Introduction to Daylighting

Presented by: Christopher Meek, FAIA, IES

Date: 19 May 2020

INTEGRATED DESIGN LAB

UNIVERSITY of WASHINGTON // W

lighting design lab

Before we begin…

During the Webinar

- Attendees will be muted
- Please use the chat feature in the control panel to submit questions to LDL staff
- The presenter will pause to address questions every ~10 minutes
- Please participate in the online polls.

Following the Webinar

- Please take the short survey
- A recording and the slide deck will be posted on LDL's webpage
- Reach out to LightingDesignLab@seattle.gov with comments or questions.

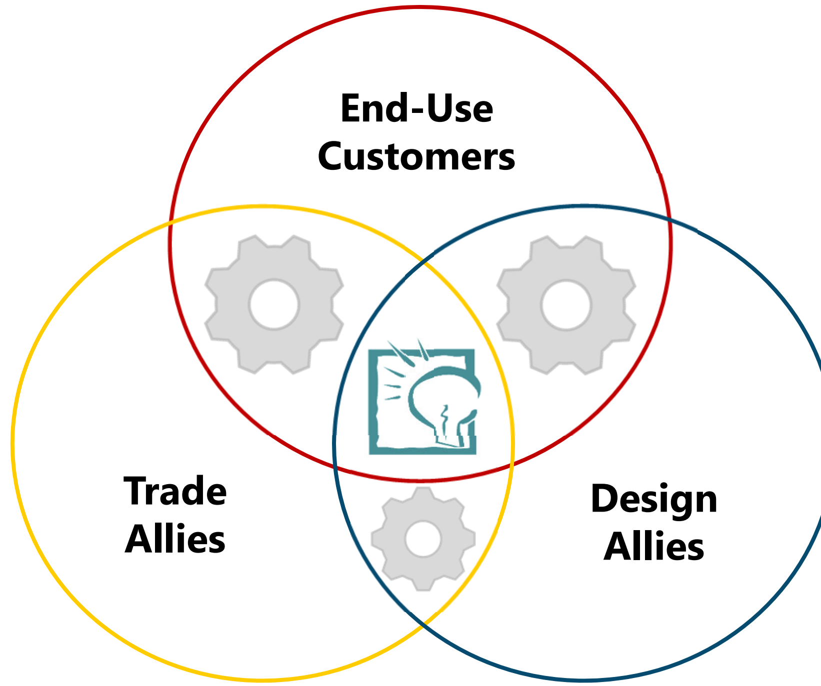
lighting design lab

Powered by

Seattle City Light

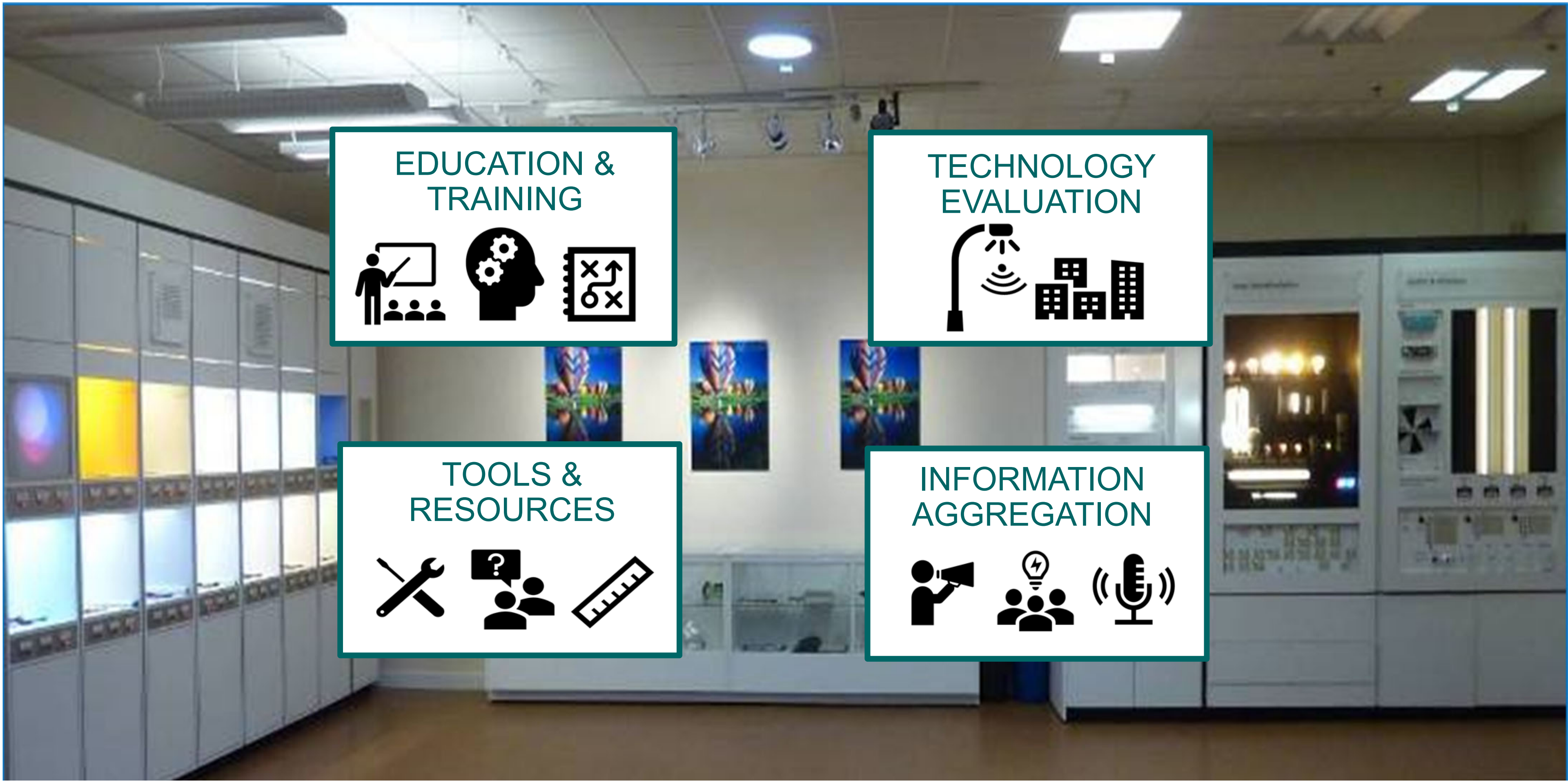
Who We Work With

It takes a village…



lighting design lab

LDL's Four Core Service Areas



Introduction to Daylighting Design

19 May 2020

Christopher Meek, FAIA , IESNA
Integrated Design Lab

Associate Professor
University of Washington
Department of Architecture
cmeek@uw.edu

@ the Bullitt Center

The Integrated Design Lab

The Discovery Commons

www.idlseattle.com

INTEGRATED DESIGN LAB

Annual Report 2018–2019

UW Center for Integrated Design
1501 E. Madison Street, Suite 200
Seattle, WA 98122

206-616-6566
www.cidseattle.com

www.idlseattle.com


DAYLIGHTING DESIGN IN THE PACIFIC NORTHWEST
CHRISTOPHER M. MEEK
KEVIN G. VAN DEN WYMELENBERG
FOREWORD BY JOEL LOVELAND
http://www.washington.edu/uwpress/search/books/MEEDAY.html

POCKET ARCHITECTURE: TECHNICAL DESIGN SERIES

CHRISTOPHER MEEK AND KEVIN VAN DEN WYMELENBERG

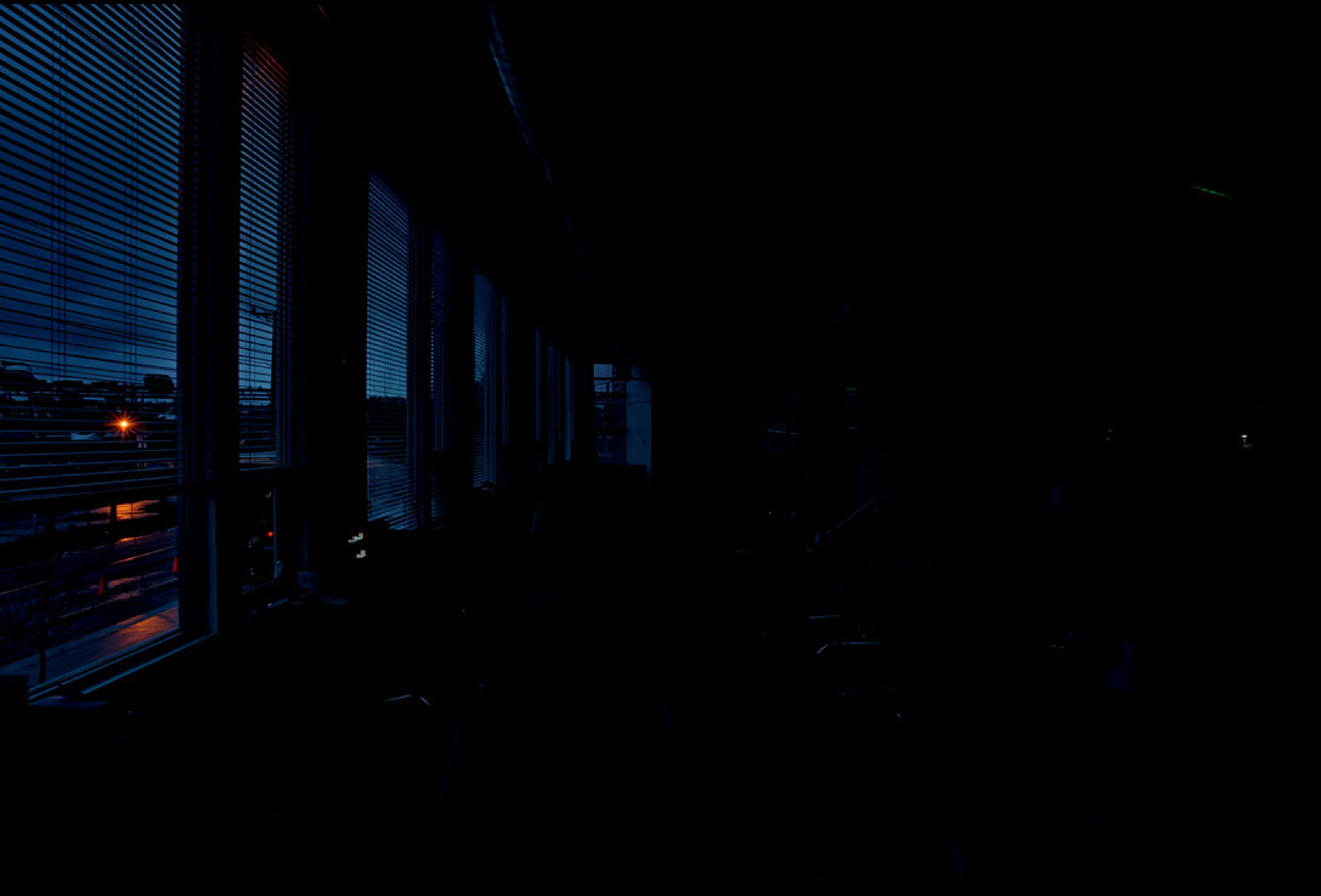
DAYLIGHTING AND INTEGRATED LIGHTING DESIGN

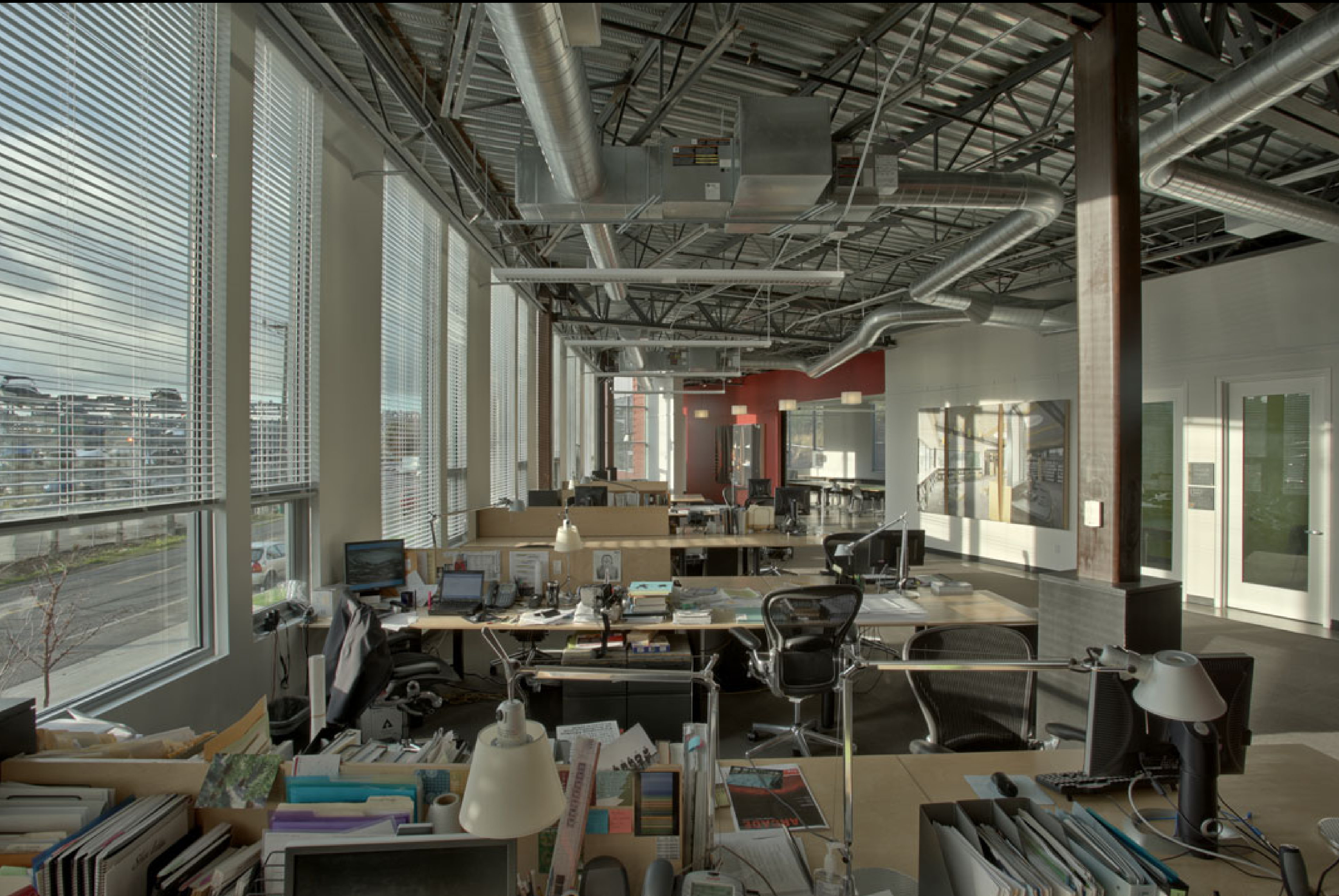
ROUTLEDGE

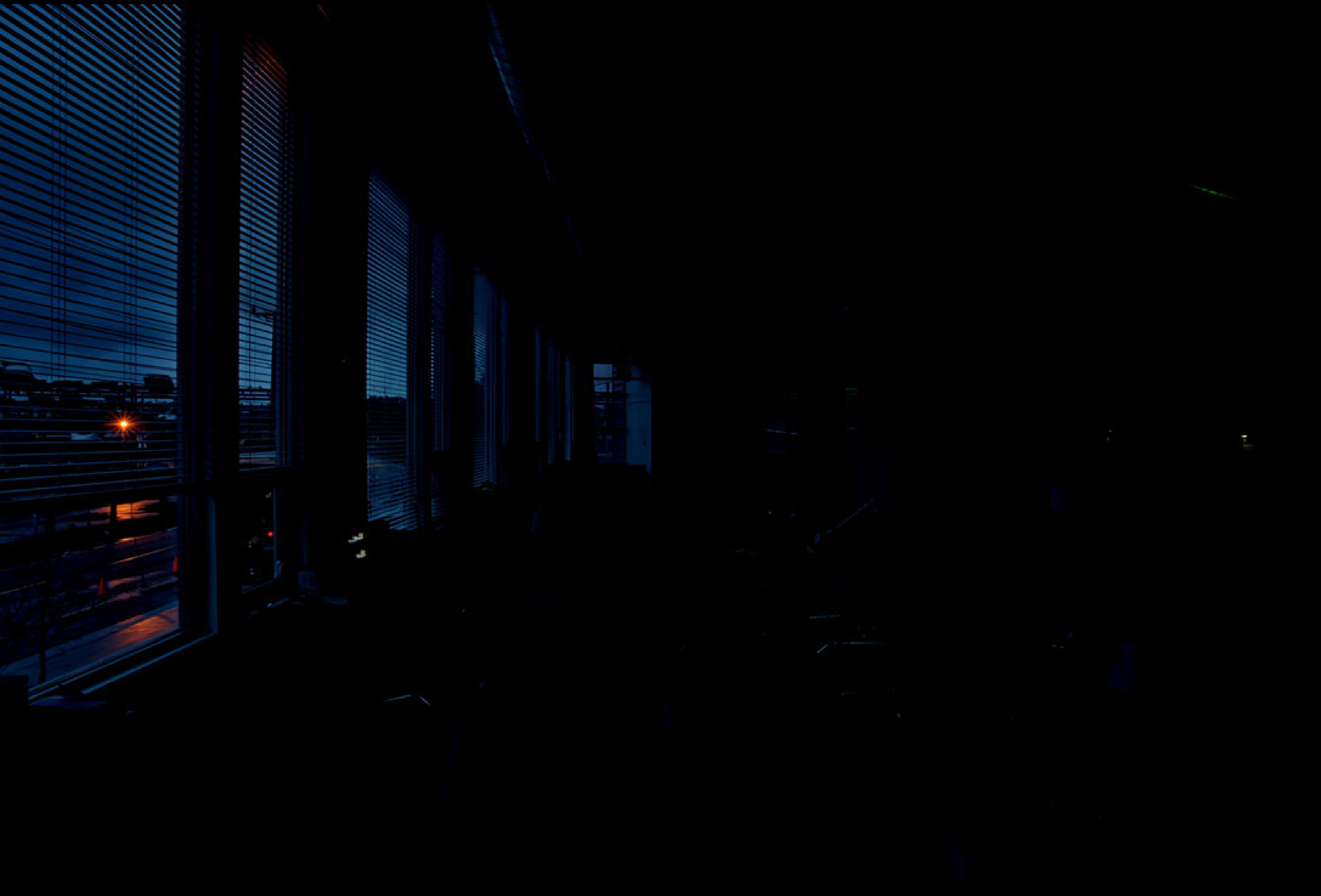
http://www.routledge.com/books/details/9780415725262/

1

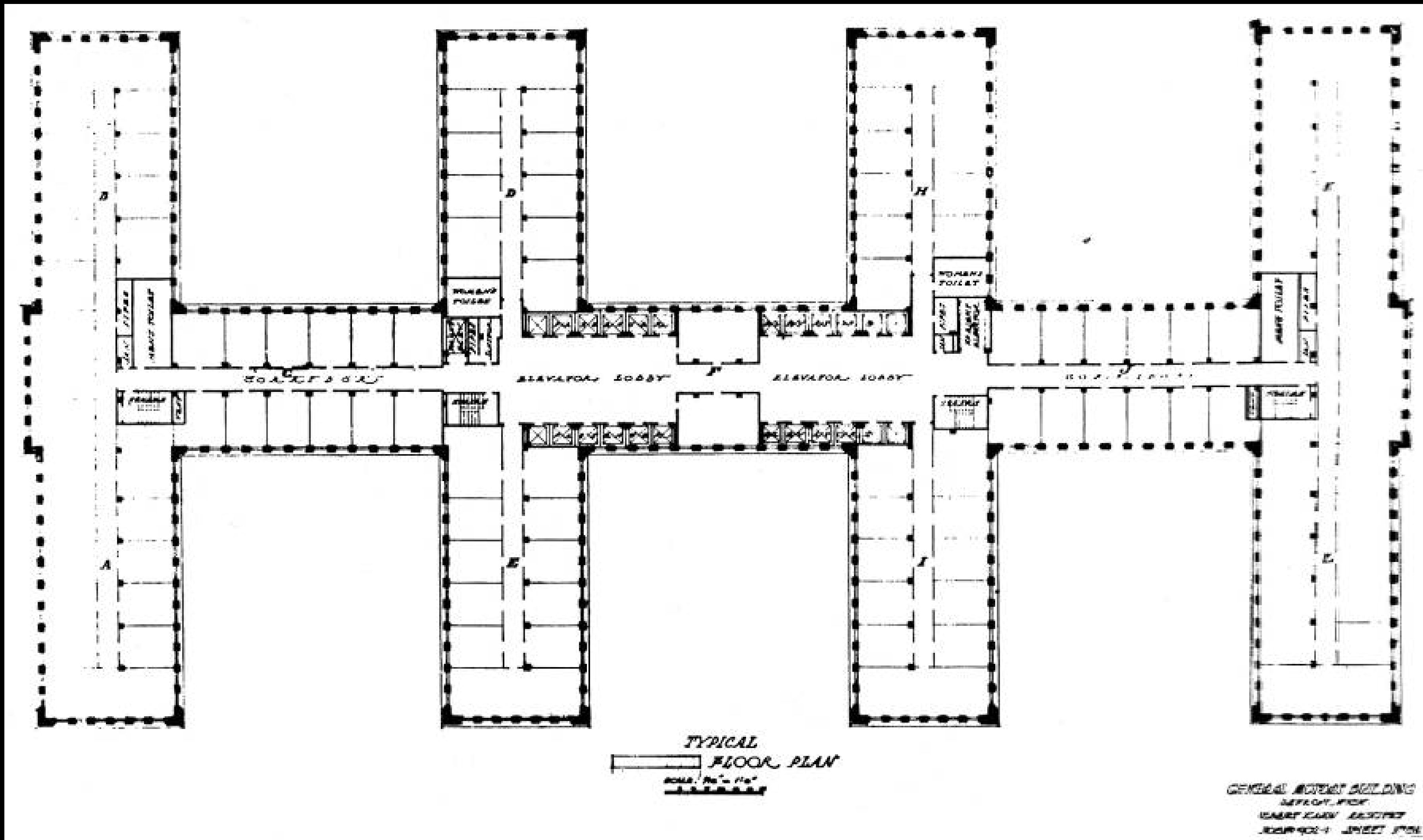
What is Integrated Lighting Design?



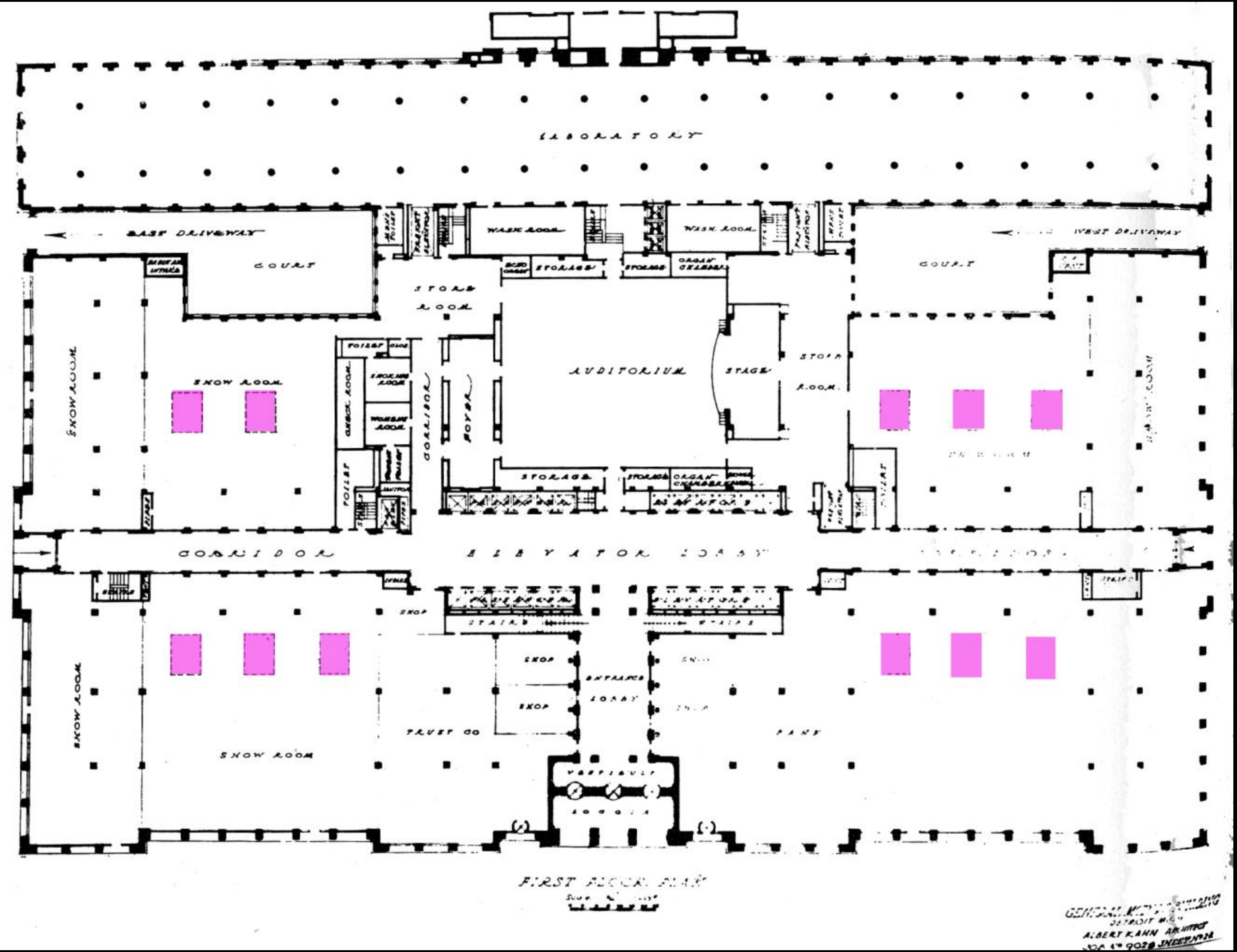




General Motors Building, Detroit, 1917; Albert Kahn and Associates



General Motors Building, Detroit, 1917; Albert Kahn and Associates

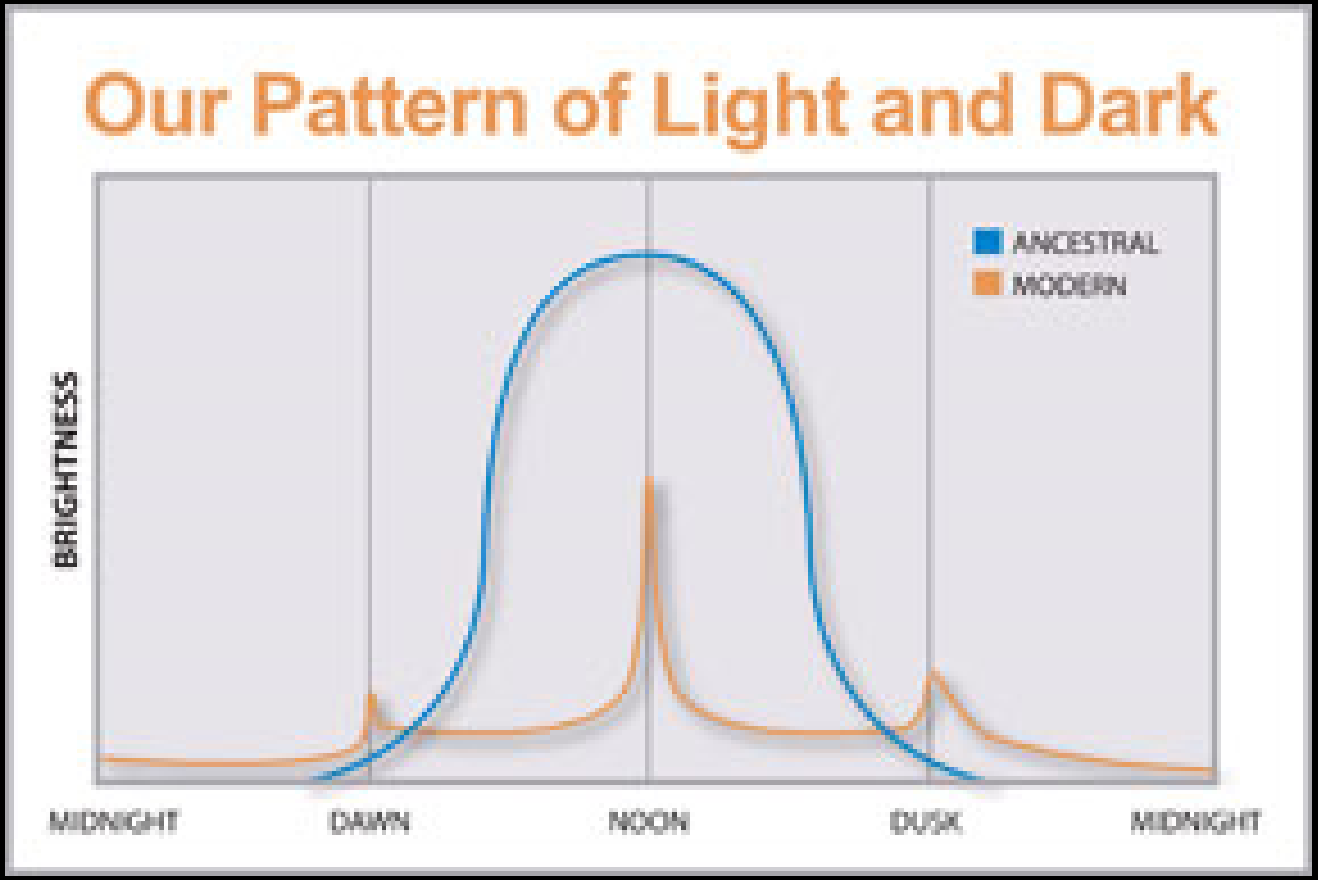


General Motors Building, Detroit, 1917; Albert Kahn and Associates

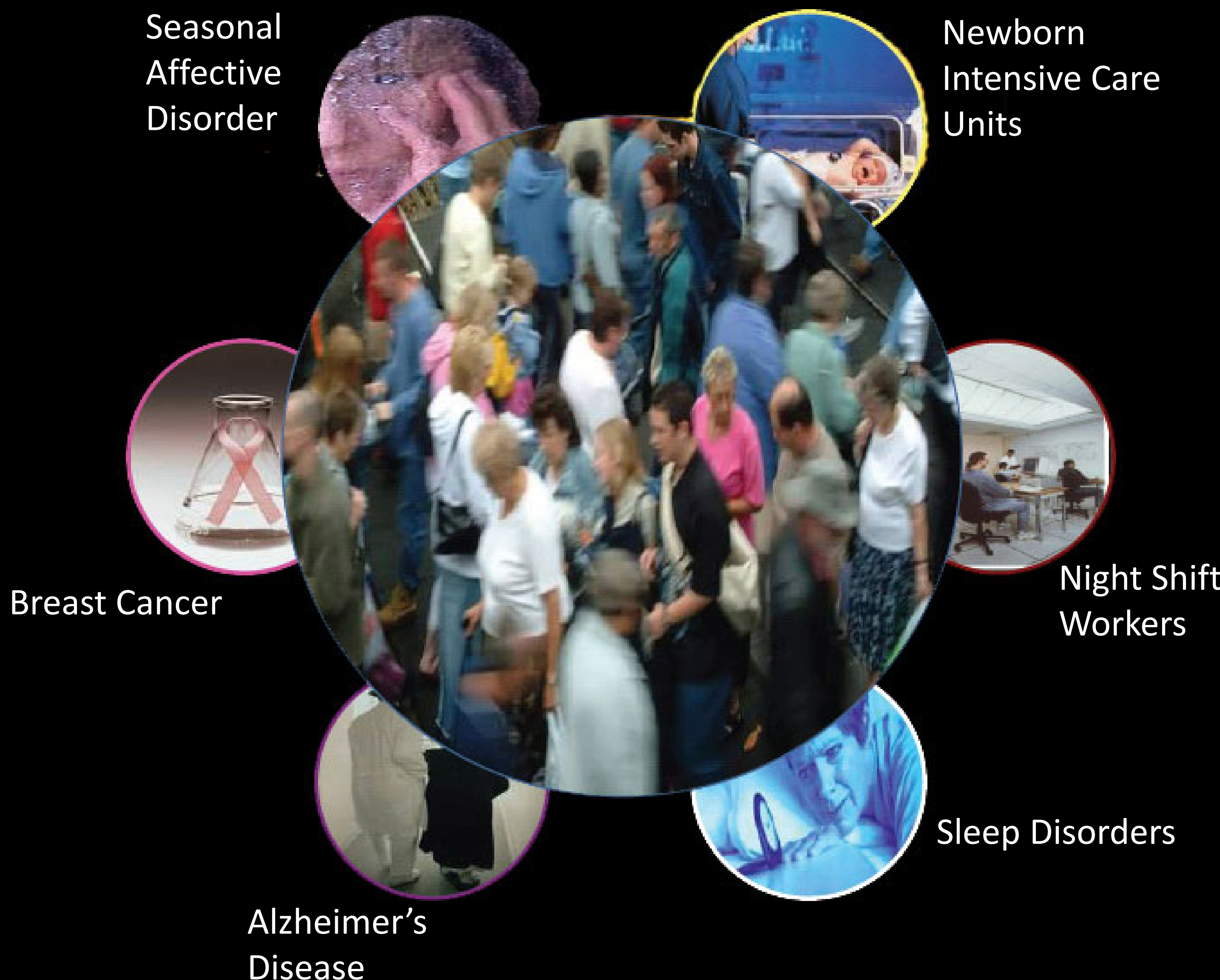
“Silos”

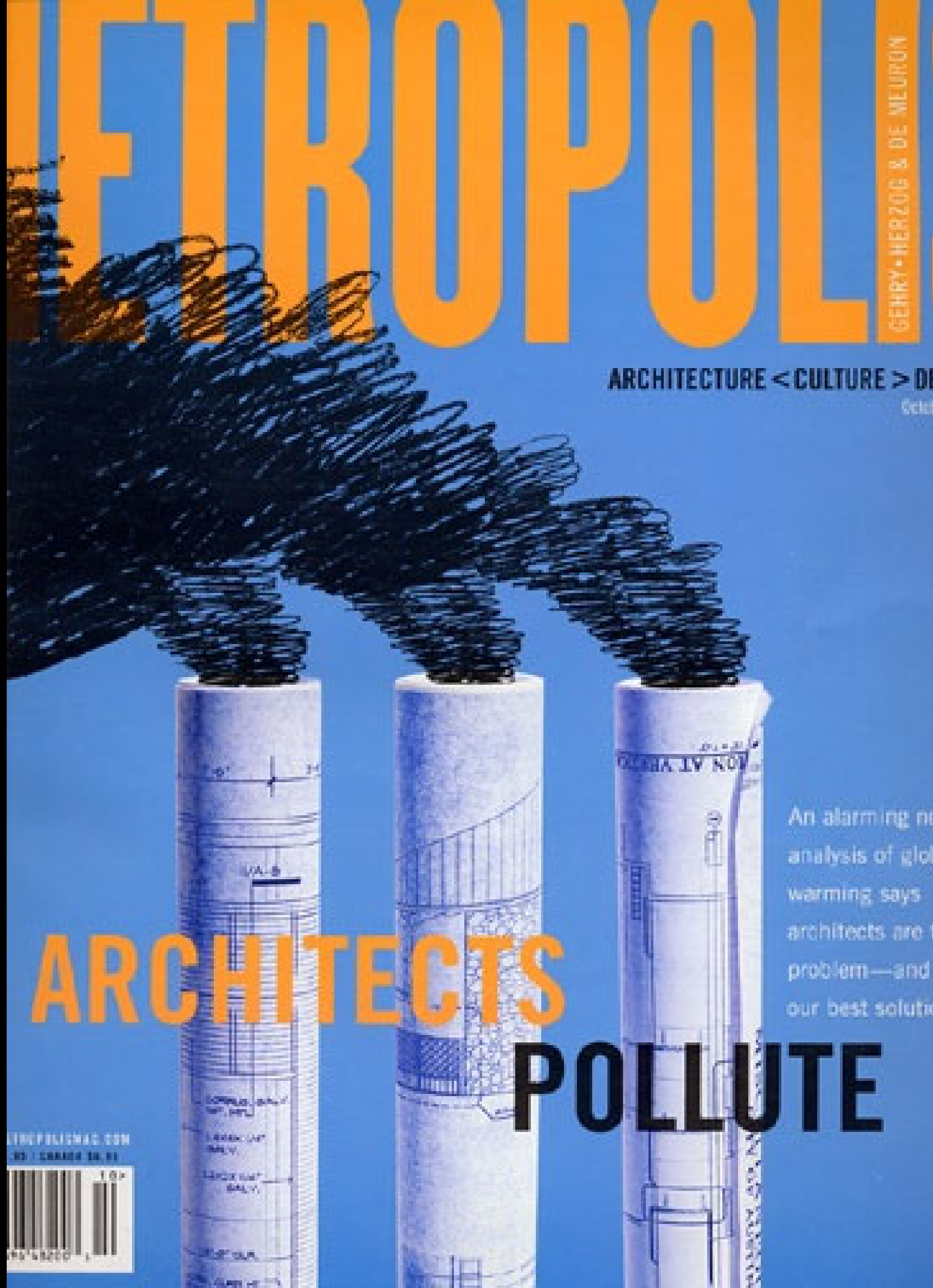
Architects

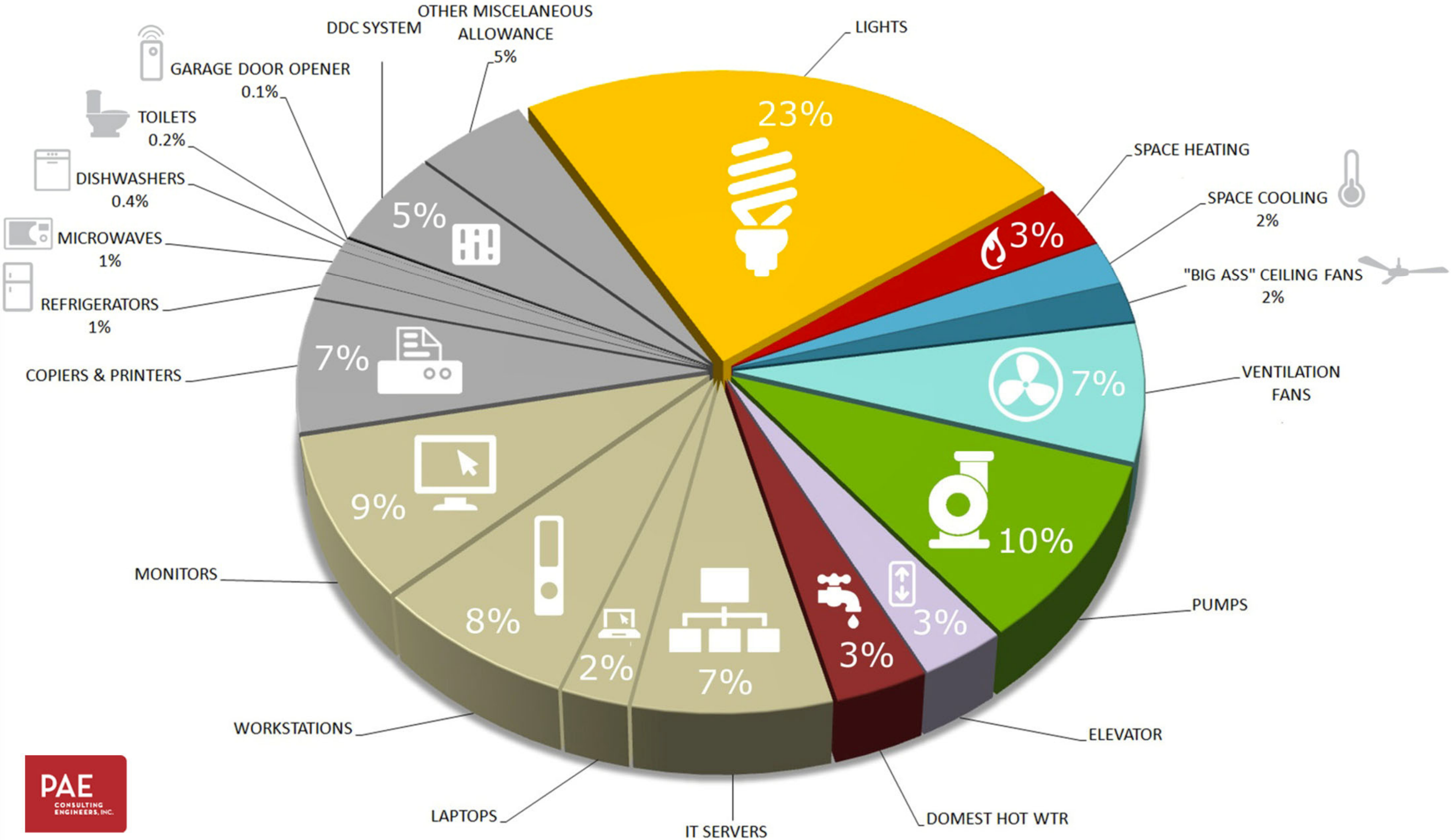
Lighting Designers and Engineers



Our Pattern of Light and Dark
ANCESTRAL
MODERN
BRIGHTNESS
MIDNIGHT
DAWN
NOON
DUSK
MIDNIGHT


Seasonal Affective Disorder
Newborn Intensive Care Units
Breast Cancer
Night Shift Workers
Alzheimer's Disease
Sleep Disorders


ETROPOLIS
GEHRY • HERZOG & DE MEURON
ARCHITECTURE <CULTURE> DE
ARCHITECTS
POLLUTE
An alarming ne
analysis of glob
warming says
architects are t
problem—and
our best solutio
ETROPOLISMAG.COM


OTHER MISCELANEOUS ALLOWANCE 5%
DDC SYSTEM
LIGHTS
23%
GARAGE DOOR OPENER 0.1%
TOILETS 0.2%
DISHWASHERS 0.4%
MICROWAVES 1%
REFRIGERATORS 1%
COPIERS & PRINTERS
5%
7%
SPACE HEATING
3%
SPACE COOLING 2%
"BIG ASS" CEILING FANS 2%
VENTILATION FANS
7%
10%
PUMPS
9%
MONITORS
8%
2%
7%
3%
3%
WORKSTATIONS
LAPTOPS
IT SERVERS
DOMEST HOT WTR
ELEVATOR
PAE
CONSULTING ENGINEERS, INC.

2

Daylight and the Sky as a Light Source

Daylight Variability

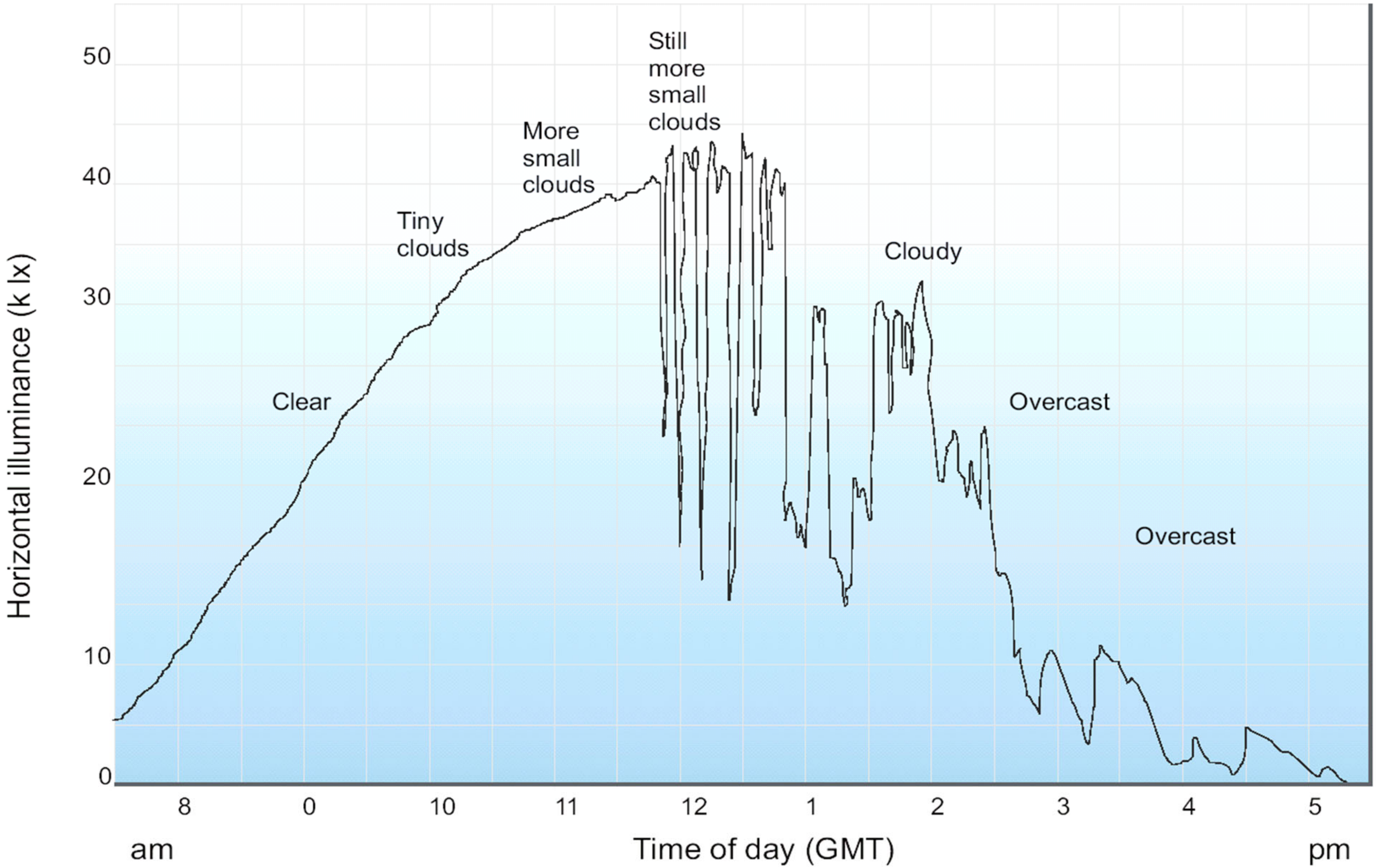
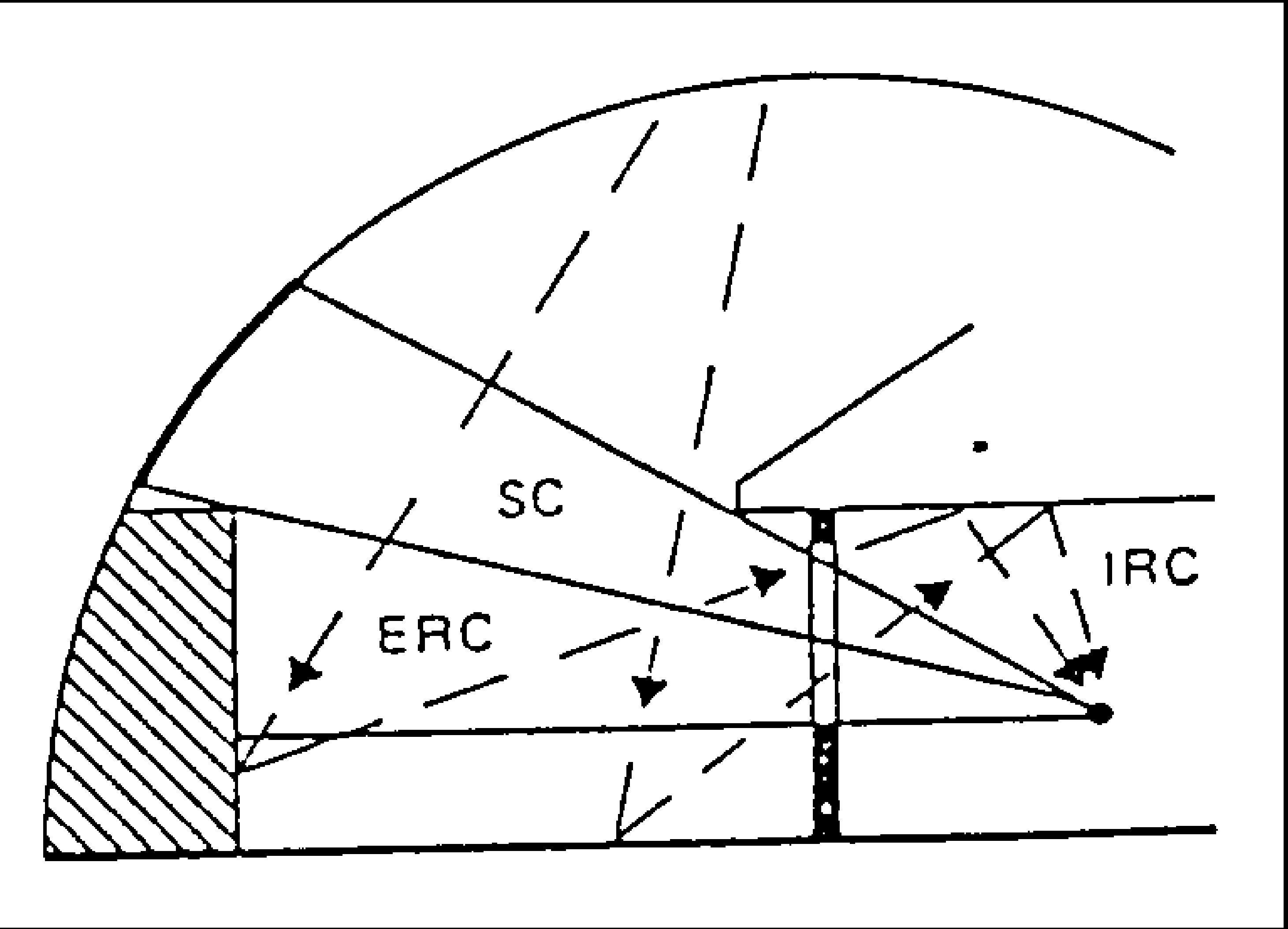


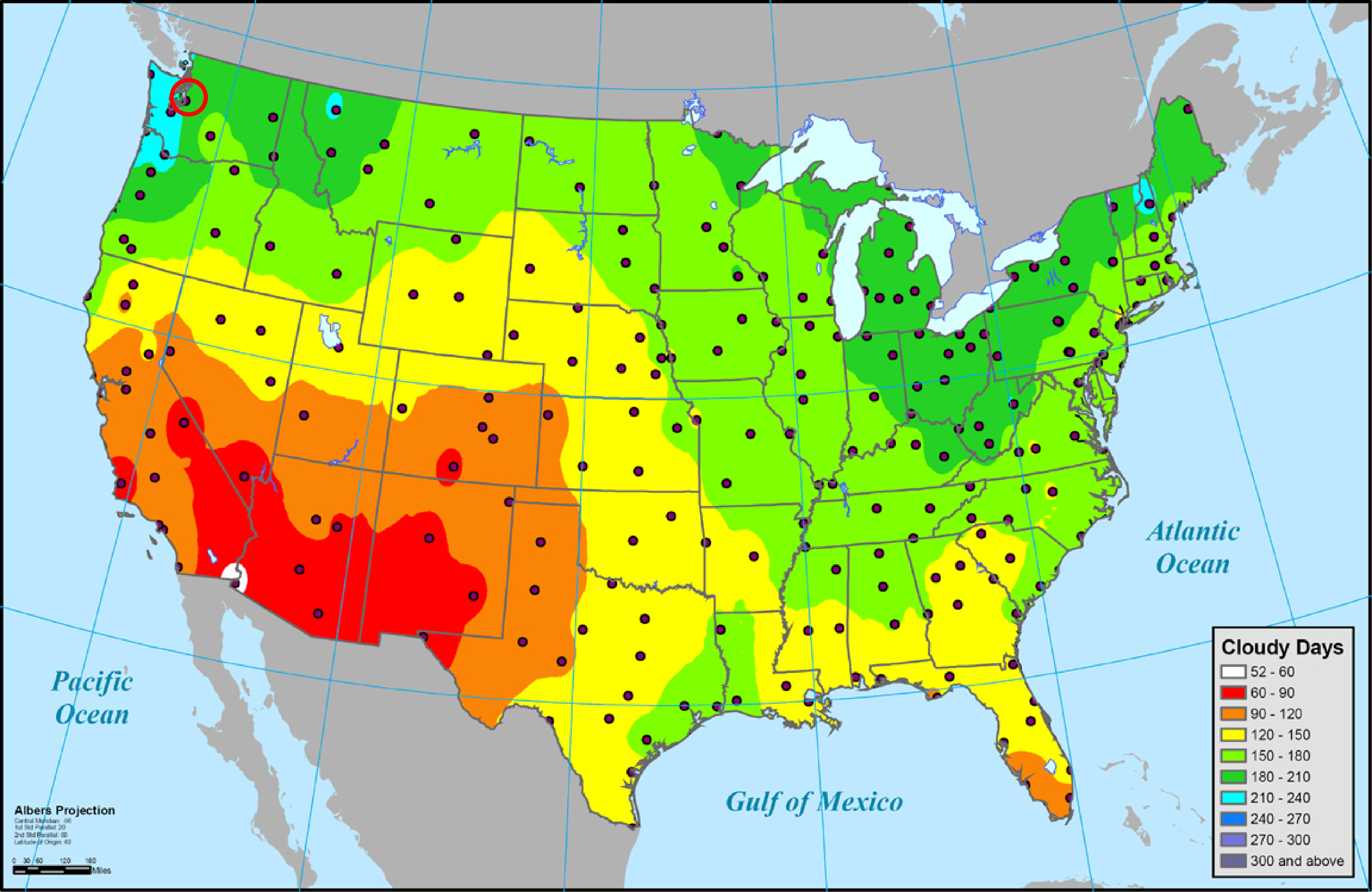
Figure 6-9 – Example of Daylight Variability

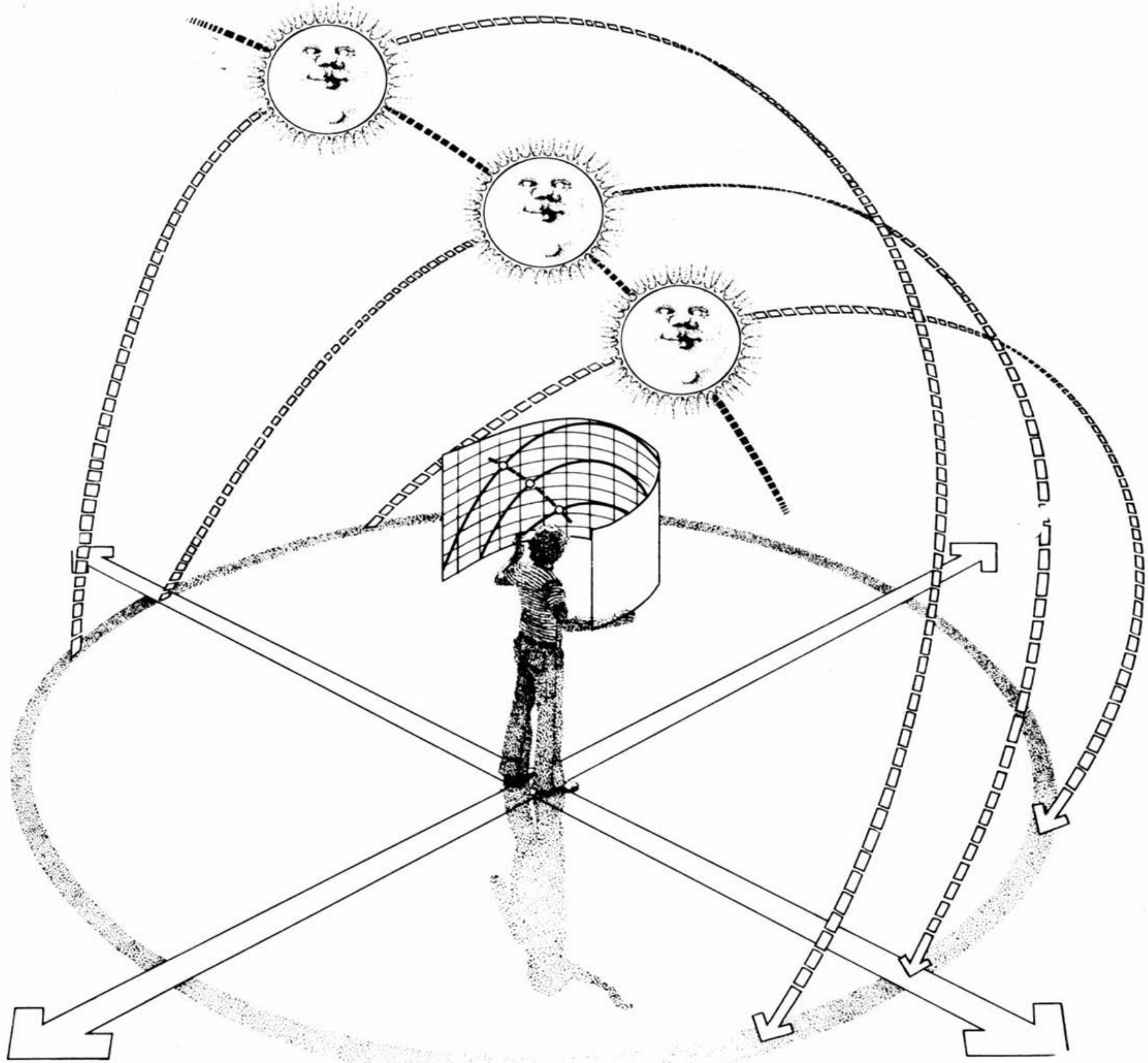


Daylight Illuminance = Sky C + External RC + Internal RC



Daylight Illuminance = Sky C + External RC + Internal RC

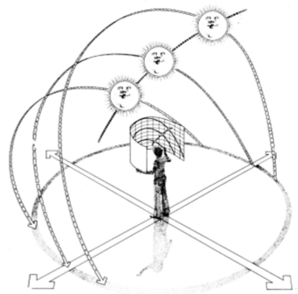

Cloudy Days
52 - 60
60 - 90
90 - 120
120 - 150
150 - 180
180 - 210
210 - 240
240 - 270
270 - 300
300 and above
Pacific Ocean
Atlantic Ocean
Gulf of Mexico
Albers Projection
Miles



The Experience of Direct Sunlight in Buildings

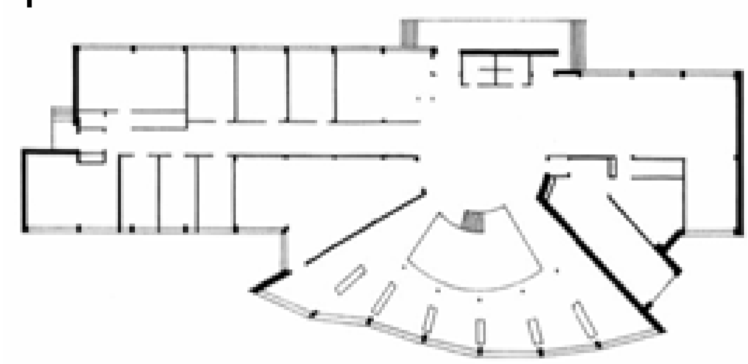
Illumination Patterns of Direct Sun

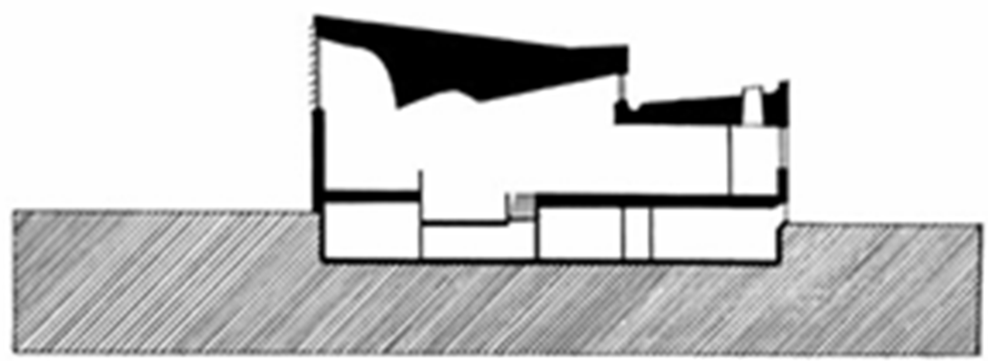
Building as a Luminaire



Seinajoki Library; Alvar Aalto; 1963

North

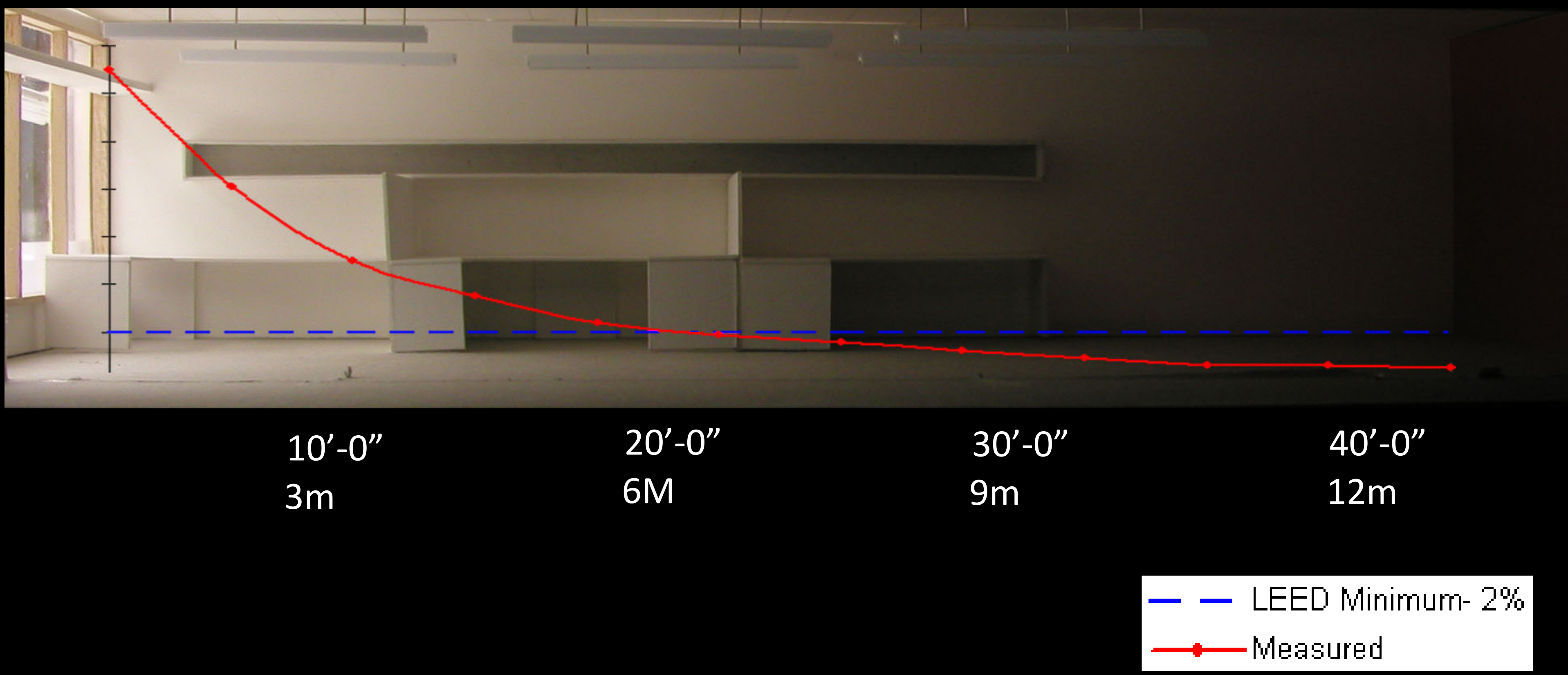




3

Design Rules of Thumb: Sidelighting and Toplighting

SIDELIGHTING: Diffuse Daylight



Glare/Thermal Control Strategies: Exterior to Interior

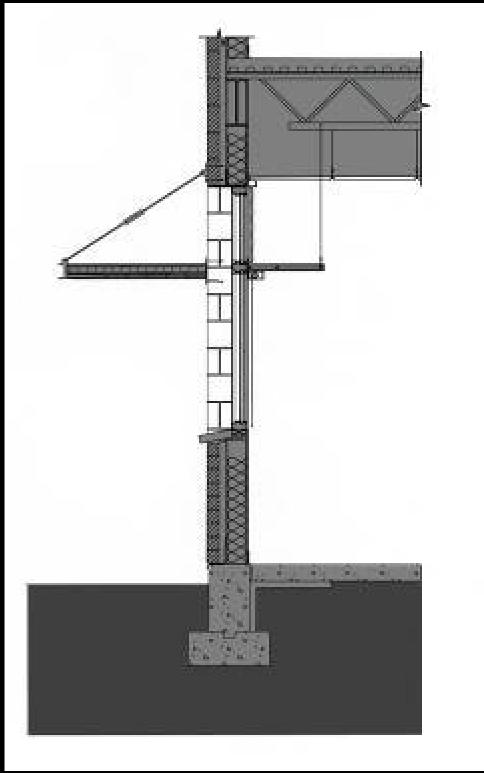
- Automated Exterior Shading Systems
- Fixed Exterior Architectural Shading Systems
- Exterior Fabric Awnings
- High Performance Glazing
- Operable Windows
- Automated Interior Shading Systems / Double Skin Systems
- Manual Interior Shading Systems

Automated Exterior Blinds

Photocell and Weather Station Control

Courtesy: Markus Klopf / Warema

Fixed Exterior Architectural Shading

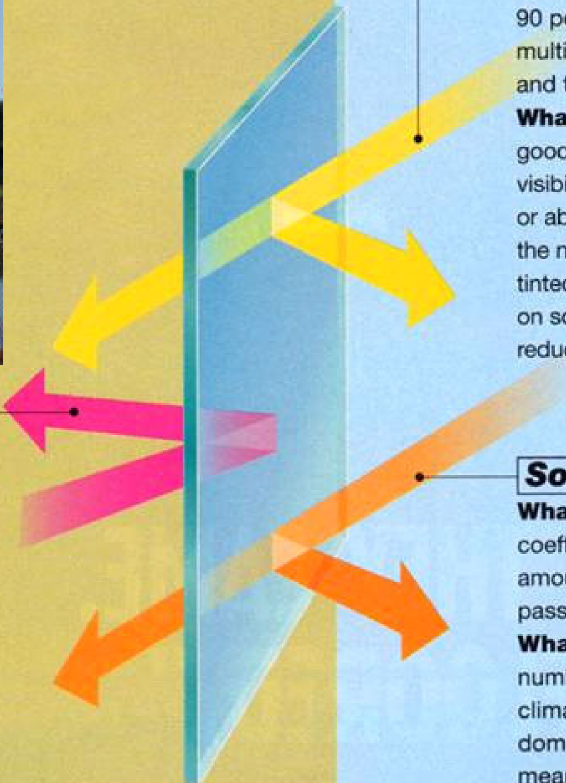


Giadrone MS, NAC Architecture

Glazing: *Light and Thermal Properties*

Visible Light

What it is: Visible light transmittance (VT) measures the amount of light that passes through a window. Clear glass has a VT rating of .90, meaning that it admits 90 percent of visible light. Add multiple panes and low-E coatings and that number starts to go down.
What to look for: To maintain good light transmittance and visibility, choose glass with a VT of .6 or above, which will appear clear to the naked eye. Lower VTs indicate tinted windows, which can cut down on solar heat gain but will also reduce visibility, especially at night.



U-Value

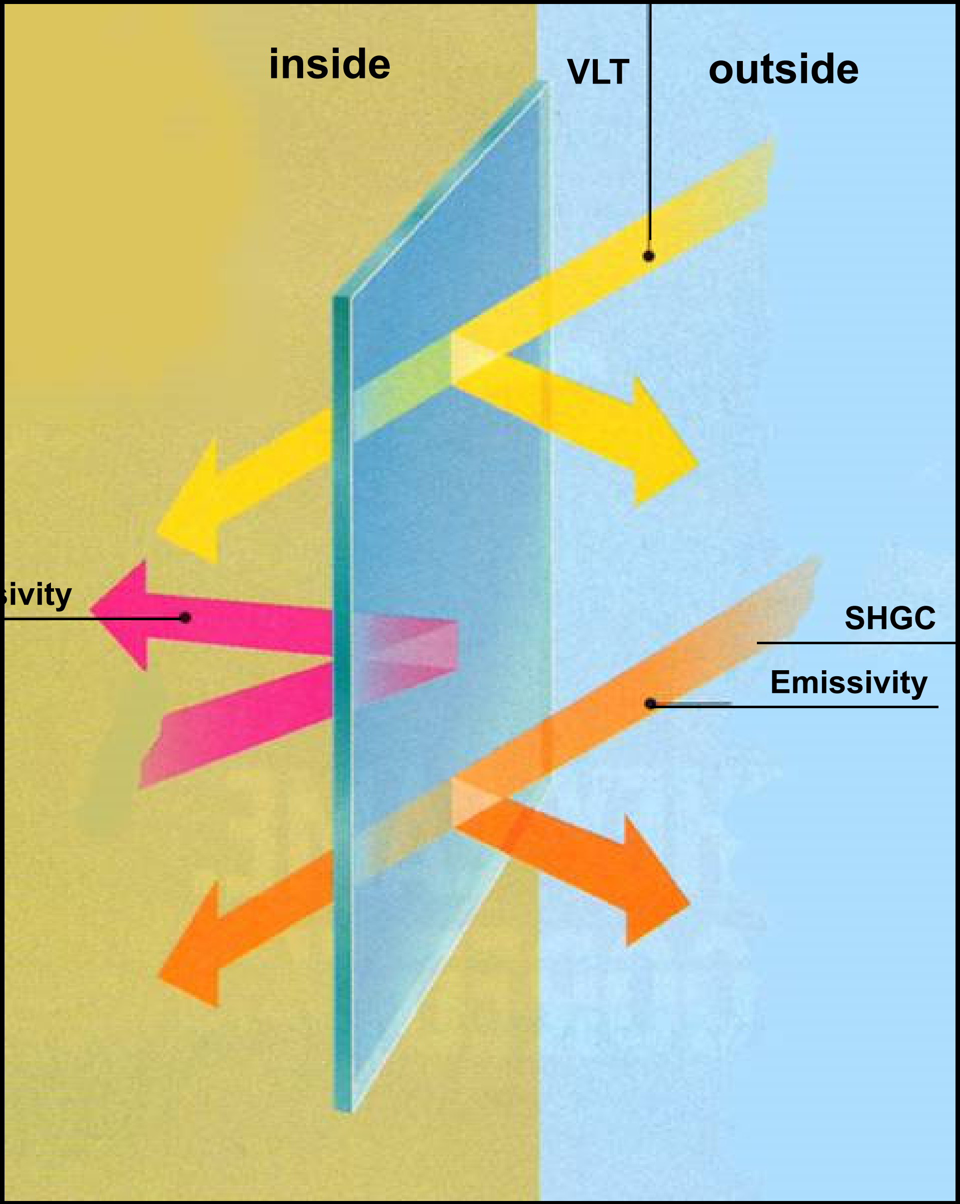
What it is: U-value measures a glazing system's insulating ability. The lower the U-value (expressed as a number between 0 and 1), the better the insulation.
What to look for: Regardless of whether you live in a heating or a cooling climate, go for windows with the lowest U-value you can afford. Single-pane windows have a U-value of around .90, while the most sophisticated Heat Mirror glazing systems have values as low as .11.

Solar Heat

What it is: The solar heat gain coefficient (SHGC) measures the amount of the sun's heat that passes through a glazing system.
What to look for: Lower numbers are best in warm climates where cooling costs dominate, while higher numbers mean more of the sun's heat will radiate indoors. For low solar heat gain, look for numbers in the .40 range; for high heat gain, look for .70 and above.

Courtesy: This Old House Magazine

LSG: *Light to Solar Heat Gain Ratio*



Ensure Visual Comfort

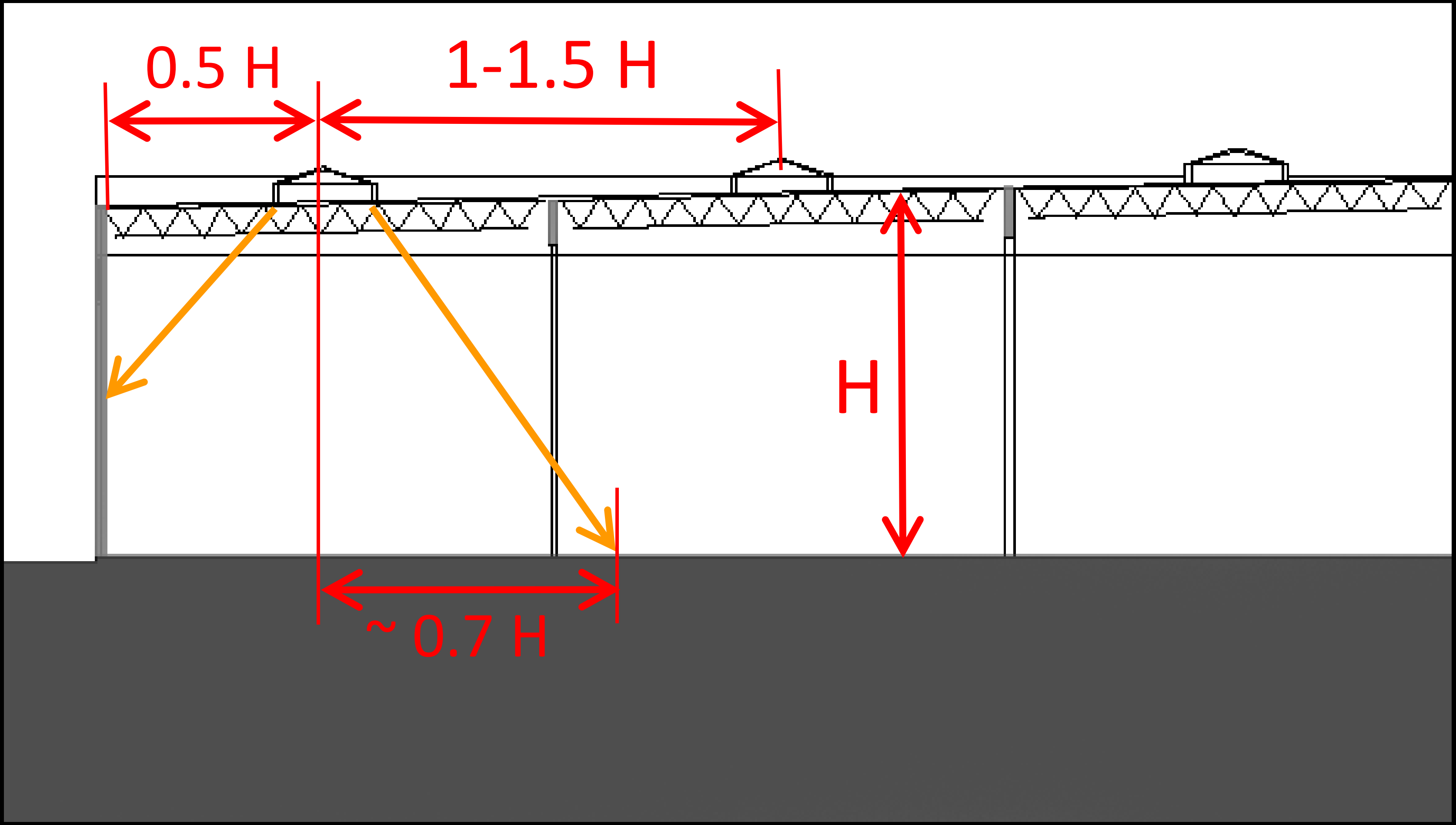
Interior Blinds


Courtesy: Behnisch Behnisch and Partner

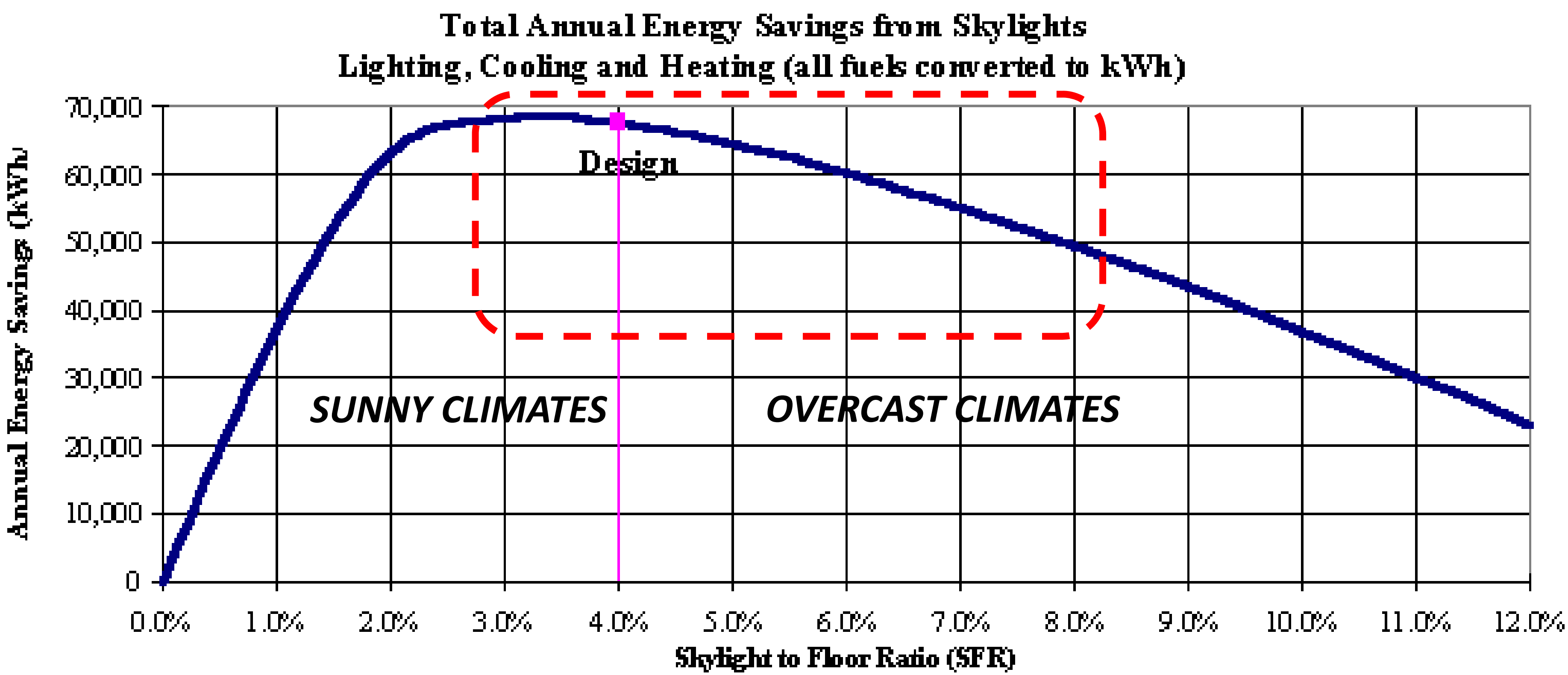

Courtesy: Markus Klopf / Warema

Provide Complete Opacity, Maintain Diffuse Daylight
Daylight Performance Varies Widely

SKYLIGHTS: Geometric Basics



SKYLIGHTS: How Much Glazing Area?



From: SKYCALC www.h-m-g.com

SKYLIGHTS: Light Diffusion

Transparent (Clear) Glazing

Translucent Glazing

SKYLIGHTS: Light Diffusion

Light Scattering Through <u>Pigment/Fibers</u>

- Insulated Glass Sandwich Panels
- Laminated Glass PVB Inter-Layers
- Fiberglass Panels
- Acrylic (White Pigment)
- Polycarbonates

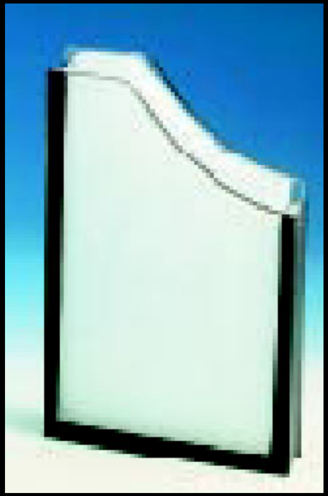


Image: Schott Glass

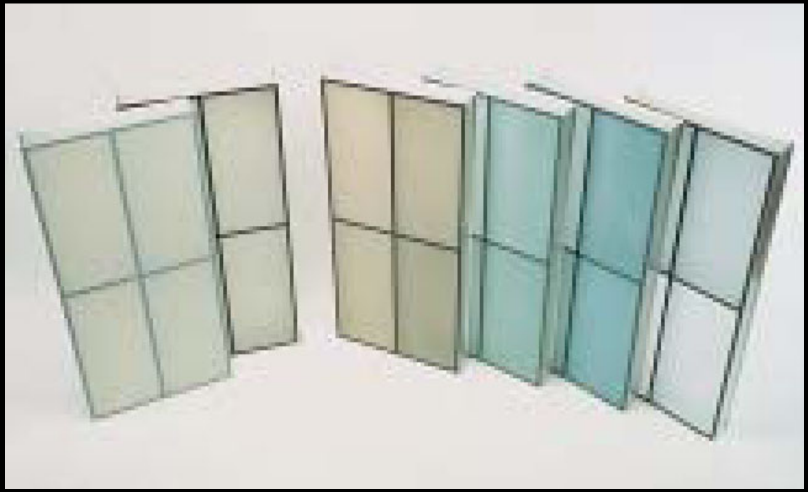


Image: Kalwall

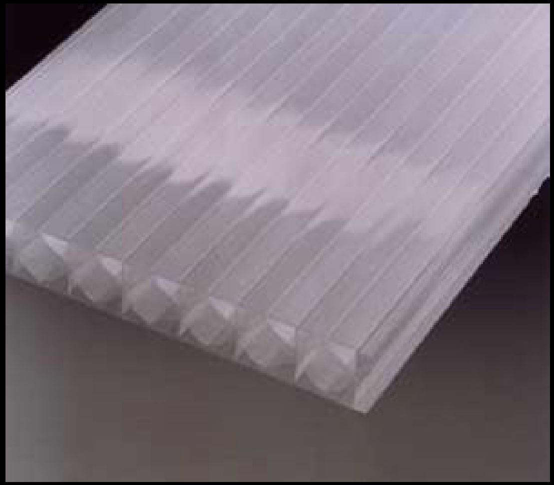


Image: Polygal

SKYLIGHTS: Light Diffusion

Light Scattering Through <u>Refraction</u>

- Prismatic Lenses
- Tubular Skylights

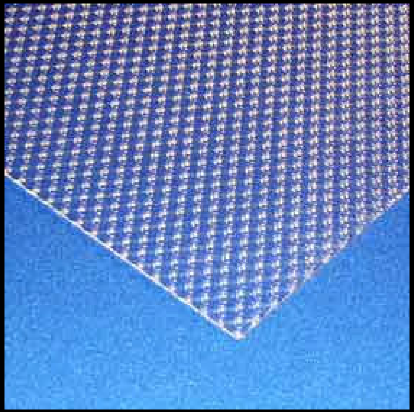
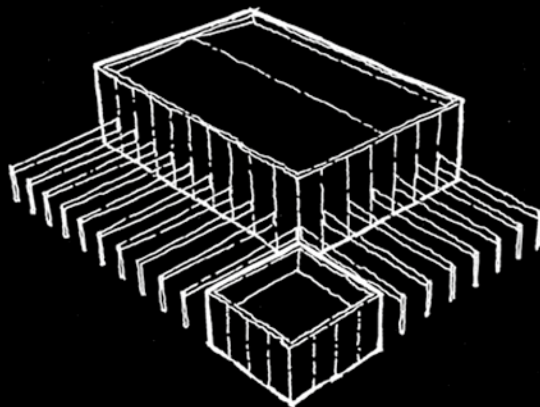


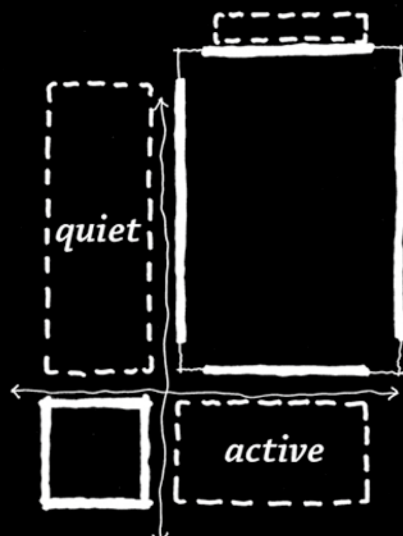
Image: Solatube

Image: Sunoptics Prismatic Skylights

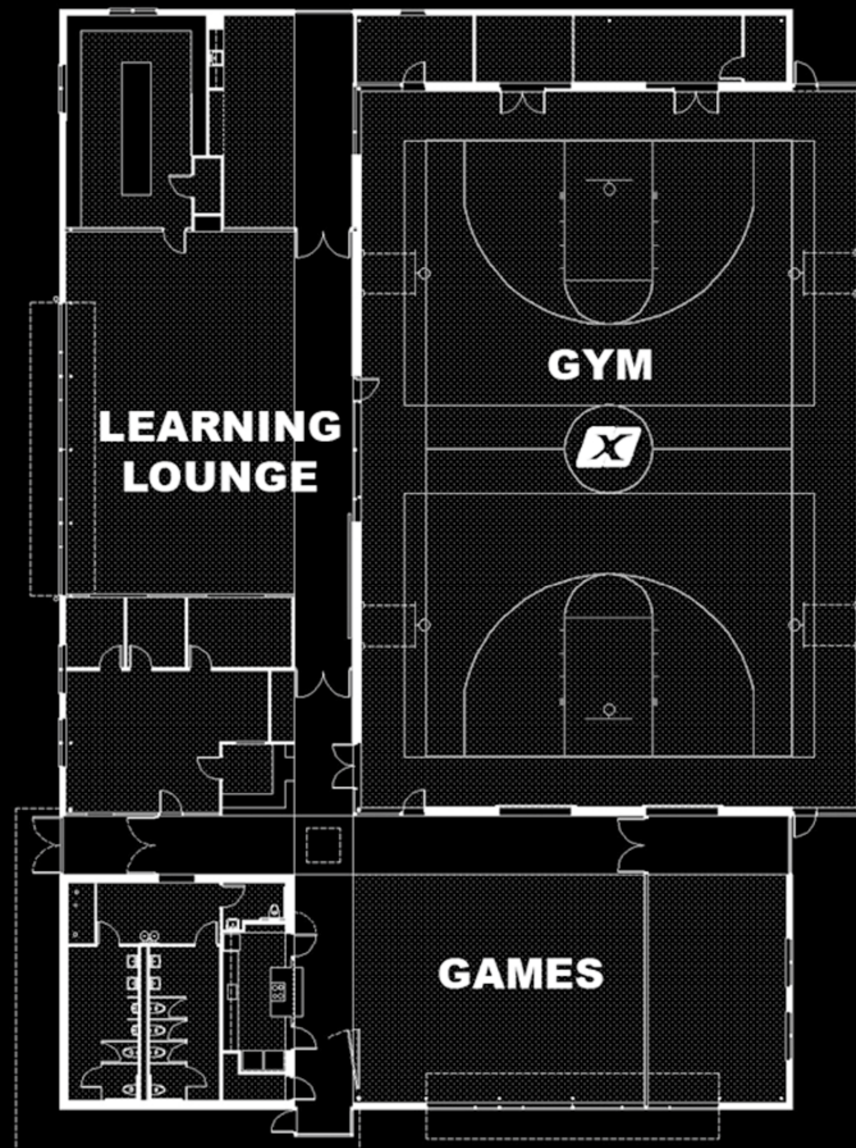
EX3 Ron Sandwith Teen Center, Weinstein A|U



TECTONIC DIAGRAM



PROGRAM DIAGRAM

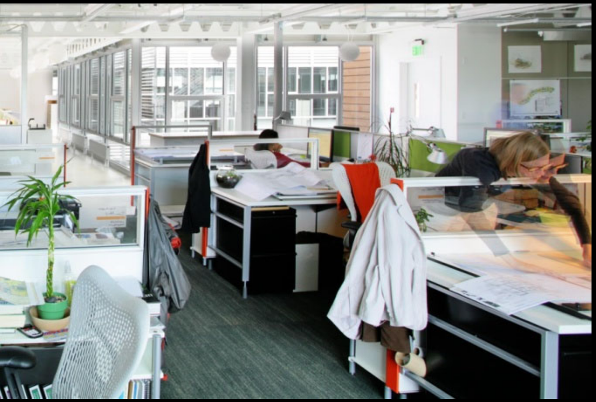



SANDWITH TEEN CENTER
MUSIC
EXPLORE
EX3
PROGRAM


HOME
GUEST
ATHLETICS

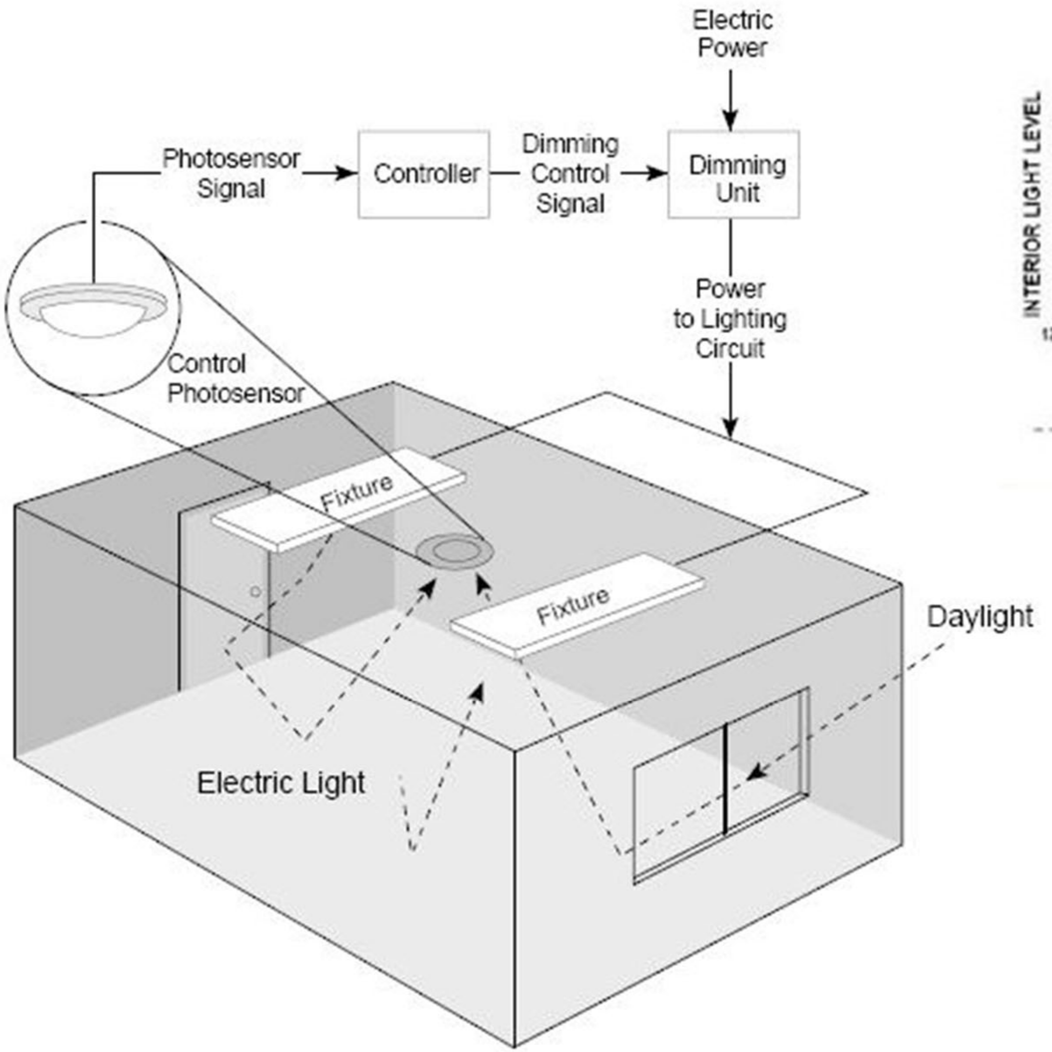

MUSIC

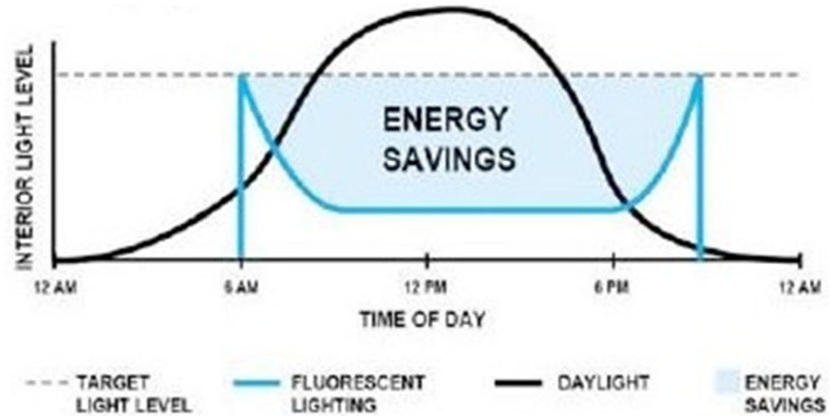
4



Concepts for Controls Integration

Controls Integration:





Daylight “Harvesting” Controls Concept

Controls Integration:

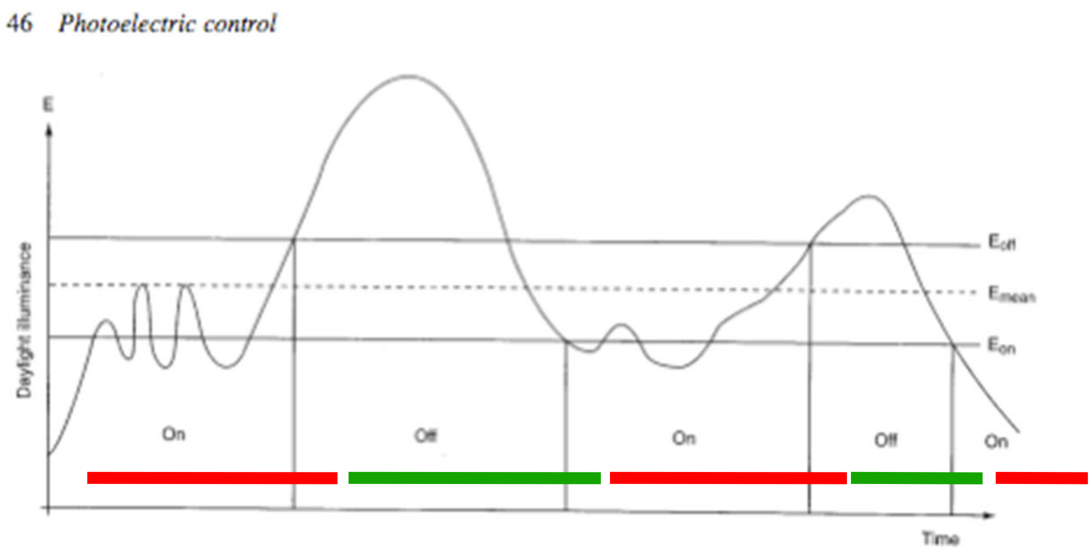
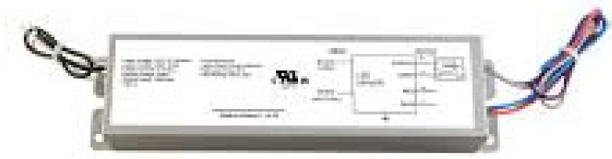


Figure 3 Operation of a 'differential switching' photoelectric control as the daylight illuminance at the control point changes

Intent, Set-Up, Operations

Controls Integration



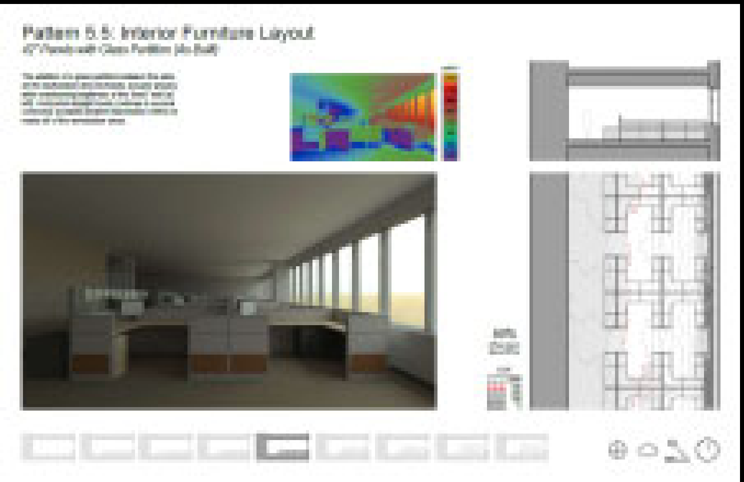
Hardware Components

Luminaire Level Lighting Controls (LLLC)

Daylight and Occupancy Control for Energy Efficiency:
Integrated Sensors, Embedded Controls, Wireless Networking,

https://www.designlights.org/lighting-controls/download-the-qpl/

5



Tools and Resources– Daylighting Pattern Guide

Optimizing Daylight Performance

patternguide.advancedbuildings.net/home

advanced buildings
Energy performance solutions from NBI

Daylighting Pattern Guide

Home | Patterns | Using this Guide | About | DPG+E Development

Introduction

New Buildings Institute in partnership with the University of Idaho and University of Washington has developed a freely available interactive tool for the design of proven daylighting strategies in a variety of building types. Users will be introduced to the Daylighting Pattern Guide while exploring the inter-relationship of sky, site, aperture, and space planning. The guide uses a combination of built examples and advanced simulation to set the stage for substantial reductions in lighting power consumption and overall energy use through successful daylighting design.

Contributors

nbi new buildings institute

INTEGRATED idl DESIGN LAB
boise + puget sound

University of Idaho
College of Art and Architecture

BE COLLEGE OF BUILT ENVIRONMENTS

▸ Learn more about our Contributors

 New Buildings Institute | Integrated Design Lab Boise | Integrated Design Lab Puget Sound | Login

Site by Fuse IQ

http://patternguide.advancedbuildings.net/home

Courtesy: Meek & Van Den Wymelenberg

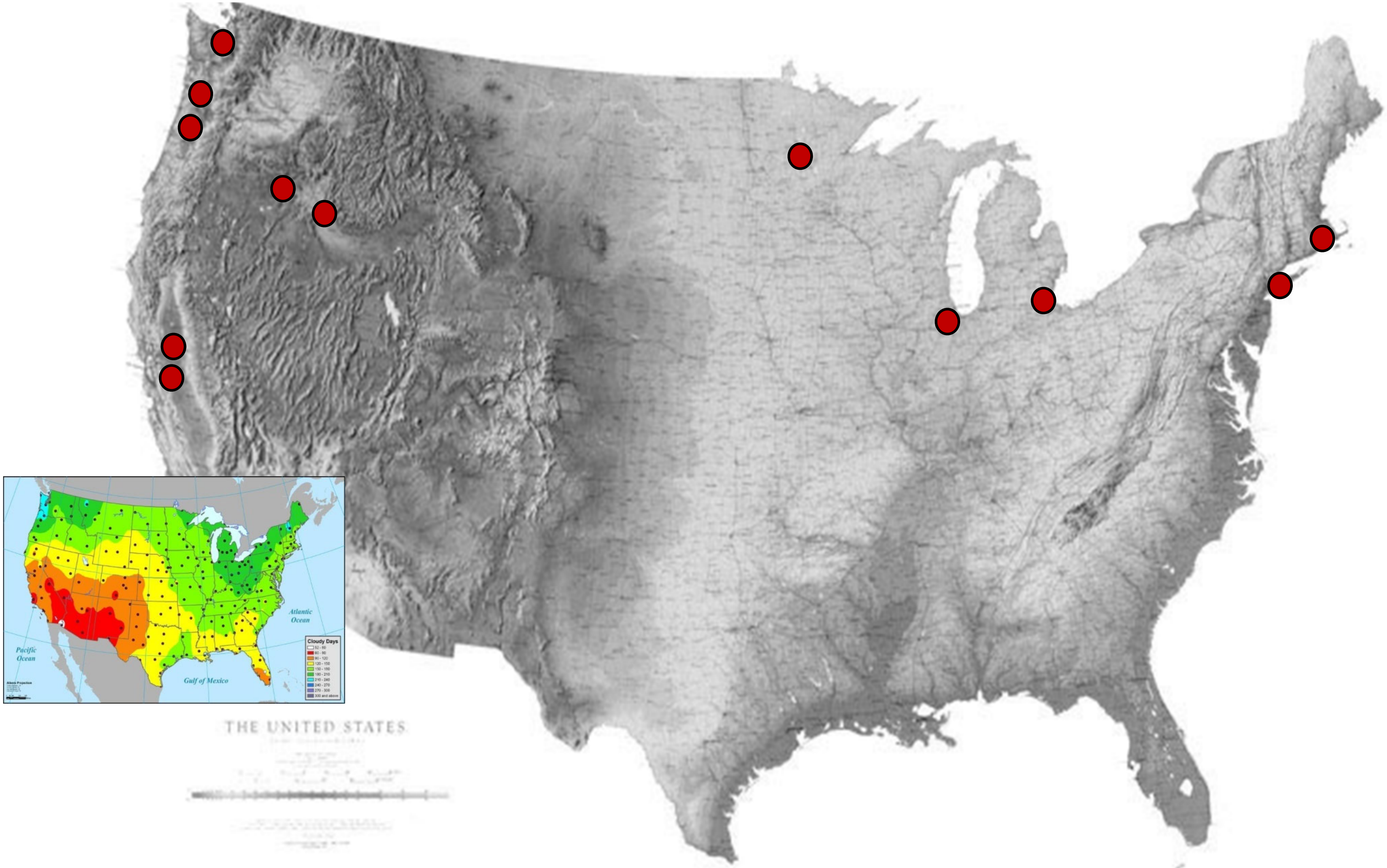
Common Space Types & Daylighting Design Challenges

Pattern #	Pattern Name	Building	ceiling height	plate depth	window height	window patterns	window area	shading horizontal	shading vertical	roller blinds	mini blinds	shading dynamic	window orientation	interior furnishing	skylighting area	skylighting	clerestory monitors	perimeter cleretories	courtyard / atrium	space programming	sun penetration	diffusing clouds (interior)	Tvis of glazing	interior reflectances	glass diffusion	sky condition	time of day	time of year	multiple metrics	
Pattern #	Pattern Name	Building		1																	1					1	1	1	1	6
x	Analysis Methods	Aon Center & Allianz Kai																												0
1	Floorplate Geometry	Multiple Buildings		1															1											2
2	Courtyard Building	Terry Thomas Building		1															1											2
3	Common Office: Window Area	Banner Bank Building			1	1	1																							3
4	Common Office: Section Depth	Banner Bank Building		1																										1
5	Common Office: Open Office Partitions	Banner Bank Building												1										1						2
6	Daylight from Multiple Sides	NBBJ Offices				1	1																							2
7	Daylight from One Side and Top: Office Scale	IDEAS				1	1								1	1		1							1					6
8	Daylight from One Side and Top: Office Scale	Kitsap Co. Administration		1										1		1				1										4
9	Daylight from One Side and Top: Classroom	Chartwell School	1	1												1														3
10	Daylight from One Side and Clerestory: Classroom	Garden City Head Start	1					1									1													3
11	Glare Storage: Intentional Sunlight	Mesa Library												1							1						1	1		4
12	Solar Shading: Windows	Phoenix Library						1	1				1														1	1		5
13	Dynamic Shading: Automated Blinds	Genzyme								1	1	1		1												1	1	1		7
14	Building Orientation: Office	Env. Services Building						1	1				1				1			1							1	1		7
15	Building Orientation: Classroom	Dalles ES						1	1																					2
16	Two Story Atrium Design for Task Illumination	CAES												1		1	1		1											4
17	Multi Story Atrium Design for Task Illumination	Great River Energy		1													1		1											3
18	Space programming for daylighting	NE Branch Library																		1	1					1	1	1		5
19	Toplighting: Small Building	Mt Airy													1	1						1								3
20	Toplighting: Industrial Building	NE Transfer Station													1	1		1					1	1	1					6
21	Toplighting: Industrial - Office	Pratt and Whitney															1	1				1			1					4
22	Toplighting: Gymnasium	Yesler Gym													1	1	1						1	1	1					6
23	Toplighting: Classroom	Mt. Angel					1									1						1								3
			2	7	1	3	4	4	3	1	1	1	2	5	4	8	6	3	4	3	3	3	2	3	4	3	6	6		**Totals**

1 Primary Principle

1 Secondary Principle

Geographic and Climate Diversity

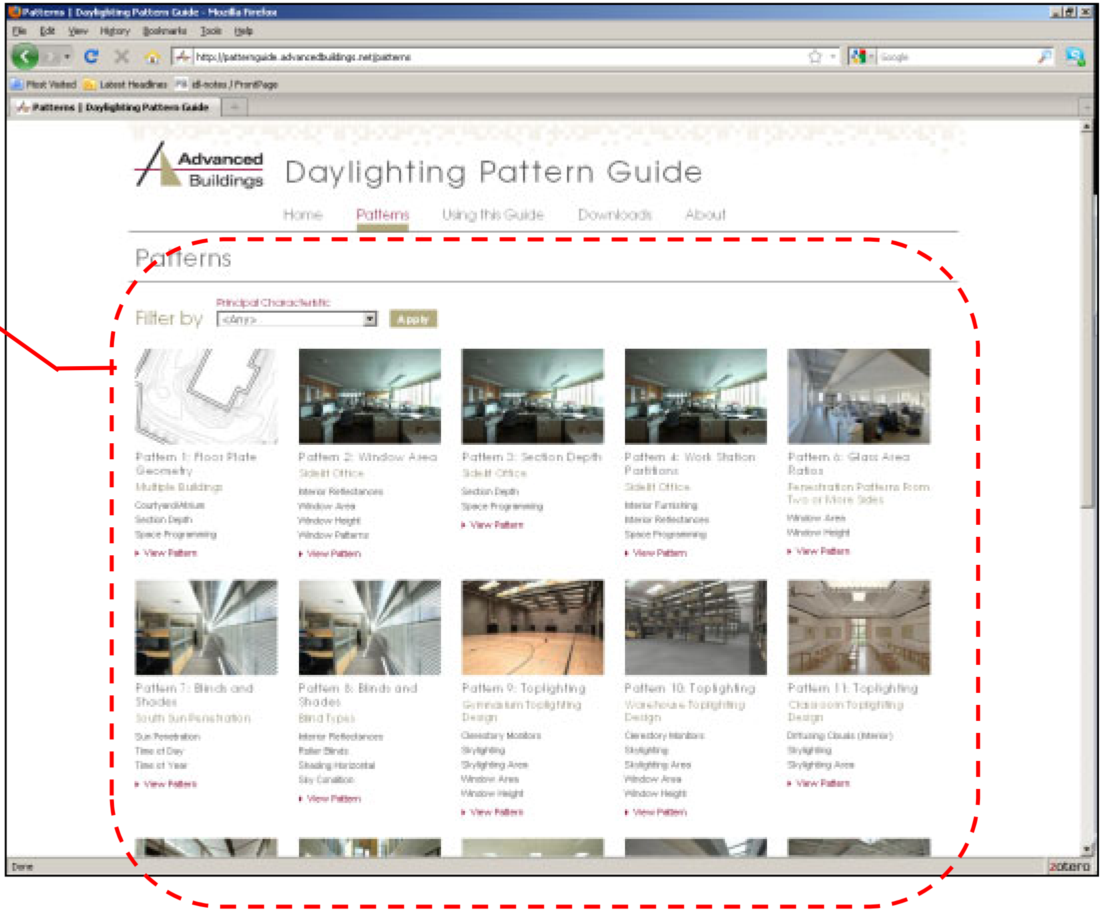


Daylight Pattern Guide

http://patternguide.advancedbuildings.net/home

Patterns and Search Page

Table of Contents and Sort Field
Thumbnail images and pattern and sub-pattern descriptions for all or sorted pattern contents.



Courtesy: Meek & Van Den Wymelenberg

Daylight Pattern Guide

http://patternguide.advancedbuildings.net/home

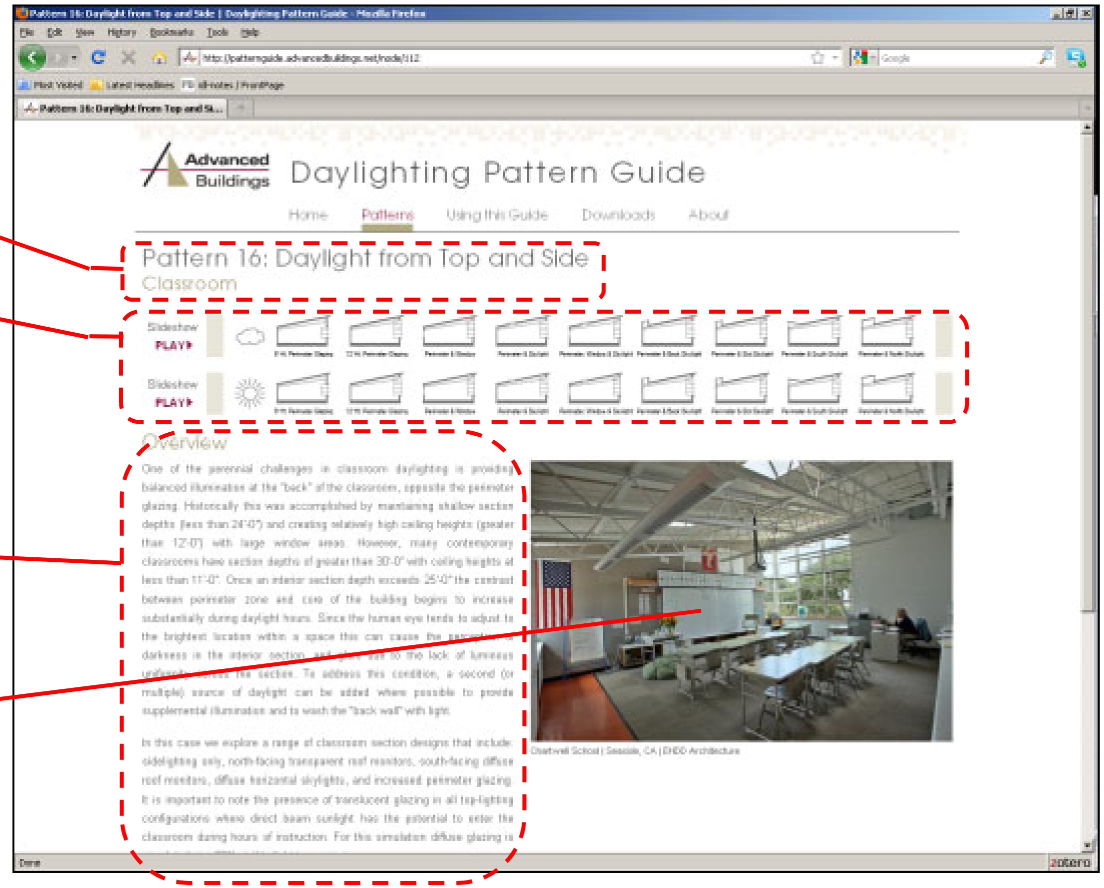
Pattern Overview Page

Pattern Title
Indicates the pattern title and number.

Pattern Overview Filmstrip Overview
Indicates the geometric or temporal variations explored in each pattern and the position of each simulation case within the larger pattern sequence.

Pattern Overview Narrative
Provides overarching design considerations inherent with each daylighting challenge.

HDR Actual Photo
High dynamic range photograph of the physical space

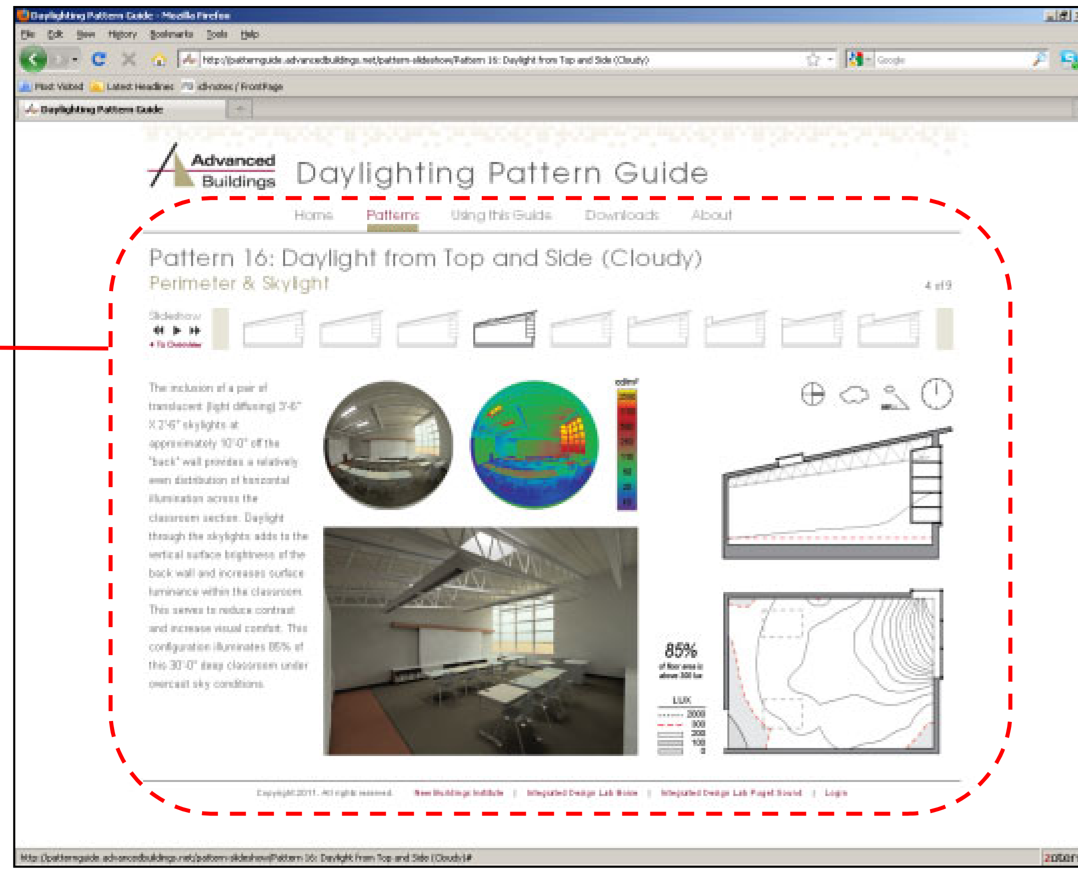


Courtesy: Meek & Van Den Wymelenberg

Daylight Pattern Guide

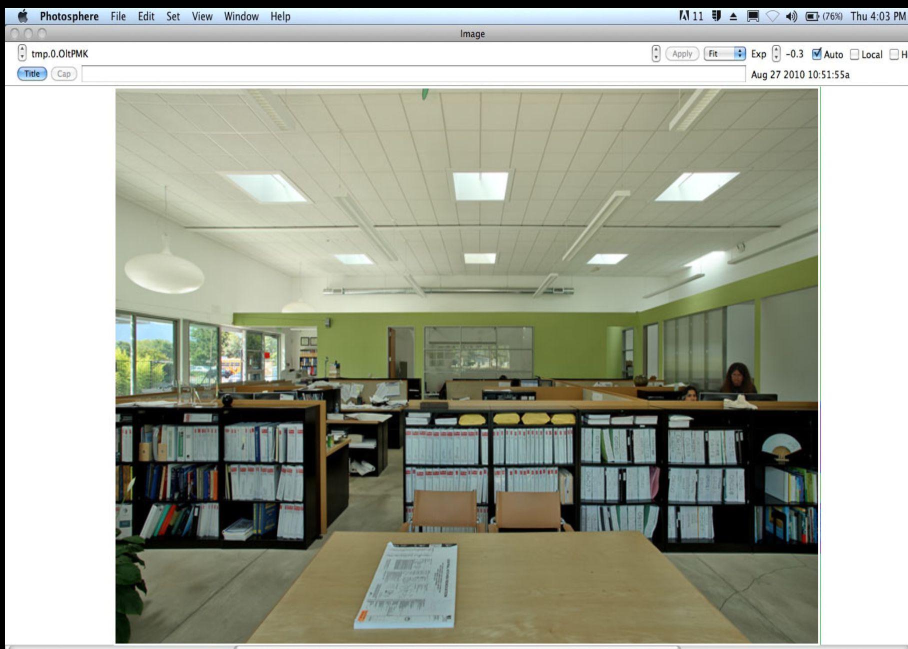
http://patternguide.advancedbuildings.net/home

Typical Pattern Page Layout and Common Elements

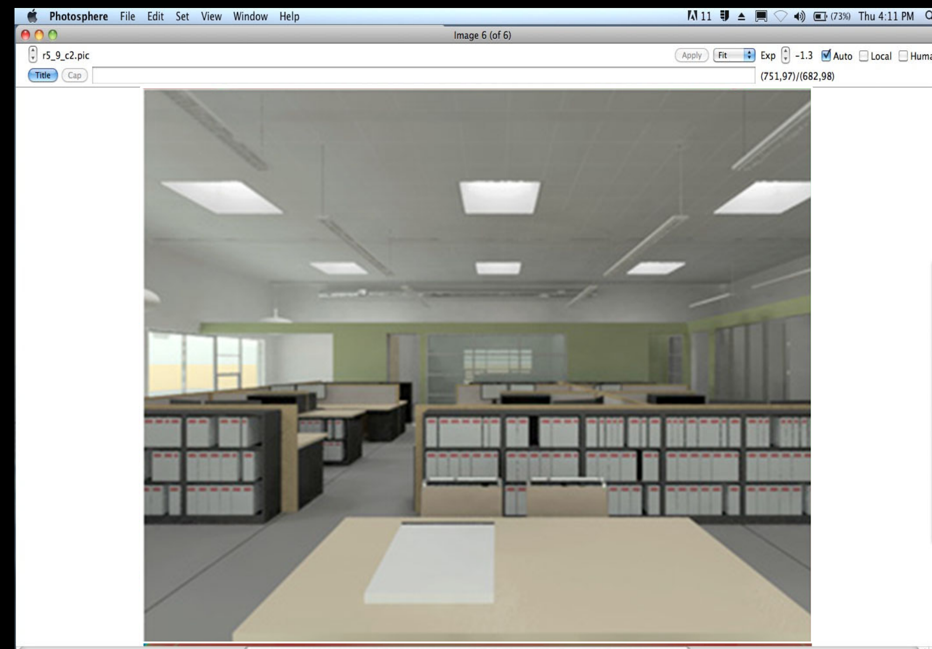


Courtesy: Meek & Van Den Wymelenberg

Simulation/Validation Tool: IDeAs Office Building (EHDD Architects)

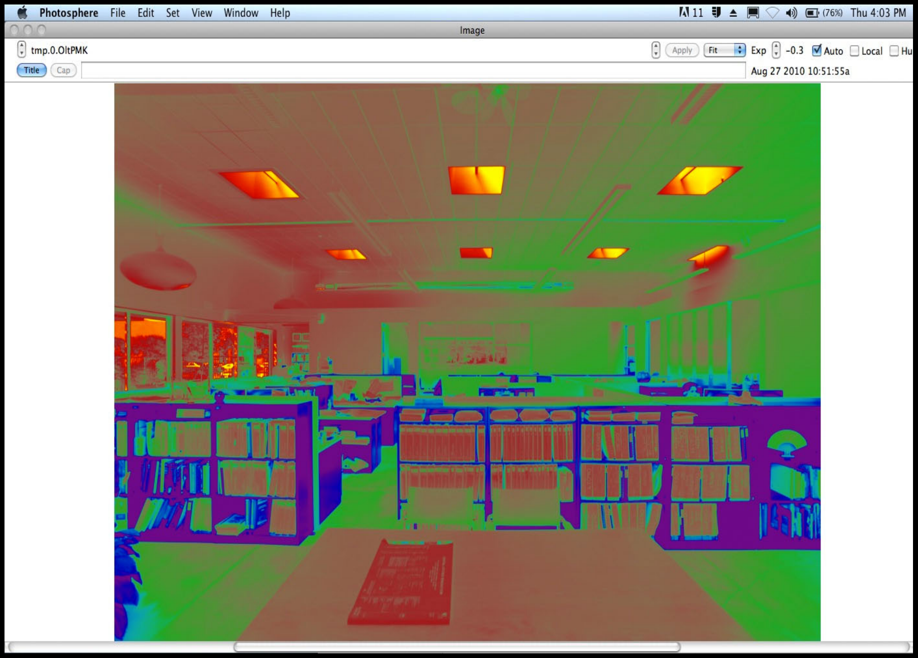


HDR Photo
from Site Visit

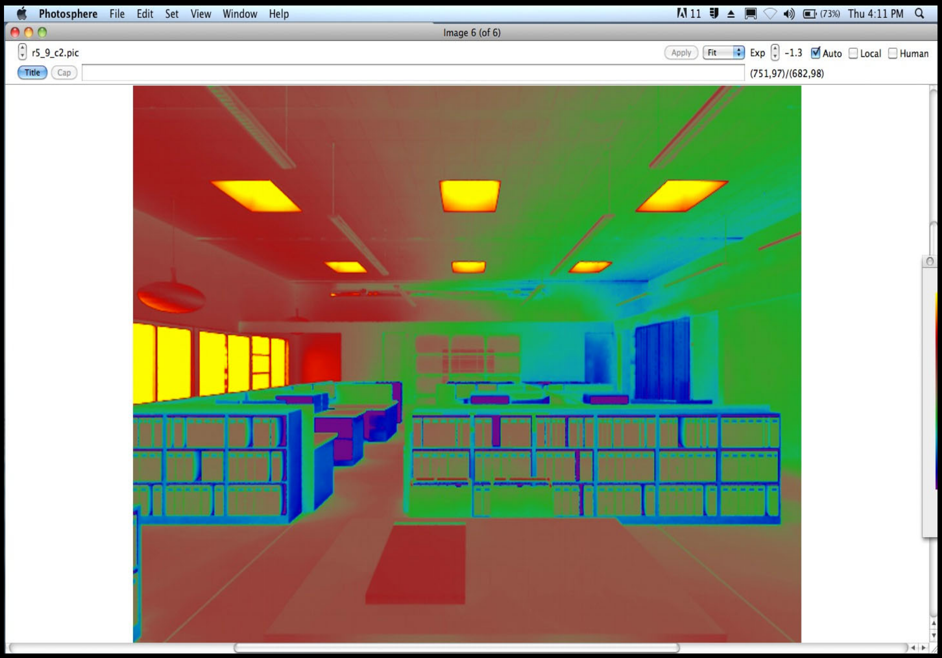


Visualization from
Radiance Model

Simulation/Validation Tool: IDeAs Office Building (EHDD Architects)



Luminance Data from Site Visit



Luminance Data from Radiance Model

(Images both scaled 10-2500 cd/m2)

Courtesy Meek

Pattern 17: Daylight from Top and Side: Classroom

Section Depth, Sidelighting and Toplighting

Chartwell School: Seaside, CA
Architect: EHDD Architecture

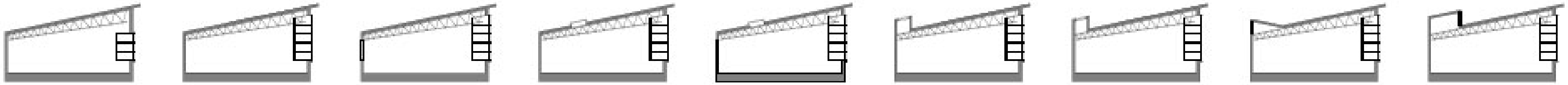
Overview

One of the perennial challenges in classroom daylighting is providing balanced illumination at the "back" of the classroom, opposite the perimeter glazing. Historically this was accomplished by maintaining shallow section depths (less than 24'-0") and creating relatively high ceiling heights (greater than 12'-0") with large window areas. However, many contemporary classrooms have section depths of greater than 30'-0" with ceiling heights at less than 11'-0". Once an interior section depth exceeds 25'-0" the contrast between perimeter zone and core of the building begins to increase substantially during daylight hours. Since the human eye tends to adjust to the brightest location within a space this can cause the perception of darkness in the interior section, and glare due to the lack of luminous uniformity across the section. To address this condition, a second (or multiple) source of daylight can be added where possible to provide supplemental illumination and to wash the "back wall" with light.

In this case we explore a range of classroom section designs that include: sidelighting only, north-facing transparent roof monitors, south-facing diffuse roof monitors, diffuse horizontal skylights, and increased perimeter glazing. It is important to note the presence of translucent glazing in all top-lighting configurations where direct beam sunlight has the potential enter the classroom during hours of instruction. For this simulation diffuse glazing is simulated at a 50% visible light transmission.

There are three primary goals for the effective daylighting of classrooms. The first is to control direct sunlight during all occupied hours. The second is to provide balanced luminance on interior surfaces, especially between the perimeter and key interior surfaces within the classroom. The third is to provide sufficient ambient daylight illumination for visual tasks. Since classrooms are predominately used during daylight hours, they provide an excellent opportunity for lighting power savings from daylight responsive controls.

The case study example is Chartwell School, designed by the EHDD Architecture. The site receives a range of sky cover including coastal fog and heavy cloud cover with periods of clear skies. For this reason we show each design case under both overcast and clear skies. The ambient illumination criterion is shown at 300 lux.

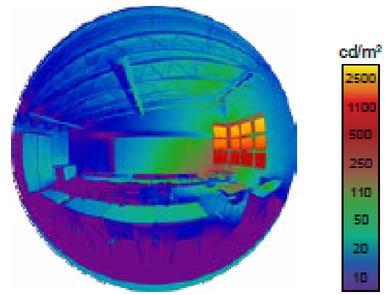


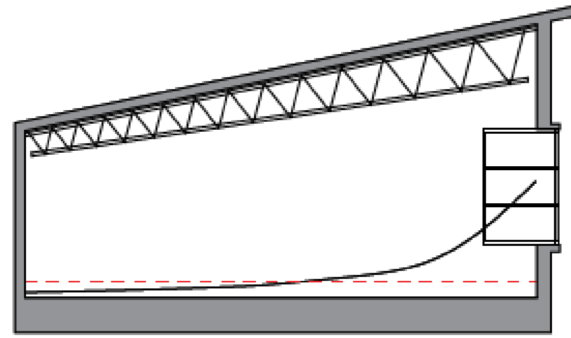
http://patternguide.advancedbuildings.net/

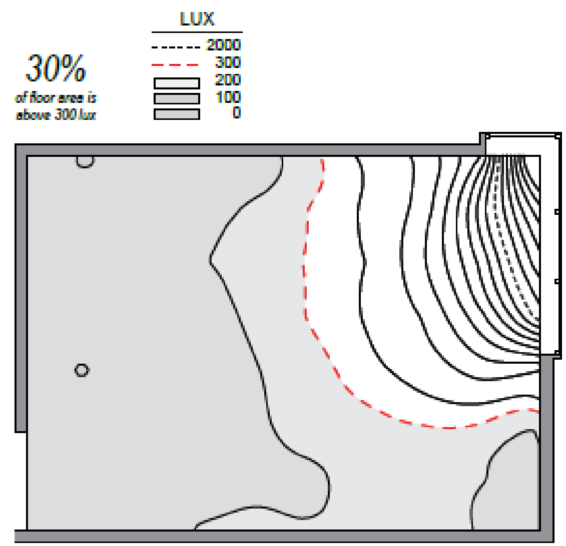
17.1(o): Daylight from Top and Side: Classroom

Perimeter with no clerestory

Vertical windows on one side are insufficient to effectively illuminate this 30'-0" deep classroom under overcast sky conditions. North-facing perimeter glazing with an 8'-0" head height provides effective daylight illuminance at only about one-third of the classroom area. The contrast from perimeter glazing and the interior surfaces of the classroom is very high, increasing the likelihood of glare. Commonly this results in the deployment of blinds and a substantial reduction in daylight performance.



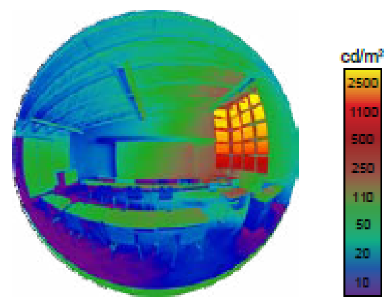


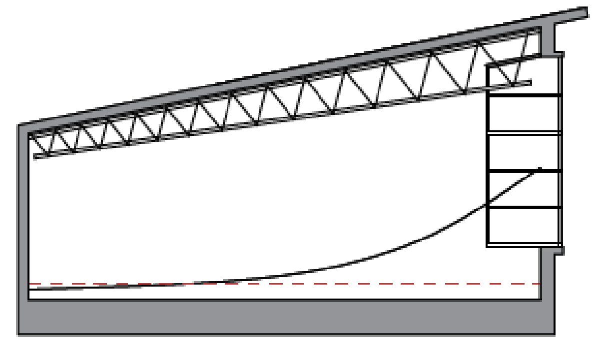


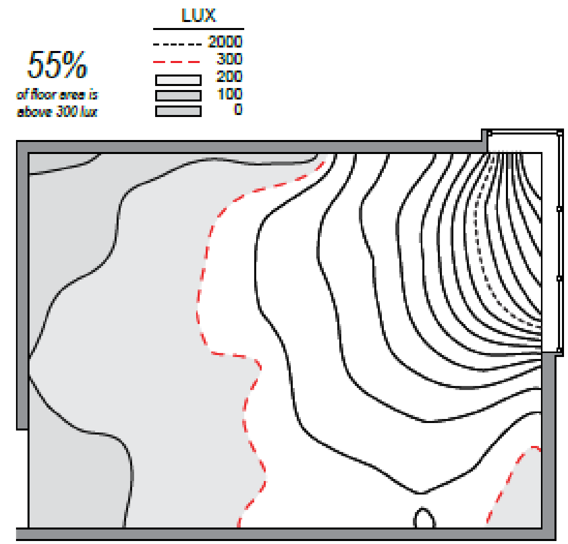
17.2(o): Daylight from Top and Side: Classroom

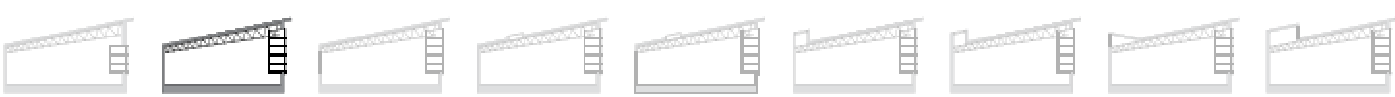
Perimeter Glazing

Vertical windows on one side are insufficient to effectively illuminate this 30'-0" deep classroom. North-facing perimeter glazing with an 12'-0" head height provides effective daylight illuminance at about two-thirds of the classroom area under overcast sky conditions. The contrast from perimeter glazing and the interior surfaces of the classroom is very high, increasing the likelihood of glare. The increase in vertical glazing does contribute to increased luminance at the "back" of the classroom.





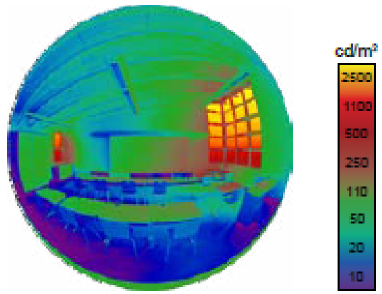


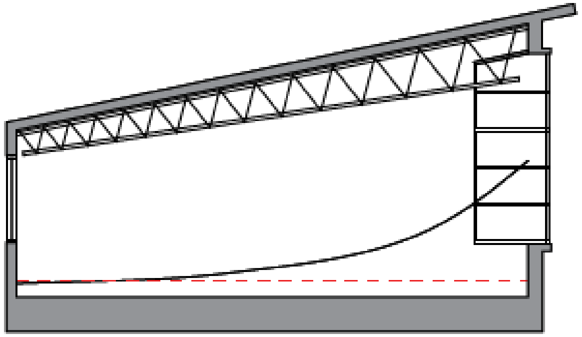


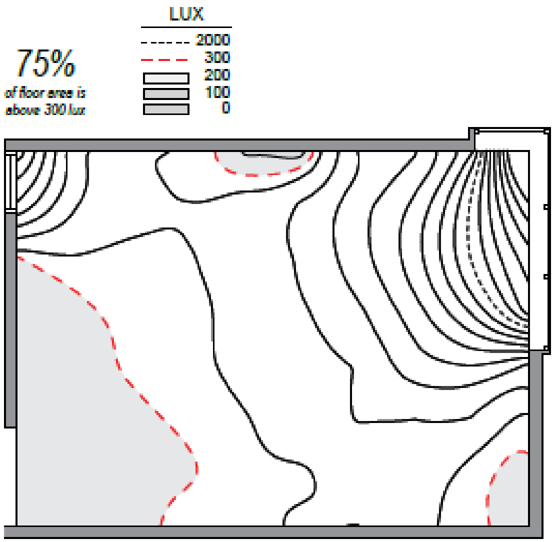
17.3(o): Daylight from Top and Side: Classroom

Perimeter + window

The inclusion of a small vertical window at the "back" wall provides balancing illumination and washes the teaching wall with daylight. The combination of these vertical windows is sufficient to illuminate approximately three-quarters of this 30'-0" deep classroom under overcast sky conditions. . The contrast from perimeter glazing and the interior surfaces of the classroom is managed across the section of the space. It should be noted that due to circulation requirements, it is uncommon for classrooms to have the potential to be side-lit from opposite vertical walls.



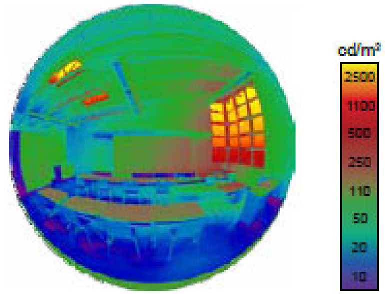


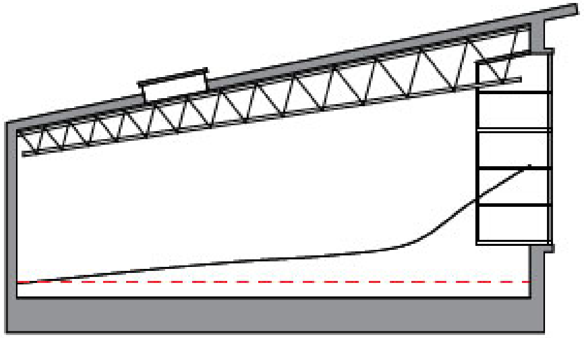


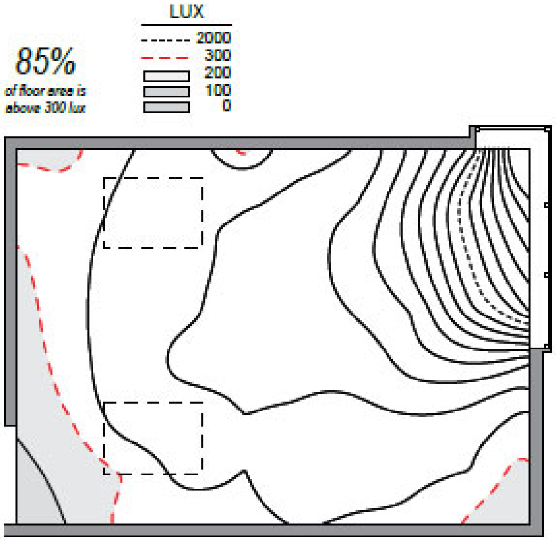
17.4(o): Daylight from Top and Side: Classroom

Perimeter + skylight

The inclusion of a pair of translucent (light diffusing) 3'-6" X 2'-6" skylights at approximately 10'-0" off the "back" wall provides a relatively even distribution of horizontal illumination across the classroom section. Daylight through the skylights adds to the vertical surface brightness of the back wall and increases surface luminance within the classroom. This serves to reduce contrast and increase visual comfort. This configuration illuminates 85% of this 30'-0" deep classroom under overcast sky conditions.



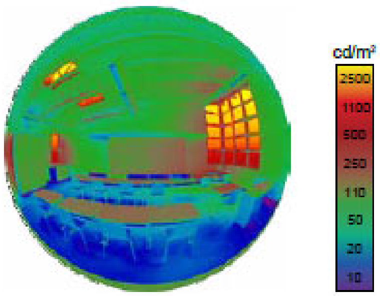


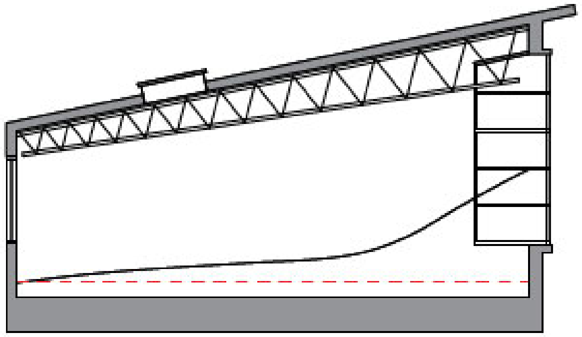


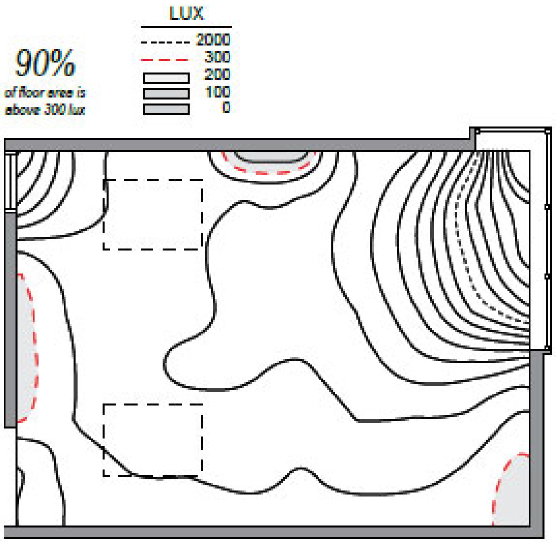
17.5(o): Daylight from Top and Side: Classroom

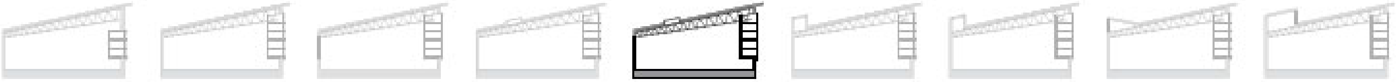
Perimeter + window + skylight (as-built)

The "as-built" configuration combines perimeter glazing a pair of translucent (light diffusing) 3'-6" X 2'-6" skylights, and a small vertical window to wash the teaching wall with daylight. This combination of apertures provides excellent interior surface illuminance and a well-composed distribution of brightness. This serves to reduce contrast and to increase visual comfort, especially views to the exterior. Nearly all of the interior of this 30'-0" deep classroom meets ambient illumination goals with daylight under overcast sky conditions.





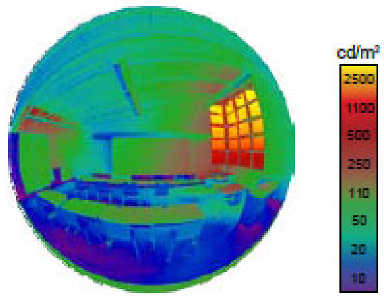


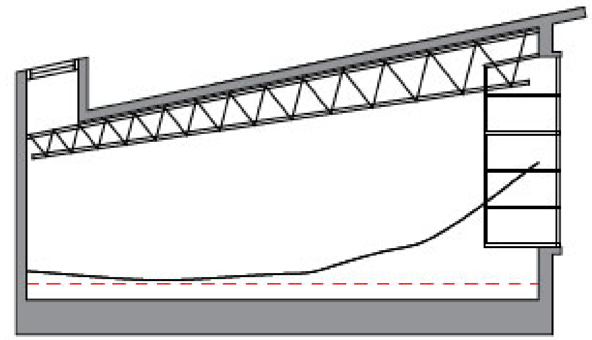


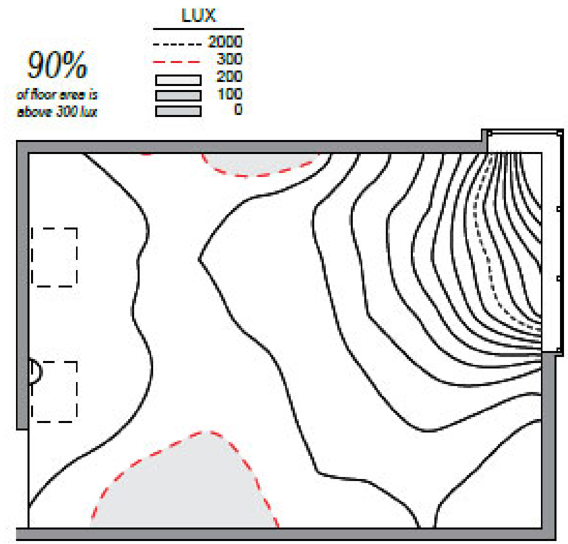
17.6(o): Daylight from Top and Side: Classroom

Perimeter + skylight engaging back wall

This configuration combines perimeter glazing with a pair of translucent (light diffusing) 3'-6" X 2'-6" skylights in a "slot" lightwell engaging the back wall of the classroom. This combination of apertures provides a continuous wash of daylight on the back wall to balance the brightness of the perimeter glazing. Nearly all of the interior of this 30'-0" deep classroom meets ambient illumination goals with daylight under overcast sky conditions.



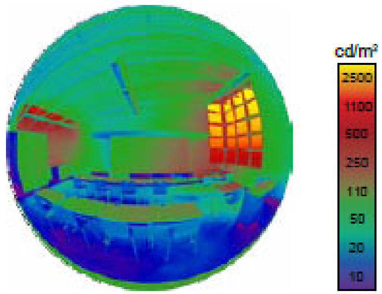


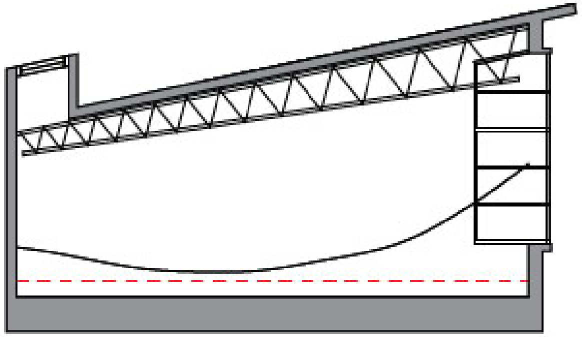


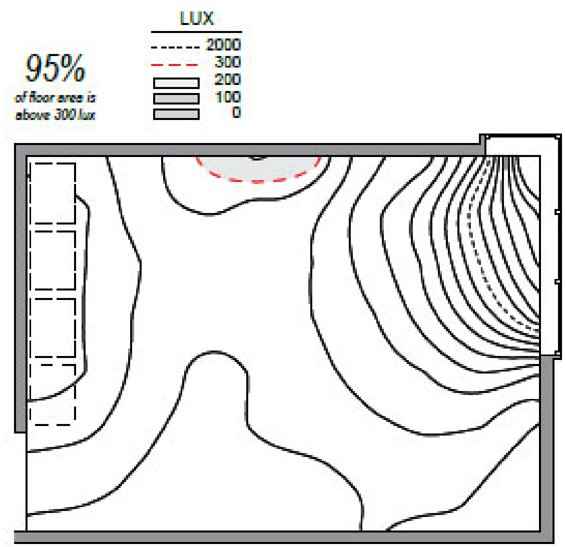
17.7(o): Daylight from Top and Side: Classroom

Perimeter + slot skylight

This configuration combines perimeter glazing with four translucent (light diffusing) 3'-6" X 2'-6" skylights in a "slot" light well engaging the back wall of the classroom. This combination of apertures provides a continuous wash of daylight on the back wall to balance the brightness of the perimeter glazing. Nearly all of the interior of this 30'-0" deep classroom meets ambient illumination goals with daylight under overcast sky conditions. Though substantially increasing surface luminance, the horizontal area exceeding 300 lux is nearly unchanged with the doubling of skylight area.



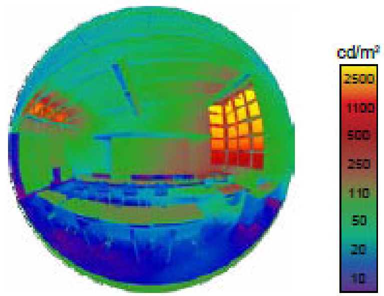


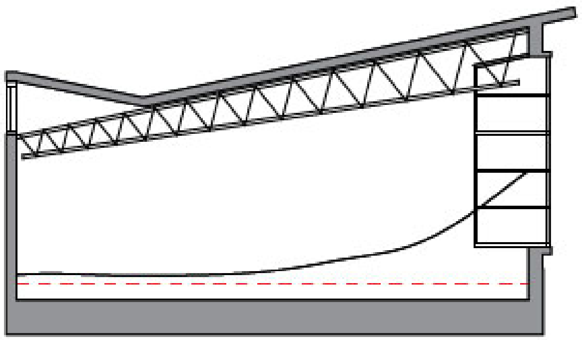


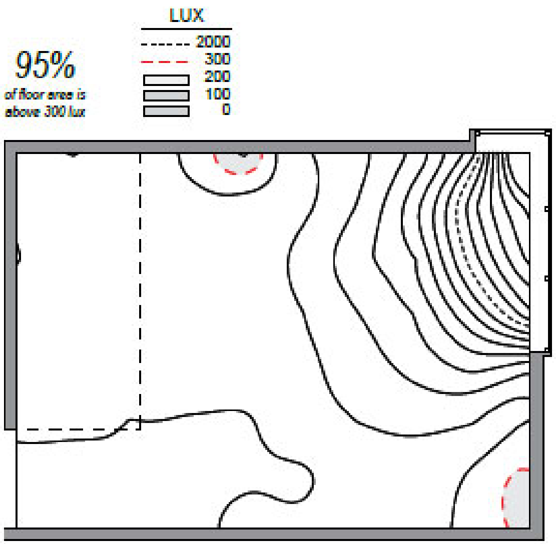
17.8(o): Daylight from Top and Side: Classroom

Perimeter + south clerestory

This configuration combines perimeter glazing with a continuous 2'-0" translucent (light diffusing) south facing clerestory above the back wall of the classroom. Given the directionality of the clerestory, this configuration creates high illumination levels at the center of the classroom, with somewhat less surface brightness on the back wall. Nearly all of the interior of this 30'-0" deep classroom meets ambient illumination goals with daylight under overcast sky conditions.



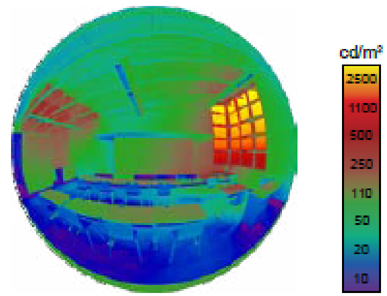


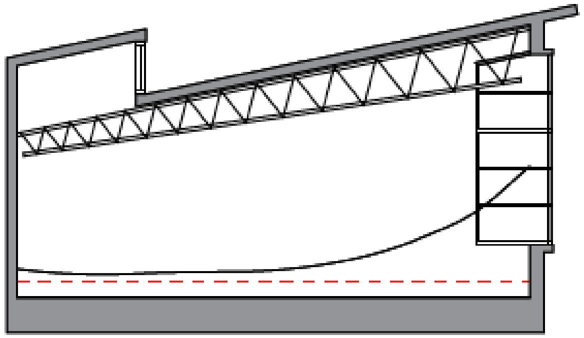


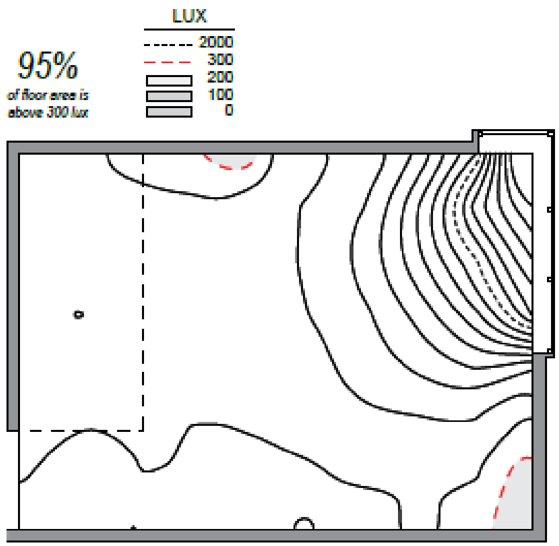
17.9(o): Daylight from Top and Side: Classroom

Perimeter + north-facing clerestory

This configuration combines perimeter glazing with a continuous 2'-0" transparent (clear glass) north facing clerestory opposite the back wall of the classroom. Given the directionality of the clerestory, this configuration creates high surface brightness on the back wall, balancing the brightness of the perimeter glazing. Nearly all of the interior of this 30'-0" deep classroom meets ambient illumination goals with daylight under overcast sky conditions.

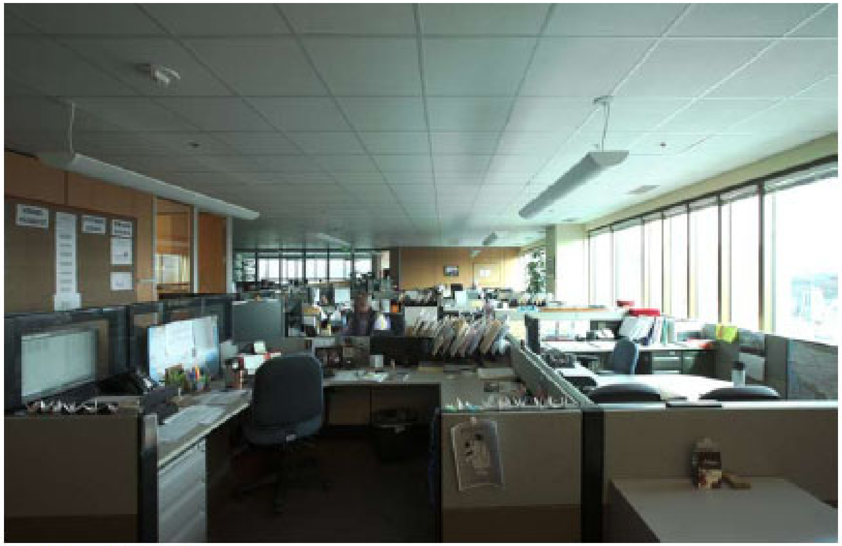






Pattern 5: Interior Furniture Layout

Daylight from One Side



Banner Bank: Boise, ID

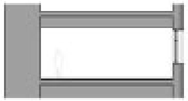
Overview

The selection and design of open office furniture, especially workstation partitions, requires care to ensure the preservation of daylight and views. Even in the most carefully considered daylighting schemes, effective workstation design can be the difference between realizing daylighting goals and unintentionally compromising design intentions. In side lit spaces, office partitions must be kept low (42" or less) and unobtrusive parallel to the direction of the daylight distribution and to ensure the maintenance of views to the exterior. Where higher partitions (48" or greater) are required for privacy or to create a sense of enclosure, they should be oriented perpendicular to the perimeter glazing. 60" (or greater) partitions that are perpendicular to the direction of daylight distribution can enable privacy and allow for ample storage without blocking views and creating dark shadows. Additionally it is critical that the partition finishes be light reflective, especially above 42".

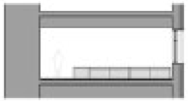
Workstations should be designed so that the primary visual field (the direction that most occupants face while performing visual tasks) is parallel to daylight openings wherever possible. This helps avoid visual discomfort from building users looking into their own shadow, or worse, from the excessive contrast that might occur when a visual task area (commonly a computer screen) is immediately surrounded by the brightness of a view to the exterior.

Often daylighting design decisions are made in early schematic design, prior to the specification of workstation layout and configurations. However, it is crucial to ensure that daylight distribution patterns are not compromised by selecting panel sizes, orientations, and reflectances that substantially hinder daylight performance. An interior office workstation layout that is carefully integrated with the daylighting design intent is critical to realizing the highest quality interior environment and delivering maximum lighting power savings from daylight.

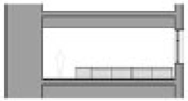
Our case study patterns are based on the Banner Bank Building in Boise, ID. It includes a 40% window to opaque exterior wall ratio with a window head height at 9'-6", a sill height at 3'-0" and a ceiling height at 10'-0". Interior reflectances are roughly 80-50-20 for ceiling, walls, and floors, respectively.



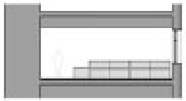
Open Volume



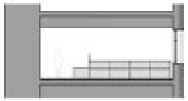
Desks Only



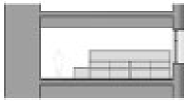
Low Panels



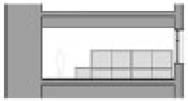
42" Panels



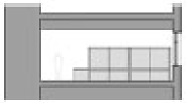
42" Panels with Glass Panel (As Built)



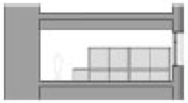
42" Panels with 60" Panels Perpendicular to Glazing



60" Panels



72" Panels

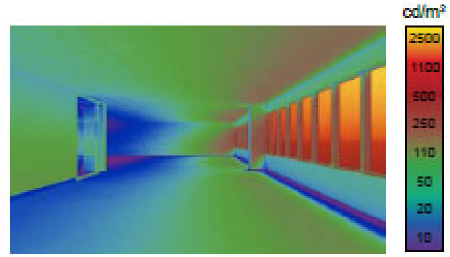


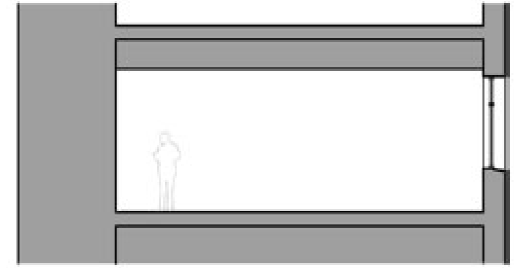
72" Panels with glass partitions

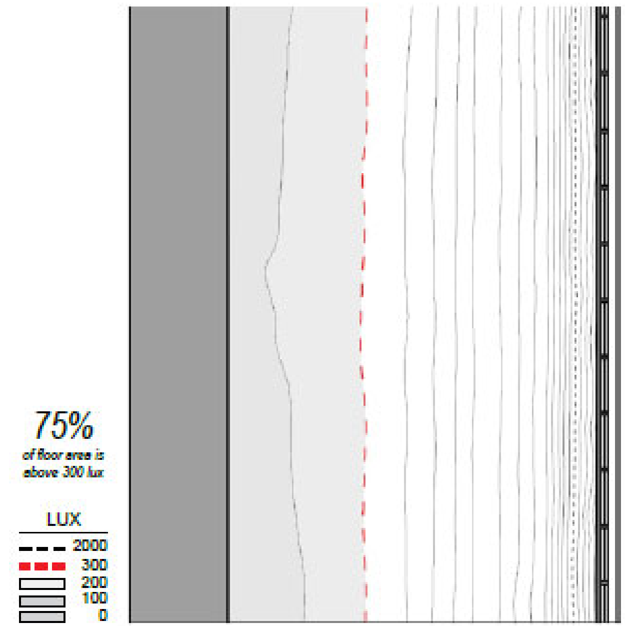
Pattern 5.1: Interior Furniture Layout

Open Volume

A horizontal band of windows at 40 percent of the opaque wall area provides daylight illumination that meets or exceeds commonly accepted minimum daylight illumination criteria at approximately 75 percent of the adjacent 26'-0" deep open office area.





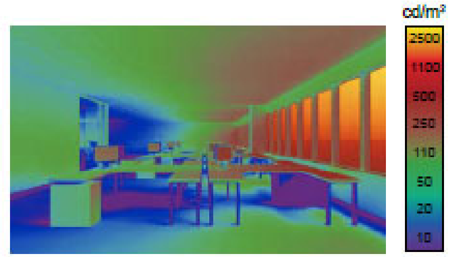


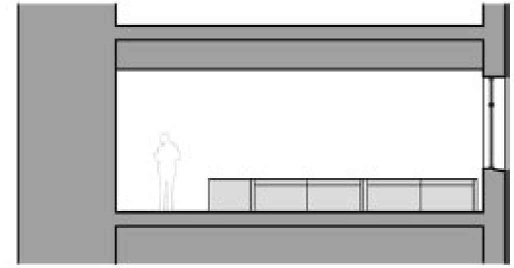
Courtesy: Meek & Van Den Wymelenberg

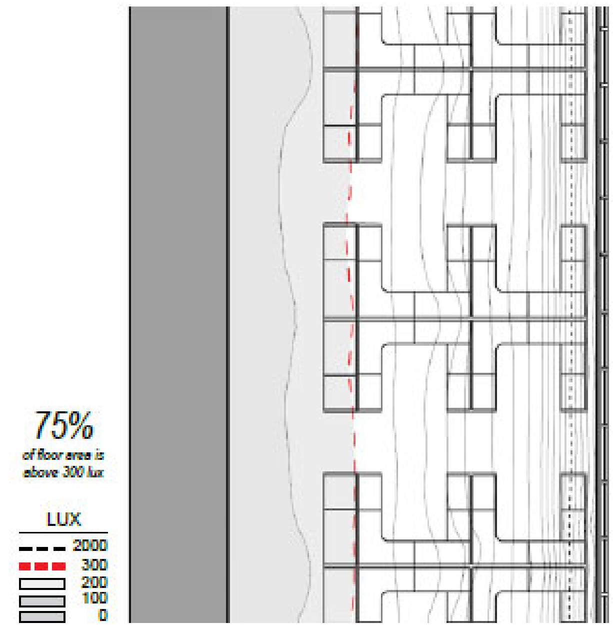
Pattern 5.2: Interior Furniture Layout

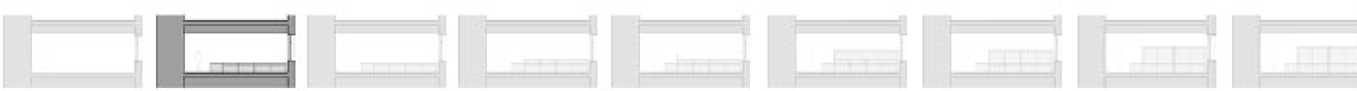
Desks Only

The inclusion of "open" desk workstations has limited impact on the daylight distribution across the horizontal workplane. Daylight levels exceed commonly accepted ambient illumination criteria at all areas except at the circulation aisle (at left).







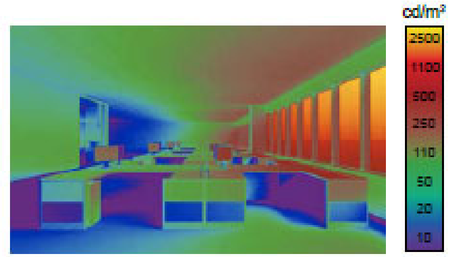


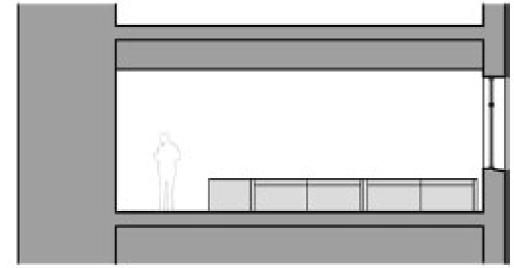
Courtesy: Meek & Van Den Wymelenberg

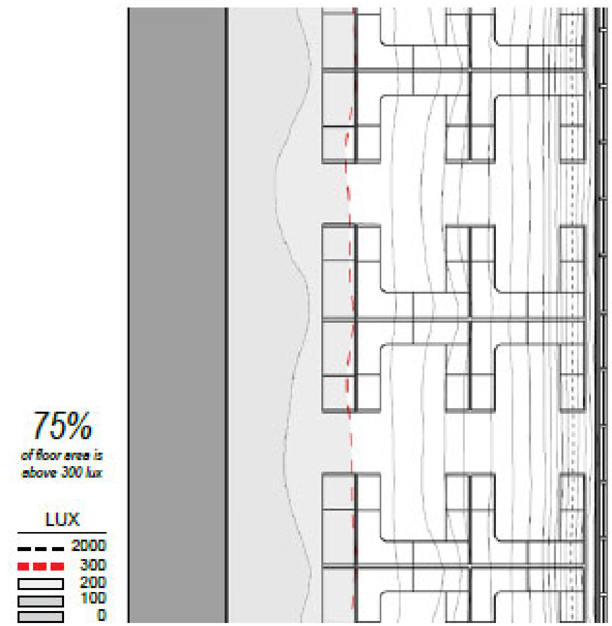
Pattern 5.3: Interior Furniture Layout

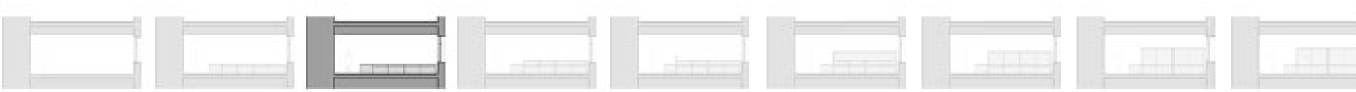
Low Panels

The inclusion of modesty panels below the 30" desk height has virtually no impact on the daylight distribution across the horizontal workplane. Daylight levels exceed commonly accepted ambient illumination criteria at all areas except the circulation aisle (at left).







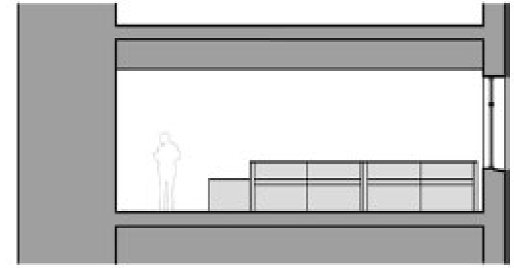


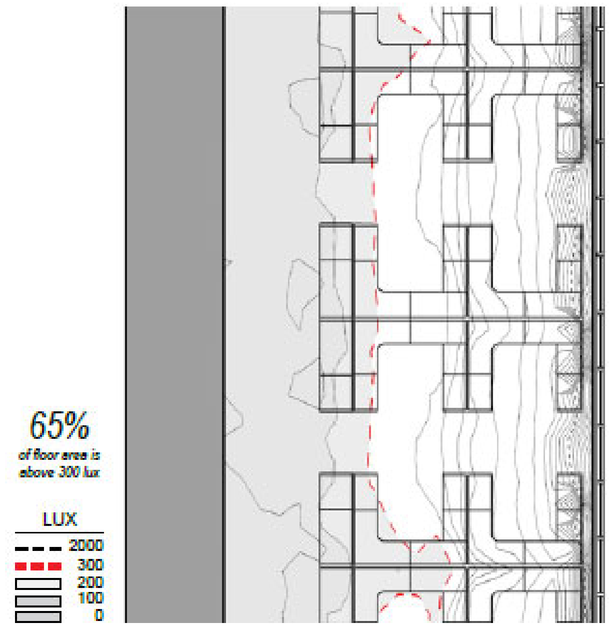
Courtesy: Meek & Van Den Wymelenberg

Pattern 5.4: Interior Furniture Layout

42" Panels

The inclusion of 42" panels begin to create some shadowing at the horizontal workplane. However, ceiling brightness begins to diminish as the reflectance off of the floor and desk surfaces is reduced by the panels. Daylight levels continue to exceed commonly accepted ambient illumination criteria at nearly all workstations.



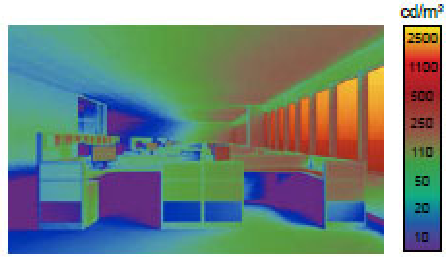


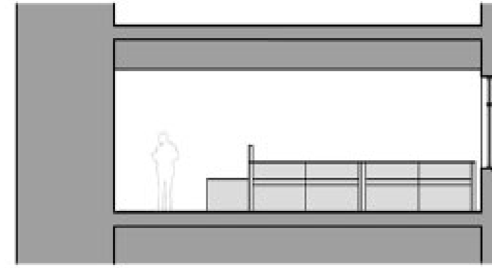
Courtesy: Meek & Van Den Wymelenberg

Pattern 5.5: Interior Furniture Layout

42" Panels with Glass Partition (As-Built)

The addition of a glass partition between the aisle an the workstation area increases acoustic privacy while maintaining brightness at the "back" wall (at left). Horizontal daylight levels continue to exceed commonly accepted ambient illumination criteria at nearly all of the workstation areas.

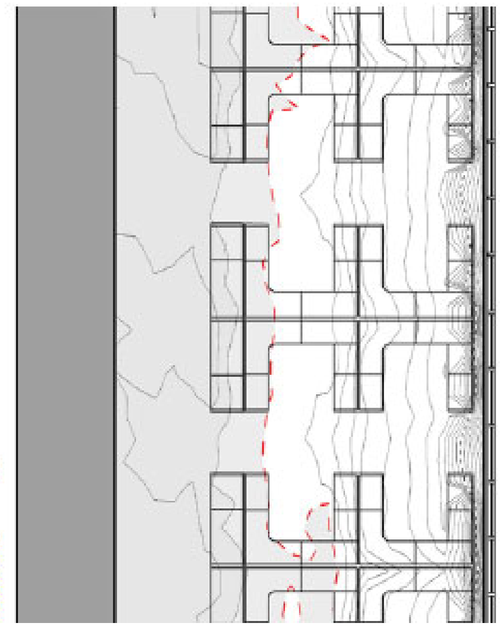


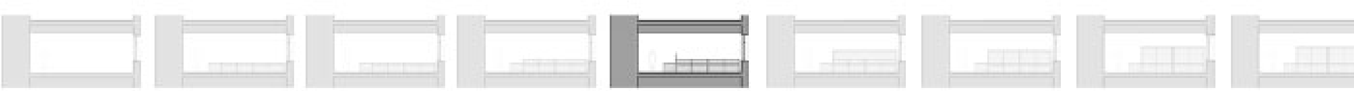


60%

of floor area is above 300 lux

LUX
2000
300
200
100
0



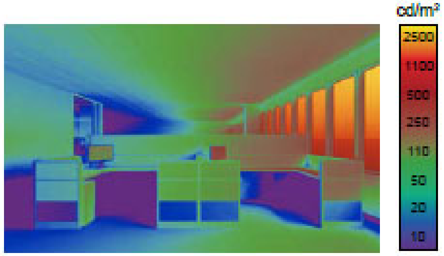


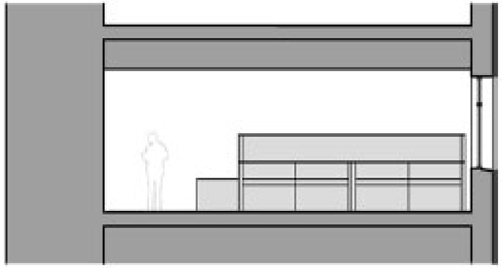
Courtesy: Meek & Van Den Wymelenberg

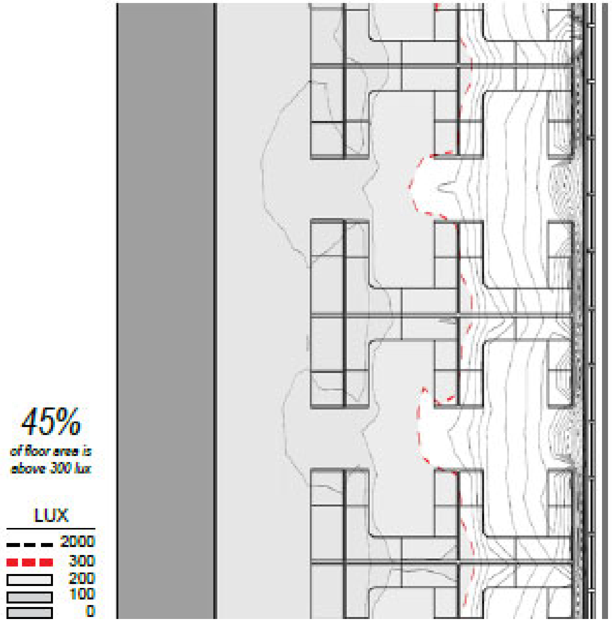
Pattern 5.6: Interior Furniture Layout

42" Panels with 60" Panels Perpendicular to Glazing

The addition of a 60" panel perpendicular to the window wall, increases both visual and acoustic privacy. Though diffuse daylight levels are reduced, views to the exterior remain largely unobstructed. Horizontal daylight levels continue to exceed commonly accepted ambient illumination criteria at 50 percent workstations.





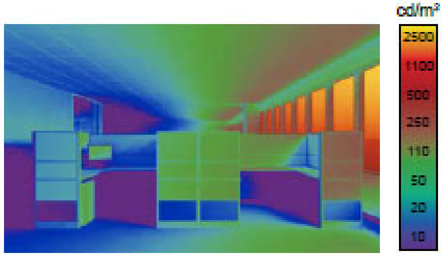


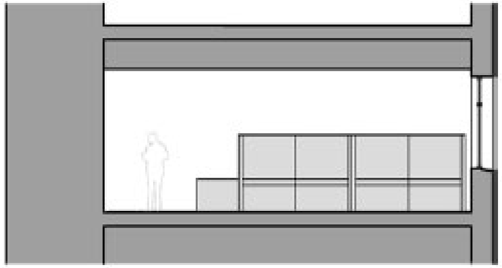
Courtesy: Meek & Van Den Wymelenberg

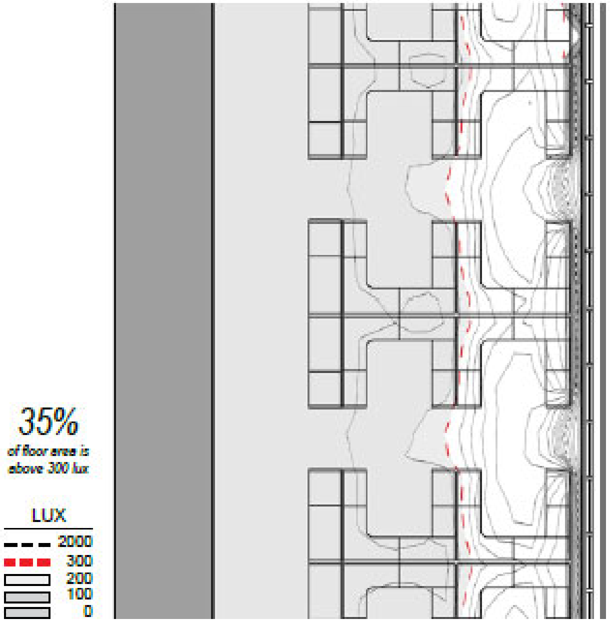
Pattern 5.7: Interior Furniture Layout

60" Panels

The addition of 60" panels surrounding all workstations substantially reduce daylight levels at the back wall and beyond the workstations directly at the perimeter. Views to the exterior are constrained dramatically at all workstations. Horizontal daylight levels exceed commonly accepted ambient illumination criteria only directly adjacent to the perimeter glazing.





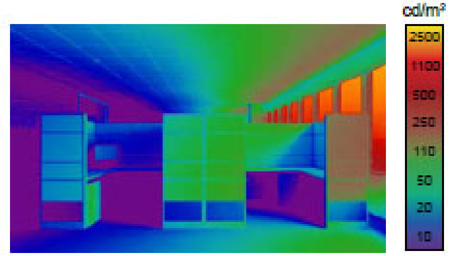


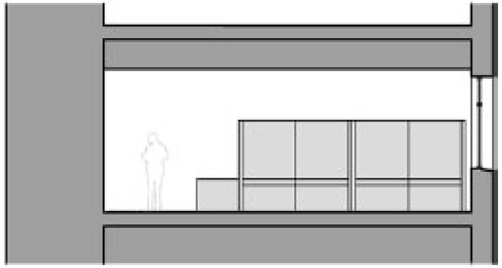
Courtesy: Meek & Van Den Wymelenberg

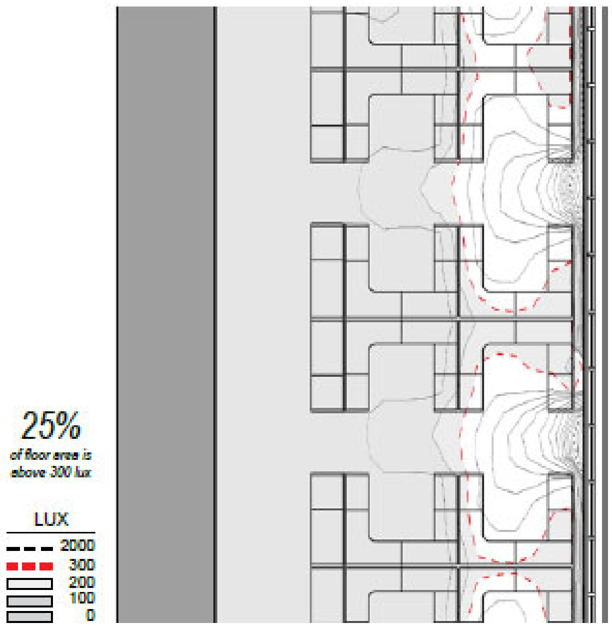
Pattern 5.8: Interior Furniture Layout

72" Panels

72" panels surrounding all workstations reduce daylight levels even further, especially at the back wall. Even the perimeter workstations are marginally daylit. Views to the exterior are constrained dramatically at all workstations. Horizontal daylight levels exceed commonly accepted ambient illumination criteria only at aisle ways directly adjacent to the perimeter glazing.





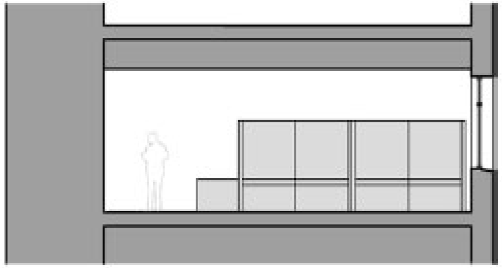


Courtesy: Meek & Van Den Wymelenberg

Pattern 5.9: Interior Furniture Layout

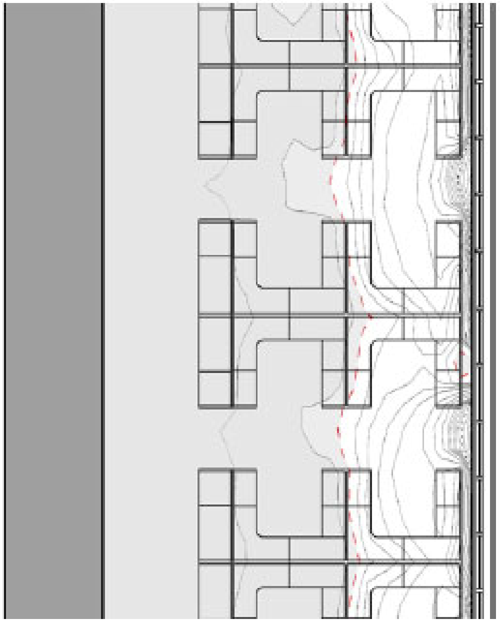
72" Panels with Glass Partitions

Changing the materiality of the workstaion panels parallel to the glazing to be transparent allows daylight distribution and views despite the 72" panel height. However, horizontal daylight levels exceed commonly accepted ambient illumination criteria only directly adjacent to the perimeter glazing.



30%
of floor area is above 300 lux

LUX
2000
300
200
100
0

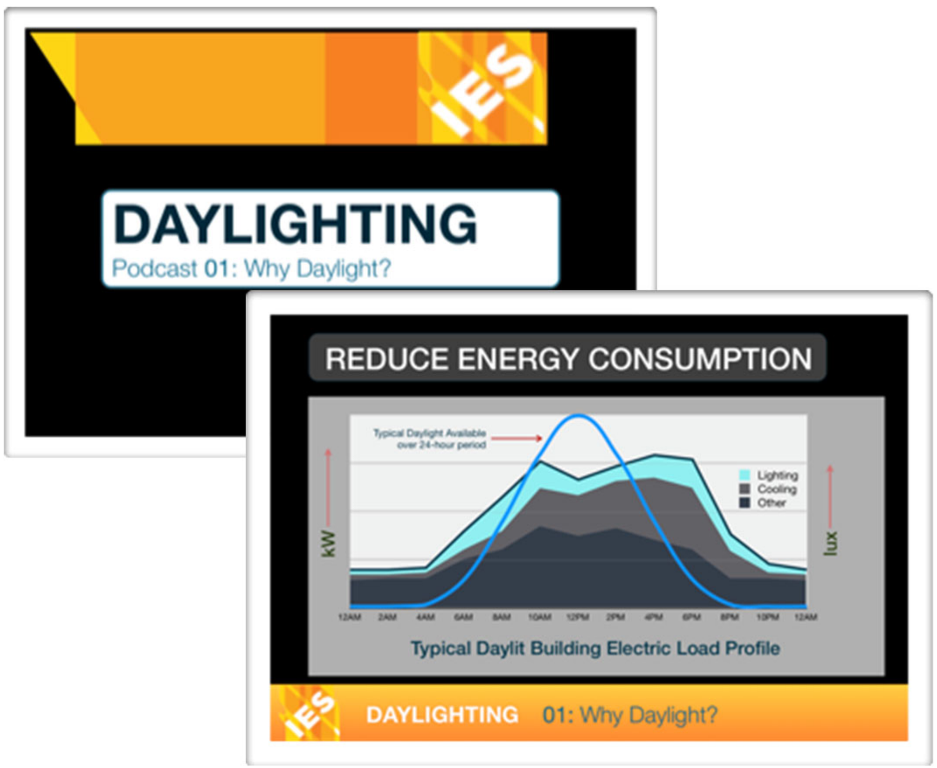


Courtesy: Meek & Van Den Wymelenberg

DAYLIGHTING
RESOURCES

IES WEBCASTS

IES
DAYLIGHTING PODCASTS
5-Part Series



Sample slides

IES Daylighting 1 - No Fee

IES recorded Webcast.
1. Listen to the recording.
2. Fill out the evaluation survey.
3. Download the IES CEU Certificate of Attendance.

IES Daylighting 2 - No Fee

IES recorded Webcast.
1. Listen to the recording.
2. Fill out the evaluation survey.
3. Download the IES CEU Certificate of Attendance.

IES Daylighting 3 - No Fee

Audio + computer recording.
1. Listen to the entire recording.
2. Fill out the required survey.
3. Download the IES CEU certificate of attendance.

IES Daylighting 4 - No Fee

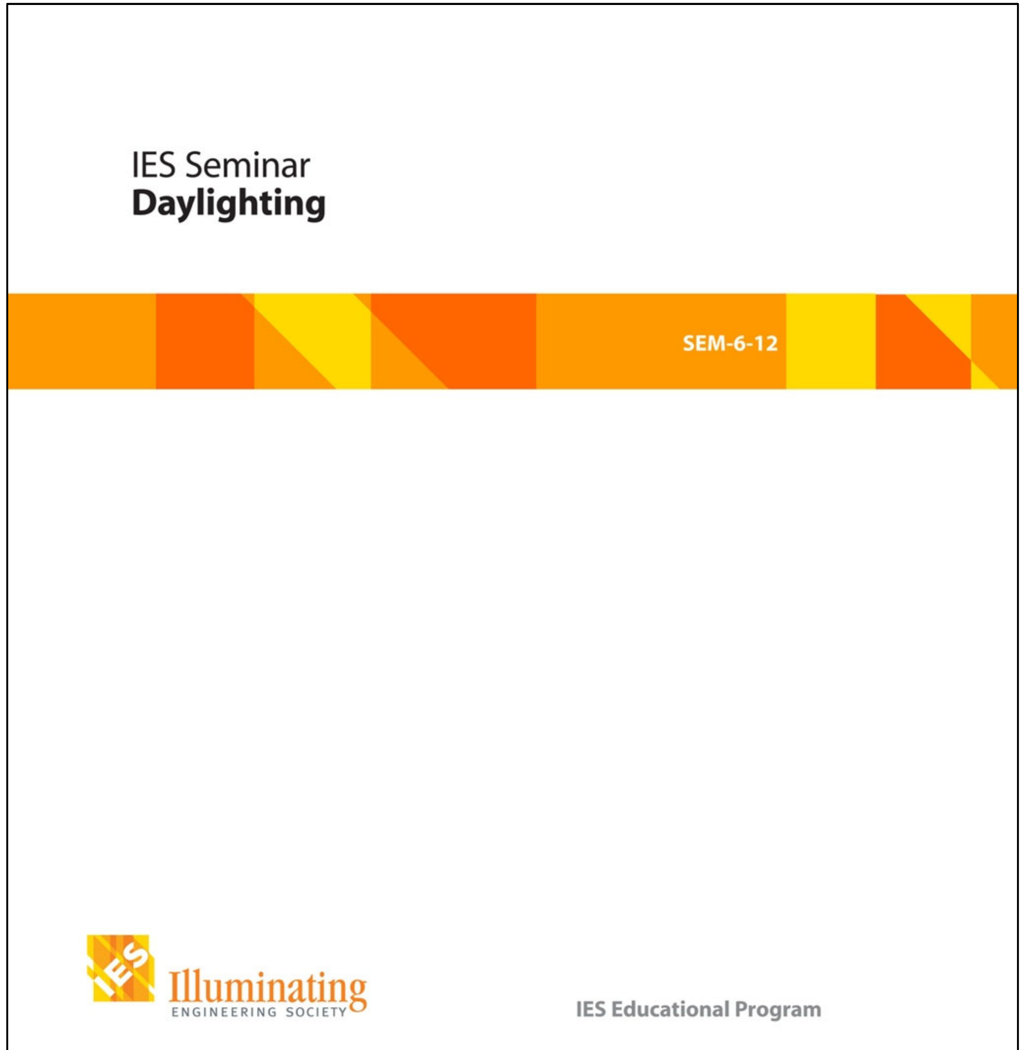
Audio + computer recording.
1. Listen to the entire recording.
2. Fill out the required survey.
3. Download the IES CEU certificate of attendance.

IES Daylighting 5 - No Fee

Audio + computer recording.
1. Listen to the entire recording.
2. Fill out the required survey.
3. Download the IES CEU certificate of attendance.

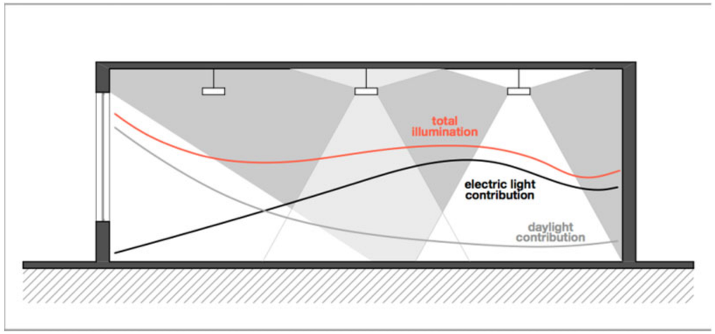
PUBLICATIONS

IES SEM-6-12
Daylighting

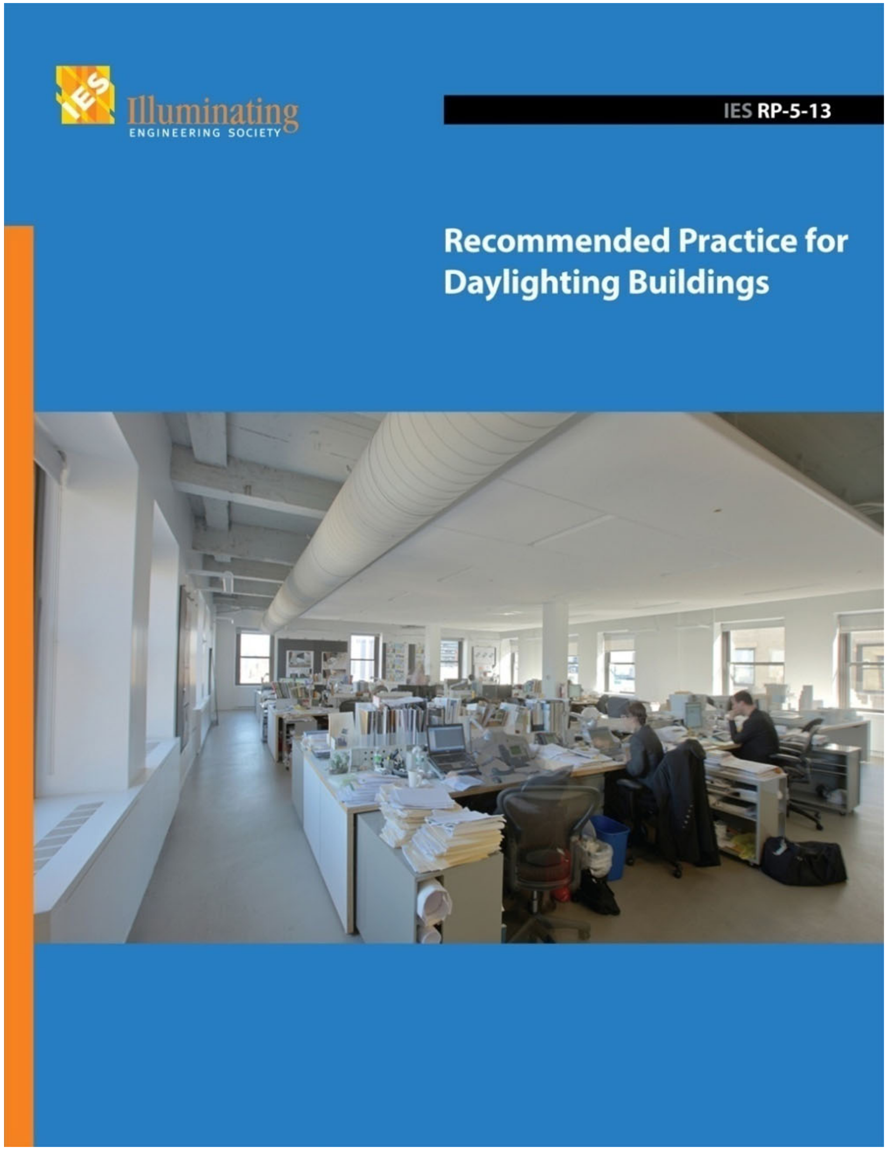


PUBLICATIONS

IES RP-5-13 **Recommended Practice for Daylighting Buildings**

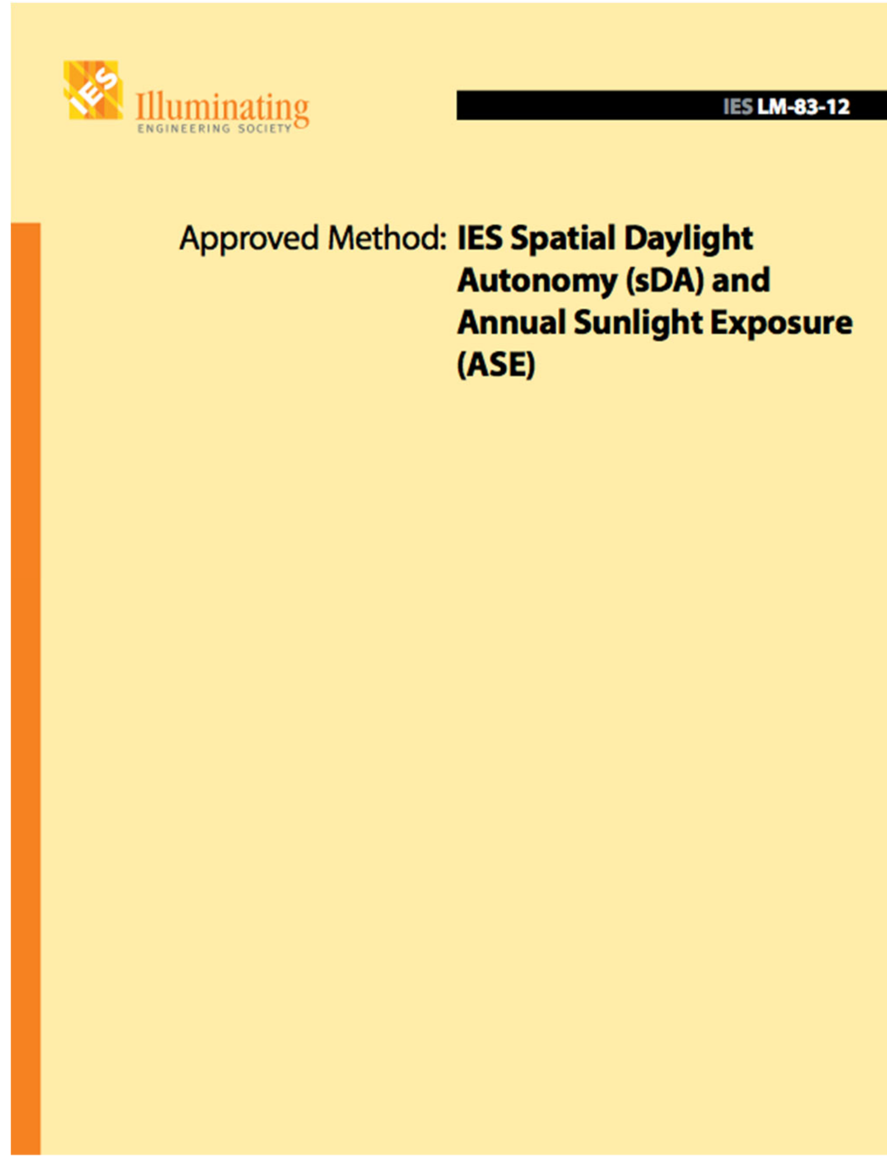


Sample figure



PUBLICATIONS

IES LM-83-12
Approved Method:
IES Spatial Daylight Autonomy (sDA) and Annual Sunlight Exposure (ASE)

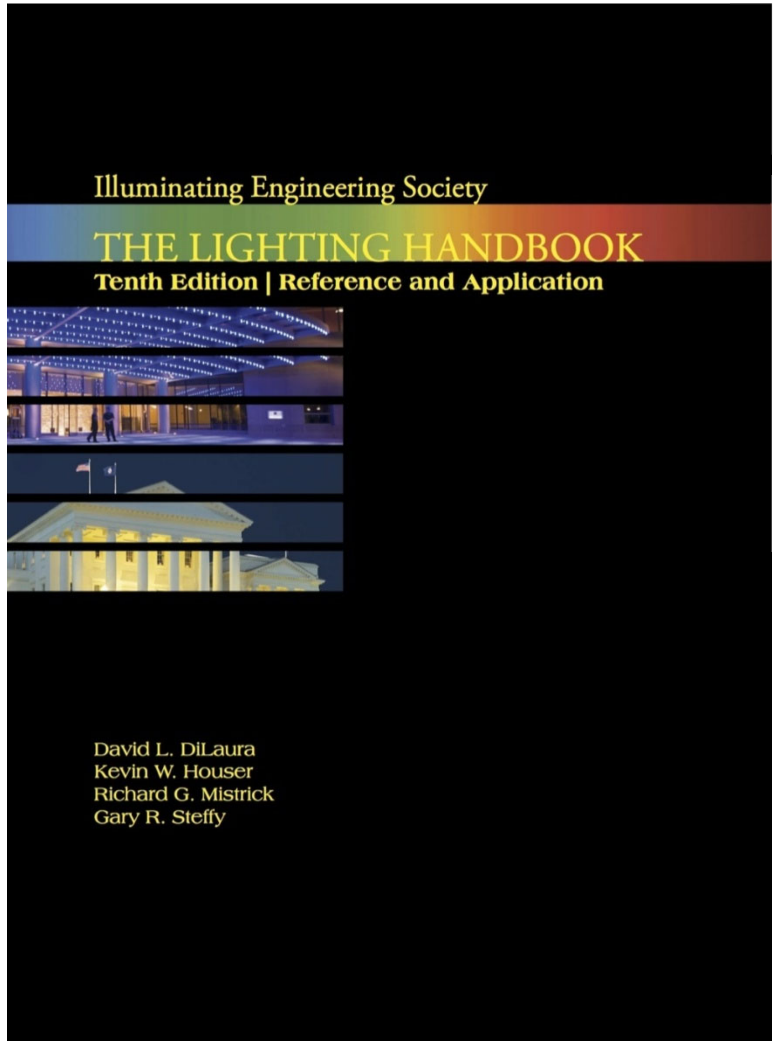

Illuminating
ENGINEERING SOCIETY

IES **LM-83-12**

Approved Method: **IES Spatial Daylight Autonomy (sDA) and Annual Sunlight Exposure (ASE)**

PUBLICATIONS

IES HB-10-11
THE LIGHTING HANDBOOK
Tenth Edition, Reference and Application



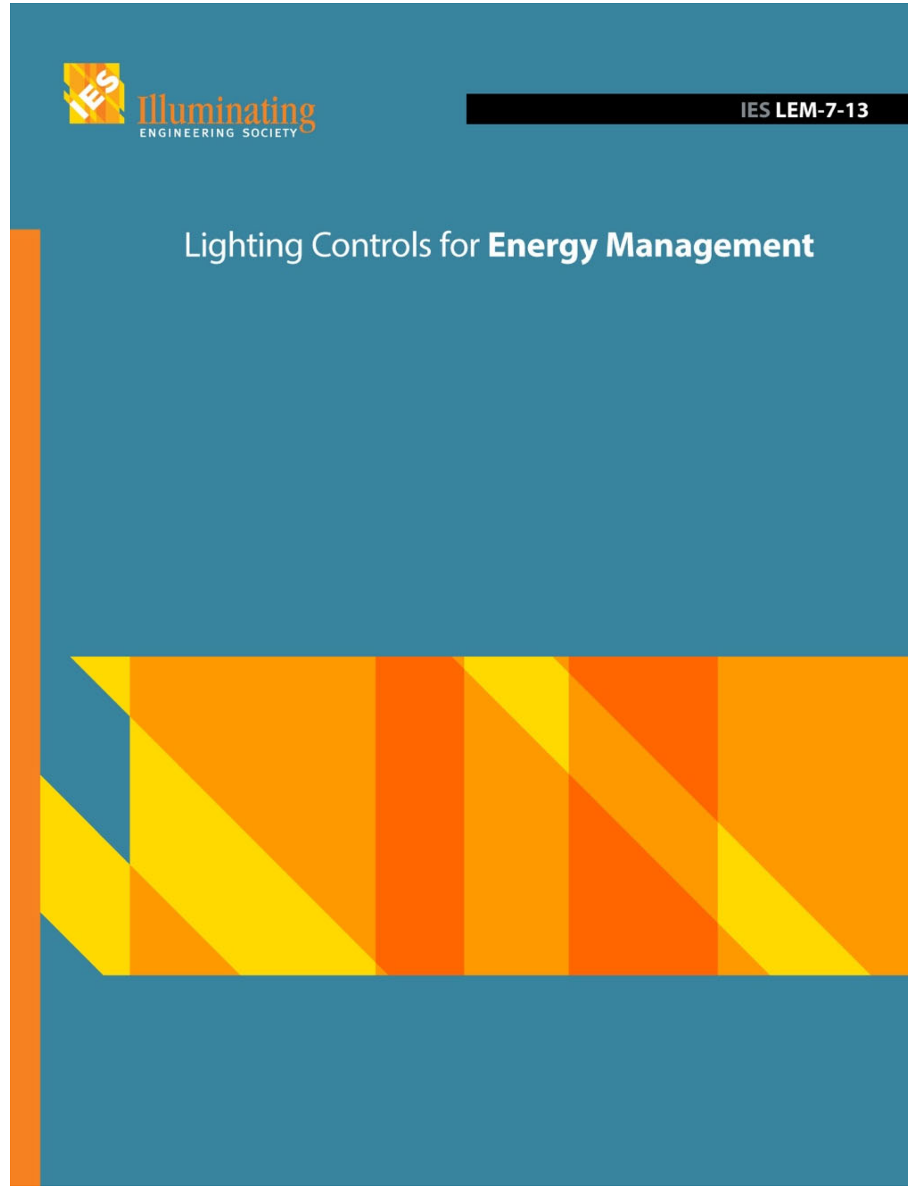
Design

Application

Framework

PUBLICATIONS

IES LEM-7-13
Approved Method:
Lighting Controls for Energy Management



Thank you!   Questions?

Christopher Meek, FAIA , IESNA
Integrated Design Lab

Associate Professor + Director
University of Washington
Department of Architecture
cmeek@uw.edu

And now – a few words from LDL

lighting design lab

Upcoming LDL Online Events

LDL Course	Delivery Date	Time
NLC for Utility Staff	June 2	11:00 - Noon
Light Sources & Luminaires	June 16	10:00 - Noon
Communicating the NLC Value Proposition	June 30	10:00 - Noon
Fundamentals of NLC (Side A – Theory & Technology)	July 14	10:00 - Noon
Fundamentals of NLC (Side B – Practical Application)	July 15	10:00 - Noon

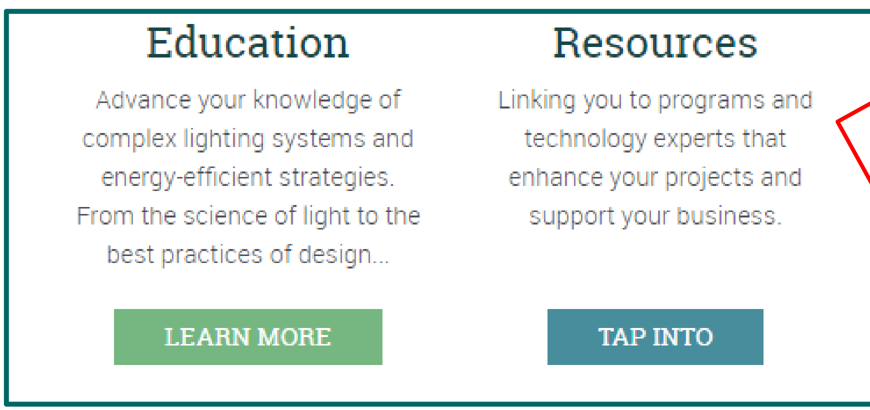
Today's slide deck and previous online courses can be found on our website

lighting design lab

Click – Call – Connect

- Today's Presenter
  - Phone
  - Email

Visit us online



OR

Email Us
lightingdesignlab@seattle.gov

Todays slide deck will be posted here!

lighting design lab

Powered by

With support from 2020 member utilities

Please take the online survey once you exit the webinar

We'll *SEE* you on the next call... ☺

lighting design lab