Daylighting Rating SC/TG Option for Simple Rating

NFRC, Atlanta Fall Membership Meeting
Nov 7th 2011
Mudit Saxena, HMG
Ross’s Suggestion
- Via memo dated Sept 17th 2011

Task 1: Agree upon a standard clear sky type

Task 2: Agree upon $L(\theta_s, \Phi_s)$

Task 3: Produce photopic BSDF via Window 7 with standard clear sky and sun located behind the window.

Then integrate over all angles to produce a single numeric rating

Note: Sun is behind the window
Electric Lighting Provide Lumens/Watt

- Example: Luminaires shown here provide **100,000 lumens** to the space
Fenestration Provide Lumens/Square Foot

• If Daylighting Rating provide in Lumens/sf,
  – then one could calculate that **four 8x8 skylights** with a rating of 400 lumens/sf will also provide **100,000 lumens**
Fenestration Provide Lumens/Square Foot

- Or four 45’x5’ windows with a rating of 111 lumens/sf will also provide 10,000 lumens
Simple Daylighting Rating Format proposal

• Just as electric Lighting efficacy measured in
  – Lumens/Watts

• A product’s daylighting rating be measured in
  – Lumens/sf
    • This allows a sf to sf comparison of products
    • Products like window, skylights, blinds etc. are already priced in $/sf
    • Products measure as a whole ie. with frame, mullions, but rating generated as per sf. of rough opening
A Scale of Lumens/sf

- This is a measure of how much daylight is brought into a room by a product
  - Does NOT address how the daylight is distributed. In other words, there is no guarantee that the lumens being brought in are going to replace equivalent electric lighting
    - But the “potential” exists!
  - The complex rating will likely address directional effects, daylight quality, distribution, uniformity etc.
A Scale of Lumens/sf

- However, on this scale **diffusing windows** will rank lower than **clear window**
  - When diffusing glazing is known to be better for daylighting
Alternative Option

• We rate the window under 2 conditions

1. Sun behind the window
   \( X \) lumens/sf

2. Sun in front of the window
   \( Y \) lumens/sf
Alternative Option

• However clear glazing will be rated **with a generic venetian blinds or shades** when sun in front of window

1. Sun behind the window
   X lumens/sf

2. Sun in front of the window
   Y lumens/sf
Final Rating = Weighted Average of the Two Conditions

• We conduct a study
  – Using TMY weather files for major metropolitan cities in the US, determine daylit hours sun is on N,S,E and W facades, and daylit hours that sun is NOT on any façade
    • Say the answer came out to be
      – 60% of the time sun is not on facades
      – 40% of the time sun is on facades

• Final Rating = 0.6*X + 0.4*Y
A Scale of Lumens/sf

- This is a more realistic rating of daylighting potential from a clear window glazing.
Advanced Daylighting Blinds/Shades

- Daylighting blinds/shades redirect or diffuse sunlight when lowered
  - Clear glazing can be rated with daylighting blinds/shades instead of the generic blinds/shades
  - Which would in turn move clear glazing products up the rating scale
    - Encouraging market to think of windows together with blinds as a daylighting product
    - Encourage products that have daylighting blinds and glazing integrated
Advanced Daylighting Blinds/Shades
Discussion ...