HERE'S A BRIGHT IDEA...

Making the decision to "go LEED" early is key for designing the best lighting solutions

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Proper lighting design attempts to incorporate the correct quantity of light fixtures to help reduce fixture costs and the lowest Lighting Power Density (LPD) to save energy without sacrificing design goals. However, every few years the LPD allowances are lowered at different rates by both the national standards and local codes. Since lighting technology remains about one step behind code requirements, just when it becomes simpler to design lighting solutions with existing lighting technology, the codes change to lower LPDs.

Whether it's due to environmental stewardship, government mandates, market drivers or peer pressure, India's building industry is growing in the demand for energy efficient design solutions. Patterned after the United States Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) Green Building Rating System, the Indian Green Building Council (IGBC) LEED-India certification process has become a major tool in India to assure that buildings meet stringent sustainability requirements. Yet, from my vantage point as a lighting designer in Seattle, Washington, USA, which is continually ranked as one of the top most sustainable cities in the United States, too many design teams begin designing for LEED too late in the design process. When the choice to "go LEED" is not made early, it can bring on major design challenges for lighting designers, as well as other consultants.

Understanding Design Standards Challenges

Lighting design is governed by codes, as is every other part of building design. Some of these codes regulate maximum Lighting Power Density (LPD) lighting, energy used per square meter, light levels in specific spaces, or even light trespass. Some municipalities in the USA use the national energy standard, American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) published ASHRAE 90.1. Likewise, India has a national code, the Energy Conservation Building Code (ECBC). Other municipalities may generate their own local energy codes. These local codes also govern the industry and must be met when calculating energy usage for a space. In Seattle, the local energy code differs from ASHRAE 90.1 adding to code design challenges.

Energy Usage/Lighting Conundrum

Proper lighting design attempts to incorporate the correct quantity of light fixtures to help reduce fixture costs and the lowest LPD to save energy without sacrificing design goals. However, every few years the LPD allowances are lowered at different rates by both the national standards and local codes. Since lighting technology remains about one step behind code requirements, just when it becomes simpler to design lighting solutions with existing lighting technology, the codes change to lower LPDs.

Changes in LEED Requirements

In the United States when a project goes LEED, a new set of challenges come into the equation. LEED India is likely to be on the path to make these same changes in the next few years. According to Leslie Johnson PE, LEED AP, CSBA of CDi Mechanical Engineers in Lynnwood, Washington, USA, "In the earlier versions of LEED building certification, i.e. LEED 2.0 and LEED 2.1, the ability to reduce the LPD contributed to the reduction in total building energy usage, so that the reduction was not solely due to the mechanical systems. What we're experiencing now in many cases with LEED 2.2, the LPD either meets or is slightly below the requirements, making it more challenging for the mechanical engineer to design to meet the minimum required 14% energy reduction as a sole entity. Concurrently, the mechanical system requirements are more stringent,

as well, compounding the challenge. It is imperative to incorporate integrated design practices at the pre-design stage in order to maximize energy savings measures."

LEED and Lighting

To even attempt to achieve LEED, the prerequisite "minimum energy performance" must be met. As mentioned above, the new USA LEED 2.2 criteria require that the overall building energy be at least 14% below the new ASHRAE 90.1- 2004 standards for new buildings. It is likely that LEED-India will follow suit in the newer version. As part of the team, the lighting designer is asked to lower the LPDs as low as possible in order to help meet the 14% reduction. Although sustainable lighting design at its most basic translates to using the lowest amount of wattage possible to provide light to a space, lower wattage does not necessarily translate to good lighting design. For example, the first generation compact fluorescent lamp used less wattage than the incandescent lamp it was meant to replace, so it did save energy, but had a poor colour rendering and took five minutes to warm up to full brightness. Keep in mind that India's National Building Code (NBC) lists a range of illuminance levels and uniformity ratios for typical commercial spaces. Light levels should not go below these NBC values. Today, it's LEDs; everywhere they are touted as lighting's panacea. But as LEDs continue to evolve, and when not specified by an experienced lighting professional, they can provide poor color, not provide the listed long lamp life, or can be used for inappropriate lighting applications.

One LEED point available for lighting is the Sustainable Site "Light Pollution Reduction" Credit 8. This outdoor lighting credit has to do with the prevention of light trespass and light escaping into the night sky. Lighting designers must design for this credit from the beginning of the design. Even though good lighting design always accounts for dark sky issues, to earn this LEED point sacrifices in some aesthetically appealing lighting applications have to be made. For example, lighting trees or signs with uplights would have to be scrapped or redesigned. In fact, the best approach to meet this credit is to have no uplighting at all. The light trespass portion requires multiple computer lighting calculations to prove that the project's light fixtures do not allow light off the site.

A second credit related to electric lighting is the "Indoor Environmental Quality" Credit 6.1. This credit requires a lighting control system that allows at least 90% of the building's occupants to individually control lighting near their workspaces. In order to gain this point, a lighting control system with typically large upfront cost would need to be specified and have defined fixtures that are specifically coordinated with it. Attempting to implement a lighting control system late in the design process requires the lighting designer to re-specify another fixture and/or ballast combination and the electrical engineer to modify the light fixture circuiting.

Daylighting

Using available daylight is, of course, one of the most sustainable lighting solutions today. However, achieving the maximum potential light from daylight depends on the building's orientation, the design and disposition of windows and other exterior openings of a building, and the placement of interior walls and furniture. For these reasons, designing for daylighting must be done early in concept design to achieve the full efficiency and benefits from natural light.

Of course, daylighting doesn't address the fact that today's society continues to function after dark due to electric lighting. The design of fixtures for night time requires careful lighting and energy planning in order to meet LEED requirements even though daylighting has been employed in the facility.

Lamp and Fixture Considerations

Using lamps that generate more light, or lumens, per watt is a major component of sustainable lighting design. In addition to the lamp itself, the fixture must be considered. Fixture manufacturers often list a model's efficiency. However, without knowing the intended use of the fixture, its efficiency alone does not tell you the whole story. If the fixture were simply a bare lamp, it would be listed as nearly 100% efficient. For example, a downlight may be listed as more efficient only because its lamp protrudes further out of its reflector when compared with another fixture. Professional lighting designers examine solutions such as high quality reflectors to redirect light to the target area while balancing efficiency and glare reduction. Knowing that the design will go LEED up front helps the designer to plan accordingly.

Lighting Design is a Mixture of Art and Science.

Designing to energy codes and LEED requirements help us to attain environmentally-friendly building design. But for all designers, there needs to be a balance between the energy used and the overall feeling of the design. Professional lighting designers believe that successful design not only saves energy, but enhances the architecture and creates an environment that is comfortable and functional for the user. Making this happen effectively while achieving LEED points can be done most efficiently when planning for LEED early in design—saving redesign efforts and translating to time and money saved on a project.

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