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Lighting: Surgical Task Lighting

All ECM content was independently developed and reviewed to be vendor-, product and service provider-neutral.

Description

The continued evolution in lighting technologies such as light emitting diodes (LEDs) provides a viable alternative to traditional tungsten-halogen (halogen) and high intensity discharge (HID) lighting for surgical suites. The benefits include reduced energy use and heat load, longer bulb life, and greater comfort for operating room (OR) staff when compared with traditional surgical lighting systems.

Project Talking Points

- Surgical area lighting is critical and must meet the demands of medical personnel who may have varying lighting requirements for different procedures.
- The use of LED lighting for surgical field illumination is not just about energy savings and reductions. It also contributes to a lower, stable room temperature that helps maintain normothermia in patients, which ultimately limits surgical site infection risks, improves wound healing, promotes patient satisfaction and supports timely discharges with the added benefit of improving staff comfort.
- Surgical field illumination systems generally include single and/or dual light heads attached to a pivot arm or track suspension that are equipped with sufficient light reflection, spectral characteristics, focus, pattern and intensity adjustments to minimize shadow creation.
- LED lights illuminate their subjects' true colors more accurately than bulb lights, and the benefit of multiple arrangements of small light sources fixed at different angles minimizes shadows for a more consistent light, even when surgical personnel lean into the spot.
- LEDs offer numerous advantages for use as surgical lighting over traditional tungsten halogen and gas discharge fixtures including: reduced electricity use (up to 70% compared to halogen or direct discharge lighting), longer life, reduced heat generation and lower ultra-violet (UV) radiation, which reduces the potential to dry exposed tissue.
- LED lighting for surgical field illumination provides better visualization for the surgeon, smaller footprint due to the compact luminaire designs and lower heating, ventilation and air conditioning (HVAC) load requirements to provide greater comfort for patients, surgeons and staff.

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Triple Bottom Line Benefits

- **Cost benefits:** Energy efficient lighting reduces energy use resulting in cost savings. The longer life expectancy of the lighting will reduce the number of bulbs and fixtures purchased, as well as reducing the frequency of replacements.
- **Environmental benefits**: Lighting impacts the environment in several ways, including energy usage and materials used to produce lighting products. Energy-efficient lighting requires less electricity, which lowers emissions from polluting power plants. Energy-efficient lighting also reduces the number of toxic chemicals released into the waste stream.

- **Social benefits**: Modern lighting will improve surgical outcomes by providing high-quality and reliable lighting.

Purchasing Considerations

- Lighting fixtures that are complete, grounded, fungi-proof, adequately enclosed for asepsis and designed for use in human operating rooms
- Lighting systems should be complete with suspension systems, light heads, transformers and controls
- Suspension components shall not flex during normal use (i.e. light head position should be maintained even when articulated without drift).
- Surfaces shall be free of burrs and sharp edges and shall be painted with a corrosion resistant primer and lacquer finish (except for stainless steel, aluminum, chrome, nickel or brass metal surfaces).
- Refer to the US Department of Energy Technical Guidance Document for specification writing guidance.

How-To

1. Engage procurement, facilities and clinical staff to establish a lighting plan.

2. Develop and monitor KPIs including the following:

    - Kilowatt-hours of energy saved.
    - Percent reduction in energy use for installed base.
    - Percent of installed base converted to LED.

ASHE Optimizing health care facilities

AHA Data & Insights

- Owner satisfaction with quality and quantity of light – initial and maintained.

3. Catalog which lighting systems should be targeted for an upgrade or retrofit, considering purchasing, installation, operating, maintenance and end-of-life disposal costs.

4. Verify that existing lighting systems are appropriate for retrofitting or upgrading – wiring requirements, controls, etc.

5. Install lighting systems and monitor performance obtaining real time data on electricity usage and comfort of OR personnel.

Case Studies

- Technical Guidance Document: Surgical Task Lighting, U.S. Department of Energy, Energy Efficiency and Renewable Energy Building Technologies Program, August 2011

- **LED Surgical Task Lighting Scoping Study: A Hospital Energy Alliance Project**, U.S. Department of Energy, Pacific Northwest National Laboratory, January 2011

Resources

- 21 CFR 878.4580 “Surgical lamp.” Code of Federal Regulations, U.S. Food and Drug Administration.
- American National Standards Institute (ANSI)/Illuminating Engineering Society of North America (IESNA) RP-29-06: Lighting for Hospitals and Health Care Facilities American National Standards Institute, Washington, DC.
- U.S. Department of Energy:
  - Lifetime of White LEDs
  - Solid State Lighting Research and Development
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Regulations, Codes and Standards, Policies

- Illuminating Engineering Society (IES) publication, RP-29-06, Lighting for Hospitals and Healthcare Facilities and in the 10th Edition IES Handbook, Chapter 27
- IESNA:
  - RP-29-06 – Lighting for Hospitals and Health Care Facilities
  - HB-9-00 – Lighting Handbook Reference and Application
- National Fire Protection Association (NFPA):
  - 70-08 – National Electrical Code (NEC)
  - 99-05– Health Care Facilities
- Underwriters Laboratories, Inc. (UL):
  - 60601-1 – Medical Electrical Equipment, Part 1: General Requirements for Safety
  - 1598-08 – Luminaires

ECM Descriptors

Energy, Supply Chain

Category List:
- LEDs
- Lighting
- Surgical lighting

ECM Attributes:
- Energy
- Optimize operations
- System upgrades

Improvement Type:
- Retrofit/renovations
- New buildings
- Operations and maintenance (O&M)

Department:
- Engineering/facilities management