Daylighting and Electric Lighting Integration - Simulations in Practice

2017 INTERNATIONAL RADIANCE WORKSHOP

ALAN DE MARCHE
LOISOS + UBBELOHDE
ARCHITECTURE, ENERGY, LIGHT

1917 Clement Ave Building 10A
Alameda, CA 94501-1315

510 521 3800 coolshadow.com
SIMULATIONS IN PRACTICE

DAYLIGHTING

ELECTRIC LIGHTING

Simulation by L + U

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.

Skylight Studies - Kol Emeth

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

VLT Tuning - Kol Emeth

Daylight Performance - Kol Emeth
ELECTRIC LIGHT SIMULATIONS
POINT BASED - GREY SCALE MODELS - OPTION STUDIES - SCENE TUNING - ARCHITECTURAL DETAIL

NOTES:
1. Footcandle values at main circulation aisles are at floor
2. Footcandle values in work areas are at 30” AFF
3. Footcandle values do not include illumination from task lights recommended at every desk.
4. Light fixtures at 8’-0” AFF
5. Simulation uses 35% flat reflective ceiling as proxy for actual ceiling with additional geometry (ducts, etc) all to be painted an 80% reflective white.

Floor is 20% reflective, and walls are 50% reflective

IES Illumination Recommendations:
- office worksurface: 20-30fc average depending on task
- Movable panel. Top is 7’-0” AFF.
  (Placed in several locations to be able read the effect of the panel on desk illumination levels)

EVALUATION
- complies with Illumination standards, but over-illuminates over a large area (excessive quantity and cost of product and labor without added value as compared to Schem B - 50% DD scheme)
- deployment of movable panels significantly reduces light levels
- significant electrical work required for any future conversion of open office space
  (Original Architectural Concept and supported by unistrut grid)

SCHEME: A2
PARALLEL LONG PENDANTS

2017 INTERNATIONAL RADIANCE WORKSHOP - PORTLAND, OR
DAYLIGHT AND ELECTRIC LIGHT INTEGRATION

Geometric Detail - Bay Area Office Bldg.

Material Specificity - Bay Area Office Bldg.

Visible Sources - Bay Area Office Bldg.

White Balance - Bay Area Office Bldg.
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
SCENE TUNING

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
SCENE TUNING - WAREHOUSE RENOVATION

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
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
GEOMETRIC DETAIL - SANCTUARY - KOL EMETH
OVERCAST SKY - DAYLIGHT ONLY

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
GEOMETRIC DETAIL
HIGHLIGHTING ARCHITECTURAL DETAILS WITH ELECTRIC LIGHTING
GEOMETRIC DETAIL
COMPLETE ELECTRIC LIGHTING
GEOMETRIC DETAIL
OVERCAST SKY + ELECTRIC LIGHTING
MATERIAL SPECIFICITY

Include:

**Specular materials** - i.e. polished floors, gloss paint, monitors, whiteboards 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
CLEAR SKY - DAYLIGHT ONLY
MATERIAL SPECIFICITY
OVERCAST SKY - DAYLIGHT ONLY
MATERIAL SPECIFICITY
CLEAR SKY + ELECTRIC LIGHT
MATERIAL SPECIFICITY
OVERCAST SKY + ELECTRIC LIGHTS
MATERIAL SPECIFICITY
DUSK + ELECTRIC LIGHTS
VISIBLE SOURCES

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.
VISIBLE SOURCES - CLASSROOM - KOL EMETH
OVERCAST SKY - DAYLIGHT ONLY

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 AT 3000K
OVERCAST SKY 5500K+ ELECTRIC LIGHTS 3000K
WHITE BALANCE 4000K
OVERCAST SKY 5500K + ELECTRIC LIGHTS 3000K
WHITE BALANCE 3750K
OVERCAST SKY 5500K + ELECTRIC LIGHTING 3000K, 2700K, & 2500K
WHITE BALANCE 3100K
DUSK + ELECTRIC LIGHTING
WHITE BALANCE 3700K
OVERCAST SKY 5500K + ELECTRIC LIGHTING 3000K, 2700K, & 2500K
THANK YOU