Examples of Using Radiance to Examine Lighting and Daylighting Quality

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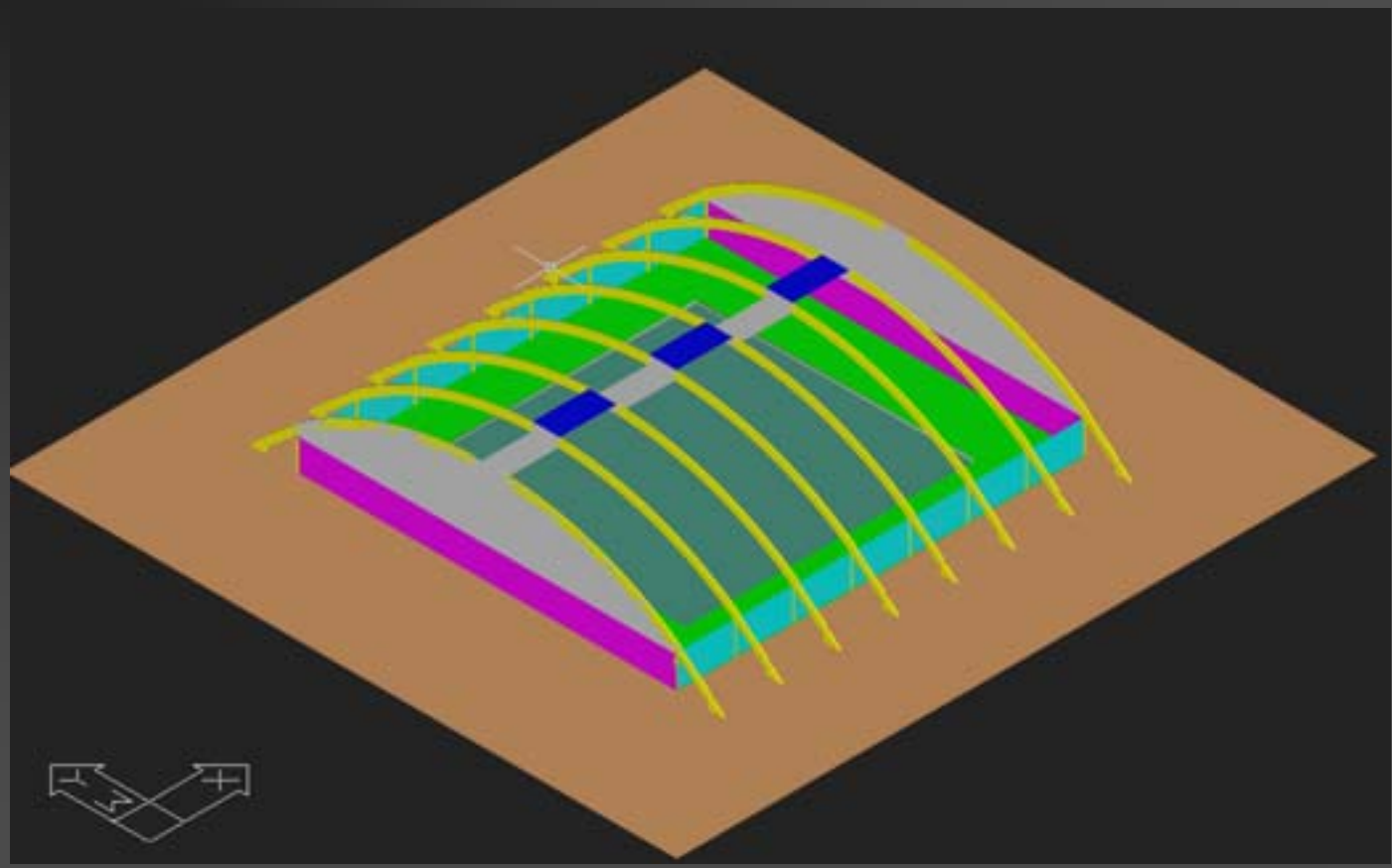
Example 1 – Swimming Pool Lighting

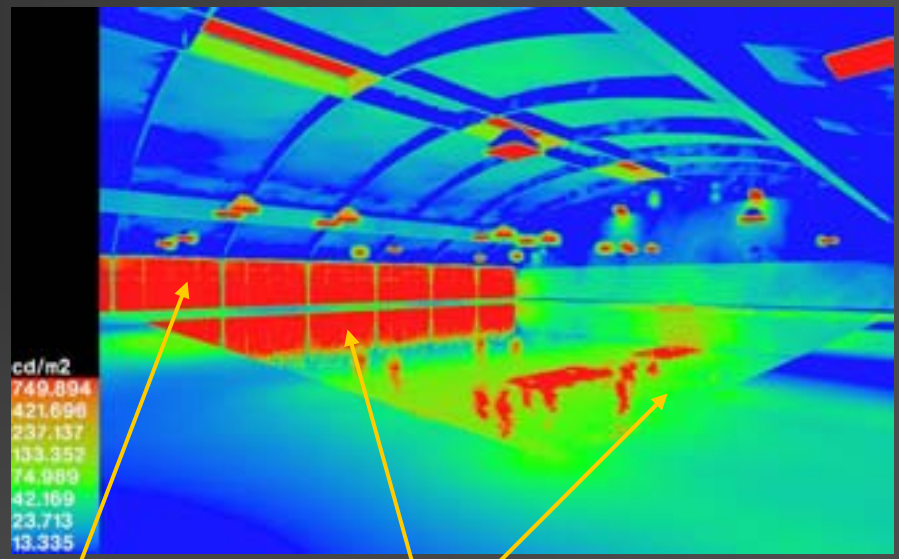
- Problem – Existing Large Public Swimming Pool in City in Southwest US
- Severe glare from:
  - White translucent garage-type windows on North and South elevations
  - Reflection onto glass from unshaded concrete deck outside
  - Dark ceiling and walls contract to excessive contrast
  - Water surface 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



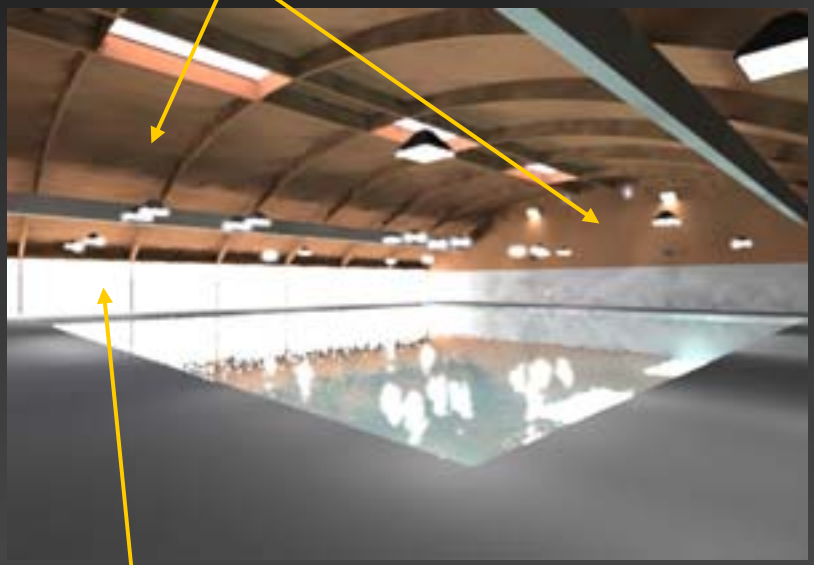
Glare from South translucent white windows

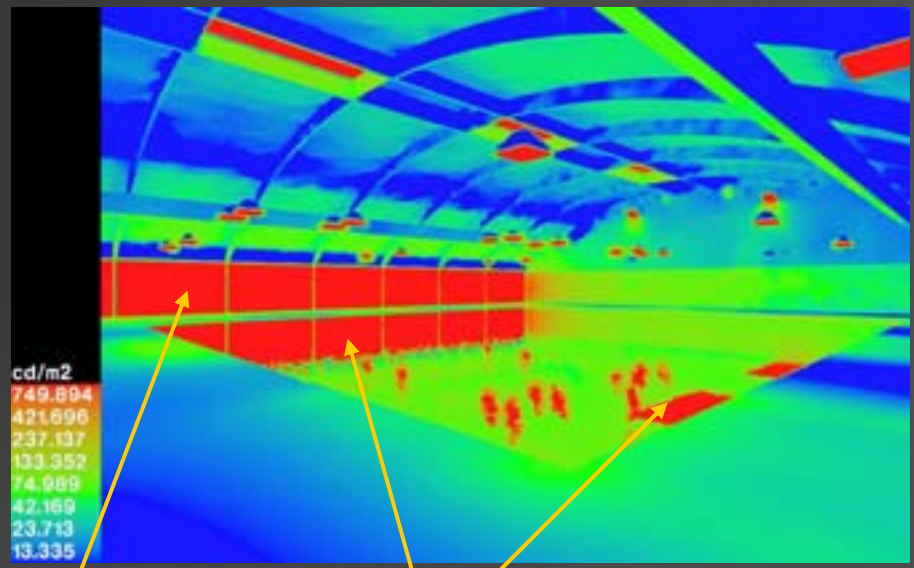
Glare in water from windows & skylights

- 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

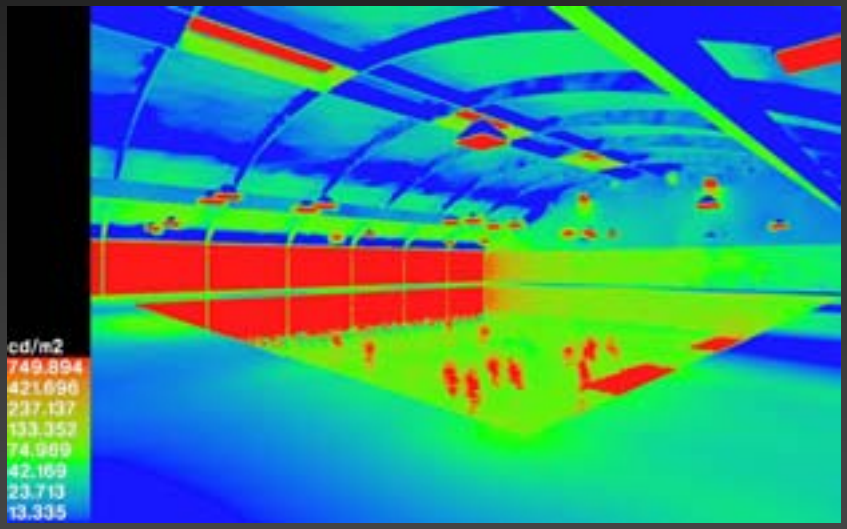
Radiance images - Before and After

Base case - September

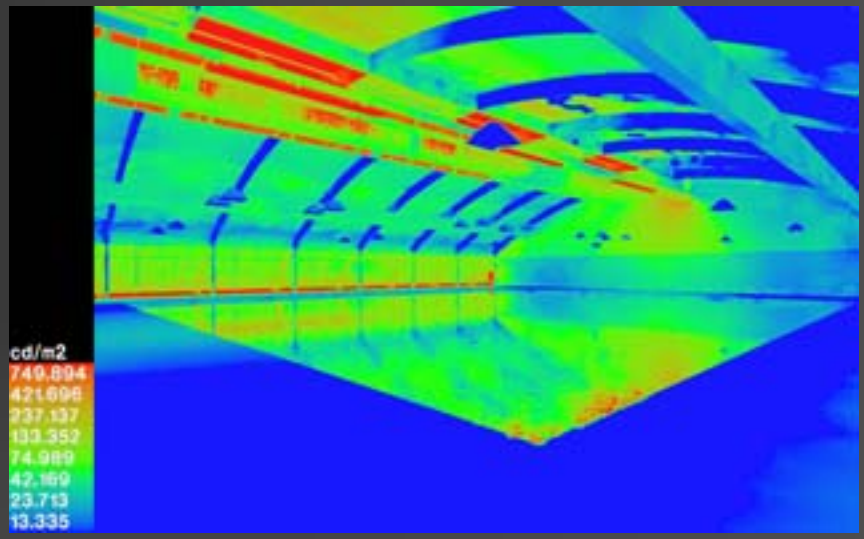
Proposal to reduce glare at pool surface

- Visual

Radiance images - Before and After



Base case - September



Proposal to reduce glare at pool surface

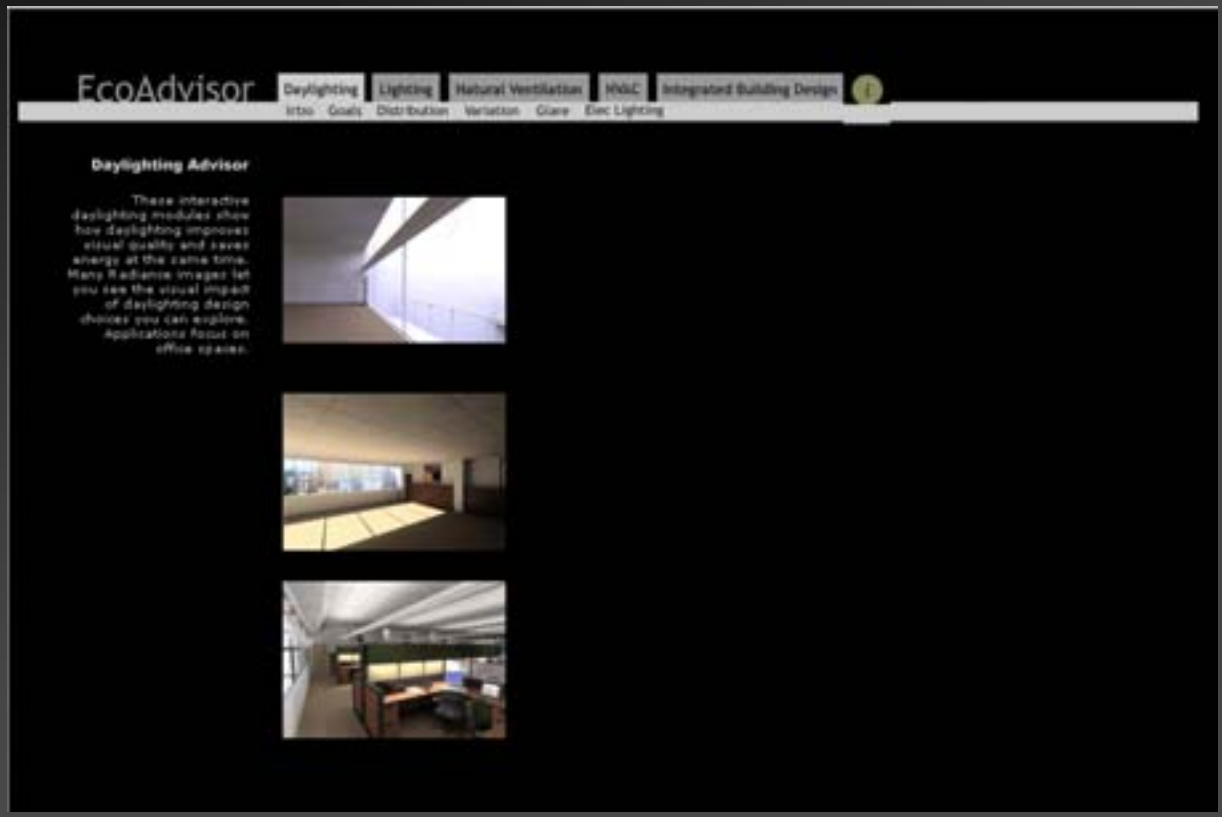
- Analysis of surfaces

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

EcoAdvisor Daylighting

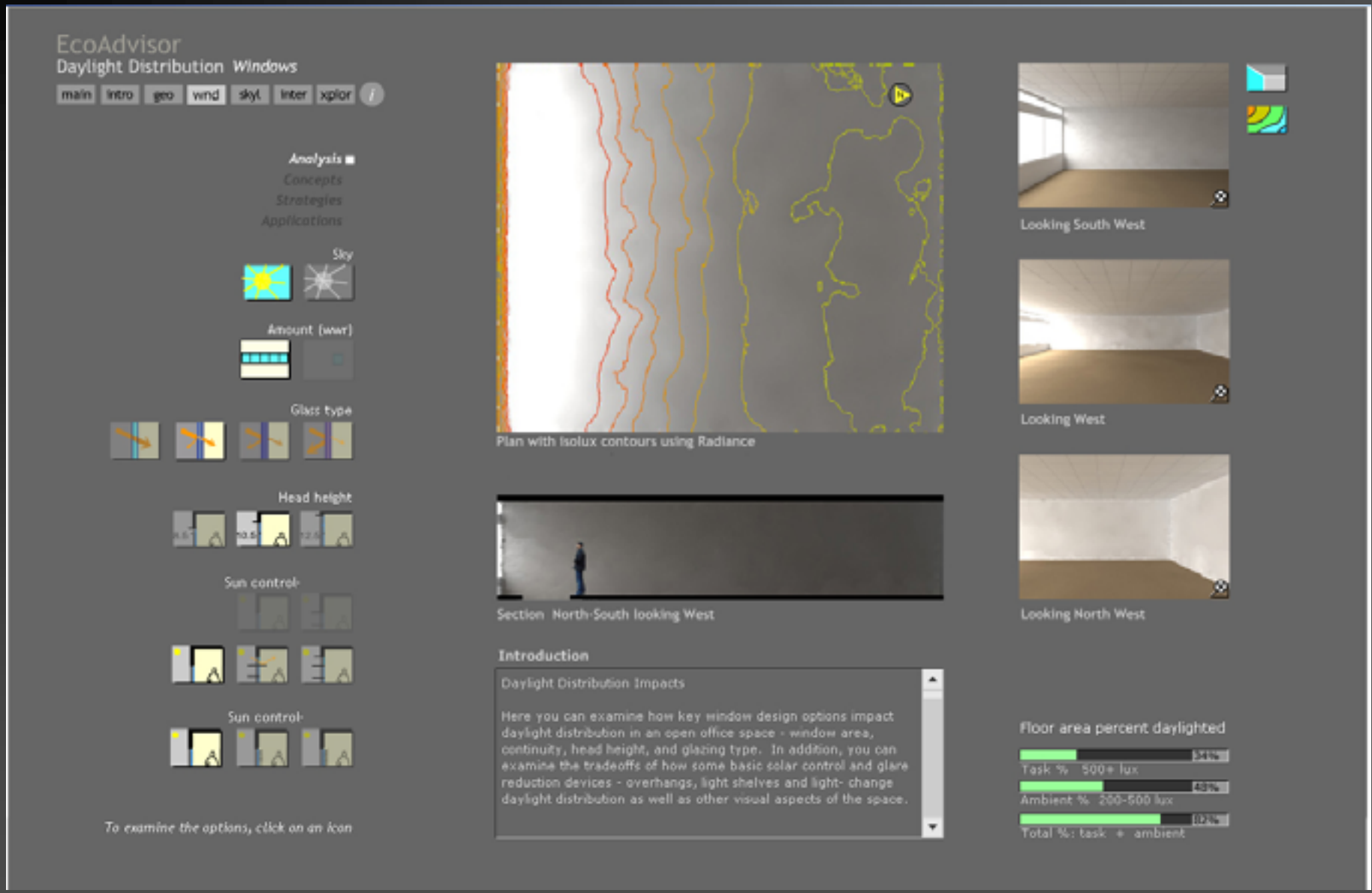
- Example Radiance-generated image of office

EcoAdvisor Daylighting

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.

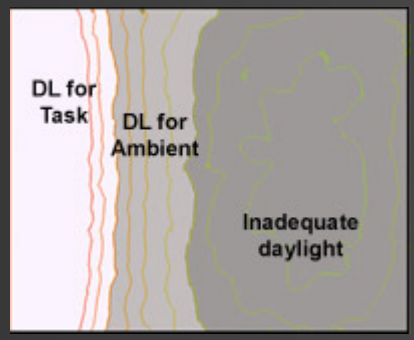
- Example Radiance-generated image with a atrium – visual artifacts result from quick “draft” mode image generation



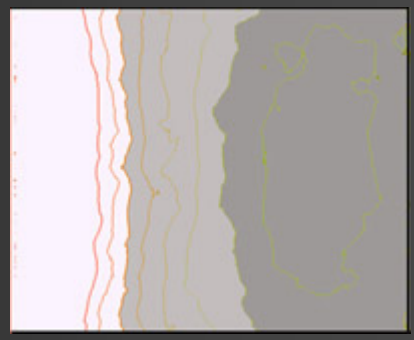
- Example Screen – analysis of window options: head height, Glass type, sun controls, sky conditions

Analysis of space configuration

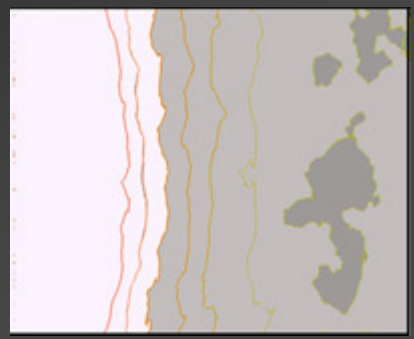
- 40’ x 40 ‘ space
- Floor plans
- Strip windows to left, facing south at noon
- Radiance images post-processed
  - White= 50 fc +
  - Light gray = 20-50 fc
  - Medium gray < 20 fc



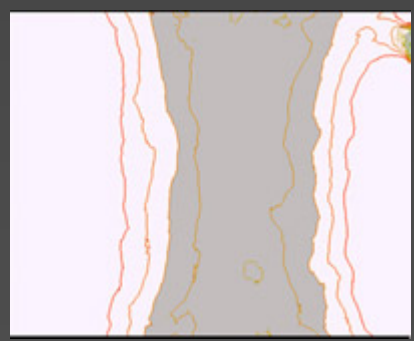
8.5’ window head height



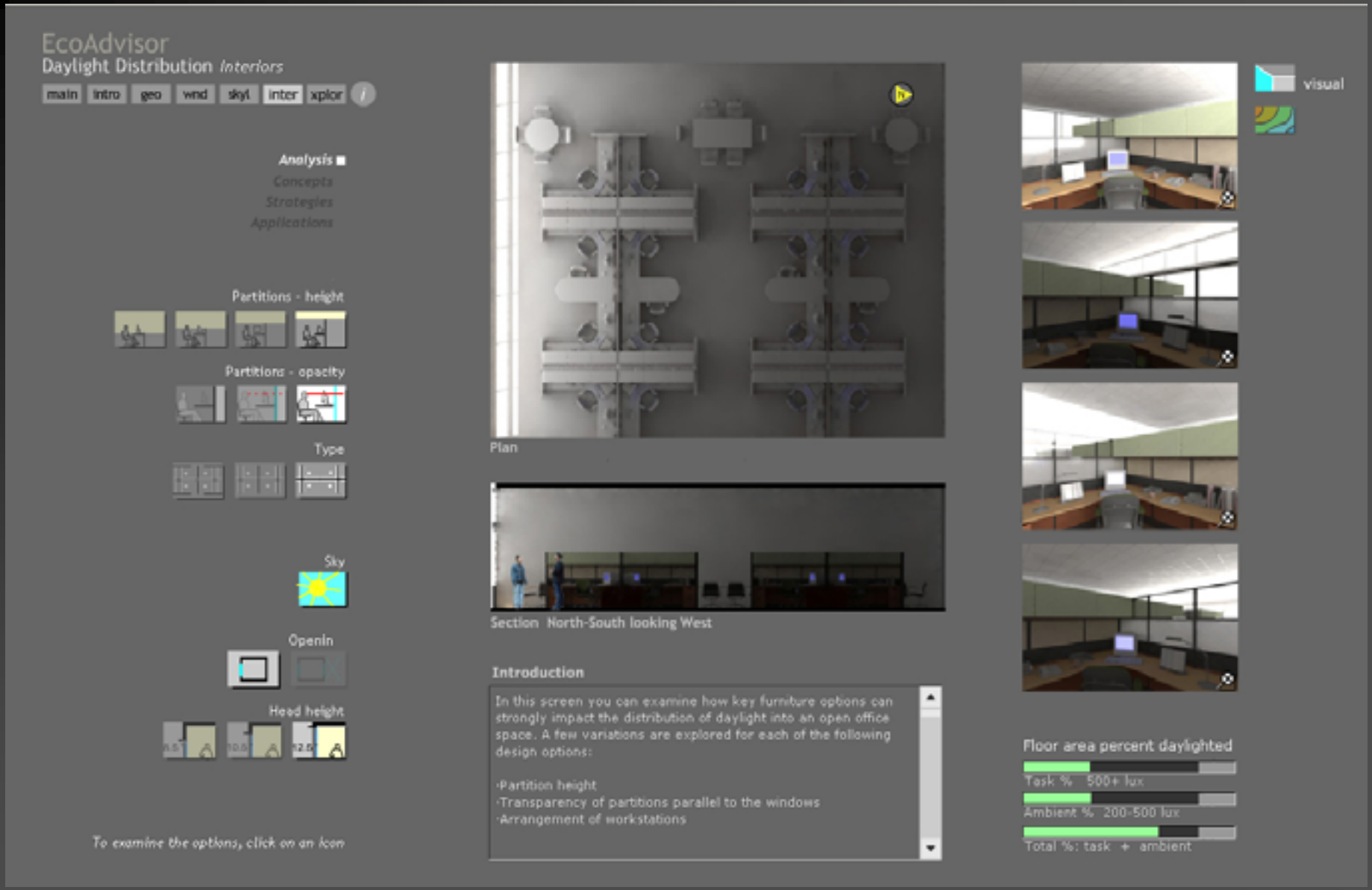
10.5’ window head height



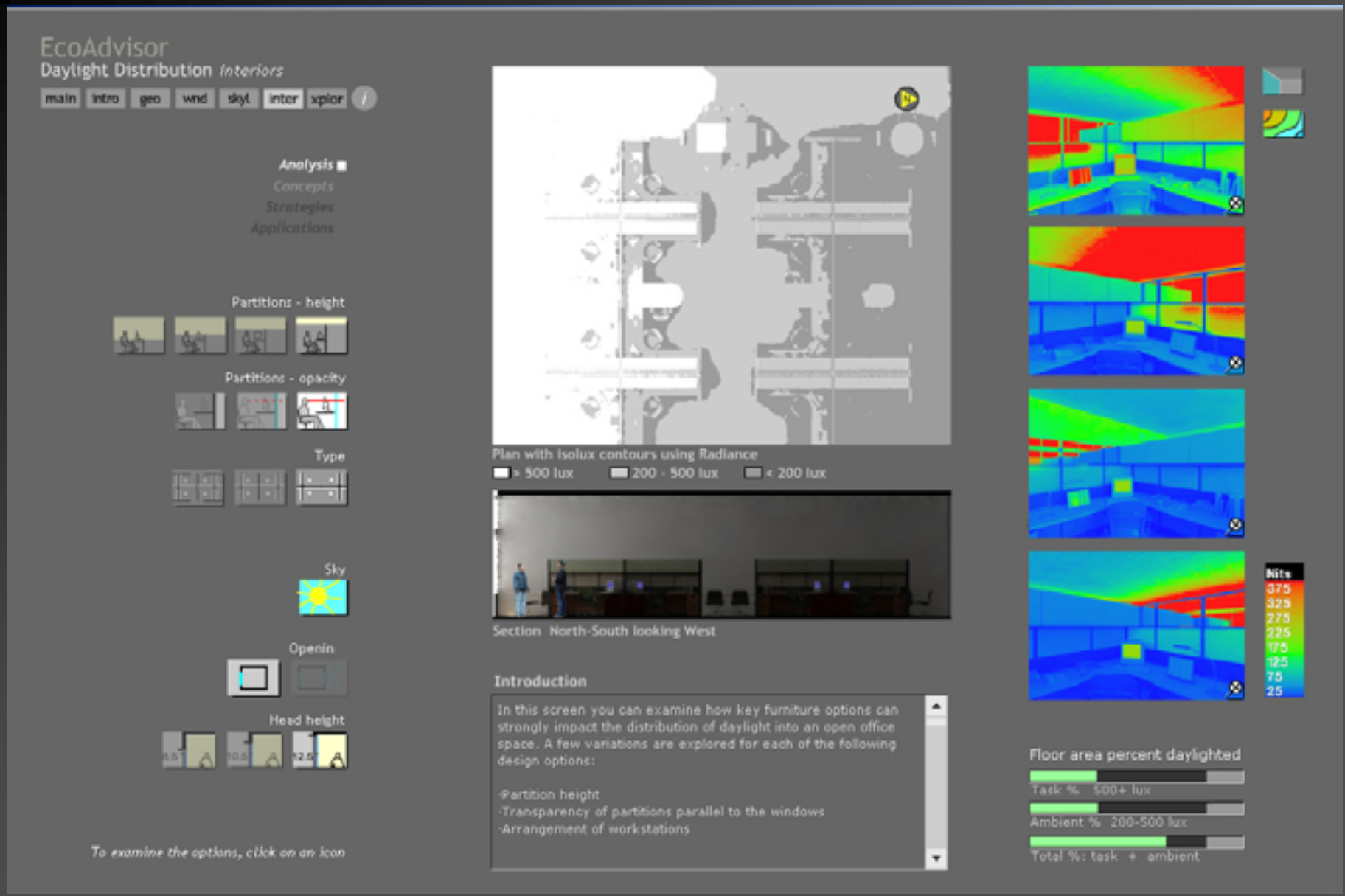
12.5’ window head height



12.5’ window head height, with atrium on right



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



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

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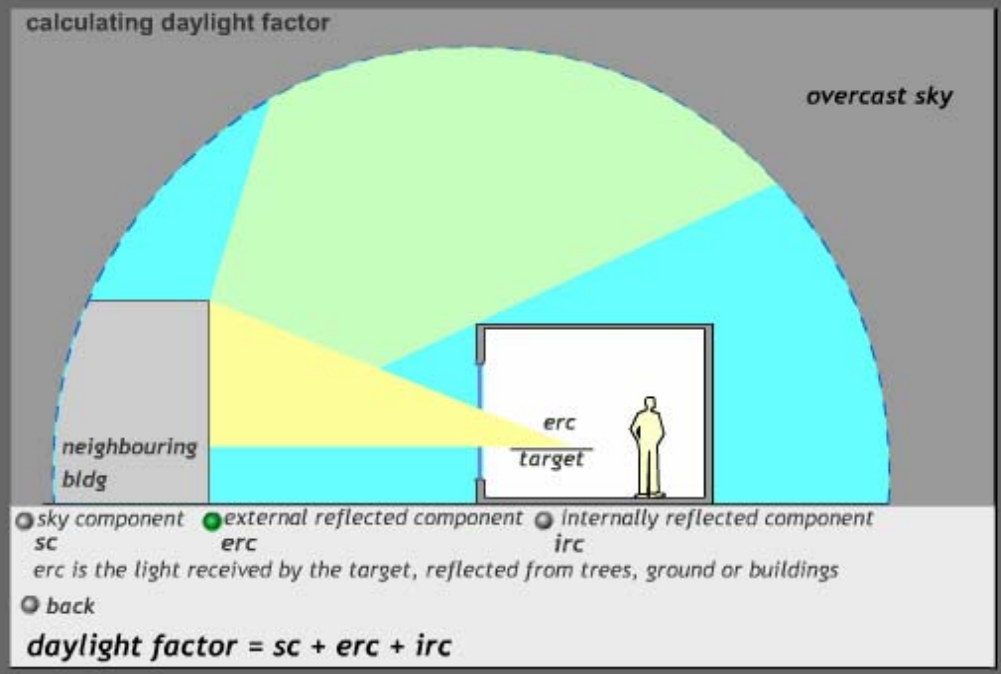
Daylight Distribution *Space Geometry*

main | intro | geo | wnd | skyl | inter | xplor | i

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