

Examples of Using Radiance to Examine Lighting and Daylighting Quality

By Joseph J. Deringer AIA

The Deringer Group Inc

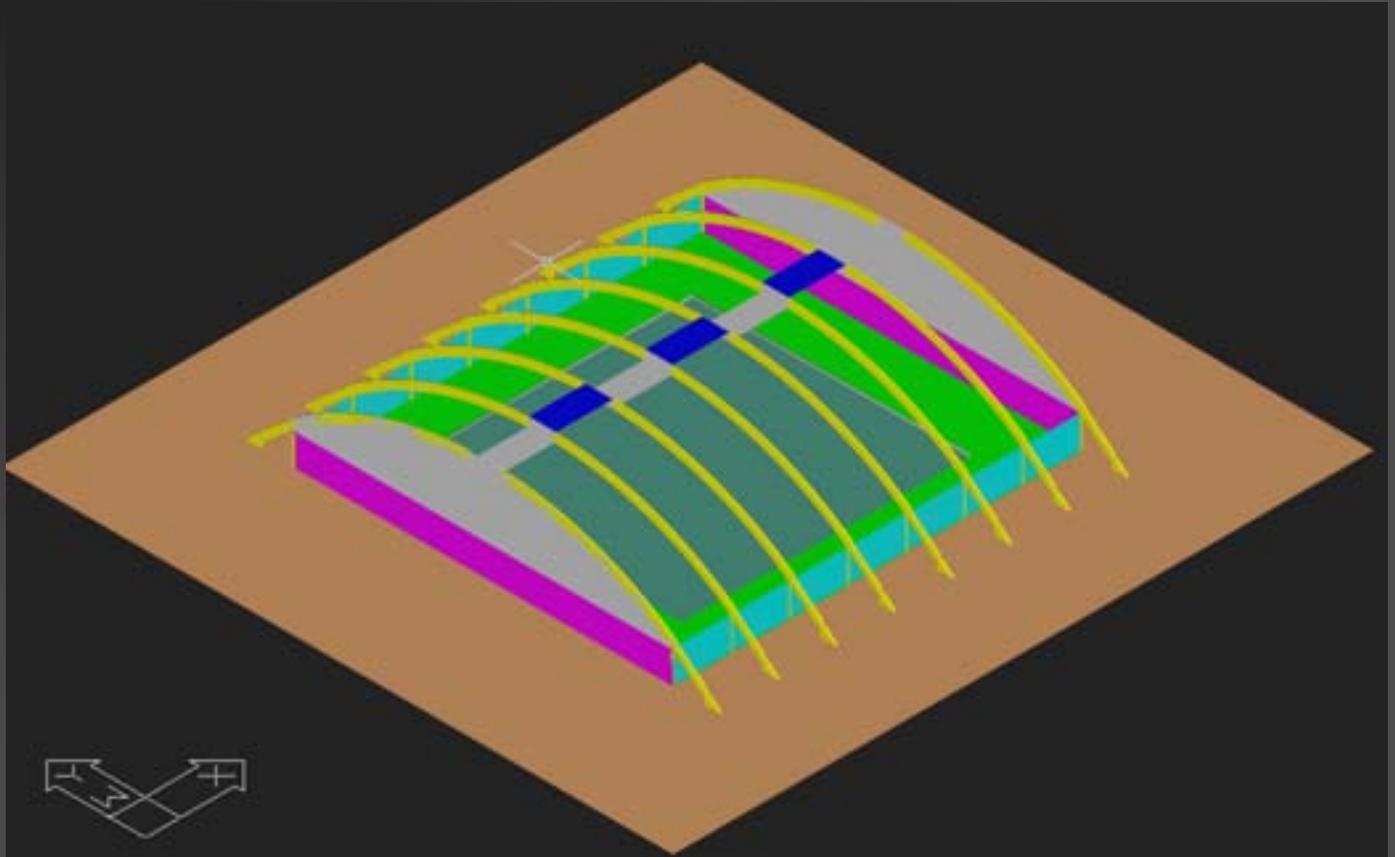
www.deringergroup.com

www.EcoAdvisor.com

Example 1 – Swimming Pool Lighting

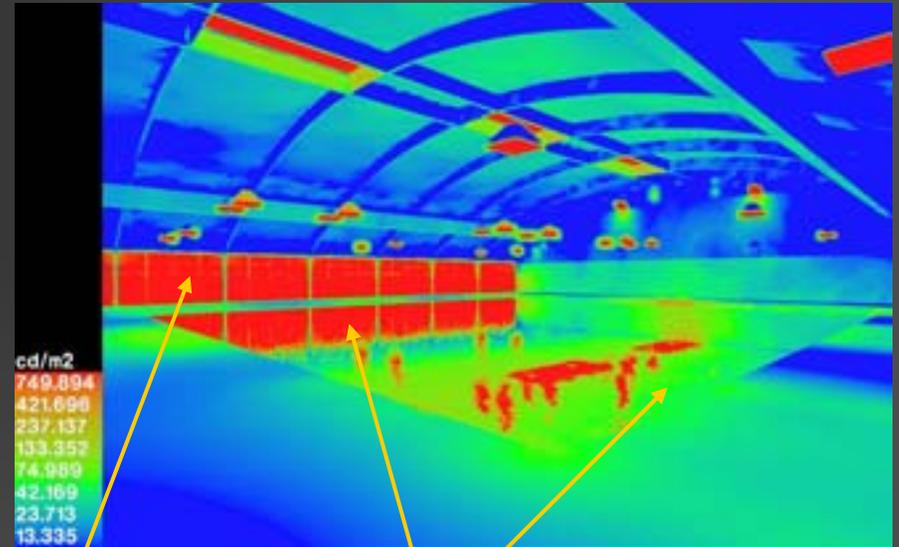
- Problem – Existing Large Public Swimming Pool in City in Southwest US
- Severe glare from:
 - White translucent garage-type windows on North and South elevations
 - Reflection onto glass from unshaded concrete deck outside
 - Dark ceiling and walls contract to excessive contrast
 - Water surface reflections
- Result: hard for lifeguards to see people in pool
- Challenge – reduce glare & contrast, at low cost

Process - Model Building in AutoCAD



Process – Use Radiance to add light sources & surface properties

Dark ceiling & walls cause high contrast with very bright translucent windows with direct sunlight on them



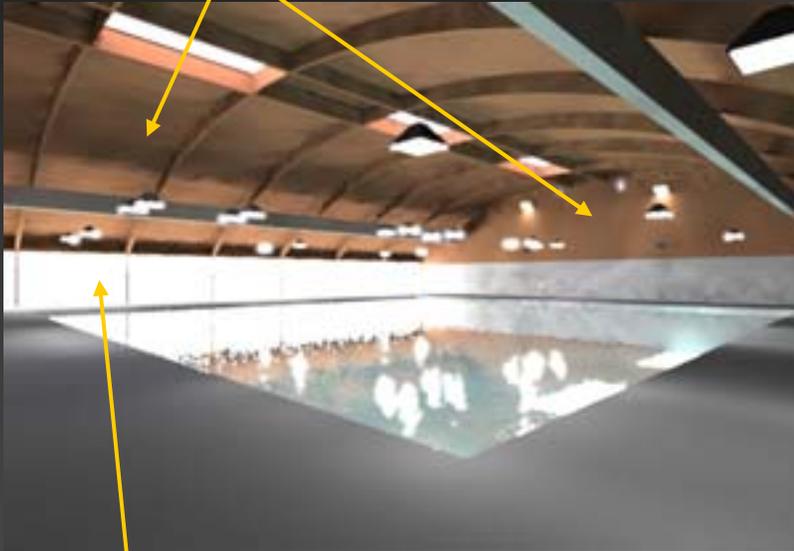
Glare from South translucent white windows

Glare in water from windows & skylights

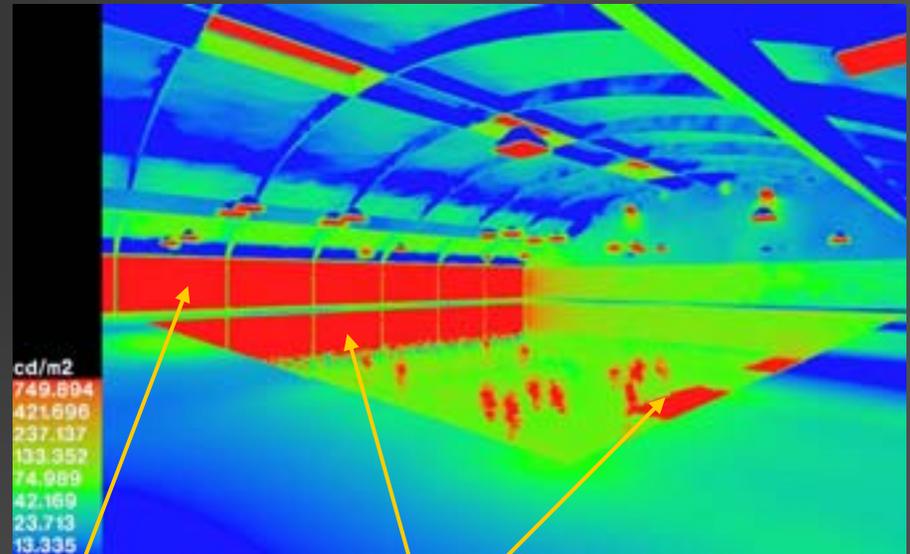
- Base Case Condition – Noon in December
- Low Sun angle
- Visual appearance (left image)
- Analyze surface surface brightness inside (right image)

Base Case Conditions – Sept. Noon

Dark ceiling & walls cause high contrast with very bright translucent windows with direct sunlight on them



Glare from South translucent white windows



Glare in water from windows & skylights

- Look at same conditions at noon in September, with intermediate sun angles from south

Strategies to reduce glare & contrast

- Shade outside concrete deck with vertical and horizontal trellises
- Convert glass from translucent to clear
- Paint ceiling and walls a light color
- Up-lighting onto ceiling to replace down-lighting

Radiance images - Before and After



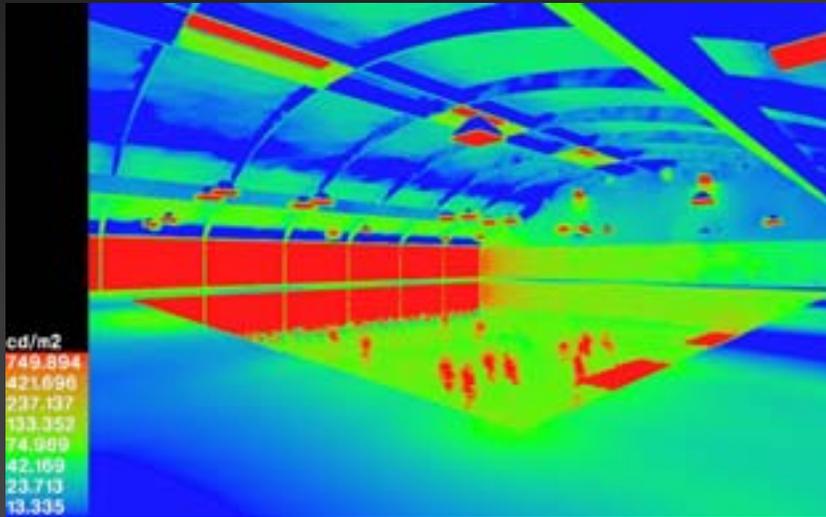
Base case - September



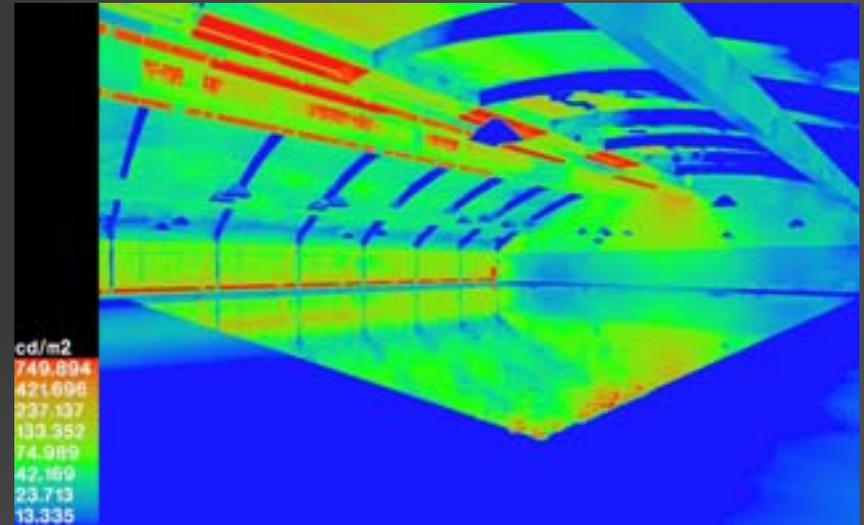
Proposal to reduce glare at pool surface

■ Visual

Radiance images - Before and After



Base case - September



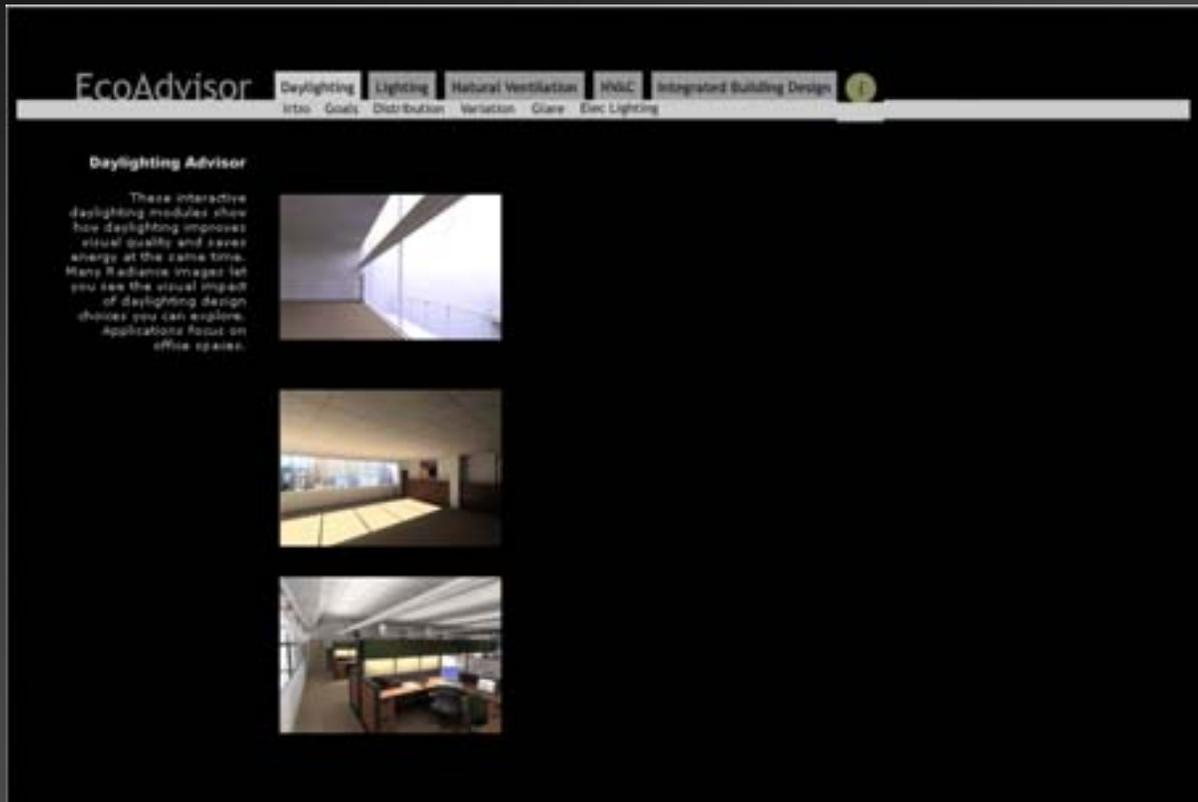
Proposal to reduce glare at pool surface

- Analysis of surfaces

Example 2 – Office Daylight Parametrics

- Objective – Demonstrate quality and quantity impacts for daylight from side-lighting for a typical open office plan
- Examples on following slides are from interactive website:
 - www.Ecoadvisor.com

EcoAdvisor Daylighting Web Module



- Written in Macromedia Flash
- 10,000 + images generated from Radiance



- Example Radiance-generated image of office



Daylighting Home
EcoAdvisor Home

Comment: visual artifacts on back wall and tables in foreground result from "sketch" image development mode, used to save computer time while generating draft images. Visual artifacts will disappear in final images. Also, contrast between atrium and office space can be reduced by several means, as while be shown in subsequent images. Check back again.

- Example Radiance-generated image with a atrium – visual artifacts result from quick “draft” mode image generation

EcoAdvisor

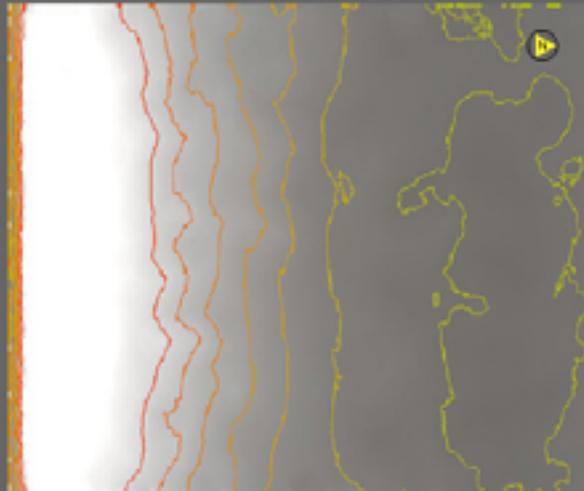
Daylight Distribution Windows

main intro geo wnd skyl inter xpior i

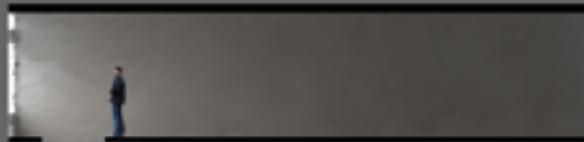
Analysis ▾
Concepts
Strategies
Applications



To examine the options, click on an icon



Plan with Isolux contours using Radiance



Section North-South looking West

Introduction

Daylight Distribution Impacts

Here you can examine how key window design options impact daylight distribution in an open office space - window area, continuity, head height, and glazing type. In addition, you can examine the tradeoffs of how some basic solar control and glare reduction devices - overhangs, light shelves and light-change daylight distribution as well as other visual aspects of the space.



Looking South West



Looking West



Looking North West

Floor area percent daylighted

Task % 500+ lux 51%

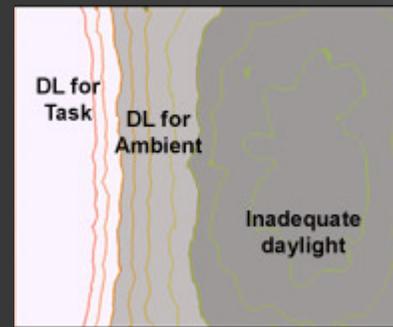
Ambient % 200-500 lux 40%

Total %: task + ambient 91%

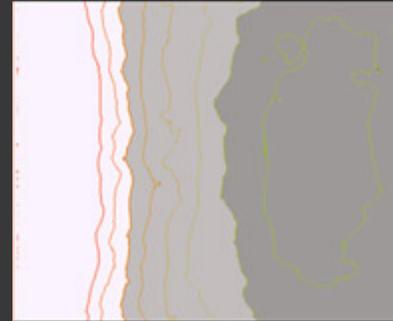
- Example Screen – analysis of window options: head height, Glass type, sun controls, sky conditions

Analysis of space configuration

- 40' x 40' space
- Floor plans
- Strip windows to left, facing south at noon
- Radiance images post-processed
 - White= 50 fc +
 - Light gray = 20-50 fc
 - Medium gray < 20 fc



8.5' window head height



10.5' window head height



12.5' window head height



12.5' window head height,
with atrium on right

EcoAdvisor Daylight Distribution Interiors

main intro geo wnd skyl inter xplor /

Analysis ▾
Concepts
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Applications

Partitions - height



Partitions - opacity



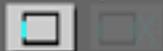
Type



Sky



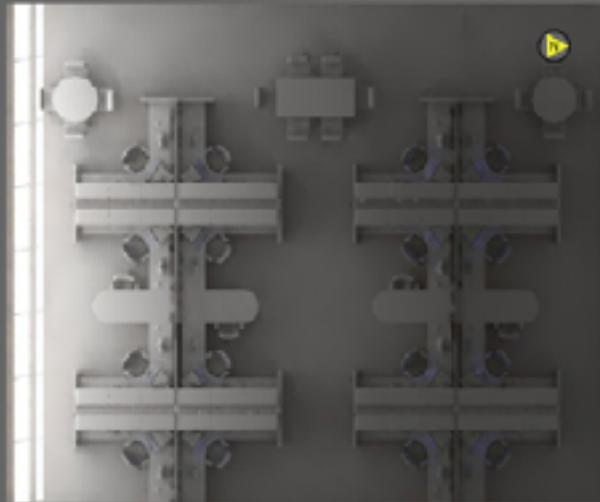
OpenIn



Head height



To examine the options, click on an icon



Plan



Section North-South looking West

Introduction

In this screen you can examine how key furniture options can strongly impact the distribution of daylight into an open office space. A few variations are explored for each of the following design options:

- Partition height
- Transparency of partitions parallel to the windows
- Arrangement of workstations



Floor area percent daylighted

Task % 500+ lux

Ambient % 200-500 lux

Total %: task + ambient

- Example Screen – visual appearance of translucent furniture partition & interference with daylighting, 12.5' window head height

Analysis ▾
Concepts
Strategies
Applications

Partitions - height



Partitions - opacity



Type



Sky



Openin



Head height



To examine the options, click on an icon



Plan with Isolux contours using Radiance
■ > 500 lux ■ 200 - 500 lux ■ < 200 lux

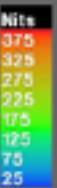
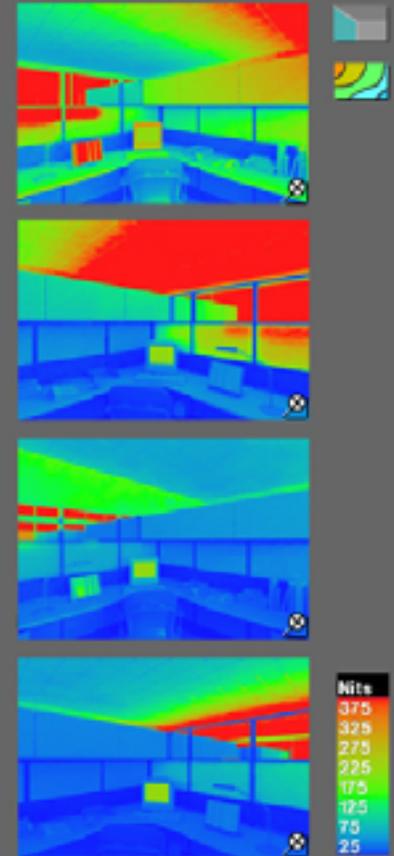


Section North-South looking West

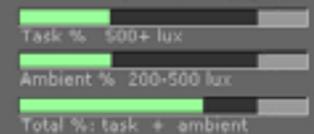
Introduction

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- Partition height
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- Arrangement of workstations



Floor area percent daylighted



- Example Screen – analysis of translucent furniture partition & interference with daylighting penetration, 12.5' window head height

Introduction

Analysis

Concepts ■

Strategies

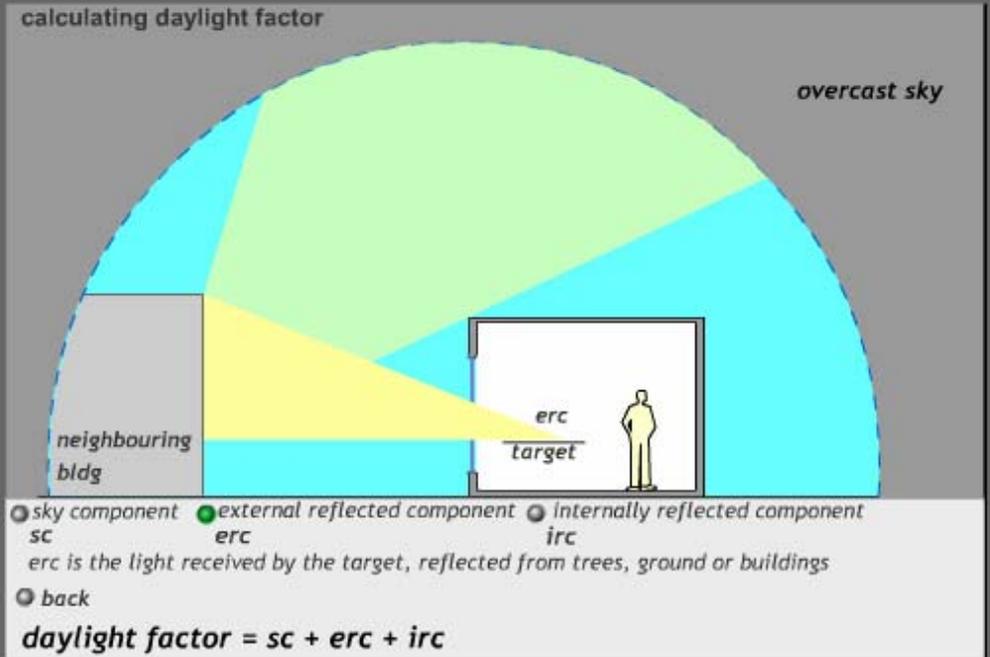
Applications

cosine law ■

luminance x apparent size ■

effective aperture ■

daylight factor ■



Daylight Factor

The daylight factor is a ratio of interior to exterior illuminance under an overcast, unobstructed sky (measured in a horizontal plane at both locations and expressed as a percentage) and remains constant regardless of changes in absolute sky luminance. This is so because the relative luminance distribution of

- Example Screen – explanation of daylight factor, with animations

End of Radiance Examples

- Thank You