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■ The SAP Americas' headquarters expansion in Newtown Square, Pa., was designed by FXFOWLE to capitalize daylighting and views of the wooded lot. Images courtesy of Lutron.

# MORE CONTROL

LIGHTING CONTROLS PLAY A KEY ROLE IN MEETING BUILDING ENERGY CODES.



>> By Michael Jouaneh, LEED AP BD+C

**B**uildings consume the bulk of the world's energy (nearly 40 percent), so the building industry has been focusing on sustainability, efficiency and practical energy-saving solutions for both new construction and retrofits.

As the building industry moves (albeit slowly) toward net-zero energy—the goal of the Architecture 2030 program—the industry is recognizing that lighting controls play a crucial role in energy conservation. According to the U.S. Dept. of Energy, lighting is by far the largest user of electricity in commercial buildings. It consumes 38 percent of a building's total electricity use—more than space heating, cooling, ventilation, equipment and computers combined.

Lighting controls can drastically reduce that appetite. They can eliminate 60 per-

LIGHTING CONTROLS ARE VITAL COMPONENTS FOR HELPING US MEET THE INCREASINGLY STRINGENT ENERGY CODE REQUIREMENTS.

cent or more of the wasted lighting energy in buildings, while enhancing occupant comfort and productivity. They provide flexible control over the lighting in a space and support energy savings by reducing the amount of power or amount of time the lighting system is in use.

## ENERGY CODES AND STANDARDS

The nation's top three building energy codes and standards—California's Title 24, the International Energy Conservation Code (IECC) and ASHRAE 90.1—are used by nearly every state as the basis for their local building energy code. They provide the minimum acceptable energy performance requirements for new construction or major renovations of commercial buildings.

These codes/standards reflect the importance of using lighting controls to conserve energy. In fact, they all have similar mandatory lighting control requirements that designers and engineers must meet for their new construction and major renovation projects.

## FOCUS ON ASHRAE 90.1 2010

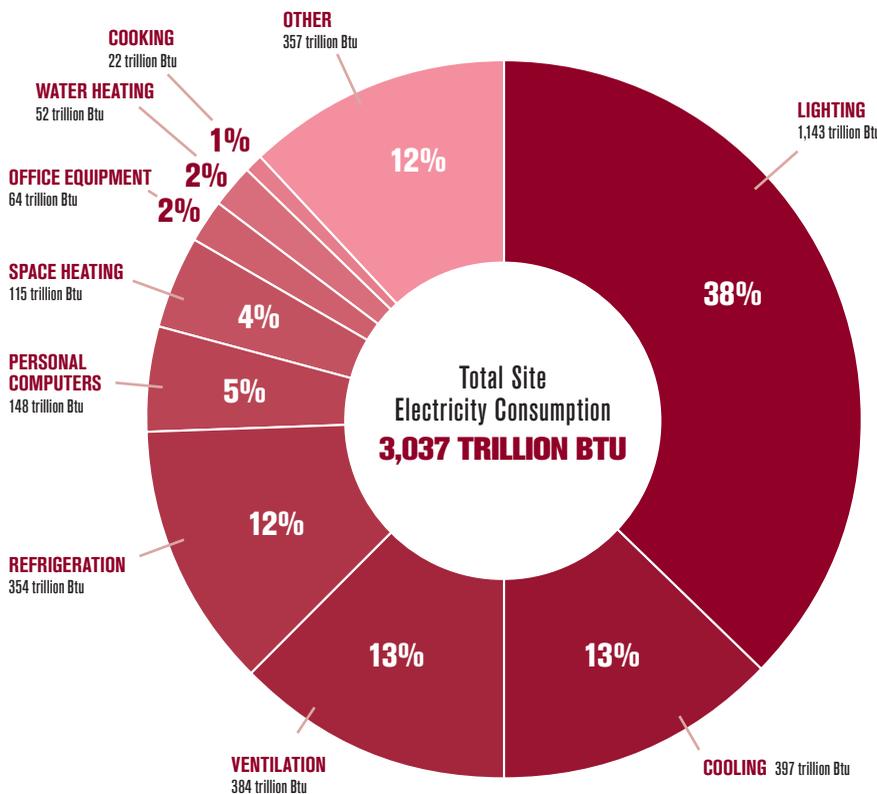
Sometimes referred to as America's primary commercial energy code, ASHRAE Standard 90.1 2010 was recently published in late 2010. The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) partners with the Illuminating Engineering Society (IES) to produce the 90.1 Standard, which provides the minimum requirements for the energy-efficient design of buildings, excluding low-rise residential buildings.

The following are some of the mandatory lighting control requirements contained in the new ASHRAE 90.1 2010 standard:

Occupancy sensor or timer switches that turn off lighting within 30 minutes of vacancy are required in the following spaces:

1. Classrooms and lecture halls
2. Conference, meeting and training rooms
3. Employee lunch and break rooms
4. Storage and supply rooms between 50 square feet and 1,000 square feet
5. Rooms used for document copying and printing
6. Office spaces up to 250 square feet
7. Restrooms
8. Dressing, locker and fitting rooms

## MORE SITE ELECTRICITY IS CONSUMED FOR LIGHTING THAN FOR ANY OTHER END USE.



Source: U.S. Dept. of Energy, Energy Information Administration, 2003 Commercial Building Energy Consumption Survey (CBECS), released in April 2009. <http://www.eia.doe.gov/emeu/cbecs/cbecs2003/lighting/lighting1.html>

### ■ Area control

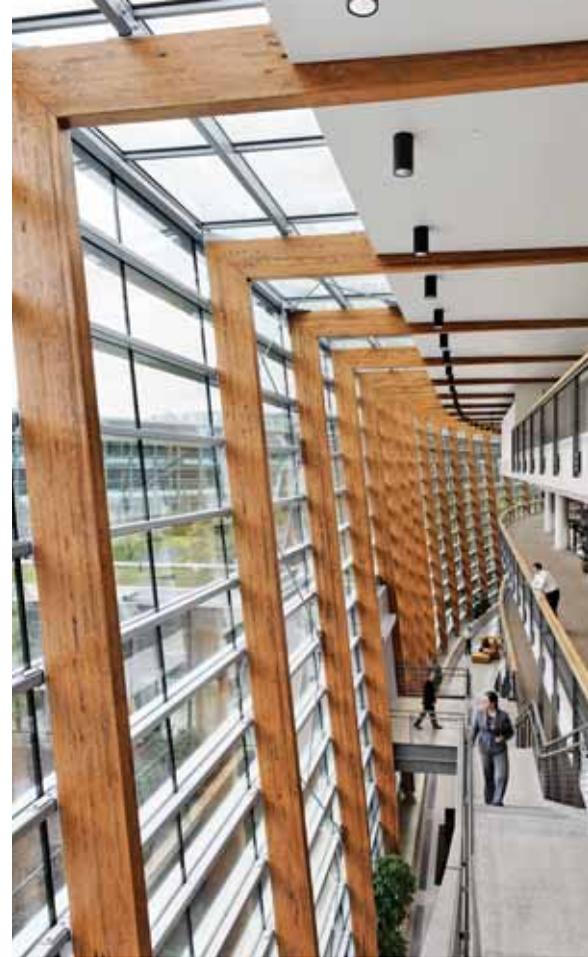
Each area enclosed by ceiling-height partitions must have an accessible, independent switching or control device (such as an occupancy sensor, manual switch or dimmer) to control the general lighting. Each control device shall be readily accessible and located so the occupants can see the controlled lighting and can only override the automatic lighting shutoff requirement by a maximum of two hours.

### ■ Automatic shutoff

All indoor lighting systems must include a separate automatic shutoff control such as an occupancy sensor or time switch. An astronomical time clock that provides a building lighting off sweep afterhours is a common way to comply with this requirement.

### ■ Daylight control

An automatic reduction in lighting power in areas where daylight can help illumi-



■ LEFT: The south-facing atrium at SAP Americas includes a brise soleil to reduce sunlight entry. RIGHT: Since lighting is by far the largest user of electricity in commercial buildings, including a combination of lighting controls and daylighting in a workspace limits energy consumption.

nate the space will be required in most areas that are side lighted (with windows) or top lighted (with skylights). Areas greater than 250 square feet for side-lighted areas or greater than 900 square feet for top-lighted areas shall have a multilevel photocontrol (including continuous dimming devices) for the general lighting.

### ■ Exterior lighting control

Permanently installed outdoor lighting must be controlled by a photocontrol or astronomical time switch that automatically turns off the lighting during daylight hours. In addition, the new standard also requires that façade and landscape lighting be turned off between midnight and 6 a.m. or in conjunction with business opening and closing times. Other outdoor lighting, such as advertising signage, must operate at 70 percent power (or lower) between midnight and 6 a.m. or in conjunction with business closing and opening times, or when no activity has been detected for 15 minutes.



■ **Manual-on control**

All automatic control devices shall not be set to automatically turn on the lighting. This effectively requires manual-on/automatic-off controls or up to 50 percent auto-on capability for automatic controls. These controls already exist and are referred to as “vacancy sensors” or “multilevel” occupancy sensors. Auto-on is allowed in some spaces, including public corridors and stairwells, restrooms, primary building entrance areas and lobbies, and areas where manual-on operation would endanger safety or security.

■ **Multilevel lighting control**

Most areas must provide at least one light level between 30 percent and 70 percent of full lighting power in addition to “off.” This can be done by continuous or stepped dimming, or stepped/dual switching of luminaires or lamps while maintaining a reasonably uniform level of illuminance throughout the area.

■ **Stairwell controls**

Lighting in enclosed stairwells shall have one or more control devices to automatically reduce lighting power by at least 50 percent within 30 minutes of all occupants leaving.

The preceding examples represent a portion of the new ASHRAE 90.1 regulations related to lighting control. Other items include automatic receptacle shutoff (to control task lighting and other plug loads), parking garage lighting control (lighting power is automatically reduced when daylight is present and/or during periods of vacancy), and functional testing requirements (to ensure that the lighting controls operate as intended). Last, there

are now extra lighting power credits for using additional lighting controls in a space above and beyond the mandatory controls for that space. The additional lighting power credit can be used anywhere in the building— not just in the space with the additional controls.

All in all, lighting controls are vital components for helping us meet the increasingly stringent energy code requirements; re-

quirements which help our nation meet its energy conservation goals in an energy-starved world. **SF**

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