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Lighting: Secret Powers

For people using a space, lighting is a subtle but significant force
by Jeffrey Kahn, IESNA, LC

Lighting Systems and Brightness



Daylight and direct-indirect fixtures can help occupants feel invigorated at work. To save energy, dim pendants along the perimeter. Photo courtesy of Tom Crane Photography.

On Philadelphia's Broad Street, a coordinated color changing light show covers eight building façades for four blocks south of City Hall. Why go through the trouble and expense? The reason is simple. We are physiologically programmed to be excited by flashing light and to react emotionally to intense color. The expectation is that people will be attracted to the fun and excitement and that the shops, restaurants and theaters in the area will benefit.

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Lighting can have a comparable influence indoors. The key is to follow through with the architectural intent for the space.

Different spaces have different lighting needs, whether it's a large main entrance lobby, an open office or a high profile conference room. The Illuminating Engineering Society of North America publishes recommended practice guides that break down criteria by space type. These give concrete recommendations such as vertical and horizontal footcandles, whether the light should create harsh or soft shadows, and acceptable contrast ratios.

What's more, they suggest what is important and why. What age brackets do occupants fall into? Will they be reading small font text on paper or operating a computer? Just as important are geometries of the space and distribution of light fixtures. These are the kinds of issues that should be considered when evaluating lighting and its effect on the way a space will be used.

One big issue to consider is brightness. Bright light can elevate a person's mood, but it can also be too intense and painful. It is perfectly acceptable to have points of sparkle in a lobby. But what about an unshielded lamp over a mirror in the restroom? Or reflections of inappropriately aimed track lighting in the monitor of a cash register? When fine visual tasks are being performed, sparkle will interfere with visual precision. The restroom mirror will

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be uncomfortable to use, but will go largely unnoticed. The cashier will likely make costly errors. And if tasks being performed could be dangerous, limiting glare and sparkle will reduce the risk of accidents.

Brightness also affects how people behave in a space. Through a natural response to light, called phototropism, people use light as a subliminal wayfinding system that will guide them through a space, not because they know where they are going but because it somehow feels right. Most humans are attracted to the brightest light within the field of vision. Brightly lighting a wall at the end of a corridor suggests that this destination is safe. By contrast, designing the lighting in an area to be visually uncomfortable makes people less likely to dawdle and encourages them to find an efficient route to a comfortable zone.

Many main entrance lobbies have a mandatory check-in at the security desk for all visitors. If that area is the brightest and most visible point in the room, it is less likely visitors will simply miss the check-in point while looking at the very prominent elevator lobby. This can be accomplished with glowing pendants over the desk, a brightly lit wall or sconces behind the desk. These brighter areas attract attention, and because people are drawn to light visitors will naturally head in that direction as they look for information about the new space they have just entered.

If a lobby has a small side corridor that leads to a storage room, slightly underlighting the door to the room can draw attention from it.

Prismatic Versus Parabolic Fixtures

Over time, ideas about what constitutes good lighting sometimes change. It used to be common to use a prismatic lens in a troffer to spread the light out evenly and slightly reduce glare by refracting the lamp image over greater surface area, rather than having the bare lamp visible. Studies found that glare from prismatic lenses was distracting and caused headaches because of the contrast of very high and uneven brightness above the eyes and much lower light levels at the task.

Over the years, prismatic lens fixtures were supplanted by polished aluminum parabolic louvers in recessed fluorescent troffers. The idea was to push the light down while eliminating excessive brightness. In fact, the louvers were so well-designed that they eliminated all fixture brightness and become dark holes in the ceiling. This allowed offices to reduce the light levels required to complete a task. With the parabolic louvers, occupants' pupils didn't need to contract to compensate for very bright fixtures, so they could take in more of the light available at the task.

After years of using very low brightness louvers, studies discovered that occupants were actually more comfortable when they were able to identify a light source in the room. People's primary experience of light begins with the sun and a sky. The perception of a space lighted with highly reflective parabolic louvers was repeatedly described as "cave-like" due to the dark walls and the dark ceiling.

The Benefits of Indirect Lighting

Because we learn about light from the sun and sky, most people are comfortable with even brightness from above as long as it falls within an acceptable contrast ratio. Thus began the current era of up-lighting, also known as indirect lighting. Of course, up-lighting is not a new concept. Many large churches designed centuries ago have well-placed openings to allow sunlight to fall on the ceiling and walls. That made the space more comfortable and appear larger than if the openings were closer to the ground and only allowed light in nearer to the floor.

But purely indirect lighting often approximates an overcast day and can have a flat and dull effect. Without the addition of brightness or points of sparkle, employees may tend to be lethargic and find it harder to work efficiently. Without access to daylight and exterior views, this effect will be exacerbated and may contribute to increased absenteeism and low morale. This situation can be helped by adding points of sparkle to a space and other points of interest that offer brightness.

Replacing indirect pendants with semi-indirect (perforated housing that allows fixtures to glow) or even direct/indirect lighting (allows some light to exit the bottom of the fixture) will help mitigate the problem. Direct source lighting approximates the sun on a cloudless day; points of sparkle are like streams of light passing through branches of trees. Art work or other focal points around the perimeter to replace the ever-changing natural horizon can complement the lighting design, just as the lighting complements use of the space. The result supports productivity two ways: by providing the proper amount of light and by taking advantage of indirect but psychologically powerful effects of light on people.

Lighting Can Help Prevent Workplace Blahs

For most people, sight is the most influential of the five senses. The winter blues are a result of experiencing less light, primarily less sunlight, during the day. Some people suffer from the more intense and debilitating Seasonal Affect Disorder, or SAD, which carries with it symptoms closely related to clinical depression. It is not just a coincidence that these cases occur more often at higher longitude, where access to sunlight access decreases with the shorter winter day.

Studies show that SAD can be effectively treated with a strong dose of light: Roughly 1,000 footcandles, about as much as a person would get from the sunrise, is recommended for half an hour each morning. The popular belief among researchers is that these glum feelings can be attributed to the production of melatonin, which seems to play a role in regulating sleep cycles and which is produced in greater quantities at night. By contrast, serotonin, which is produced by bright light and points of sparkle, can elevate a person's mood. [confirm that this rewrite is correct] In short, on sunny days we are likely to have more spring in our steps, and on overcast days we are more likely to feel "blue" and wish for the sunnier days to come.

Since occupants will be spending most of their days away from direct sunlight and under very even soft light, maintaining select areas for revving up serotonin production by the light of the sun or multiple points of bright sparkle will serve the occupants well by offering short reprieve or a nano-vacation that can leave people feeling happier and more energetic.

Lighting Can Hold or Hurry Customers, and Define the Image of a Space

In high end restaurants, there will often be fairly low levels of light. Just the table and perhaps some artwork or architectural features will be lighted to encourage the presumption of privacy make it comfortable for people to linger. By contrast, fast food establishments use a higher level of even lighting to encourage quick table turnover. The corporate dining room works best with a balanced combination of light settings that is inviting but also energetic so that it does not encourage loitering.

Or suppose a building is looking to boost the profits of a small café off the main lobby. Adding light fixtures just inside the café entrance allows welcoming light to pour out of the entrance as an invitation to passersby to come in.

Lighting design also plays a part in representing the building and its occupants. A lighting design for a main lobby with a backlit floating wall panel or a well-placed decorative sconce conveys a different image than commodity linear fluorescent troffers.

When a space's use changes drastically, the lighting may also need to change. If a new vice president in the company decides to take over a large storage room and convert it into an office, the existing lighting needs to be re-evaluated. Storage spaces typically use utilitarian, inexpensive light fixtures. It is very likely that the new occupant will bring important visitors into the office, and the message to these visitors shouldn't be that vice presidents are kept in closets.

Jeffrey Kahn, IESNA, LC, is a lighting designer with KlingStubbins. His experience includes historic renovation, commercial campus and municipal master plans, high-end building fitouts, R&D labs, and industrial spaces.

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