

# Daylighting and Electric Lighting Integration - Simulations in Practice

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2017 INTERNATIONAL RADIANCE WORKSHOP

ALAN DE MARCHE

**LOISOS + UBBELOHDE**

ARCHITECTURE . ENERGY . LIGHT

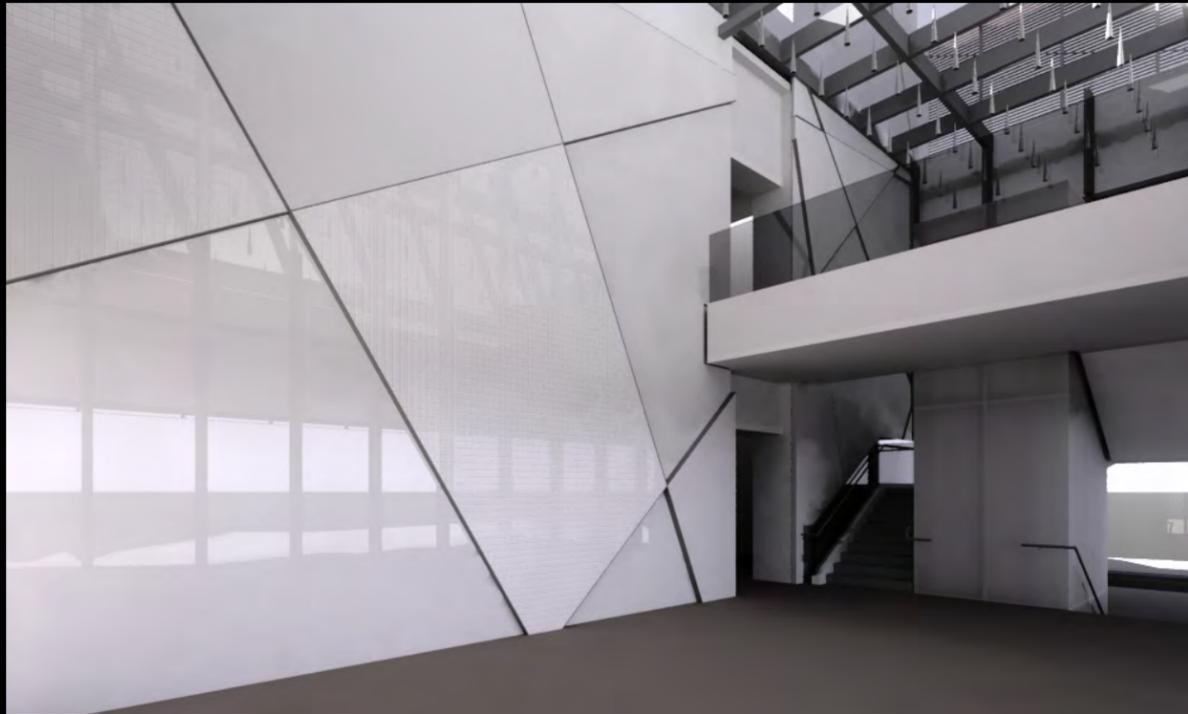
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# SIMULATIONS IN PRACTICE

## DAYLIGHTING



Simulation by L + U

## ELECTRIC LIGHTING



Simulation by L + U



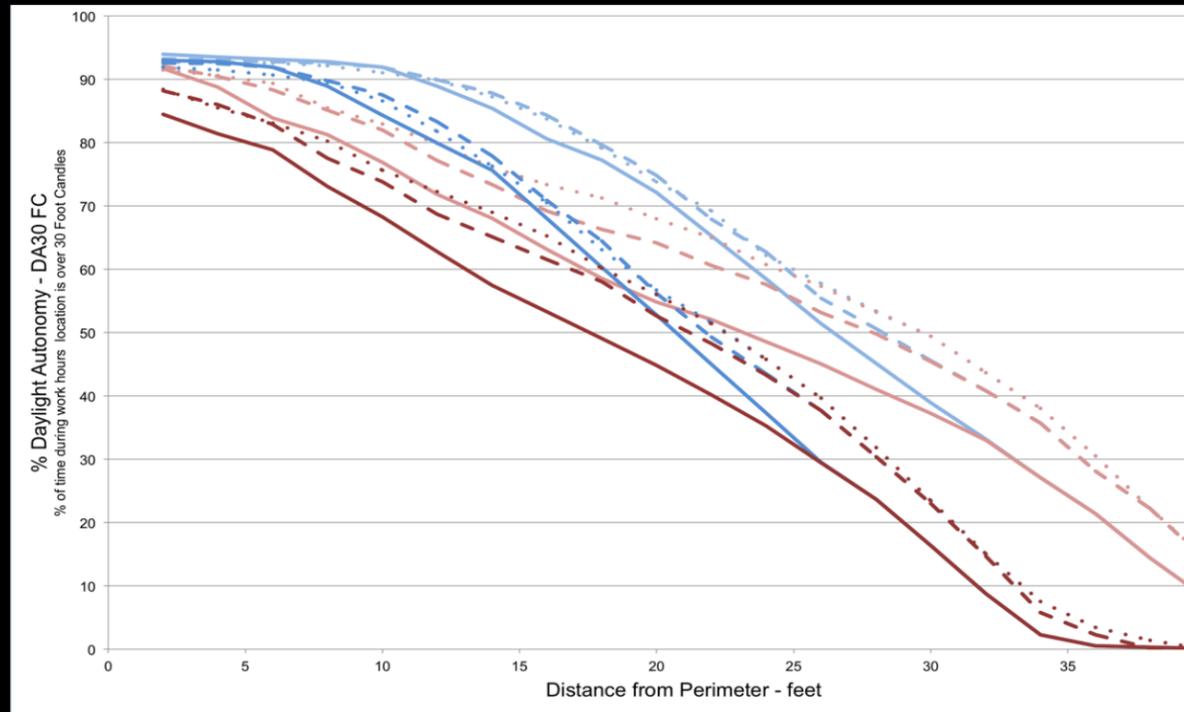
Photograph by Bruce Damonte



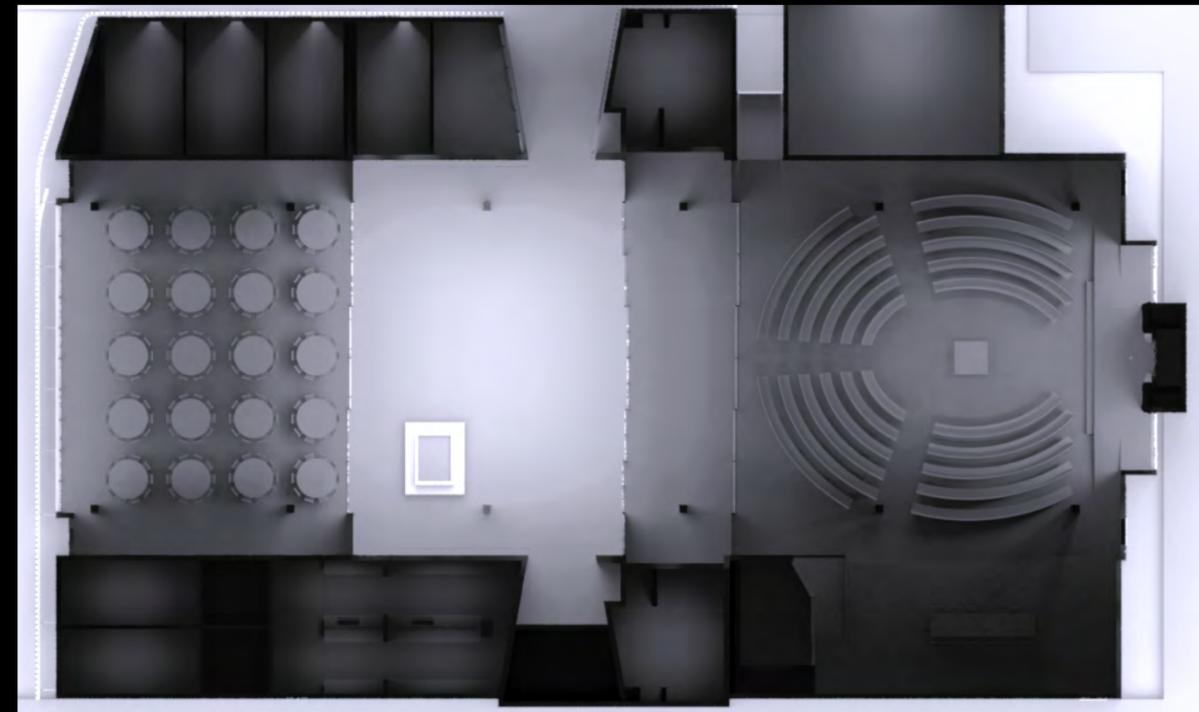
Photograph by Bruce Damonte  
Chu Hall - Solar Energy Research Center | SmithGroupJJR - Architect

# DAYLIGHT SIMULATIONS

POINT BASED - GREY SCALE MODELS - OPTION STUDIES - VLT TUNING - ARCHITECTURAL DETAIL



Perimeter Daylight Autonomy Study - Bay Area Office BLDG.



VLT Tuning - Kol Emeth\*



Skylight Studies - Kol Emeth\*

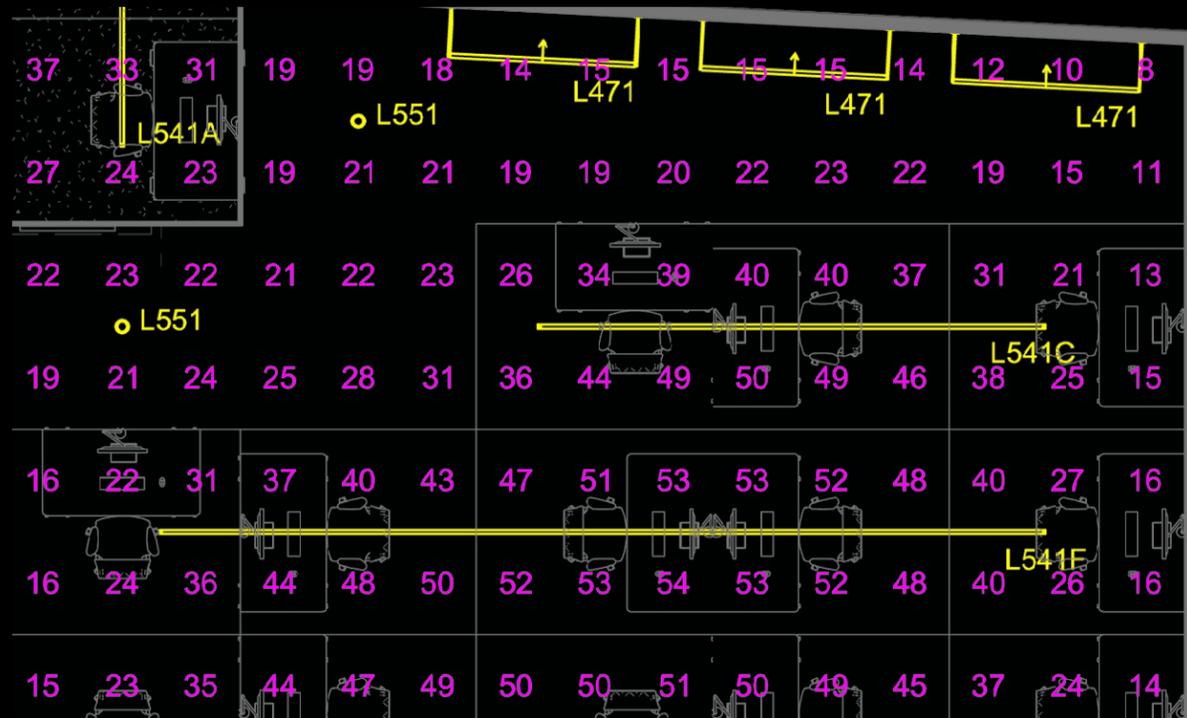


Daylight Performance - Kol Emeth\*

\*Congregation Kol Emeth - Field Architecture - H.P.S. - Loisos + Ubbelohde (Daylighting and Electric Lighting)

# ELECTRIC LIGHT SIMULATIONS

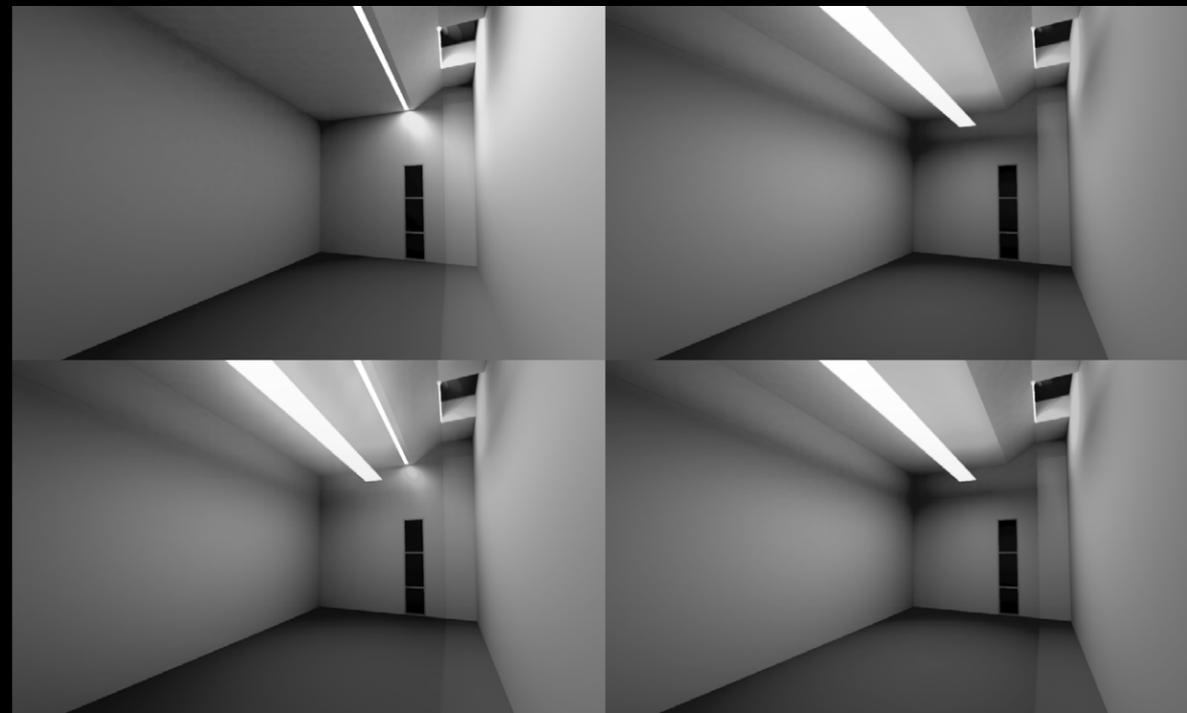
POINT BASED - GREY SCALE MODELS - OPTION STUDIES - SCENE TUNING - ARCHITECTURAL DETAIL



Open Office Electric Lighting - Bay Area Office BLDG.



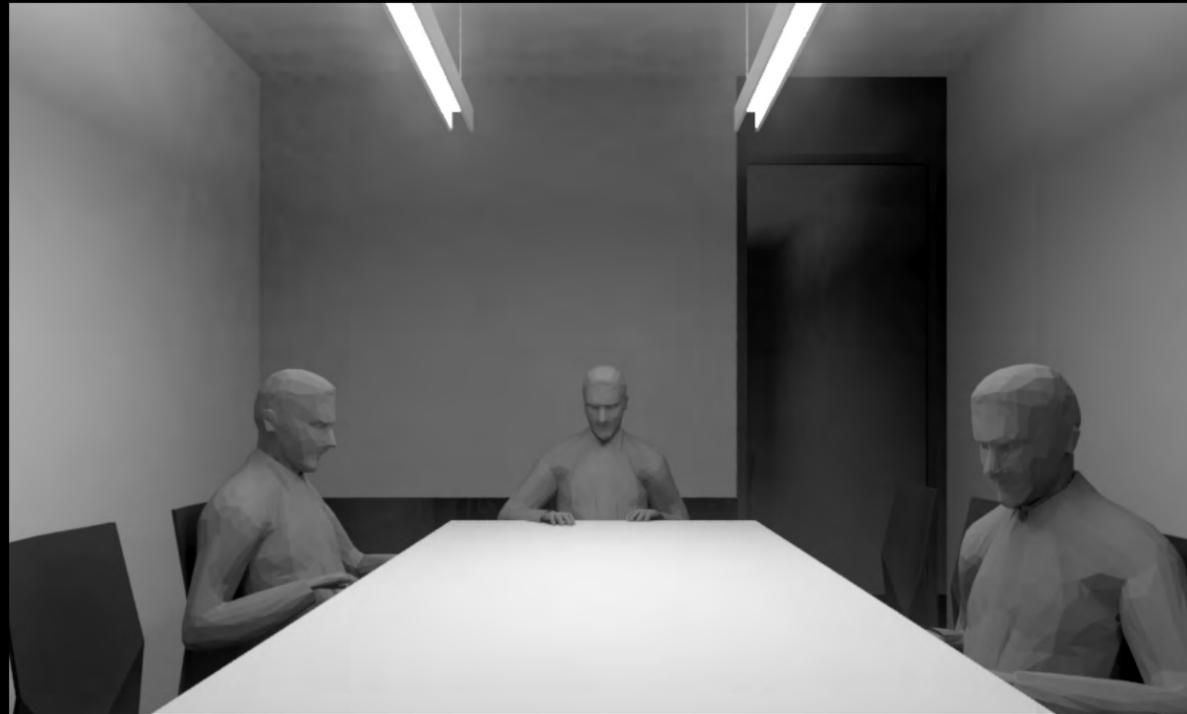
Scene Tuning - Bay Area Office BLDG.



Fixture Options Studies - Kol Emeth



Electric Lighting Performance - Kol Emeth



Geometric Detail - Bay Area Office Bldg.



Visible Sources - Bay Area Office Bldg.



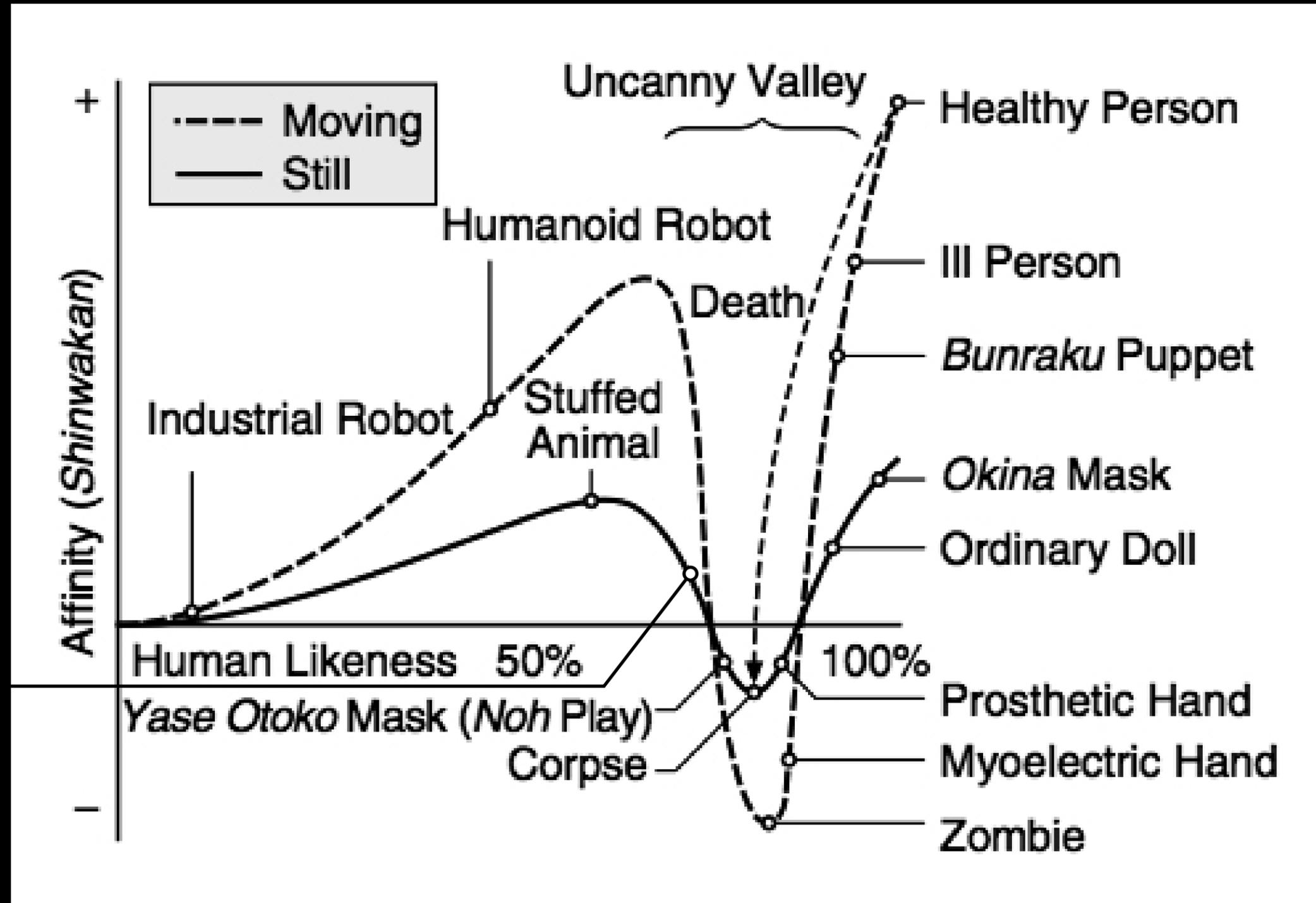
Material Specificity - Bay Area Office Bldg.



White Balance - Bay Area Office Bldg.



RESUSCI ANNIE



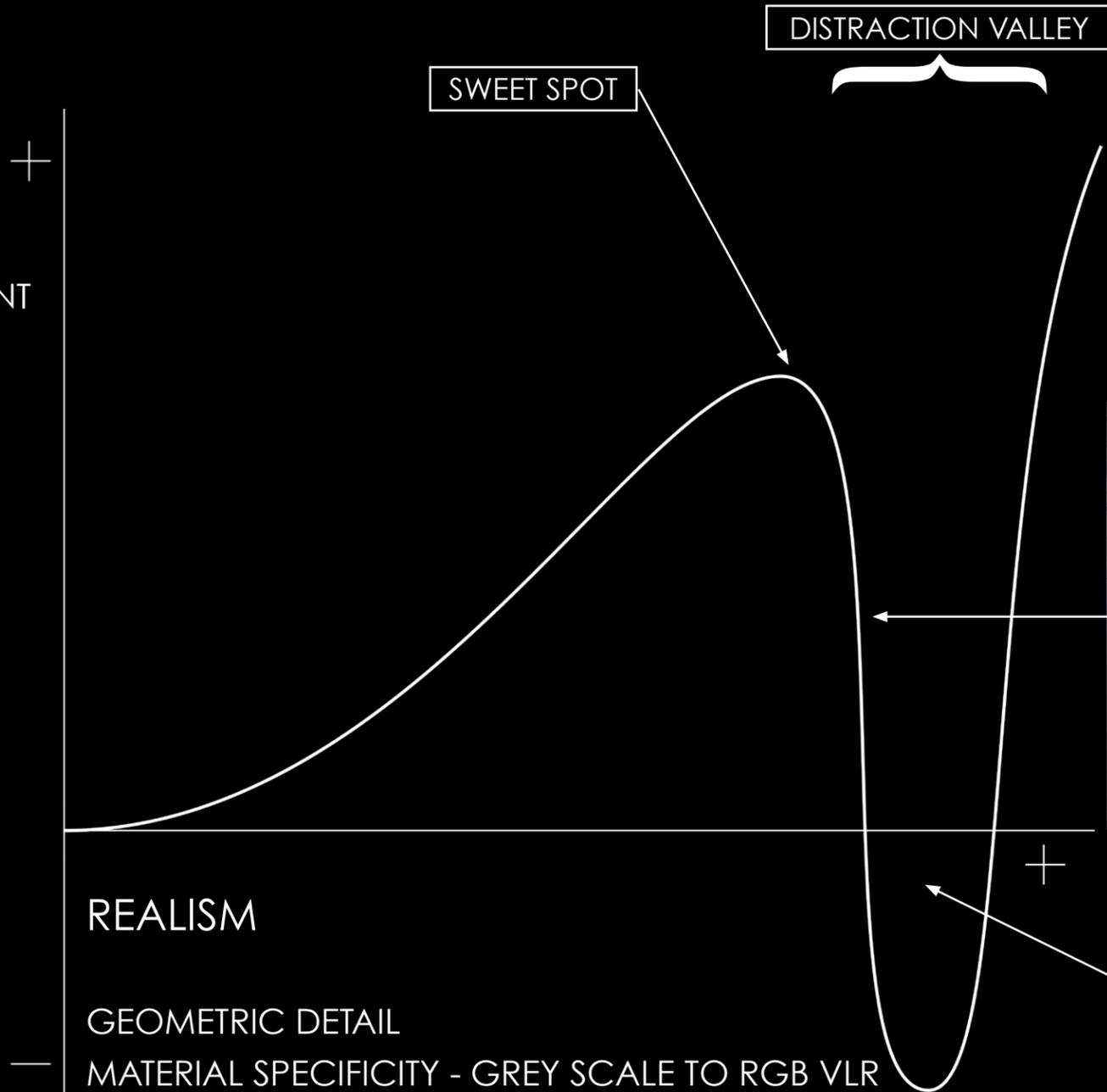
M. Mori, "The Uncanny Valley," Energy, vol. 7, no. 4

# THE "DISTRACTION" VALLEY

## REALISM AND THE EFFICACY OF IMAGES AS ANALYTICAL TOOLS

EFFICACY

FOCUS ON TOPIC OF ANALYSIS  
COMMUNICATION OF DESIGN INTENT  
EMPATHIC RESPONSE



REALISM

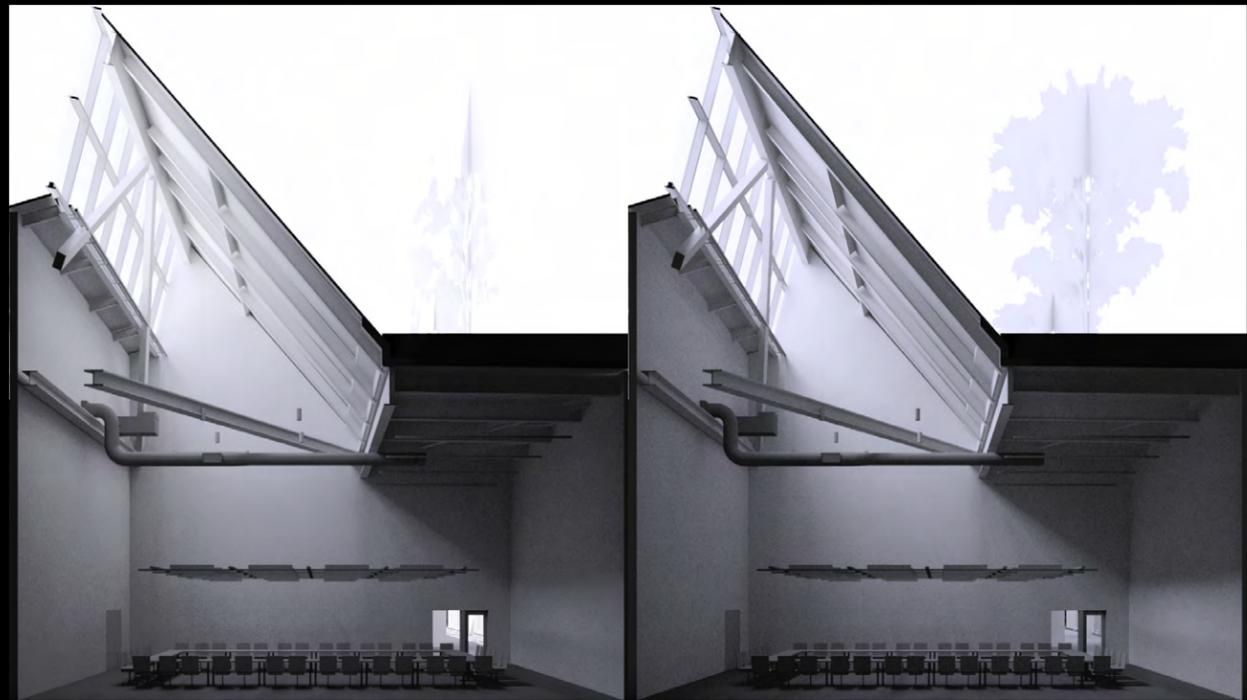
GEOMETRIC DETAIL  
MATERIAL SPECIFICITY - GREY SCALE TO RGB VLR  
SOURCE CCT  
IMAGE WHITE BALANCE  
*and* MODELING + SIMULATION TIME  
*and* INCREASES IN POTENTIAL DISTRACTIONS

Separate Simulations for:

**Typical Sky Conditions** - Design Criteria - Overcast - Clear - Time of Day - etc...

**Fixture Type** - scale by output option - Light Loss Factor

**Break out fixtures by Zone** - for daylight dimming - scene tuning - direct / indirect



Clear Sky

Overcast Sky



Overhead Direct



Primary Direct



Primary Indirect



Secondary Direct

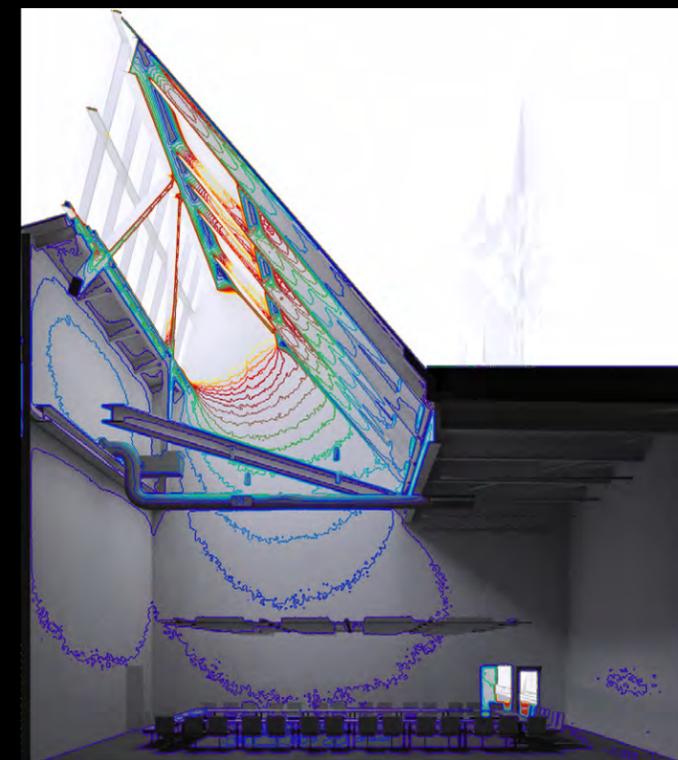
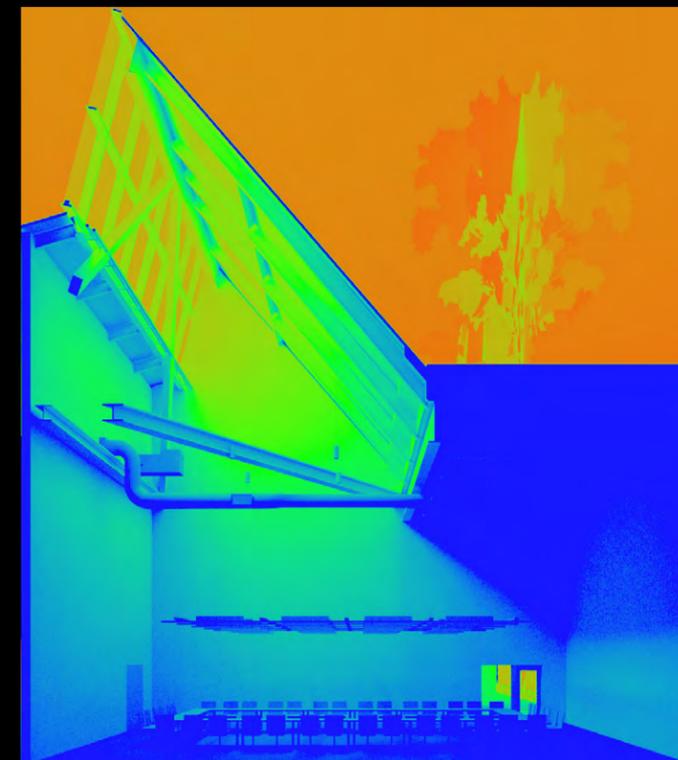
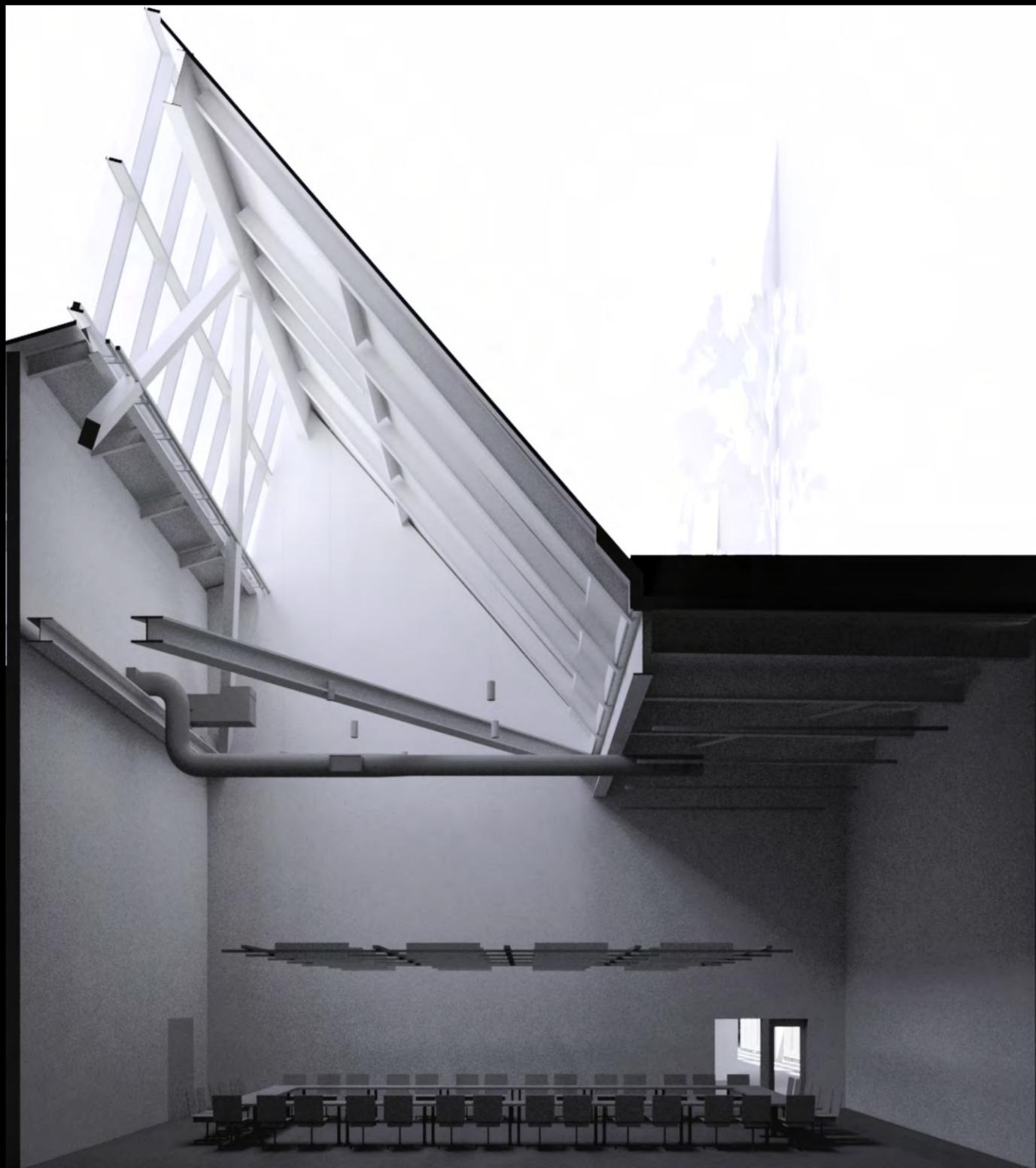


Secondary Indirect

Loisos + Ubbelohde (Daylighting) - Electric Lighting Design by others

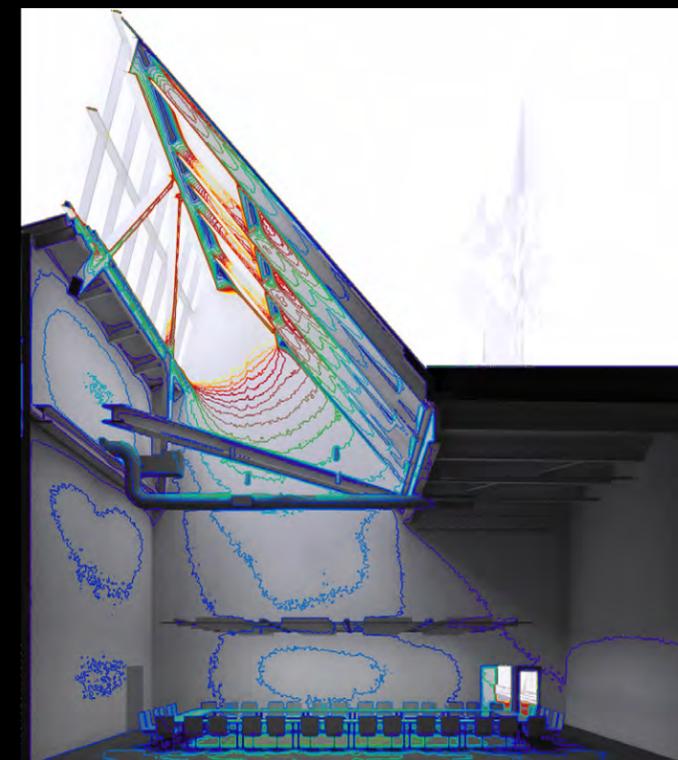
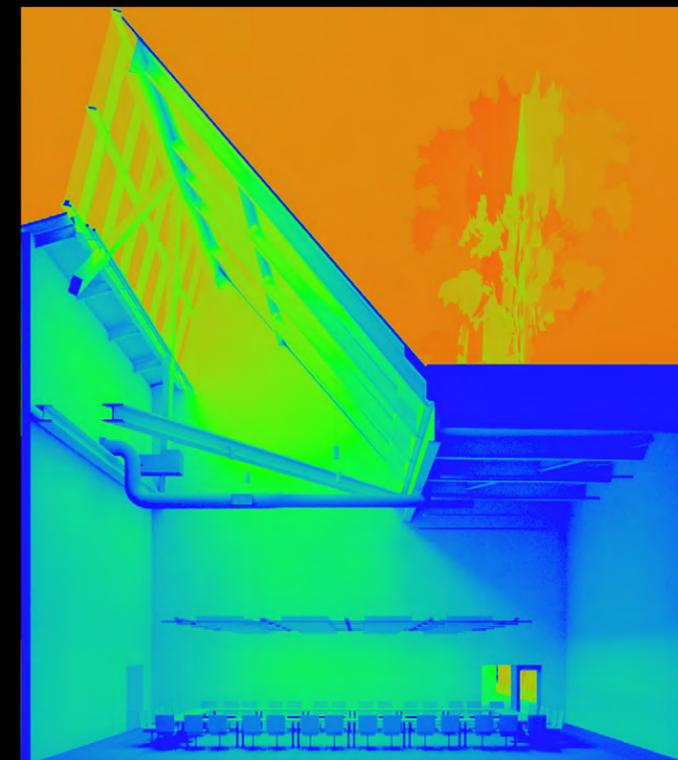
# SCENE TUNING

## CLEAR SKY - DAYLIGHT ONLY



# SCENE TUNING

## CLEAR SKY + DIRECT ELECTRIC LIGHTING



# SCENE TUNING

## CLEAR SKY + DIRECT ELECTRIC LIGHTING



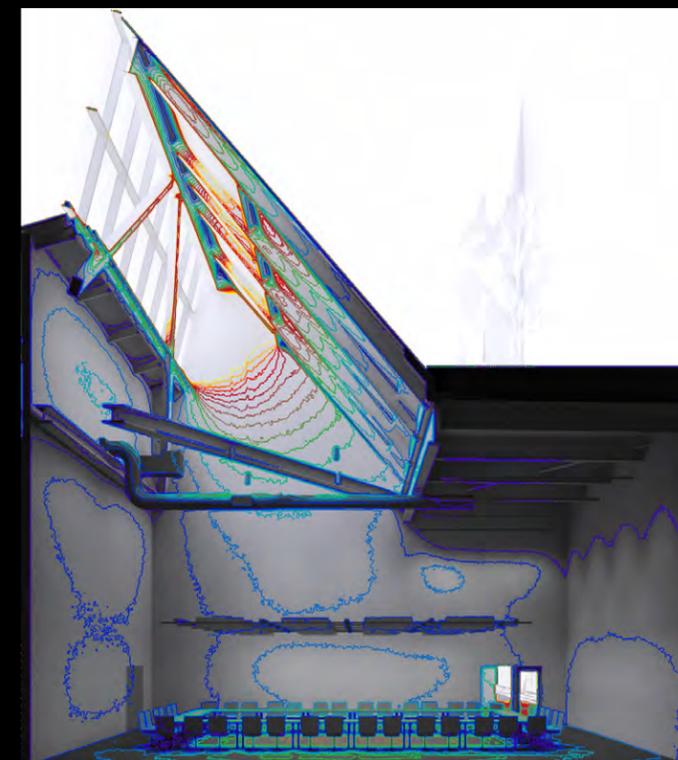
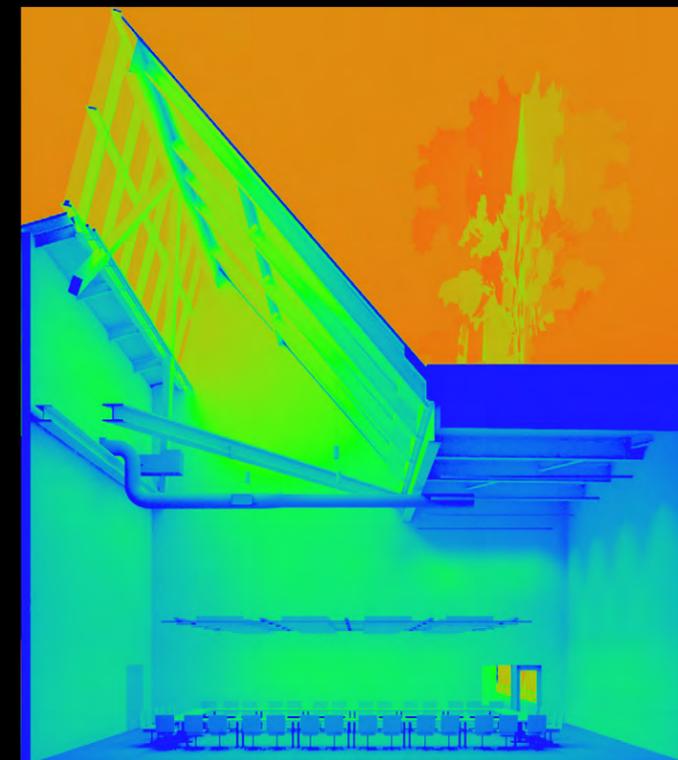
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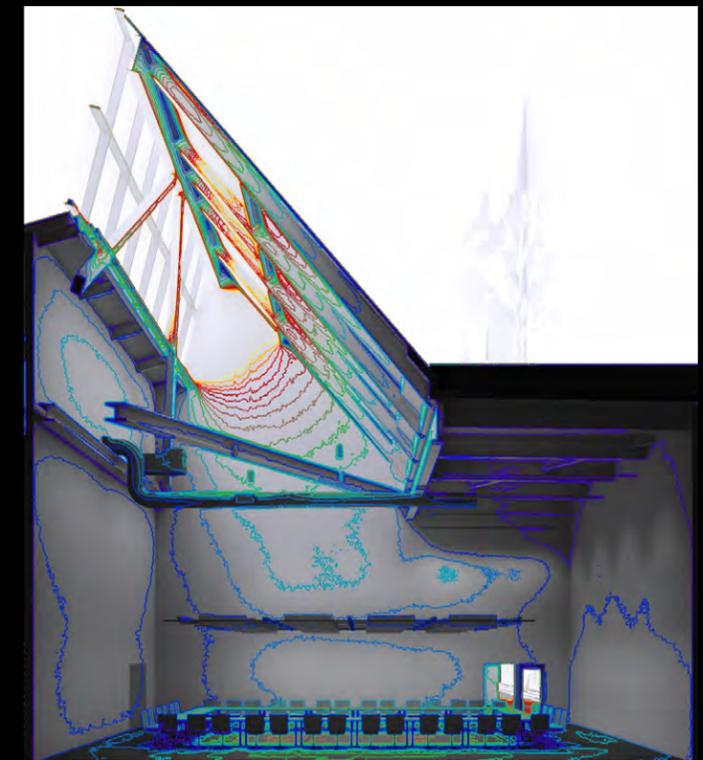
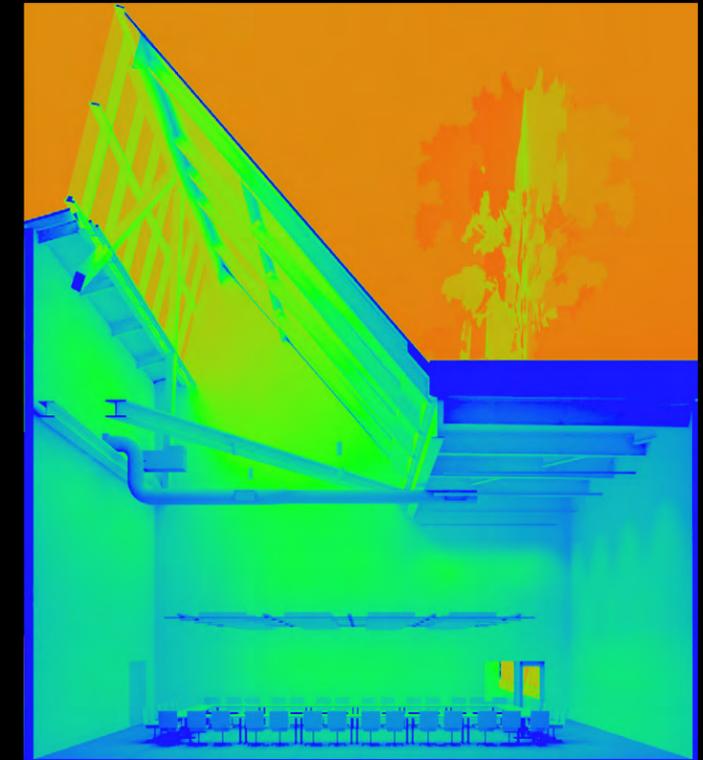


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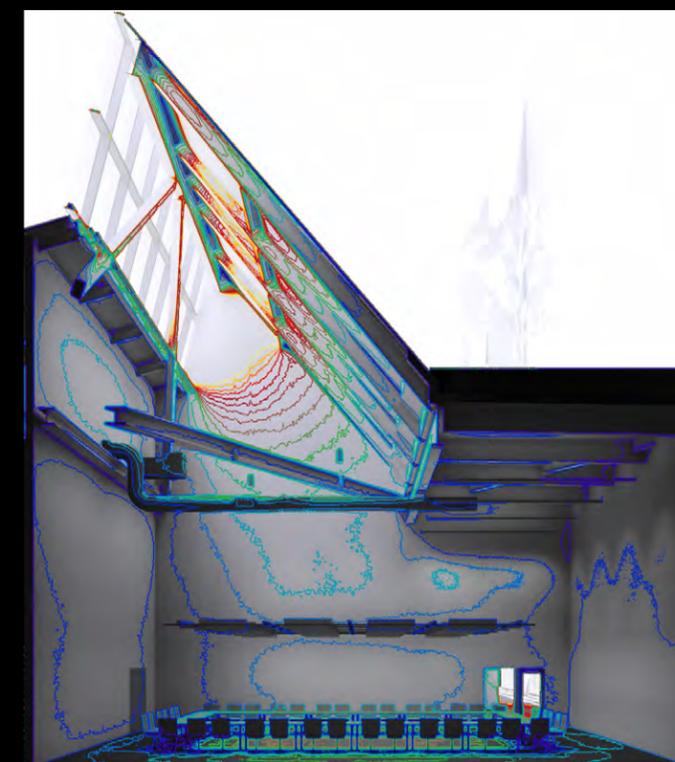
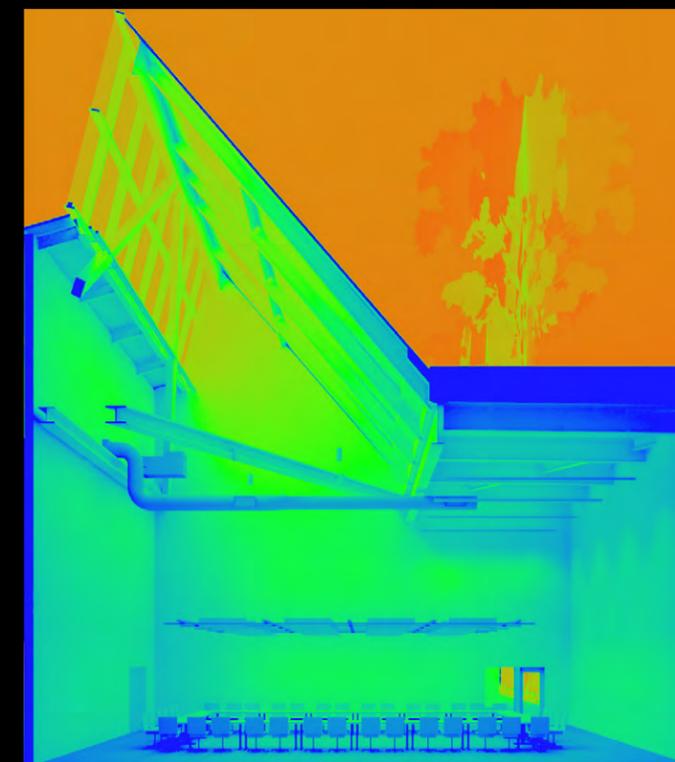
# SCENE TUNING

## CLEAR SKY + DIRECT + DIMMED INDIRECT ELECTRIC LIGHTING



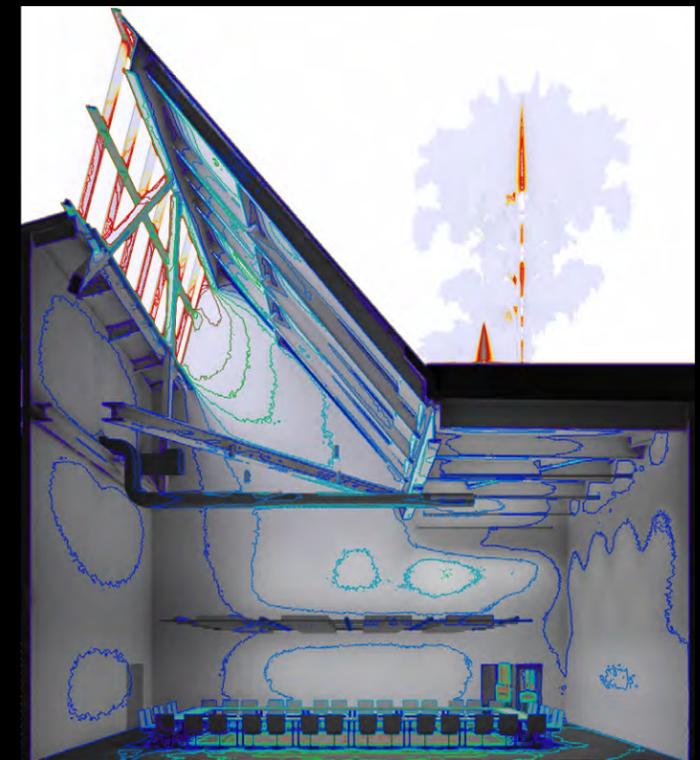
# SCENE TUNING

CLEAR SKY + DIRECT + DIMMED INDIRECT ELECTRIC LIGHTING



# SCENE TUNING

## OVERCAST SKY + DIRECT + INDIRECT ELECTRIC LIGHTING



Include:

**Geometry at daylight apertures** that might reduce or alter transmission

**Fixture geometry** where visible

**Surfaces / objects to be illuminated** - work surfaces, architectural details, etc...

**Geometry for scale** - especially in large spaces

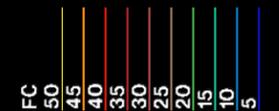
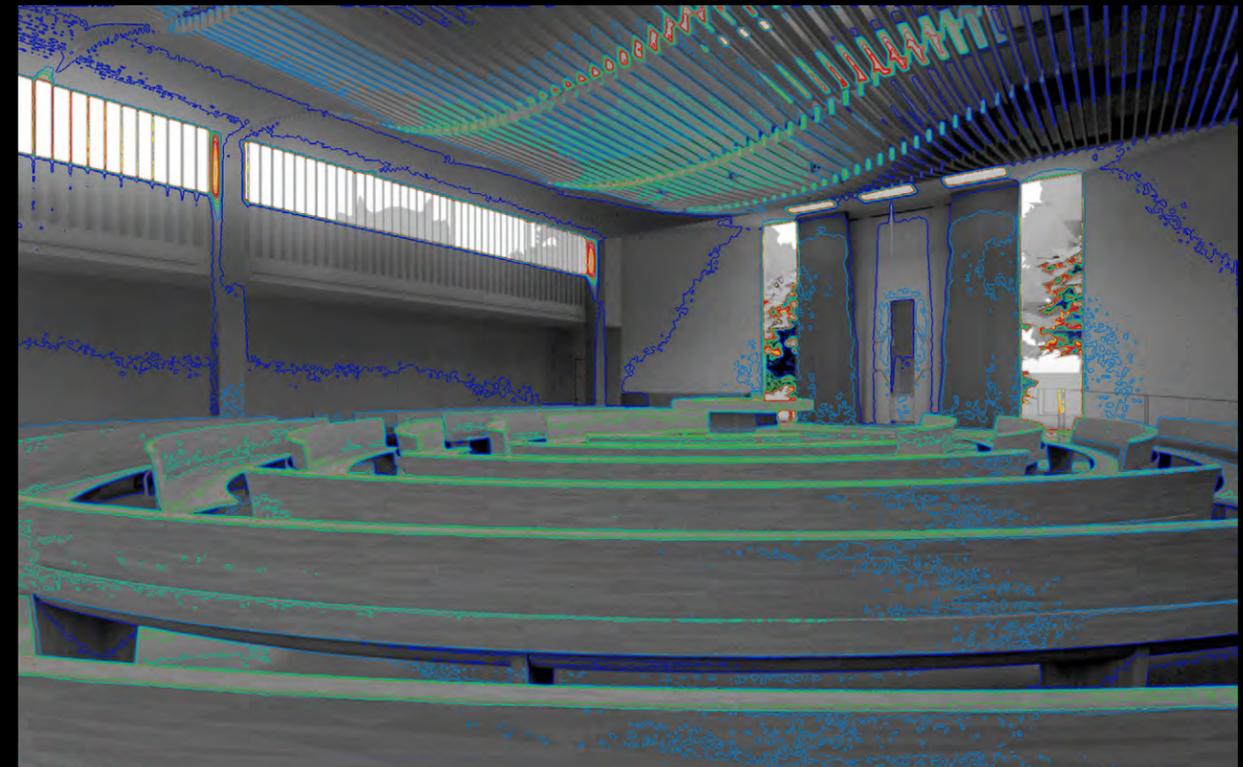
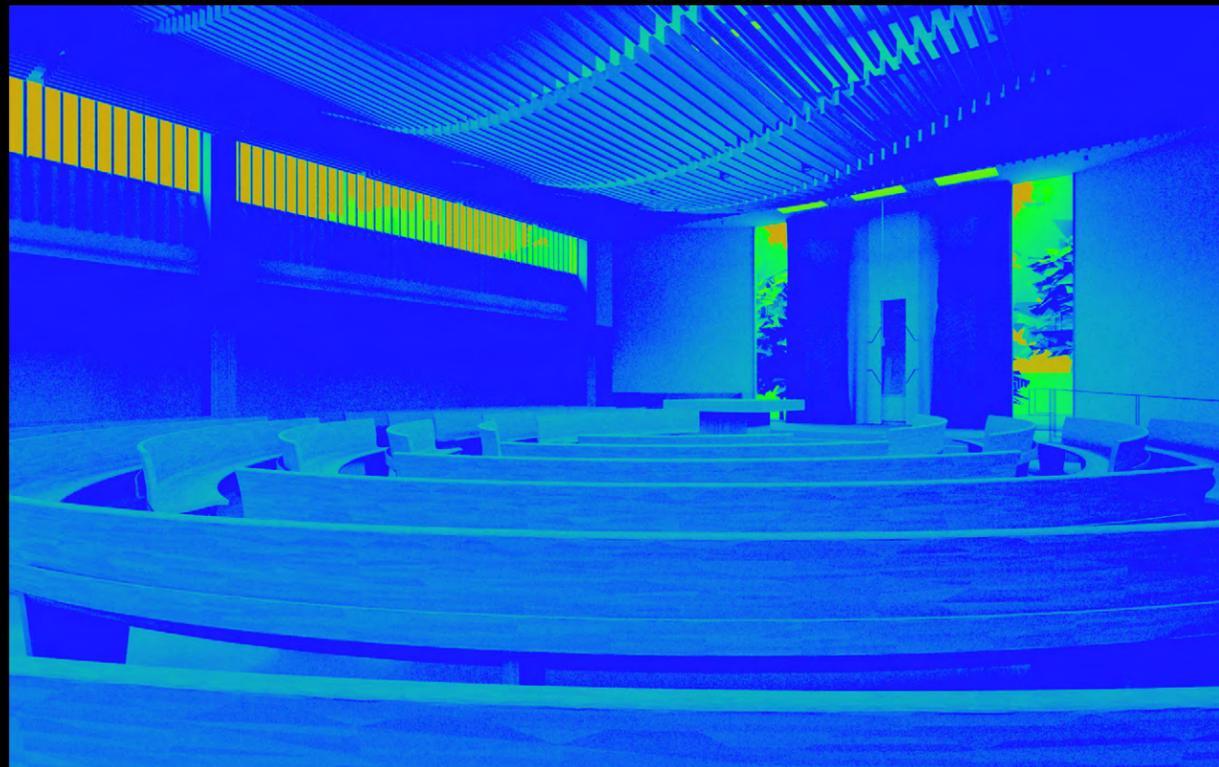
**Geometry that might cast shadows** with interior sources

**Exterior** - trees, site elements



Congregation Kol Emeth - Field Architecture - H.P.S. - Loisos + Ubbelohde (Daylighting and Electric Lighting)

# GEOMETRIC DETAIL OVERCAST SKY - DAYLIGHT ONLY



GEOMETRIC DETAIL  
ELECTRIC LIGHTING AT SKYLIGHTS



GEOMETRIC DETAIL  
ELECTRIC LIGHTING WASHING SURFACES



HIGHLIGHTING ARCHITECTURAL DETAILS WITH ELECTRIC LIGHTING



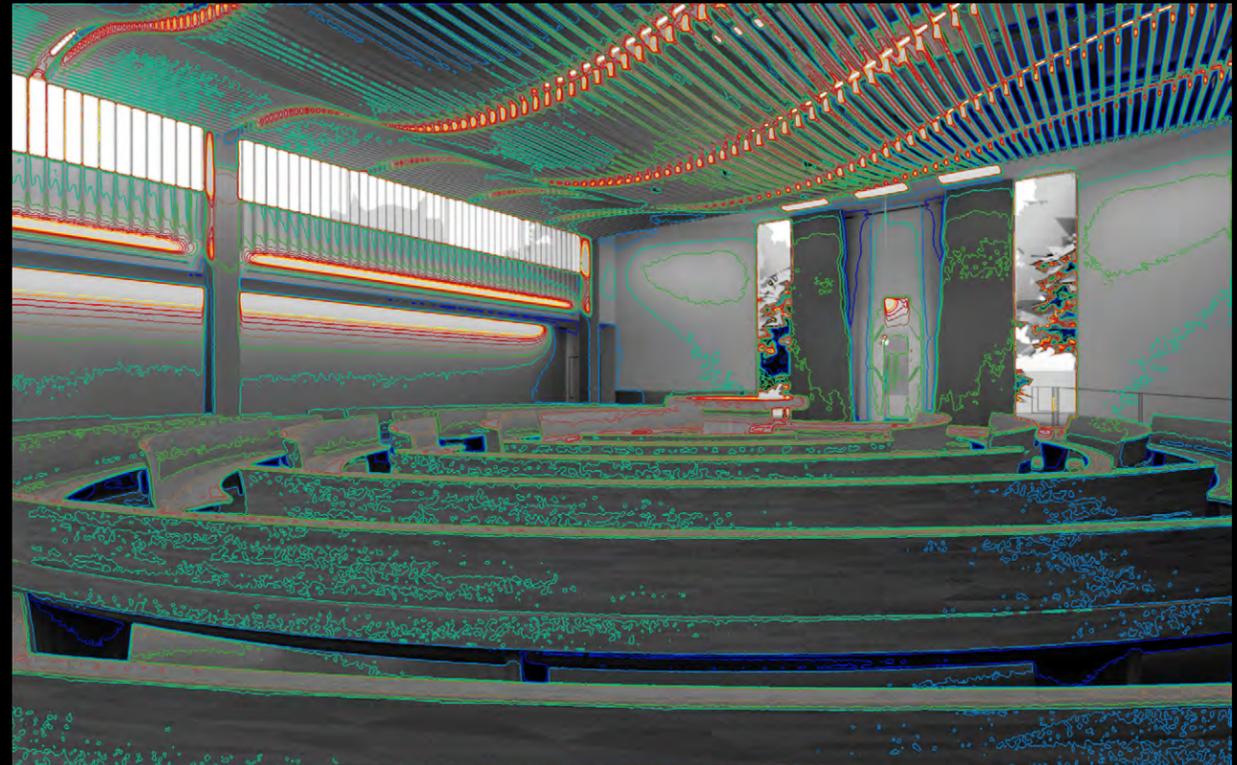
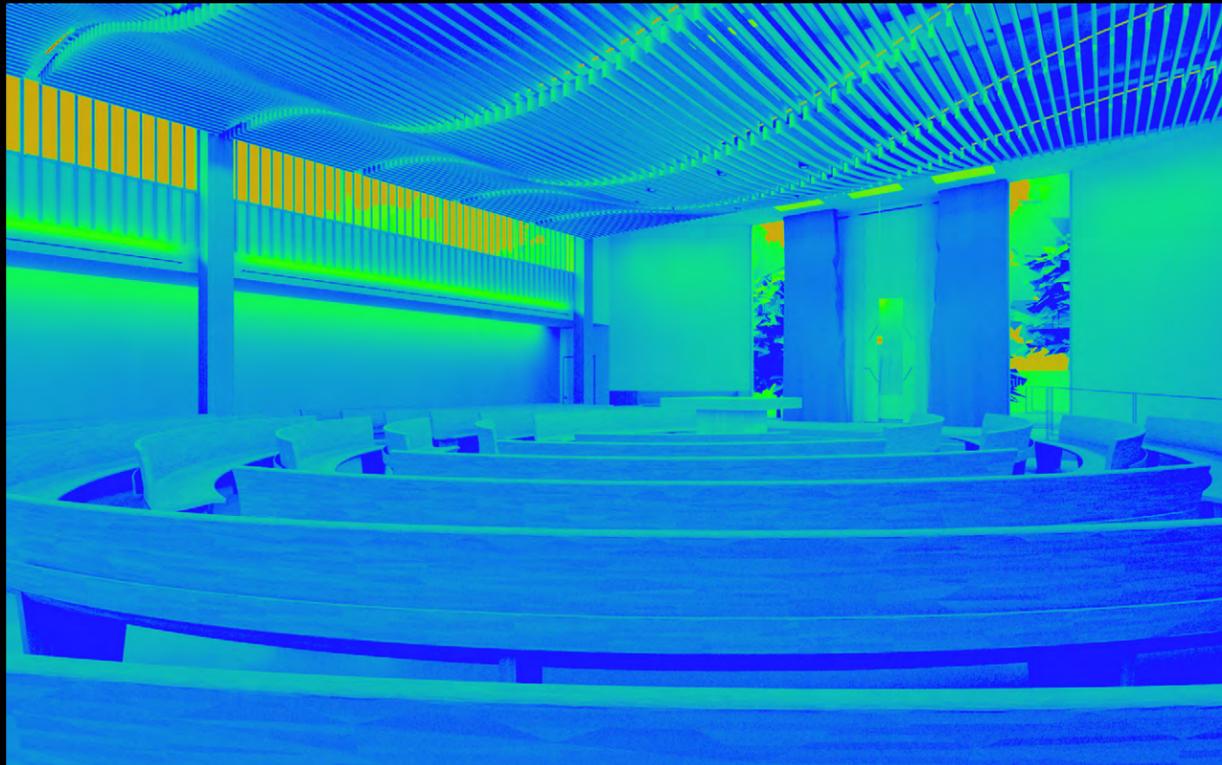
GEOMETRIC DETAIL  
COMPLETE ELECTRIC LIGHTING



GEOMETRIC DETAIL  
OVERCAST SKY + ELECTRIC LIGHTING



# GEOMETRIC DETAIL OVERCAST SKY + ELECTRIC LIGHTING



Include:

**Specular materials** - i.e. polished floors, gloss paint, monitors, white boards  
where reflections are relevant

**RGB reflectances** - for color casting, when a prominent part of design  
retain grey scale when possible to best register source CCT, color casting

**Fixture finishes** - to show intent

**Functional Textures!** - brightfunc







MATERIAL SPECIFICITY  
OVERCAST SKY + ELECTRIC LIGHTS





**Model fixtures when visible** - with details as required by view

**Model source surfaces as separate materials** - i.e. reflectors, lens, etc...

**NOTE:**

*These images are to capture design intent and the perception of the fixture in space.  
This does not replace physical mock-ups or focused studies on fixtures as glare sources.*



Congregation Kol Emeth - Field Architecture - H.P.S. - Loisos + Ubbelohde (Daylighting and Electric Lighting)

# VISIBLE SOURCES

OVERCAST SKY + PENDANT + SKYLIGHT FIXTURE

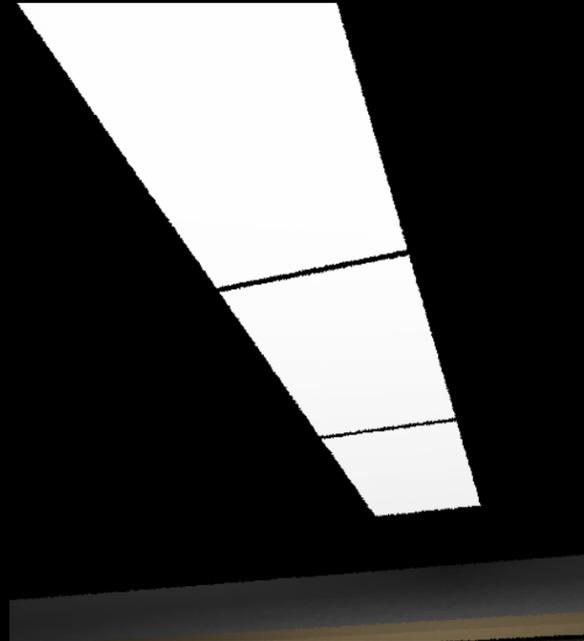


# VISIBLE SOURCES

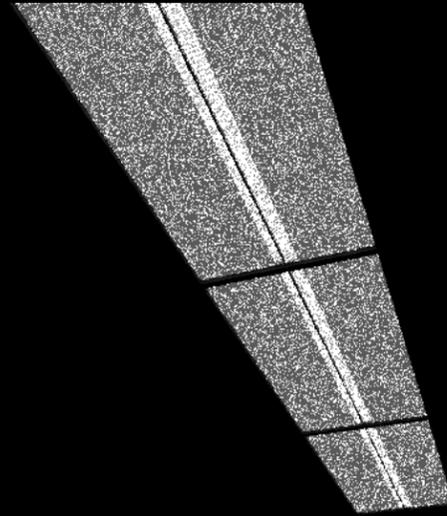
## VISIBLE FIXTURE SOURCE CALIBRATION



ies2rad as illum



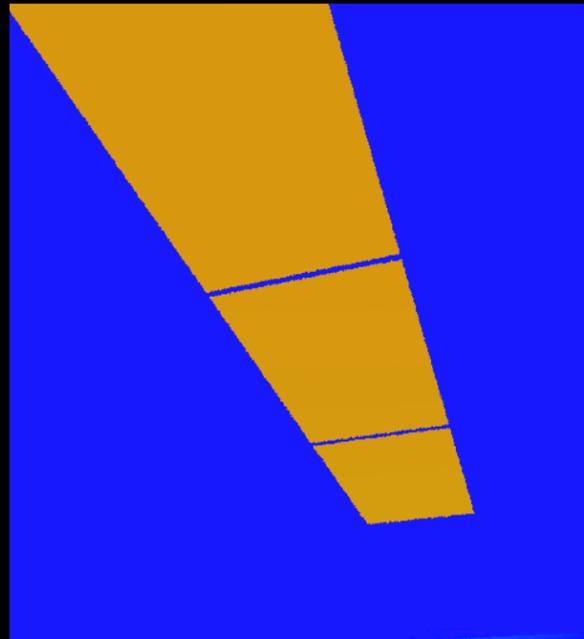
rvu - ies2rad as light



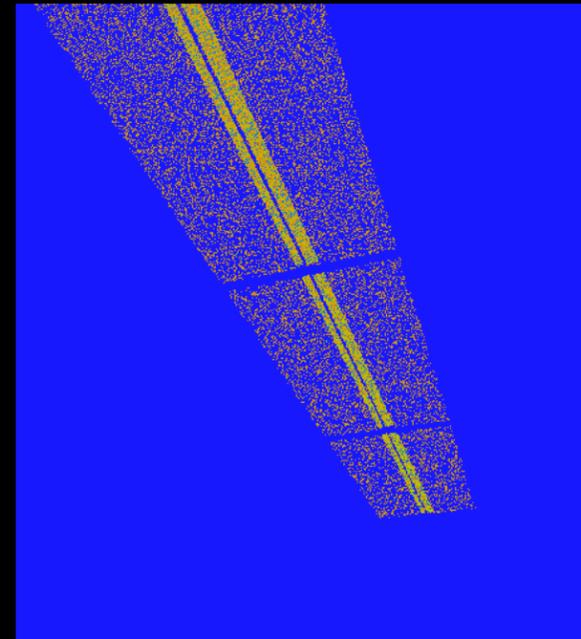
rvu - glow materials



manufacturers brochure



luminance - ies2rad as light



luminance - glow materials



# VISIBLE SOURCES

OVERCAST SKY + PENDANT + SKYLIGHT FIXTURE



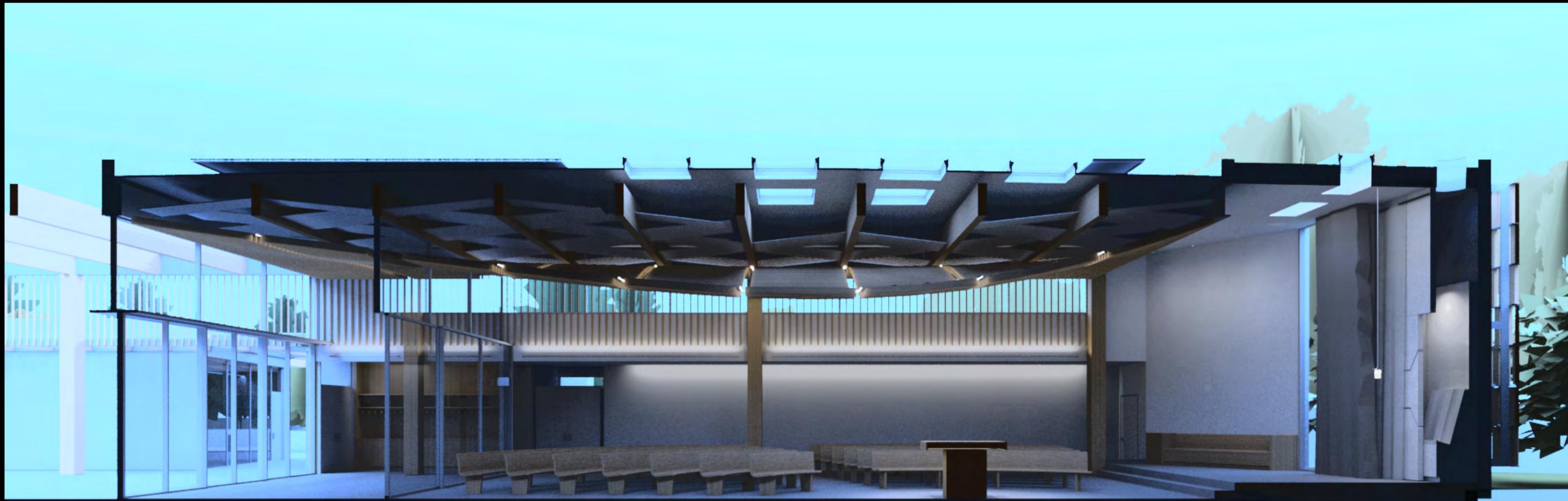
**To communicate design intent and fixture specifications - source CCT**

**Perception of daylight and electric light contribution - pools of light, accents**

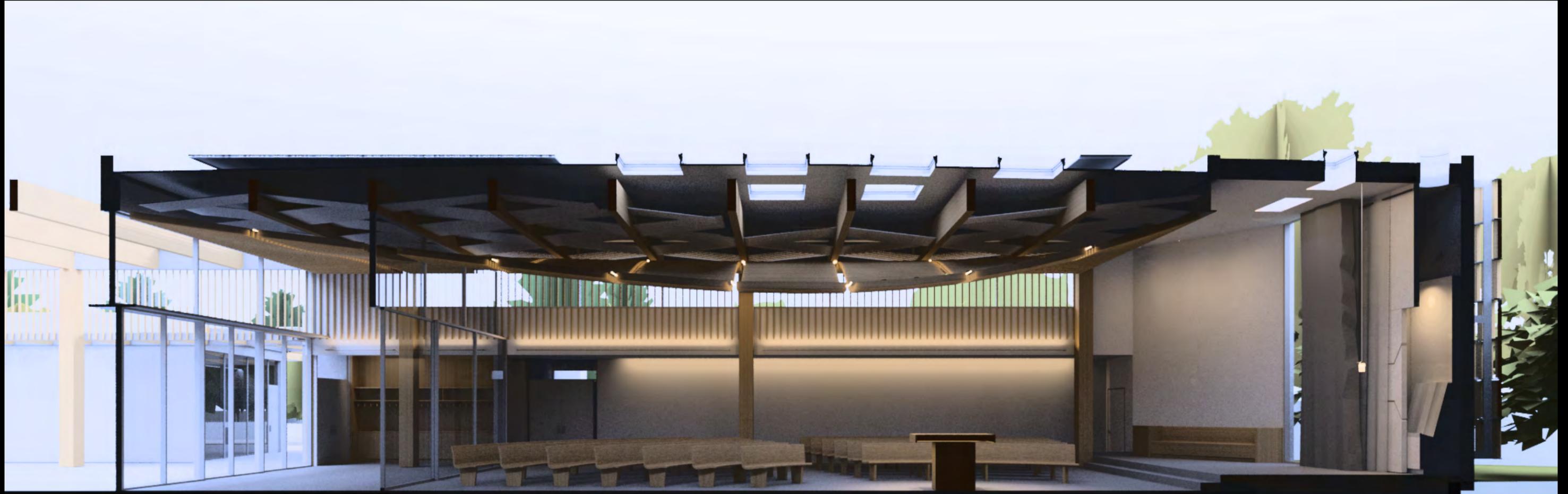
**Perception of space under various sky conditions**

WHITE BALANCE  
OVERCAST SKY + ELECTRIC LIGHTS





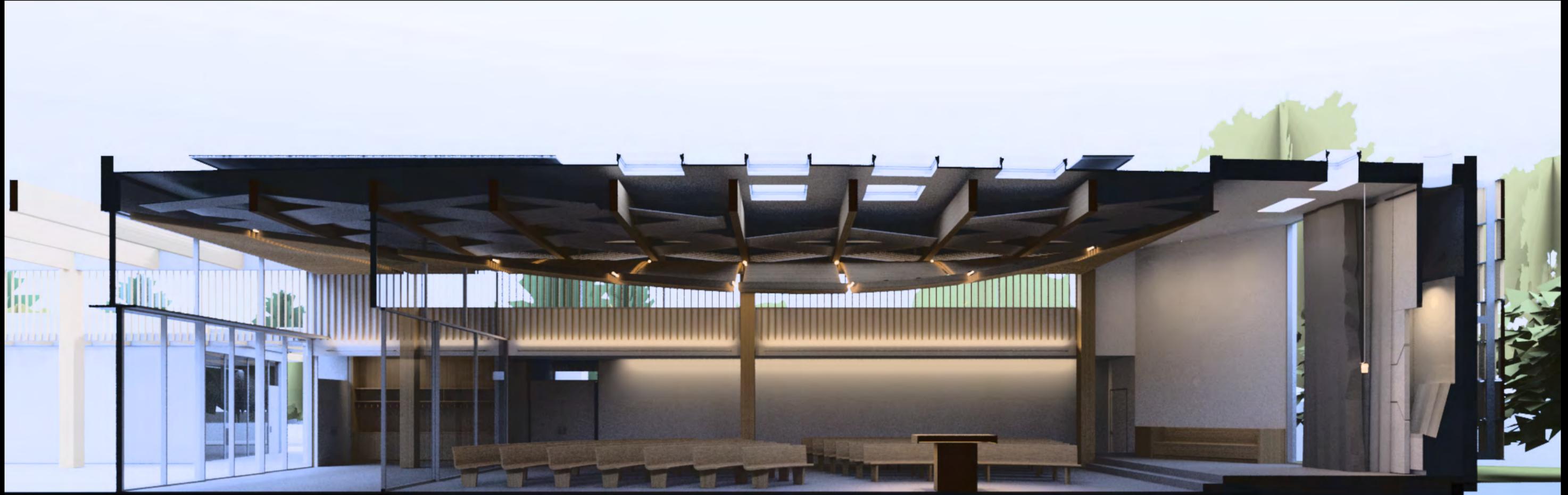
WHITE BALANCE 4000K  
OVERCAST SKY 5500K + ELECTRIC LIGHTS 3000K



WHITE BALANCE 3750K

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OVERCAST SKY 5500K + ELECTRIC LIGHTING 3000K, 2700K, & 2500K





WHITE BALANCE 3700K

OVERCAST SKY 5500K + ELECTRIC LIGHTING 3000K, 2700K, & 2500K



# THANK YOU

