

Greening Your Building and Your Bottom Line

Building design and construction practices that minimize environmental impacts and maximize energy savings are becoming commonplace today. In fact, some major developers—including many state and federal government agencies—are requiring their architects and contractors to adhere to standards developed especially to improve buildings' environmental performance.

What's new? Green design efforts are turning to the nation's 5 million existing buildings. In the process, designers and construction contractors are developing new options for owners who are interested in adding some green to their bottom lines.

Owners also are beginning to realize that today's rapidly rising energy prices are creating new incentives for investing in performance improvements. But making the most of any environmentally friendly upgrade requires a strategic approach.

Sure, a few kilowatt-hours can be saved by switching light bulbs or setting back the thermostat. But achieving real savings means one must first step back—to understand current operations and prioritize the changes that make the most sense for any given building.

Identifying efficiency options

Reining in energy use is a typical first target for owners hoping to boost their buildings' green quotient.

Buildings account for approximately 70% of all U.S. electricity consumption, the U.S. Department of Energy (DOE) reports. Reducing the amount of energy buildings use could help reduce the need for more power plants, and help cut emissions from those already operating.

For the building owner, the key is that savings from lower energy bills can help finance future improvements.

Establishing a baseline of current energy performance is a good first step for owners seeking to save by going green. An energy audit is a great way to get this baseline information and identify a list of the most cost-effective improvements.



How do you get this audit done?

1. Do a basic audit yourself. Walk around your building's interior walls, feel for drafts around windows, doorways and other wall penetrations; evaluate the efficiency of lighting and other equipment.

2. Hire a professional energy auditor. This is likely to provide more accurate and complete details. In addition to having a trained eye toward building design and energy use, a professional auditor also uses equipment designed to detect leaks in the building envelope.

Knowing where air is leaking into/out of your building is important; air infiltration is a big contributor to heating and cooling bills. Caulking around windows, adding weather stripping around doorways, and boosting insulation levels can help bring energy costs down.

Your electric utility can help point you toward qualified energy auditors in your area

Illuminating suggestions

Lighting is the next big area to consider when assessing your building's energy use and outlining potential energy-saving strategies. Lighting can account for 10% of building energy use, according to the DOE.

Looking at your light fixtures and bulbs is a sensible move in a larger efficiency upgrade. In addition to cutting illumination costs, this effort also can help reduce your cooling bills, since less-efficient lamps (and/or too many of them) produce more heat, which your air-conditioning system then has to remove.

Task and ambient lighting are the two most important lighting categories to look at. *Task lighting* includes fixtures that focus light downward toward a work surface; *ambient lighting* fixtures provide illumination for a larger space.

Most task and ambient fixtures in commercial buildings already use fluorescent lamps. If you have got desk lamps using standard incandescent lamps, for example, you can generate immediate savings by switching them over to compact fluorescent lamps (referenced as CFLs).

Simple math: A 13-Watt CFL produces as much light as a 60-Watt incandescent lamp, but draws 47 fewer watts to do so.

Ambient lighting options

Most commercial spaces get their ambient lighting via fluorescent tubes. Historically, T12-style tubes have been the standard lamp used in commercial fluorescent-lighting fixtures (or "luminaires" in professional terms).

Moving from these workhorse models to newer T8 or T5 high-output (T5HO) models can cut energy use in these

Opportunity To Save Energy— And Money

Periodically, the U.S. DOE performs a Commercial Building Energy Consumption Survey, otherwise known as CBECS. The most recent survey was conducted on calendar year 2003; before that, comparable data are available based on surveys for 1999 and 1995.

See the table to the right, which shows buildings in thousands. In other words, there are 2,261,000 buildings in the 1,001-5,000 sq. ft. category, of which 2,068,000 make use of standard fluorescent lighting.

Evidently, there is plenty of incandescent lighting still in use (as of 2003) in commercial buildings ...roughly half of them.

Beyond these data, CBECS provided information on renovations. The survey turned up 3,188,000 "lit buildings" still in use that were constructed before 1980 (303,000 of them dated to before 1920!). Of these, the survey reported, 444,000 had undergone a lighting renovation since 1980.

If the CBECS survey is accurate, simple math reveals that, as of 2003, 2.7 million commercial buildings built before 1980 were in dire need of a lighting retrofit.

applications significantly. Selecting either of these more efficient options will mean a further investment in the luminaire.

T8 lamps require a different ballast—the device that regulates current flow to the lamp—than that used by T12 lamps. Electronic ballasts available for T8 lamps are more efficient than standard magnetic ballasts.

What's more, *dimming ballasts* made for use with T8 lamps provide greater flexibility in brightness and energy use when the luminaires are connected to a lighting control system.

When you see a T5HO lamp, you'll notice that they are significantly more narrow than either T12 or T8 models. Obviously, they cannot be retrofitted into existing T12 luminaires.

About the T5HO

T5HO products offer advantages that could make a difference in a larger lighting-retrofit project.

- A two-lamp T5HO fixture produces as much light as a standard three-lamp T8 unit, so fewer luminaires and lamps will be required.

- T5HO lamps offer environmental benefits. Fewer toxic materials and less packaging are required to manufacture these smaller units. Their improved design means they require less mercury for optimal performance than do T8 lamps—so disposal is less hazardous.

- T5HO lamps also are a good replacement option for metal halide and other high-intensity discharge lamps typically used in industrial applications and commercial high-bay settings.

Thanks to their high light output, T5HO models work well mounted on high ceilings, and they produce significantly more light per watt than metal halide lamps.

T5 lamps also maintain lighting intensity better than metal-halide products. *What that means:* After one year of continuous operation, standard metal halide lamps only deliver 65% of their full light output, while T5HO products retain 95% of their output.

Lighting Equipment—Non-Mall Buildings, 2003

Thousands of Buildings – note that more than one lighting type may apply

Buildings By Square Footage	Lit Buildings	Incandescent	Standard Fluorescent	CFLs	HID	Halogen
1,001 to 5,000	2,261	1,070	2,068	382	101	205
5,001 to 10,000	821	418	772	148	88	107
10,001 to 25,000	716	412	665	189	106	123
25,001 to 50,000	231	145	223	102	60	55
50,001 to 100,000	126	75	123	60	51	37
100,001 to 200,000	63	43	62	36	3	25
201,000 to 500,000	24	17	24	16	13	10
500,000+	6	5	6	5	4	4
Total, U.S., 2003	4,248	2,184	3,943	941	455	565

Source: CBECS – www.eia.doe.gov/emeu/cbecs/contents.html (Table B43)

Abbreviations above: CFLs = compact fluorescent lamps; HID = high-intensity discharge lighting

T5HO lamps also may offer building owners improved dimming ability, to adjust light output to meet actual needs. Windows, glass doors, skylights, and light tubes all can bring free, natural light into a store or office—but electric bills won't decline if artificial light levels can't be adjusted, in turn.

Control issues

This leads to another effective energy-saving retrofit: Electronic controls.

Programmable lighting and temperature controls are becoming standard in new-building construction; some of these devices can be retrofitted into existing buildings. For example, programmable thermostats can replace manual models, so night-time temperature set-back becomes automatic.

Newer wireless products, which use radio frequencies or the building's electrical wiring system to communicate between sensors and controls, are coming onto the market. These devices provide new options for controlling lighting systems (based on occupancy or available light).

Some *occupancy sensors* simply screw into existing light sockets or replace existing low-voltage wall switches. This allows for inexpensive installation in existing structures. Such products can quickly pay for themselves in savings when installed in such infrequently used spaces as bathrooms and storage closets.

Photosensing controls, which can be more complicated to install and calibrate, allow you to take full advantage of nature's own ambient lighting source—sunlight. Based on daylight levels, photosensor-based control systems (connected to electronic ballasts) adjust artificial light levels up and down.

Correct photosensor placement is critical to this kind of “daylight harvesting” approach. There is skill involved here, to ensure the light levels the sensor detects accurately reflect work-surface conditions.

Other options for savings

Of course, going green means more than simply cutting your building's energy use. All your building's systems have an impact on the local—and global—environment.

Even your landscaping plans can make a difference in how your building performs. Planting a deciduous tree along a southern or western exposure will provide cooling shade in the summer, while allowing the sun's warming rays to penetrate your building when it loses its leaves in the winter.

With so many possibilities for improving your building's performance, there are options available for every budget and level of green enthusiasm.



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