Before we begin…

During the Class
- 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 Class
- 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.
It takes a village…

Who We Work With

End-Use Customers

Trade Allies

Design Allies

TECHNOLOGY EVALUATION

INFORMATION AGGREGATION

TOOLS & RESOURCES

EDUCATION & TRAINING

Selected Awards

- Amgen Helix Campus
- Amgen Helix Pedestrian Bridge
- Canyon Ranch Spa Club
- Harvard University 60 Oxford
- King Street Station
- Lighting Design Lab
- Methodist Hospital Research Institute
- Microsoft B16/17
- One Cambridge Center
- Pacific Place Retail Center
- Real Networks Headquarters
- San Francisco PUC Headquarters
- Tommy Bahama Headquarters
- Reebok World Headquarters
- Reno Sparks Convention Center
- San Francisco PUC Headquarters
- Tommy Bahama Headquarters
- King Abdullah University of Science and Technology
- San Francisco PUC Headquarters

Selected Projects

- King Abdullah University of Science and Technology
- Methodist Headquarters
- Pearl/River Tower
- Canyon Ranch Spa Club
- Amgen Helix Campus
- Reebok World Headquarters
- Nesto Sparks Convention Center
- Pacific Place Retail Center
- Ala Moana Retail Center
- REI Denver Flagship Store
- Boeing Commercial Airplanes Offices
- Real Networks Headquarters
- Tommy Bahama Headquarters
- Microsoft B16/17
- San Francisco PUC Headquarters

More than 30 years in the lighting industry as an architectural lighting designer, instructor, daylighting and sustainability specialist, lighting control systems consultant, and theatrical designer.

- Has taught and consulted on sustainability issues, lighting, and daylighting for the Lighting Design Lab and University of Washington Architecture Department.

Shaun Darragh

Shaun.Darragh@seattle.gov

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Learning Objectives

- Understand the key concepts in lighting design strategy and development
- Understand the basics of developing visual lighting hierarchies
- Understand how and why to select target light levels and related criteria
- Understand the most common types of project delivery and milestones

Pop Quiz

How would you best describe your role?

Why are we all here?

As much as 80% of our environmental perception is visual.
Light is intensely personal

How Does It All Work Together?

Let's look at four simple elements:

- Generators
- Modifiers
- Encoders
- Interpreters

Generators
Integrated Design

Every building system impacts every other building system.

Sometimes it seems we’re successively approximating our way to success.

Be prepared to do unfamiliar tasks.

Naturally, all of these things will need to happen in an already compressed schedule....
Integrate Early

The integrated design team needs to be assembled and engaged in the process from the beginning.

Project Methodologies

- There are several prevalent project delivery models
- Retrofit projects may follow hybrid approaches, but most will share some level of commonality.
Pop Quiz

Does project delivery method impact the Design process?

I don't know what it is, but I know it when I see it……

Quality in Three Categories

- Bad: the lighting system suffers from a quality defect.
- Indifferent: the lighting system has no quality defects
- Good: the lighting system is technically correct and excites the spirit.
Quality in Three Categories

- Form
- Composition
- Style
- Best Practices
- Codes & Standards

Architecture

- Installation
- Maintenance
- Operation
- Energy
- Materials
- Decarbonization
Human Needs

- Visibility
- Task performance
- Visual comfort
- Social communication
- Mood and atmosphere
- Health, safety, and well being
- Physiology
- Circadian Entrainment

Light For People!

Consider the needs of human vision before the needs of a light meter.

Make sure that your client understands the difference early on.

What is lighting design?

- A concept
- Meeting visual needs
- Defining space
- Selecting luminaires
- Selecting controls
- Making it all work together
- Art
- Science
Who makes choices about lighting?

Architects

Who makes choices about lighting?

Lighting Designers

Who makes choices about lighting?

Engineers
Who makes choices about lighting?

- Lighting Designers
- Electrical Engineers
- Manufacturers Agents
- Facility Operators
- Interior Designers
- Electricians
- Architects
- Owners
- End Users

Communication

- Interior Designer
- Lighting Designer
- Owner's Rep
- Landscape Architect
- Electrical Engineer
- AV Consultant
- Architect

Think Inside the Box

Establish project parameters early

Make sure that everyone understands the project goals and needs and is working towards them together.

Owner
Architect
Interior Designer
Engineers
Other Consultants
Contractors
User Groups
Pop Quiz

What is the most important consideration for any lighting design?

What is needed to convey for construction?

- Basis of Design
- Code Review Documents
- Lighting Plans
- Reflected Ceiling Plans
- Lighting Details
- Luminaire Schedules
- Control Plans
- Control Schedules
- Calculations
- CSI Specifications
- Cut Sheet Packages
- Energy Code Forms

That's great but where do we begin?
Fundamental Questions

Begin at the beginning... and go on till you come to the end; then stop.

- What are the critical visual tasks?
- Who is using this space?
- How will users be impacted?
- Where are the surfaces that are most important?
- Why are we doing the lighting (expectations)?
- When does the lighting need to be engaged?

What is the primary purpose for the lighting?

- Working tasks
- Way finding
- Recreation
- Aesthetic
- Safety
What are the primary tasks

Where are the primary tasks?
- Vertical
- Horizontal
- At grade
- Higher up

What are the dominant surfaces?
- Walls
- Ceilings
- Specific Tasks?
Where are the dominant surfaces?

What is lighting design?

• Fundamentally it’s integrating the visual field
• Understanding how light interacts with surfaces
• Understanding how that interaction affects human perception and physiology
• Applying light and lighting equipment to most effectively meet stated project goals.

Just put the light…and shadow… where you want it …

‘You just chip away everything that is not David’

Michelangelo…(well, maybe…)

47

48

49
Pop Quiz

How do we commonly perceive brightness?

Plymouth Church
LMN

Lobby floor plan analysis
Lobby floor plan analysis

- Locate entrance and egress points
- Identify main destinations
- Identify main circulation routes

Lobby floor plan analysis

- Locate secondary destinations
- Locate secondary circulation routes
- Locate areas to highlight for interest
Lobby floor plan analysis
Identify main circulation routes

Lighting Hierarchy
- Which areas should have the highest emphasis
- Medium emphasis
- Low emphasis
Lighting Hierarchy

A hierarchy may suggest:

- Light levels
- Surfaces to be accented
- Specific Task locations
- Wayfinding Routes
- Destinations

Fundamental Toolkit

Intensity
- Candela
- Lux

Direction
- Accent
- Ambient

Chromaticity
- Color Temperature
- Color Spectrum

Surfaces
- Color
- Texture

Develop Concepts
Develop Concepts

The stacks in this area are existing metal stacks that stand 7’–6” above finished floor. The reading material in the stacks will be illuminated by a fluorescent, direct/indirect stack light mounted on uni-strut and supported on the metal braces that support the metal stacks. This lighting system allows the ceiling to be free of penetration while ensuring even illumination of the stacks as well as providing uplighting for the ceiling plane.

- **Design Light Level:** 15-20 fc
- **Design Light Level at Vertical Surface of Stacks:** 15-45 fc
- **Allowed Lighting Power Density:** 1.2 watts/sf
- **Lighting Control:** Relay switched with sweep and override
Present Concepts

Tommy Bahama Headquarters

Pop Quiz

How important is it to iteratively develop concepts and review them with the team?

So….what about the science?

- We have a hierarchy, and know what we want to highlight, what about the specifics?
- Most commonly that means picking target light levels.
So….what about the science?

- IES to the rescue – but there are others....
- THE IES develops and published a variety of recommended practice documents that provide guidance on things like target horizontal AND vertical illuminance.

Other Resources?

https://www.lightingdesignlab.com/resources
So….what about the science?

Design Considerations

Color Quality of the Light

- Spectral Power
- Color Temperature
- Color Rendering
- Color Fidelity
- TM 30

- Light and Human Perception Class
- https://www.lightingdesignlab.com/resources
Flicker

- All light sources can flicker under the right circumstances
- LED sources may be particularly susceptible with low quality drivers or in specific cases.
- This may be ok, mildly annoying, hugely annoying, or disastrous.
- In some cases (think LiFi) very high frequency flicker is desirable.

Lehman/Wilkins Flicker Risk Graph

- Is it flicker, flutter, shimmer, or other?
- % flicker = amplitude
- Amplitude and frequency both matter.
- Check at multiple dimmed light levels.
- Do the research upfront to ensure compatibility
- When in doubt ask for samples and test

Control and Flexibility

- Almost all luminaires are now dimmable
- Dimming control is the way to fine tune and extend the range of the project.
Why use advanced lighting controls?

- Flexibility
- Productivity
- User Satisfaction
- Aesthetics
- Maintenance
- LEED / WELL / LBC
- Energy Savings
- Energy Codes

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Why use advanced lighting controls?
Surfaces

Room Surfaces must be considered as part of the lighting system in any space. They are effectively primary or secondary reflectors.

80%
20%
80% AVG.

80%
50%
23.6 AVG.

Surfaces

Color contrast can add visual interest to many spaces.

90%
60%
28 AVG.

Surfaces

Typical Reflectance Values
- ACT Ceiling Tile: 70-90%
- White Paint: 70-90%
- Light Carpeting: 40-50%
- Dark Carpeting: 5-20%
- Brick: 10-30%
- Wood: 10-60%
Pop Quiz

How can we effectively use lighted surfaces in architecture?
Simple Steps to Better Lighting

- Effective Daylight
- View to Horizon

Simple Steps to Better Lighting

- Light Surfaces
- Consider Brightness Perception
- Consider Context
- Consider Composition

Simple Steps to Better Lighting

- Light Surfaces
- Consider Brightness Perception
- Consider Context
- Consider Composition
Simple Steps to Better Lighting

- Manage Contrast
- Balance the Visual Field

Simple Steps to Better Lighting

- Select appropriate light
- Put light where it's needed
- Let Shadow live where it's appropriate
- Accept natural variability

Simple Steps to Better Lighting

Lighting Controls
- Basically all energy codes now require significant lighting controls.
- Widespread adoption of LED technology makes dimming an obvious choice
- Allowing users to select their own light levels generally leads to enhanced satisfaction – and lower light levels.
Less Simple Steps to Better Lighting

- Consider Color Spectrum
- Tunable Color
- Black body curve dimming

The documentation class(es)....

- Concepts Narratives and Sketches
- Basis of Design
- Schematic Drawings
- Code Review Documents
- Lighting Plans
- Lighting Details
- Luminaire Schedules
- Control Plans
- Control Schedules
- Calculations
- CSI Specifications
- Cut Sheet Packages
- Energy Code Forms

Any Questions?
And now – a few words from LDL

Upcoming LDL Online Events

<table>
<thead>
<tr>
<th>LDL Course</th>
<th>Delivery Date</th>
<th>Time</th>
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<tbody>
<tr>
<td>Audit and Retrofit Techniques</td>
<td>August 11</td>
<td>10:00 - Noon</td>
</tr>
<tr>
<td>Introduction to Codes and Standards</td>
<td>August 25</td>
<td>10:00 - Noon</td>
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<tr>
<td>Promoting Energy Efficient Lighting Systems</td>
<td>September 8</td>
<td>10:00 - Noon</td>
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<tr>
<td>What Went Wrong?</td>
<td>September 22</td>
<td>10:30 - Noon</td>
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Today’s slide deck and previous online courses can be found on our website

Click – Call – Connect

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Visit us online

OR

Email Us
lightingdesignlab@seattle.gov

Todays slide deck will be posted here!
With support from 2020 member utilities

Please take the online survey once you exit the webinar

We’ll SEE you on the next call... 😊