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LEED AP(BD+C), GSAS CGP, GCP, ISO 14001

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MODULE
19

Energy Efficiency Lighting

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Energy efficiency in lighting systems within educational institutions is crucial for reducing operational costs, environmental sustainability, and the overall learning environment. Schools often have extended hours of lighting use, making the optimization of lighting systems not only an economic necessity but also a pedagogical imperative.

Learning Objectives

- Green school buildings are dynamic learning environments.
- Operations and Maintenance for Whole School Sustainability
- Meaningful, purposeful, and engaging learning
- Sustainable Grounds & Transportation
- Indoor Environment—Air Quality
- Smart Cleaning & Integrative Pest Management
- Indoor Environment—Acoustics
- Water Efficiency and Quality
- **Energy Efficiency—Lighting**
- Plug Loads & HVAC Systems
- Materials and Resources
- Innovation & Conclusion
- Summary and Resources / GCP Quiz

INTRODUCTION

- Importance of energy efficiency in school lighting: reduces operational costs, promotes environmental sustainability, and enhances learning environment.
- Primary lighting technologies: incandescent bulbs, fluorescent lamps, LEDs, and smart lighting systems.
- Primary types: Incandescent bulbs convert 90% of energy into heat, fluorescent lamps produce light through mercury vapor, LEDs are the most energy-efficient option, last longer, and provide high-quality light.
- Strategies for implementing energy-efficient lighting systems: conduct energy audits, select appropriate technologies, use natural light, implement control systems, and educate stakeholders.
- Lighting is a critical factor in educational environments, accounting for nearly 50% of the electric bill.
- Implementing strategies to optimize lighting use in classrooms can significantly reduce energy consumption and operational costs.

KEY ENERGY SAVING TIPS FOR SCHOOLS

- Turn off lights when not in use: Implementing a policy of turning off lights during breaks or after lessons can save up to \$200.
- Establish a Student Energy Patrol: Forming a student energy patrol can foster a culture of sustainability and reduce unnecessary energy consumption.
- Create Reminders: Visual reminders can encourage students to turn off lights when leaving a classroom.
- Accessible Light Switches: Ensure switches are easily accessible and visible to encourage habitual light switch-off.
- Optimize Natural Light: Reduce the number of unnecessary light fixtures, especially in areas where natural light is abundant.
- Experiment with Lighting Levels: Conduct experiments to assess comfort levels at varying light levels to gauge the impact on student comfort and learning outcomes.



UNDERSTANDING CLASSROOM LIGHTING

- Window Dynamics: Analyze window orientation, solar access, and the interplay between natural and artificial lighting.
- Optimizing Daylighting: Keep window shades open during daylight hours, repair or replace broken shades, remove decorative items that obstruct window access and light flow, and select wall decorations that do not absorb significant light.

Lighting Controls

- Advanced Control Systems: Integrate bi-level switches, dimmers, occupancy sensors, and daylight sensors for automatic adjustment of lighting based on occupancy and available daylight.



TYPES OF LIGHTING

- Fluorescent Lighting: Standard due to their efficiency compared to incandescent bulbs.
- Compact Fluorescent Lamps (CFLs): Energy-efficient alternative to incandescent bulbs.
- Light Emitting Diodes (LEDs): Offer superior energy efficiency and longevity.
- Incandescent and Halogen Bulbs: Transitioning to CFLs or LEDs from incandescent or halogen bulbs is a simple way to enhance energy efficiency.



LIGHTING BEST PRACTICES

- Turn Off Unoccupied Lights: Turn off lights in unoccupied rooms to lead to substantial energy savings.
- Utilize Task Lighting: Turn off main room lighting when not needed.
- Upgrade Lighting Infrastructure: Replace outdated lighting systems with more efficient T8 or T5 tubes with electronic ballasts.
- Advocate for Automatic Controls: Discuss the implementation of automatic lighting controls with building management.
- Report Issues Promptly: Prevent unnecessary energy waste and maintain an optimal learning environment.



ENERGY EFFICIENCY IN LIGHTING SYSTEMS WITHIN EDUCATIONAL INSTITUTIONS



- Energy efficiency in lighting is crucial for educational institutions, impacting operational costs, environmental sustainability, and the learning environment.
- Schools often have extended hours of lighting use, making the optimization of lighting systems an economic necessity and a pedagogical imperative.

THE IMPORTANCE OF ENERGY EFFICIENCY IN SCHOOL LIGHTING

- **Cost Reduction:** Energy-efficient lighting technologies can reduce utility bills and lead to energy savings of up to 75%.
- **Environmental Impact:** Schools have a responsibility to model sustainable practices for students, reducing greenhouse gas emissions associated with electricity generation.
- **Enhanced Learning Environment:** Proper lighting is essential for student performance and well-being, improving concentration and reducing eye strain.



UNDERSTANDING LIGHTING TECHNOLOGIES

- Incandescent Bulbs: Traditional bulbs convert approximately 90% of energy into heat rather than light, making them highly inefficient.
- Fluorescent Lamps: More efficient than incandescent bulbs but have limitations in lifespan and light quality.
- Light Emitting Diodes (LEDs): Most energy-efficient lighting option available, can achieve efficiencies exceeding 90% and provide high-quality light with better color rendering.
- Smart Lighting Systems: Integrate advanced technologies to optimize energy use based on actual needs.



IMPLEMENTATION STRATEGIES

- Conducting Energy Audits: Assess current lighting conditions, usage patterns, and energy consumption levels.
- Selecting Appropriate Technologies: Based on audit findings, decision-makers should select appropriate lighting technologies.
- Utilizing Natural Light: Architectural considerations like strategic placement of windows and skylights can reduce reliance on artificial lighting.
- Implementing Control Systems: Integration of smart lighting controls can lead to further energy savings.
- Educating Stakeholders: Training staff and educating students about the importance of energy efficiency can cultivate a culture of sustainability.



ENERGY SAVING TIPS FOR SCHOOLS



- Energy Audits: Comprehensive assessments of a building's energy use to identify areas of energy waste and provide recommendations for improvements.
- Upgrading Lighting Systems: Use LED lighting to reduce energy consumption and lower maintenance and replacement costs.
- Optimizing HVAC Systems: Regular maintenance of HVAC systems ensures efficient operation and reduces heating costs.
- Building Insulation and Sealing: Proper insulation in walls, ceilings, and floors maintains comfortable temperatures within school buildings.

ENERGY SAVING TIPS FOR SCHOOLS +

- **Incorporating Renewable Energy Sources:** Schools can invest in renewable energy technologies like solar panels to offset energy consumption.
- **Promoting Energy Awareness and Behavioral Changes:** Schools can create campaigns to raise awareness about energy-saving practices.
- **Implementing Energy-Efficient Appliances:** Schools should prioritize Energy Star-rated products when purchasing new appliances and equipment.



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