

Daylighting Rating SC/TG Option for Simple Rating

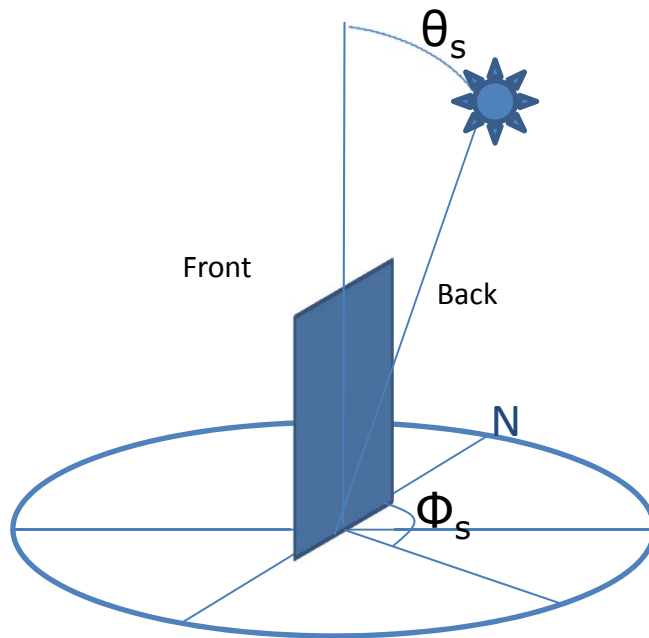
NFRC, Atlanta Fall Membership Meeting

Nov 7th 2011

Mudit Saxena, HMG

Ross's Suggestion

- Via memo dated Sept 17th 2011



Note: Sun is behind the window

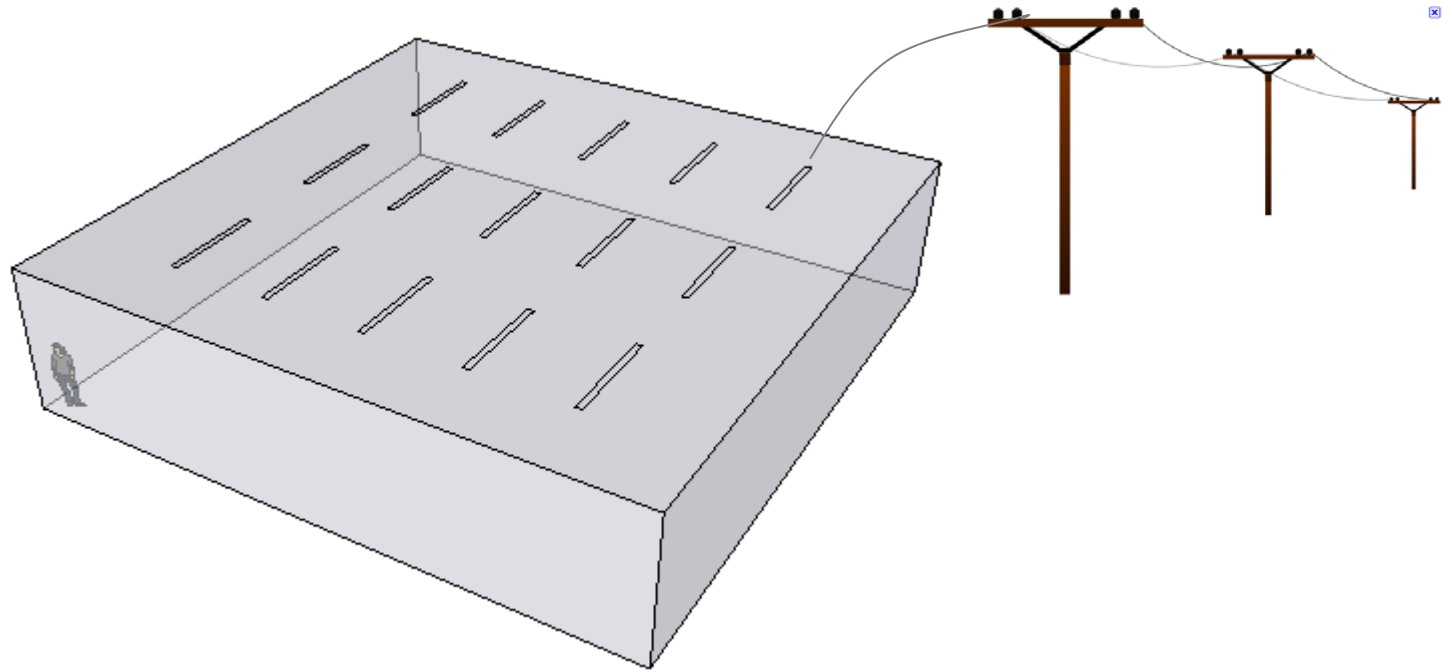
Task 1: Agree upon a standard clear sky type

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.

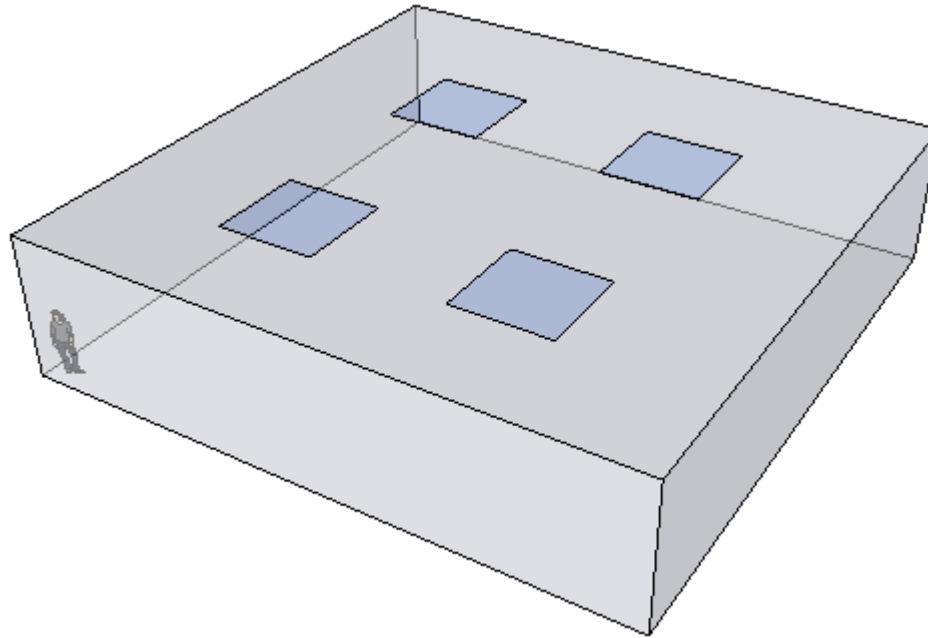
Then integrate over all angles to produce a **single numeric rating**

Electric Lighting Provide Lumens/Watt



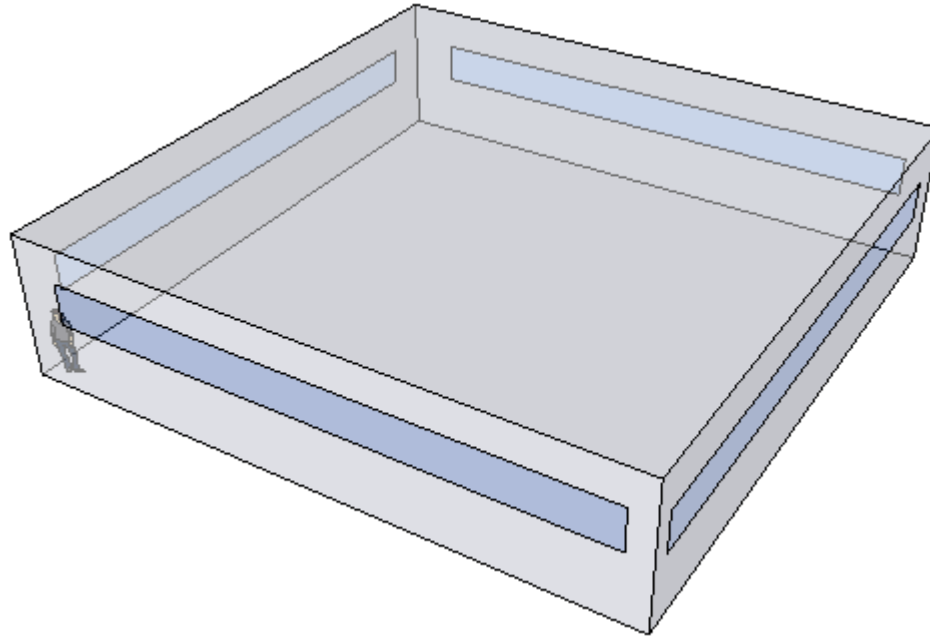
- Example:
Luminaires shown here provide **100,000 lumens** to the space

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

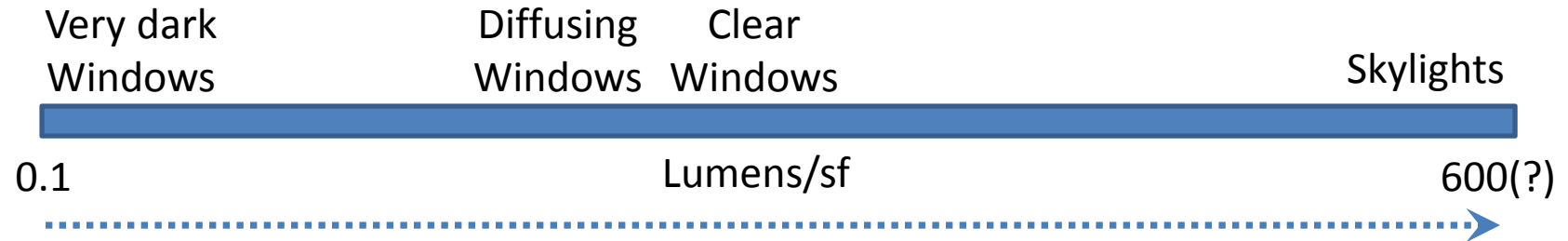


- Or **four 45'x5' windows** with a rating of 111 lumens/sf **will also provide 10,000 lumens**

Simple Daylighting Rating Format proposal

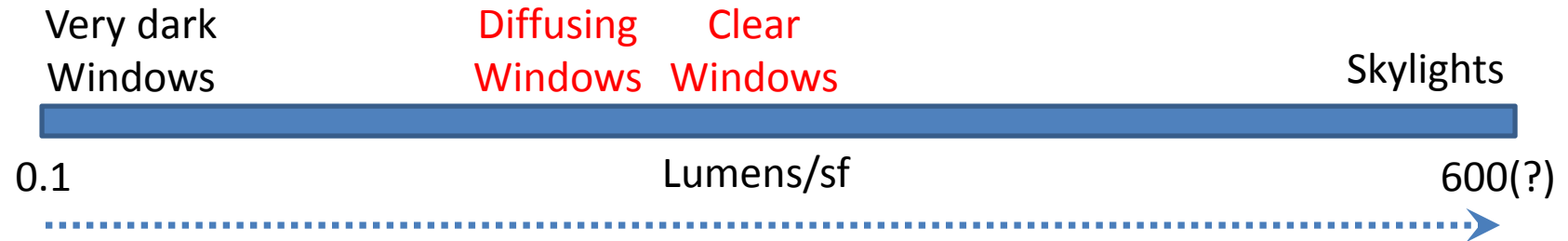
- Just as electric Lighting efficacy measured in
 - Lumens/Watts
- A product's daylighting rating be measured in
 - Lumens/sf
 - This allows a sf to sf comparison of products
 - Products like window, skylights, blinds etc. are already priced in \$/sf
 - Products measure as a whole ie. with frame, mullions, 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.

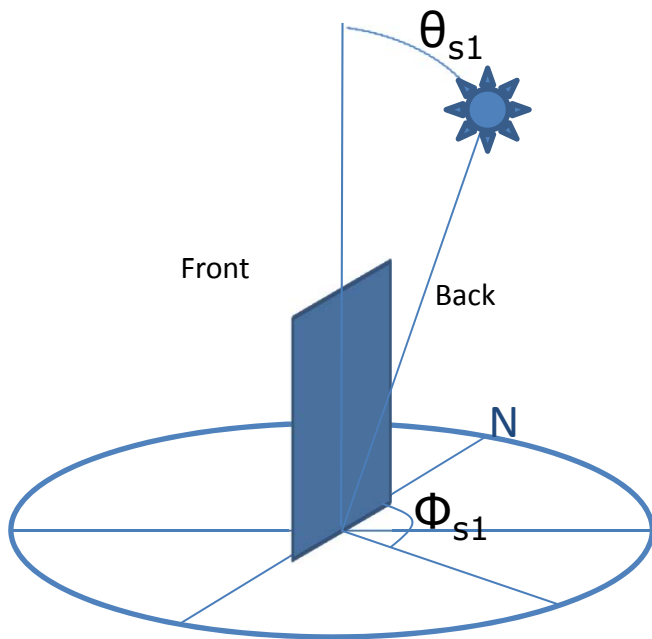
A Scale of Lumens/sf



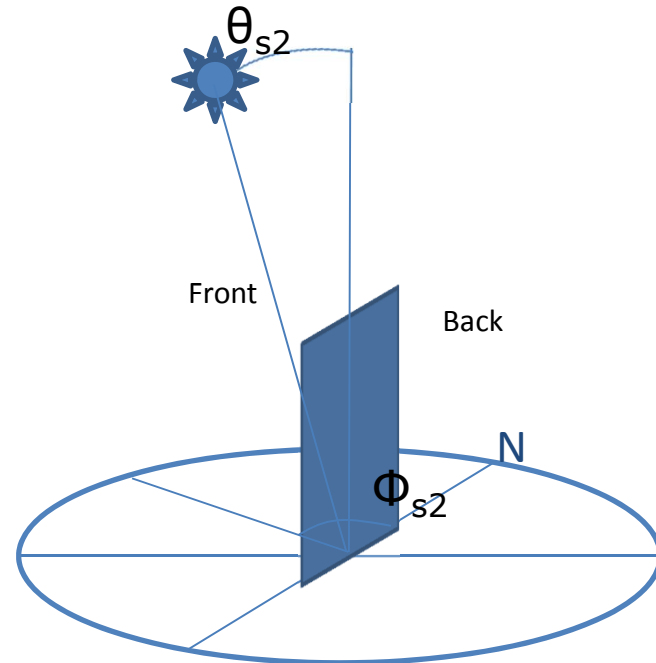
- However, on this scale **diffusing windows** will rank lower than **clear window**
 - When diffusing glazing is known to be better for daylighting

Alternative Option

- We rate the window under 2 conditions



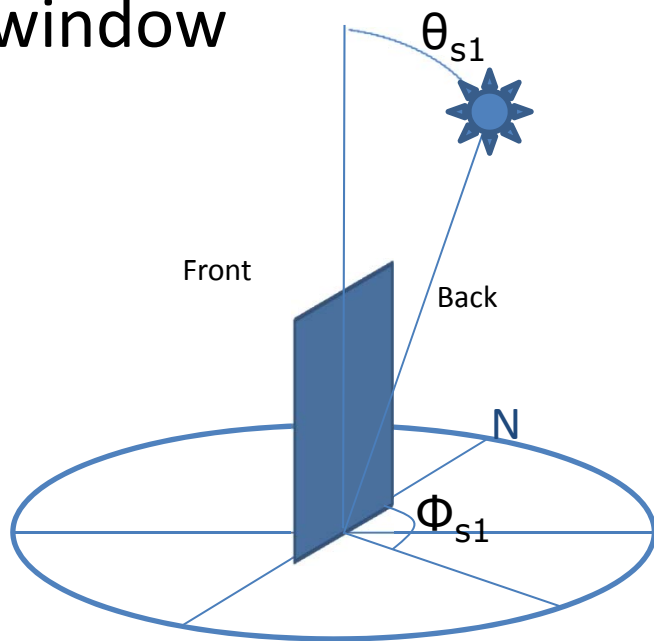
1. Sun behind the window
X lumens/sf



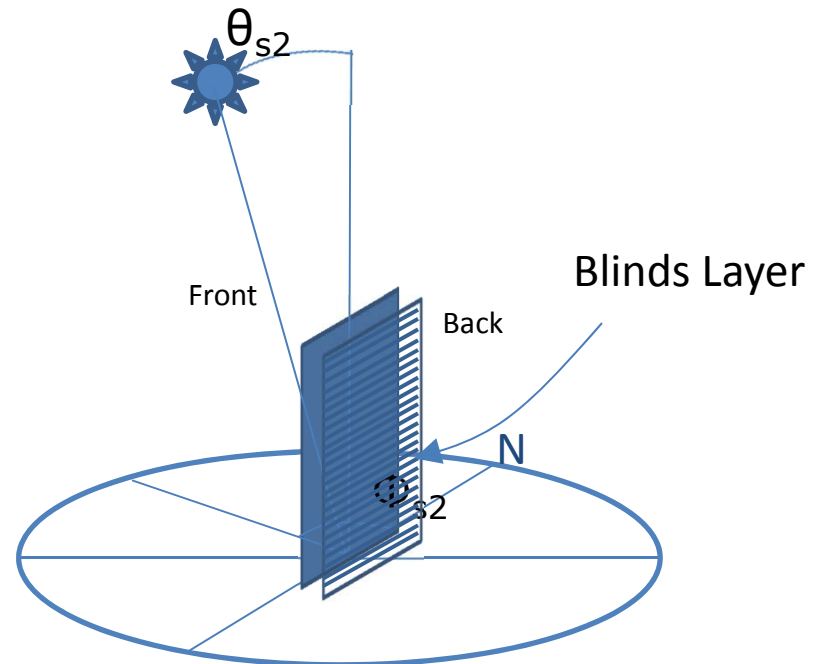
2. Sun in front of the window
Y lumens/sf

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

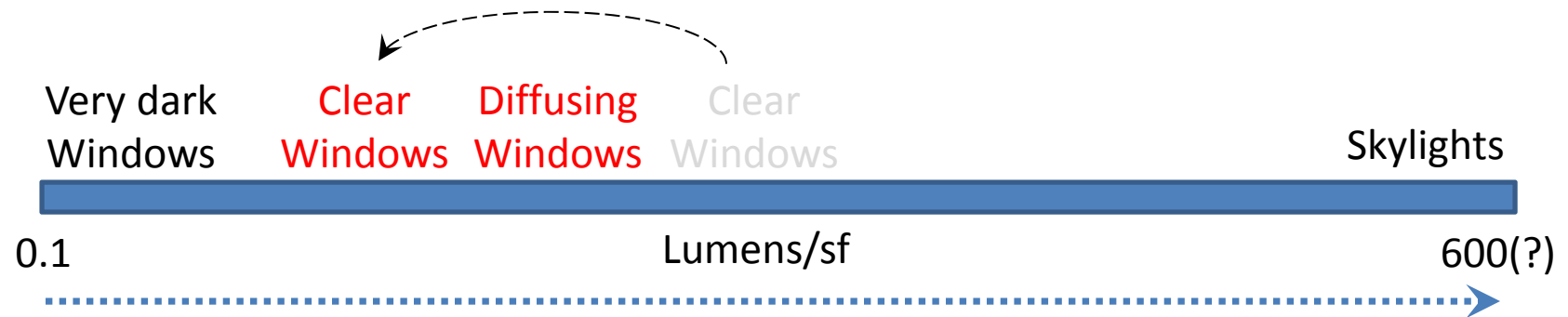


2. Sun in front of the window
Y lumens/sf

Final Rating = Weighted Average of the Two Conditions

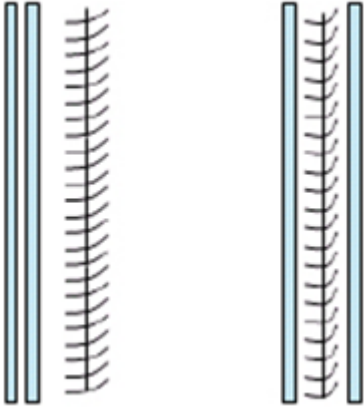
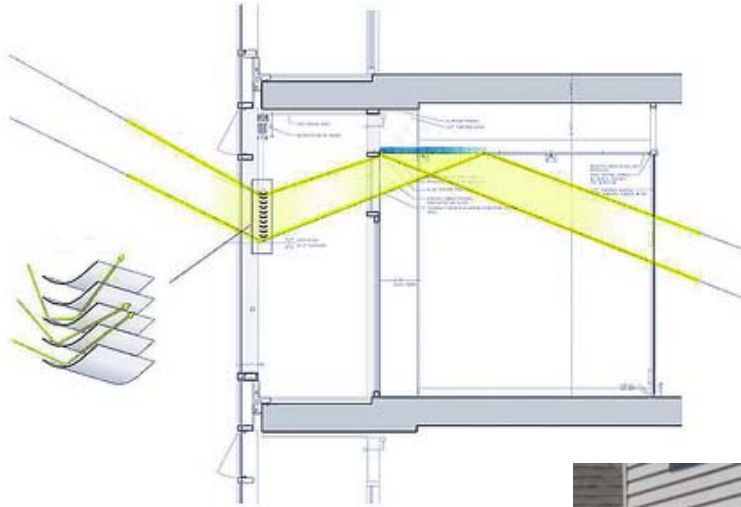
- We conduct a study
 - Using TMY weather files for major metropolitan cities in the US, determine daylight hours sun is on N,S,E and W facades, and daylight hours that sun is NOT on any façade
 - Say the answer came out to be
 - 60% of the time sun is not on facades
 - 40% of the time sun is on facades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



Discussion ...