Lighting the Way:
Strategies for Positive Change
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Learning Objectives

- Recognize the key role lighting plays in sustainable building and how organizations can enact lighting strategies to create positive change.

- Recognize the impact of energy saving strategies on indoor environmental quality and occupant satisfaction.

- Present evidence supporting the premise that office lighting quality, job satisfaction and organizational productivity are linked.

- Examine and evaluate different lighting options and the impact they can have on energy savings, employee performance, visual comfort, and organizational productivity.

- Identify specific steps that building owners, architects, etc. can take to adopt lighting systems that work towards achieving net-zero energy, contributing to the reduction of greenhouse gas emissions.
Organizational Change

LEED

Energy Standard for Buildings Except Low-Rise Residential Buildings

ASHRAE STANDARD

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
Organizational Change

Meaningful change is net positive
Organizational Change

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- Meaningful change is net positive
- Some energy saving measures can reduce human performance
Organizational Change

- Meaningful change is net positive
- Some energy saving measures can reduce human performance
- Focus on conservation strategies that increase organizational productivity
Why Focus on Office Lighting?
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Office lighting power consumption is the largest.
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Why Focus on Office Lighting?

- Office lighting power consumption is the largest
- Generation and delivery losses are high
- Lighting energy savings are multiplied
Why Focus on Office Lighting?

- Office lighting power consumption is the largest
- Generation and delivery losses are high
- Lighting energy savings are multiplied
- Offices are overlit and lights are on when not needed
Lighting and Productivity

Employee satisfaction is linked to organizational productivity.

The good news:

Workplace lighting quality is linked to organizational productivity.
Employee satisfaction is linked to organizational productivity.

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Workplace lighting quality is linked to organizational productivity.
Employee satisfaction is linked to organizational productivity.

- The good news:

  Workplace lighting quality is linked to organizational productivity.

- The bad news:

  Workplace lighting quality is linked to organizational productivity.
“Lighting and Office Renovation Effects on Employee and Organizational Well-being”

- Conducted by Veitch, J.A.; Newsham G.R.; Mancini, S.
- National Research Council Canada Institute for Research in Construction
- September 2010
- Major renovation of three office buildings
- Old lighting consisted of recessed parabolic-louvered luminaires
- New lighting consisted of workstation-specific individually controllable suspended direct/indirect
Survey Results

- A higher percentage of people than expected rated this lighting as comfortable (80% versus 69%)
- People who rated their lighting as better rated the office as more attractive, their mood more pleasant, and their physical symptoms at the end of the day less severe and their own performance rated as better
- People who rated their lighting as better are less likely to experience physical and visual discomfort and are less likely to be off sick and less likely to leave the organization
Conclusions

- There exist lighting solutions that will benefit individuals, their employers and the environment.
- Energy efficient lighting can also be high quality lighting.
- Workstation-specific direct/indirect luminaire with individual control was the most highly rated lighting design.
- Demonstrated a lighting appraisal and important health and satisfaction outcomes.
Strategies for Positive Change

Meaningful change is net positive. To effect positive change:

- Avoid conservation strategies that reduce IEQ.
- Choose conservation strategies that improve IEQ.
Lighting Strategies for Positive Change

- Eliminate barriers to efficiency
- Adopt a task/ambient approach
- Manage luminance
- Implement lighting controls
Eliminate Barriers
Rearrange the Office
Eliminate Barriers
Rearrange the Office

LEED recognizes the impact of exterior views on IEQ.
Eliminate Barriers
Rearrange the Office

- Increase daylight contribution
- Provide access to exterior views
Eliminate Barriers
Avoid dark finishes
Eliminate Barriers
Use light finishes
Eliminate Barriers
Use light finishes

- Increase light utilization
- Improve luminance ratios
Eliminate Barriers
Avoid shadows
Eliminate Barriers
Avoid shadows
Eliminate Barriers
Choose smart storage
Eliminate Barriers
Choose smart storage
Eliminate Barriers
Choose smart storage

- Reduce connected load
- Improve luminance ratios
- Expand personal space
Eliminate Barriers
Avoid tall panels
Eliminate Barriers
Avoid tall panels
Eliminate Barriers
Use low panels
Eliminate Barriers
Use low panels

- Increase light utilization
- Provide access to exterior views
- Encourage respectful interaction
Eliminate Barriers

Rearrange the office  
Use light finishes  
Choose smart storage  
Use low panels

- Increase daylight contribution
- Increase light utilization
- Reduce connected load
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- Improve luminance ratios
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Office Lighting
Evolving practice
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Evolving practice
Task/Ambient Lighting

- Saves energy by reducing ambient levels
- Avoids over-lighting non-task areas
- Provides personal control

Two-component task/ambient

Single-component task/ambient
Task/Ambient Lighting

- Saves energy by reducing ambient levels
- Avoids over-lighting non-task areas
- Provides personal control

California Title 24 energy code rewards task/ambient lighting.
Task/Ambient Lighting
Single-component strategy

- Distributes light from the occupant’s perspective
- Eliminates overhead luminaires, wiring and glare
- Improves acoustics and daylighting
- Portable, easy to install and reconfigure

single-component task/ambient
Open Plan Office

Single-component Task/ambient

A system of luminaires deployed in close proximity to the primary tasks that delivers a balanced measure of task and ambient lighting from a single lamp.
Open Plan Office

Single-component Task/ambient

T5 lamp
Open Plan Office

Single-component Task/ambient

- T5 lamp
- Task reflector
Open Plan Office

Single-component Task/ambient

- T5 lamp
- Task reflector
- Backlight reflector
Open Plan Office

Single-component Task/ambient

- T5 lamp
- Task reflector
- Backlight reflector
- Glare control louvers
Open Plan Office

Single-component Task/ambient

- T5 lamp
- Task reflector
- Backlight reflector
- Glare control louvers
- Task lens
Open Plan Office

Single-component Task/ambient

- T5 lamp
- Task reflector
- Backlight reflector
- Glare control louvers
- Task lens
- Backlight shield
Implement Task/Ambient Lighting

Deploy lighting strategically
Use proximity effectively
Design what the user sees
Simplify with single-component
Avoid over-lighting non-task areas
Provide individual control
Improve daylighting efficiency
Maintain task illuminance
Provide individual control
Eliminate glare
Improve acoustics
Manage Luminance

- Luminance is visual information
- Visual sensitivity shifts with luminance condition
Manage Luminance

- Luminance is visual information
- Glare is unwanted luminance
Manage Luminance

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- Luminance ratios determine visual comfort
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*Pilot Study: High-Performance Office Lighting with a View*
University of Washington Dept. of Architecture
Integrated Design Lab, 2010
Manage Luminance

- Illuminate workstation surfaces
- Illuminate meaningful room surfaces
- Support ambient light reductions
Manage Luminance

- Illuminate workstation surfaces
- Illuminate meaningful room surfaces
- Support ambient light reductions
- Enhance personal space
- Improve visual comfort
Lighting Controls
Office of the Future – Glumac Engineering, Irvine, CA

- Personal Control
- Daylight response
- Occupancy response
- Demand response
Lighting Controls
Office of the Future – Glumac Engineering, Irvine, CA

\[ \text{LPD} = 0.6 \text{ w/sf} \]
\[ \text{LPD}_{T24} = 0.4 \text{ w/sf} \]

\[ \text{Operating load} \]
(week #1, 3/21/10)
0.29-0.35 w/sf
Lighting Controls
Office of the Future – Glumac Engineering, Irvine, CA

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- Operating load
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Panel-mounted Solutions
Panel-mounted Solutions
Stanchion-mounted Solutions
Stanchion-mounted Solutions
Monitor Arm Solutions
Monitor Arm Solutions
Some energy-saving measures have a positive impact on employee satisfaction and organizational productivity.

Task/ambient lighting provides a path to productive net-zero energy buildings.
What Have We Learned?

To succeed we must:

- Eliminate barriers to efficiency
- Adopt a task/ambient approach
- Manage luminance
- Implement lighting controls
Lighting the Way: Strategies for Positive Change
Transforming the Workplace, Changing a Culture

Tim Shea
2nd VP Facilities, Purchasing, and Contracting
National Life Group
Who is National Life Group?

- Our business
- Campus and building occupants
- Environmental achievements
The Modernization Project

WHAT WE DID

- Replaced old modular furniture and chairs
- Installed new carpet and painted
- Installed nature-inspired benches and planters
- Installed a state-of-the-art lighting system
- Installed new movable floor-to-ceiling walls
- Added branding to workspace
The Modernization Project

WHY WE DID THE PROJECT

- Upgrade overall workplace aesthetics
- Connect workplace to brand and values
- Move from “I” to “We” space – open/more collaborative workspace
- Refresh aging furniture and outdated space standards
- Free up rental square footage
The Process

HOW WE DID IT

- Proactive engagement
  - Workspace strategist

- Communication
  - Website, business unit liaisons

- Feeling of “buy in”

- Ability to personalize
Connecting Brand and Values

BRAND STATEMENTS
- Mission, values on walls in central areas
- Photomurals of historic photos
- Naming of conference rooms and photomural

INSPIRED BY NATURE THROUGHOUT
- Carpet patterns, wall colors and other accents
- Extensive plantings in common areas
- Resin panels with leaf and grass inclusions, maple woodwork
Employee Well-being

WELLNESS AND MORALE

- Less hierarchical layout, a perimeter free of walls
- Cultural transparency with glass walls
- Encourages use of stairs with music and calendar murals
- Increases oxygen in workplace with vegetation
- Low VOC paints, finishes, carpets, lighter finishes on work surfaces
- Open plan encourages team interaction
- Views to mountains, extensive daylighting
The Results

- More efficient and flexible space for long term
- Better employee interaction and collaboration
- Brand recognition
- Additional rentable square footage
The Results… by the Numbers

- Less than 0.60 watts/square foot
- Six year payback with additional rental income
- Over $40,000 in rebates with efficiency measures implemented
- 220 tons of recycled materials distributed
Questions?

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Thanks for listening.