The Future of Fenestration Rating

William C. duPont Sunergy Consulting April 14, 2015 BEST 4 Conference

Measurement of Material and Optical Properties of Frame & Glazing System Established

- Material Properties of Frame Components
 - Thermal Conductance ASTM C518
 - Emittance ASTM C1585, NFRC 301
 - Reviewed by NFRC & Stored in THERM
- Optical Properties of Glazing System Layers
 - Properties (TRA) of Specular Glass ASTM E903, NFRC 300
 - Reviewed by NFRC & Stored in WINDOW IGDB
 - Properties (Bi-Directional) of Diffusing Layers Spectrophotometer, Goniophotometer
 - ► Stored in WINDOW CGDB

Simulation & Measurement of Whole Fenestration Systems Established

- Caluclation of U-Factor, SHGC & Visible Transmittance
 - WINDOW uses IGDB & CGDB to determine U-Factor, SHGC & VT of Glazing Systems NFRC 100 & NFRC 200
 - THERM uses Material Properties Library to determine U-Factor of Frame
 - WINDOW & THERM used to determine Condensation Resistance (CR)
- Measurement of U-Factor, SHGC & Visible Transmittance
 - ▶ U-Factors ASTM C1199, ASTM E1423 & NFRC 102
 - SHGC ASTM E903, NFRC 300 & NFRC 201
 - Visible Transmittance ASTM E903, NFRC 300, NFRC 202 & NFRC 203
 - Condensation Resistance AAMA 1503
 - Air Infiltration ASTM E283 & NFRC 400

Rating of Whole Fenestration Systems Established

- ► U-Factor, SHGC & Visible Transmittance
 - ► THERM uses Material Properties Library to determine U-Factor of Frame NFRC 100
 - WINDOW uses IGDB & CGDB to determine U-Factor, SHGC & VT of Glazing Systems NFRC 100 & NFRC 200
- Measurement of U-Factor, SHGC & Visible Transmittance
 - ▶ U-Factors ASTM C1199, ASTM E1423 & NFRC 102
 - SHGC ASTM E903, NFRC 300 & NFRC 201
 - Visible Transmittance ASTM E903, NFRC 300, NFRC 202 & NFRC 203

Limitations of Rating Systems

Heat Transfer by U-Factor is a Function of Temperature Difference

- Varies over Location, Season, and Time of Day
- SHGC & Visible Transmittance is a Function of Incident Irradiation
 - ▶ Incident Angle Varies over Location, Season, and Time of Day
 - Currently Direct Normal Irradiation Only
 - Direct & Diffuse Irradiation
 - Include and Separate Diffuse Irradiation (Hemispherical)
- New Systems are Being Characterized
 - Spandrel Panels
 - 4th Surface Low-E Double Glazing
 - TDDs
 - Shading Systems

Building Performance of Structures with Fenestration Characterized

- Residential Construction
 - RESFEN & Energy Plus
- Commercial Construction
 - COMFEN & Energy Plus

Rating Organizations Future

- Need to Compile & Verify Material and Optical Properties
- Let Marking Departments Determine Rated Values
 - Different for Residential and Commercial