Did you know that buildings account for 40 percent of the world’s energy use (‘EIA Annual Energy Outlook’ report, The Environmental Information Administration, 2008)? In fact, as the world becomes more serious about preserving natural resources, leading government and private agencies recognize the need to operate buildings more efficiently as a step toward confronting tomorrow’s energy crisis. For example, the United States Green Building Council (USGBC) is continually raising the requirements for building energy reduction in their sustainability rating systems. Likewise, the American Society of Heating, Refrigeration, and Air-Conditioning (ASHRAE) standards are becoming progressively more stringent.

Here’s another eye-opening fact: Of all the energy buildings consume annually, 40 percent goes toward lighting them (‘EIA Annual Energy Outlook’ report, The Environmental Information Administration, 2008). Even in dry, arid climates like Las Vegas, lighting surpasses even air conditioning as the number one energy cost. What’s the lesson? If you’re looking for the most obvious area in which to reduce your building’s energy costs, then consider retrofiting your building’s lighting. With this in mind, let’s look at four diverse, sensible approaches.

#1. Use More Natural Light

Natural lighting is the first and most obvious approach to reducing your light load. A design professional can perform a “daylighting analysis” of your building’s current condition of natural lighting. The results often reveal the surprising amount of natural light that already exists in a building. In fact, of the 20-50 foot candles that office environments usually require, a daylighting analysis can show that natural light can provide most if not all of the required light.

After a daylighting analysis, the design professional will be able to recommend ways to take better advantage of existing natural light sources. It is possible that an artificial lighting reduction could result in better light quality and less energy demand. Similarly, adding dimming ballasts and light harvesting sensors may reduce the use of artificial light when there is enough natural light to meet requirements. Motion occupancy sensors are another reduction strategy that can significantly reduce energy use when spaces are unused. Of course, you should make sure that natural light does not cause glare or high levels of direct light gain. In these cases, a designer can add shading devices to best control light or lighting shelves, which can direct light through the building as desired.

In the case of an existing building with insufficient natural day lighting, there are several products that can filter light through the roof to work surfaces without reducing the insulation value of the building envelope, or contributing significantly to heat gain. One example is a tubular daylighting device (TDD), which uses lenses and reflectors to move daylight into the space to the desired location. Another method of allowing light in from above is by using a high performance translucent building system. These systems are structural and allow light to flood into a space while restricting the heat gain associated with clear glass. In temperate climates, sun tracking skylights can be used to increase light and solar gain.

As with new construction, it is imperative to address building orientation of any additions or remodels during the design phase. A large portion of lighting requirements can be met by properly orienting the building or building addition to take advantage of sunlight.

How much of a difference can be achieved by retrofitting a building for natural light? Consider that duration or intensity reduction is a 1:1 energy savings. In other words, every hour that a lamp is not in use it equates to a 100% savings of that hour’s worth of energy. Likewise, a lamp dimmed 50% creates a 50% savings on an energy bill for that lamp.

#2. Use the New High-Tech, Low Watt Lamps

When designing for artificial lighting, it is vital to have your design professional analyze the type of lamps being used. An upgrade to energy-efficient fluorescent tubes can bring savings of 37% and an upgrade to LED lamps from halogen lamps can bring energy savings of 91% without losing any quality of
lighting. LED lamps also process a fraction of the heat that an incandescent lamp does, which has the added benefit of reducing cooling loads. Today’s LEDs boast 50,000 hour life which has a huge impact on maintenance requirements for replacement of expired bulbs as well as storage and replacement costs.

#3. Use “Intelligent” Lighting Control Systems

Today’s lighting control systems are intelligent systems which offer numerous options to reduce unnecessary light use. A good quality lighting control system can be based on desired light foot-candle intensity. From this baseline, the system will measure the natural lighting within the space and add artificial light as required. These systems allow each person to increase or decrease the level of light in their space. This creates an environment that allows occupants to use an amount of light that is comfortable for them individually but eliminates wasted electricity resulting from lights left on when not in use.

#4. Use Task Lighting

Another approach to lighting design involves providing individual task lighting for work surfaces. This allows for ambient ceiling lighting to be reduced or even eliminated. An added benefit is the individual controllability of light levels and direction, providing for additional occupant satisfaction. This system can be efficient, flexible, and comfortable.

The Benefits of Retrofitting Your Lighting – More Than Just Financial

There are many incentives available that can offset retrofit costs. The direct savings of these incentives combined with instant reduction in energy costs and the indirect reduction in operational replacement costs translate into a short return on investment. In addition to the tangible cost benefits of a lighting retrofit, studies have found that occupants are more productive and happier when introduced to natural and properly lit environments. There is also the intangible benefit of contributing to a greener planet and overall reduction of energy consumption. A lighting retrofit can improve the work environment, reduce your bottom line and provide your organization with an opportunity to market your commitment to the sustainability of the planet.

Craig Palacios is Project Manager for YWS Architects. He can be reached by calling (702) 243-5670 or email cpalacios@ywarchsitects.com.