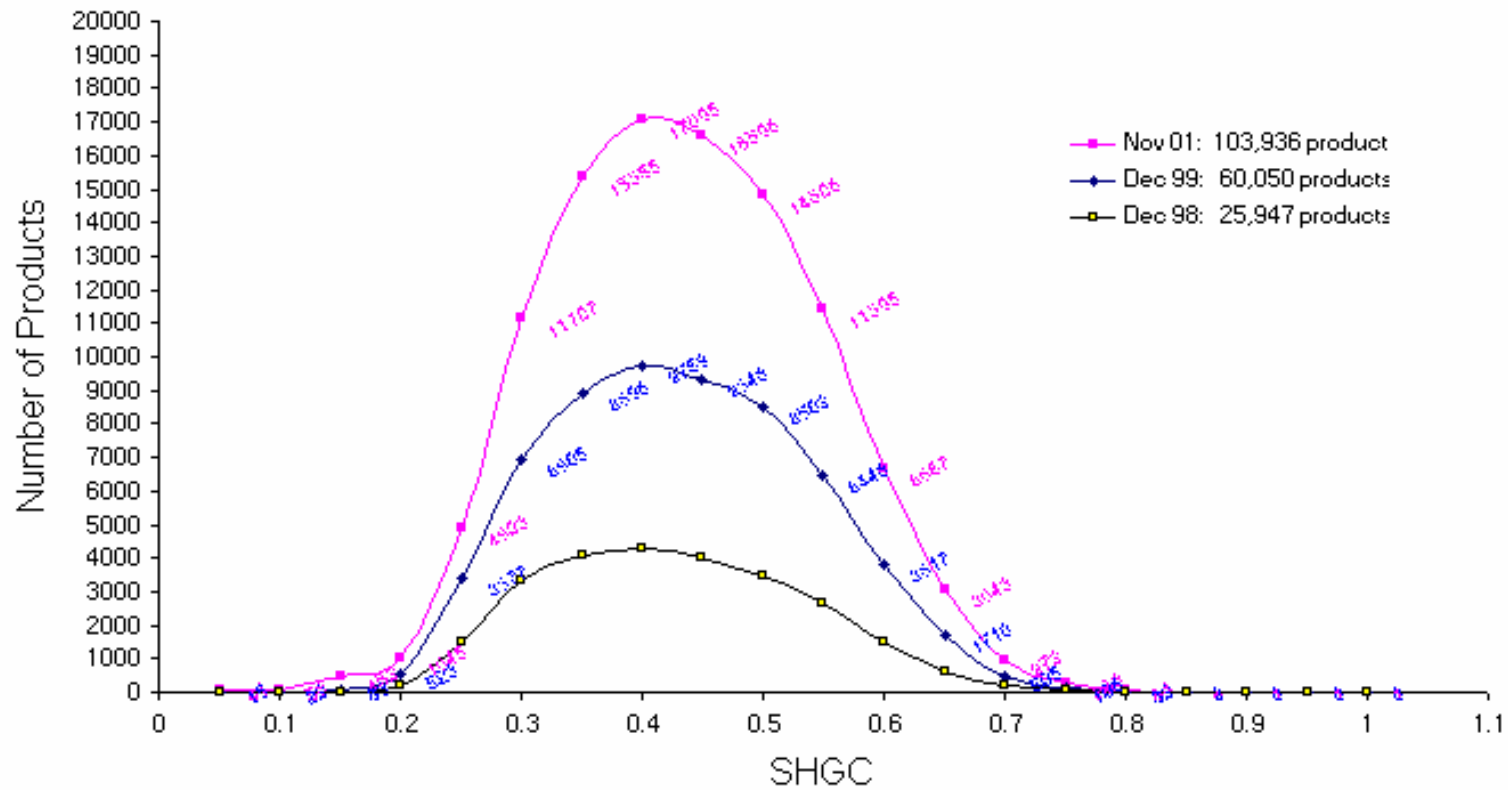


## Distribution of All Products (Residential Size only)

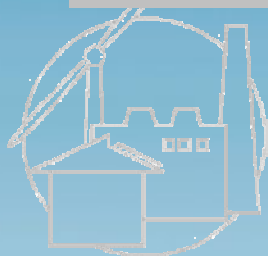
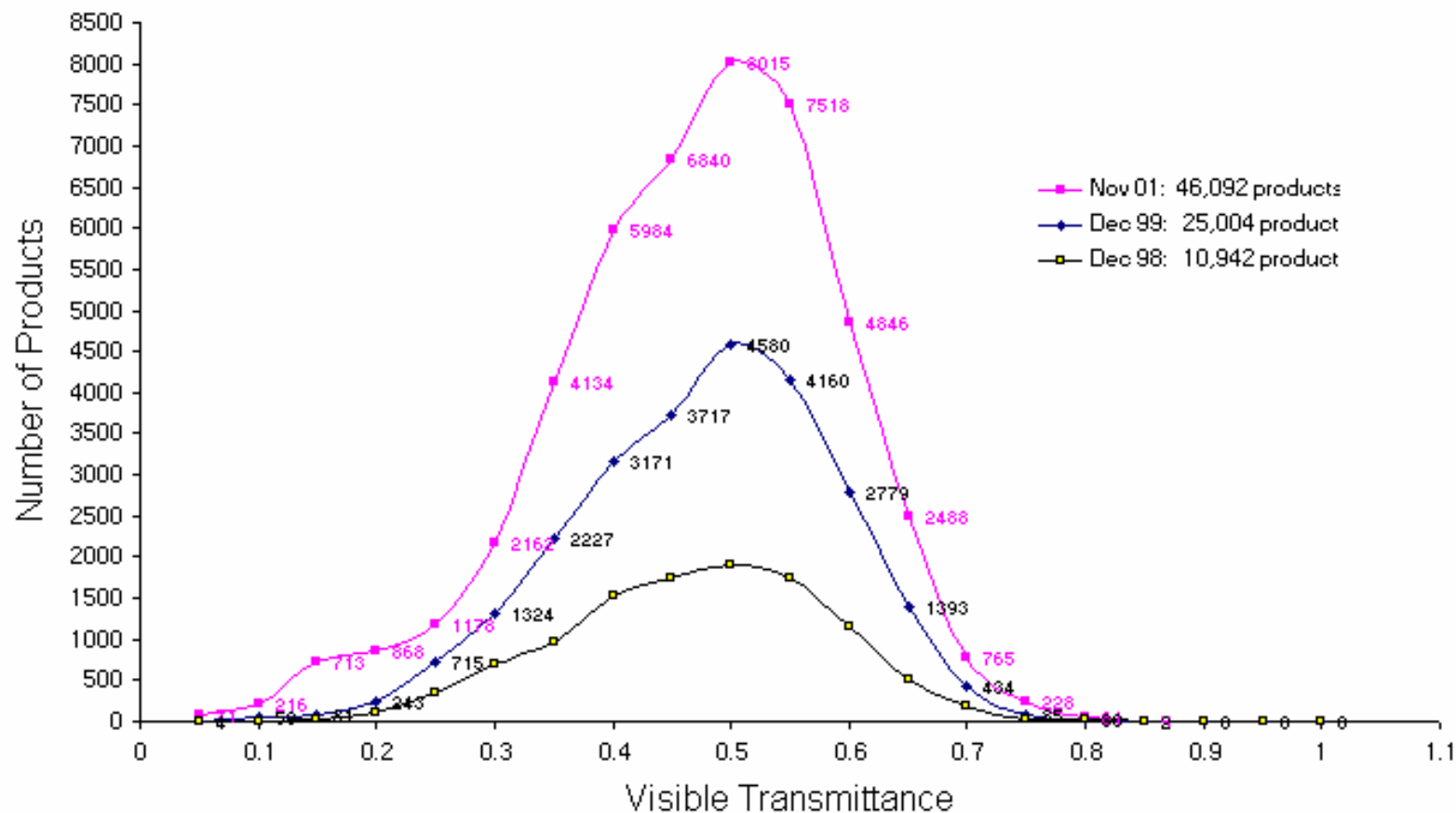
- Nov. 01: 113,879 product
- Dec. 99: 82,678 products
- Dec. 98: 61,613 products
- Dec. 97: 41,699 products
- Nov. 96: 29,495 products
- Nov. 95: 21,784 products
- Nov 94: 16,242 products
- May 94: 12,840 products
- Dec 93: 3,837 products



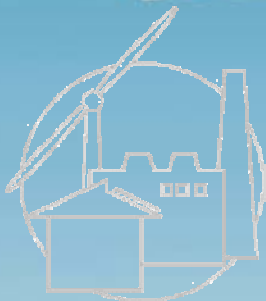
## Distribution of All Products (Residential Size only)



## Distribution of All Products (Residential Size only)



# The NFRC "Process"

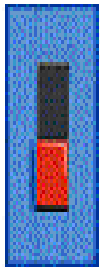


# Residential and Commercial market

Residential Buildings

Non-Residential Buildings

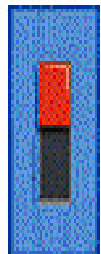
Thermo



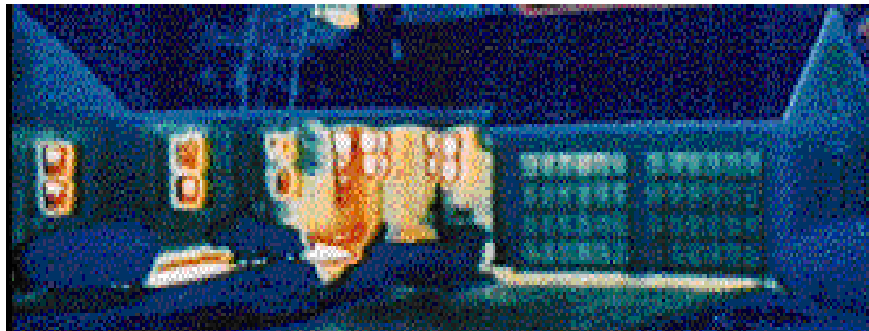
Normal



COOL  HOT



Normal

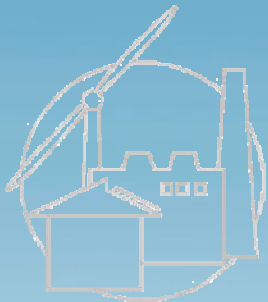


COOL  HOT



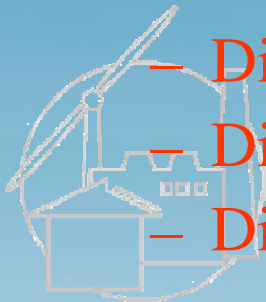
# Residential Product: Rating Challenges

- Certification
- Labeling
- Technical
- Energy Rating vs Performance



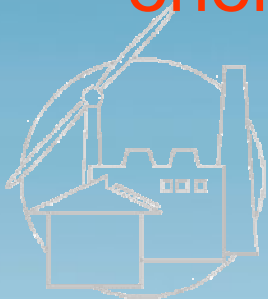
# Residential Products: Issues In the Existing Rating System

- Size
  - Same size for residential and commercial
  - Different Rated product size (casement, horizontal slider, door). How to cross compare.
  - Installed vs. reported performance
- How much testing for validation
- Emerging technologies, Products that cannot be simulated and/or tested using existing methodologies
- Index for annual energy use
  - Different climates
  - Different building uses
  - Different construction of buildings



# Residential Products: Issues In the Existing Rating System – Cont.

- Defining individual products within a product line (i.e., keeping the matrix which is manageable and traceable)
- Certification of products with attachments and applied films.
- Explaining rating to consumers who are mainly home owners.
- Differentiating between energy performance and energy rating.



# NFRC's Label

This mark indicates that NFRC has rated and certified the energy performance of the product to perform as stipulated by the manufacturer

This area is reserved for the name of the product, manufacturer, the product name, and a description of the product (type of frame, number of glazing layers, etc.).


This space lists contacts where you can get more information and provides details about NFRC testing procedures

U-factor (Btu/hr-ft<sup>2</sup>-F): measures how well a product prevents heat from escaping your home. U-factor ratings generally fall between 0.20 and 1.20 Btu/hr-ft<sup>2</sup>-F. The lower the U-factor, the better. U-factor is particularly important in northern climates.

Solar Heat Gain Coefficient\*: (SHGC) measures how well a product blocks heat caused by sunlight. SHGC is expressed as a number between 0 and 1. A lower SHGC is particularly important in southern climates.

Visible Transmittance\* (VT) measures how much light comes through a product. VT is expressed as a number between 0 and 1. Heavily tinted products have a relatively low VT.

Air Leakage Rating



National Fenestration Rating Council  
**CERTIFIED**

**World's Best Window Co.**  
**Millennium 2000+ Casement**  
Vinyl-Clad Wood Frame  
Double Glaze • Argon Fill • Low E

**ENERGY Performance**

- Energy savings will depend on your specific climate, house and lifestyle
- For more information, call [manufacturer's phone number] or visit NFRC's web site at [www.nfrc.org](http://www.nfrc.org)

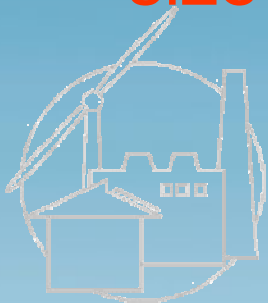
| Technical Information |          |            |                             |            |
|-----------------------|----------|------------|-----------------------------|------------|
| Res                   | U-Factor | <b>.32</b> | Solar Heat Gain Coefficient | <b>.45</b> |
| Non-Res               |          | <b>.31</b> |                             | <b>.45</b> |
|                       |          |            | Visible Transmittance       | <b>.58</b> |
|                       |          |            |                             | <b>.60</b> |
|                       |          |            | Air Leakage                 | <b>.3</b>  |
|                       |          |            |                             | <b>.3</b>  |

Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product energy performance. NFRC ratings are determined for a fixed set of environmental conditions and specific product sizes.



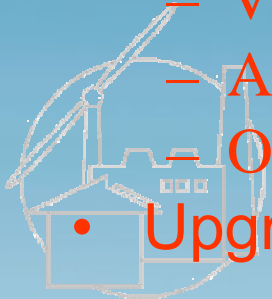
# Labeling Challenges For Residential Buildings

- Simplification of Label, so that consumer can understand what the numbers mean
- Ability to trace the product to the database (central system) for verification of rating numbers
- Am I getting what I am buying, based on numbers on the label.
- Ability to translate the ratings numbers to any size

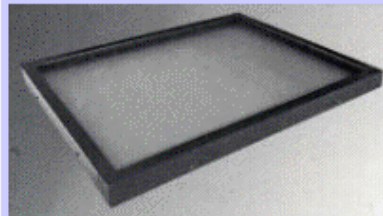


# Technical Challenges For Residential Buildings

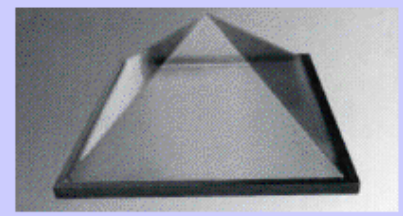
- Existing products:
  - attachments,
  - applied films,
  - glass blocks,
  - domed skylight (having variable glazing cavity),
  - Tubular daylight devices
  - Garden or Bay windows
  - SHGC and VT for diffused glazing (i.e., patterned, frosted)
- Emerging Technologies and how to rate them:
  - Vacuum glazing
  - Aero gels
  - Other
- Upgrade of both testing and simulation procedures



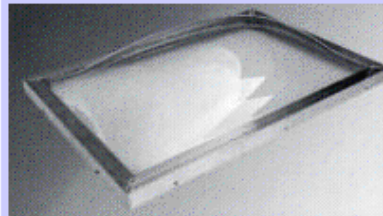
# Partitions & Shower Walls



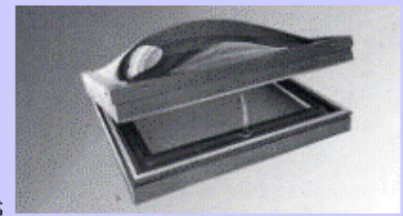
Flat Glass



Pyramids



Acrylic Domes



Operables

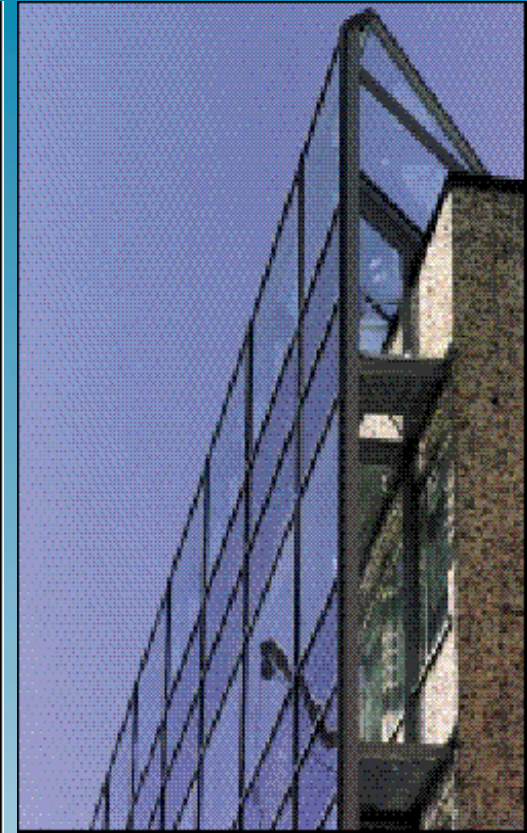
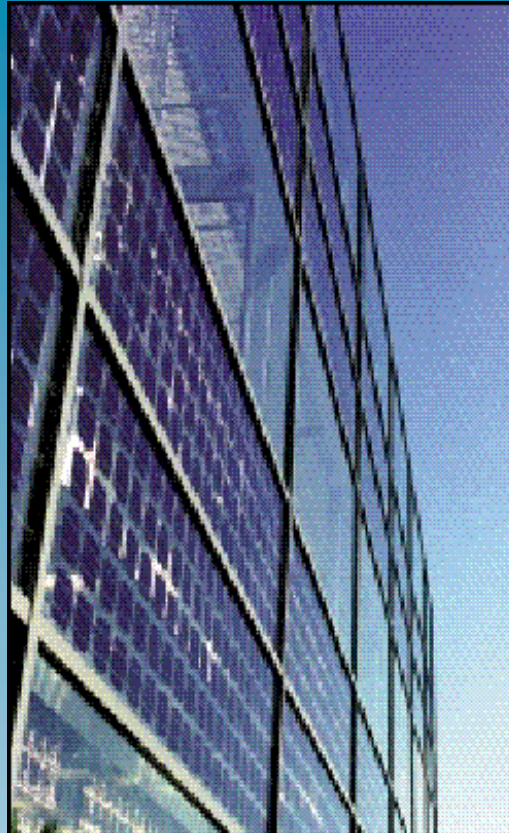
## 1. The Sunlight



## 2. Mirror Tubes



## 3. Ceiling Fixture



# Some Other Technical Challenges For Residential Buildings

- Rating for glare, day-lighting ... etc
- Rating for comfort
- Window wall interface
- Window and inside envelope interface and effects
- 3D effect and it importance
- Non planner installations



# Commercial Fenestration Systems

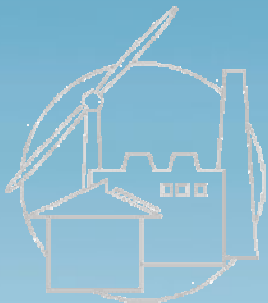


- Different target audience
  - Architects
  - Engineers
- Different categories:
  - Punched Opening
  - Site Built
  - Custom systems



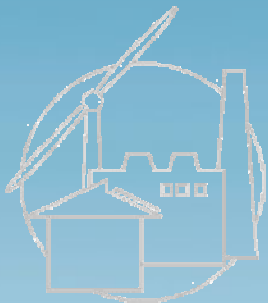
# Rating Challenges For Commercial Buildings

- Defining Representative Products for a project
- Certification of Products With Attachments and applied Films.
- Double facades, how to rate such products?
- Differentiating Between Energy Performance and Energy Rating.
- Who is the responsible party for compliance



# Labeling Challenges For Commercial Buildings


- How to Label products on multi story buildings
- Ability to translate the fixed product size ratings numbers on the label to any size so as to perform actual energy calculation
- Ability to trace the product to the database for verification of rating numbers, perform quality control checks at site
- Am I getting what I am Buying, based on numbers on the label.
- Means to verify the components used during modeling



# NFRC's Site Built Label

## NFRC Label Certificate

(For Site-Built Products)

|   |   |                             |                       |             |
|---|---|-----------------------------|-----------------------|-------------|
| <br>National Fenestration<br>Rating Council<br><b>CERTIFIED</b>   | <b>ENERGY Performance</b>   |                             |                       |             |
|   | <ul style="list-style-type: none"> <li>• Energy savings will depend on your specific climate, house and lifestyle</li> <li>• For more information, call (manufacturer's phone number) or visit NFRC's web site at <a href="http://www.nfrc.org">www.nfrc.org</a></li> </ul> |                             |                       |             |
| <b>Technical Information</b>  |   |                             |                       |             |
|   | U-Value   | Solar Heat Gain Coefficient | Visible Transmittance | Air Leakage |
| Non-Res   | <b>.31</b>  | <b>.45</b>                  | <b>.60</b>            | <b>.3</b>   |
| <small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product energy performance. NFRC ratings are determined for a fixed set of environmental conditions and specific product sizes.</small> |   |                             |                       |             |

### PROJECT LOCATION

Street Address: \_\_\_\_\_  
 City, State, Zip code: \_\_\_\_\_  
 Project name (optional): \_\_\_\_\_ Design (optional): \_\_\_\_\_

### PRODUCT LINE INFORMATION

Operation Type (per NFRC 100, Table 1): \_\_\_\_\_  
 Product Line ID Number: \_\_\_\_\_ Individual Product ID Number: \_\_\_\_\_  
 How many of this individual product: \_\_\_\_\_ Casework in building: \_\_\_\_\_  
 Elevation drawing page: \_\_\_\_\_ Facade area (window & door) schedule page: \_\_\_\_\_

### FRAME MATERIAL SUPPLIER

Company name: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 City, State, Zip code: \_\_\_\_\_ Phone: \_\_\_\_\_ Facsimile: \_\_\_\_\_  
 Contact person: \_\_\_\_\_

### GLAZING MATERIAL SUPPLIER

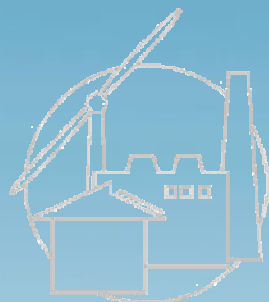
Company name: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 City, State, Zip code: \_\_\_\_\_ Phone: \_\_\_\_\_ Facsimile: \_\_\_\_\_  
 Contact person: \_\_\_\_\_

### GLAZING CONTRACT OR INSTALLER

Company name: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 City, State, Zip code: \_\_\_\_\_ Phone: \_\_\_\_\_ Facsimile: \_\_\_\_\_  
 Contact person: \_\_\_\_\_

### CERTIFICATION AUTHORIZATION

Independent Certification and Inspection Agency (IC): \_\_\_\_\_  
 Date Certification Authorization issued: \_\_\_\_\_



# Technical Challenges For Commercial Buildings

- Defining the representative products for a building project.
- Simulation of Products with attachments, applied films, commercial dome skylight (having variable glazing cavity), daylight devices.
- Simulating Product with Air Exchange
- Simulating Double façade fenestration products
- Simulating products for SHGC and VT having diffused glazing, patterns, Ceramics.
- Means to translate Rating numbers to Performance number for energy calculation
- Summer Condition and Winter Condition Rating their impact on ratings and performance.



# Technical Challenges For Commercial Buildings Cont...

- Testing and Simulation deviations for SHGC and VT
- Test Procedure to determine VT for products that are difficult to Simulate
- Rating for Glare, Day-lighting ... etc
- Window wall interface
- Window and inside envelope interface and effects
- 3D effect and it importance
- Non planner installations (Corner Window)

