

Designers, engineers need to work to comply with ever-changing codes

By Chris Larson and Jim Megerson

Lighting energy

consumption is a growing concern for retail store design. The adoption and enforcement of current model energy codes has made it more difficult for retailers to accomplish their illumination goals with the lighting solutions that they have traditionally used over the years. With the ever changing aspects of new energy codes comes a responsibility for lighting designers and engineers to remain well versed in the application of these codes and to work together to ensure the success of their clients, while preserving our environmental resources and protecting the interests of the public.

The increased emphasis on energy conservation and energy code enforcement is not surprising given the

increased costs for fossil fuels. Simply a quick look at current adoptions of the **International Energy Conservation Code** amplifies this point. For a current summary of jurisdiction adoption of the IECC, refer to www.iccsafe.org/government/index.html. Other states and cities have adopted modified versions of model energy codes or their own energy codes. The city of Chicago and several states such as Wisconsin, Washington and Oregon have their own requirements.

California has its own industry-leading Title 24 code. Many jurisdictions have moved to **ASHRAE 90.1-2001** with 2004 already having been published and its adoption pending. Various construction websites provide data regarding current energy code requirements by jurisdiction, with www.firstsourceonl.com

being one. Title 24 takes a big step Oct. 1, if released on schedule, with the 2005 version. You can download the new version online from www.energy.ca.gov/title24/. Clearly, energy codes are here to stay and will grow in importance.

We are confronted every day with new implementation or enforcement procedural issues regarding energy codes. A registered energy professional designation is required to submit drawings for permit in Chicago, and that designation requires an individual to attend a day-long training session in Chicago. A downloadable PDF list of registered energy professionals is posted at <http://egov.city-ofchicago>



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.org/webportal. Recently, the city of Dallas implemented a requirement that a third party review be performed on all energy code calculations submitted with plans for permit. The third party reviewer must be someone from their approved list. As time passes, many new procedures will be implemented by jurisdictions to manage this energy code enforcement process.

For the most part, energy codes define lighting based on how it is intended to be used and limits how many watts are allowed. Limitation can be based on floor area and/or display area. The total watts allowed for a sale floor area might be 2.1 watts per square foot, for example. There are also exempt lighting types, although what is or isn't exempt depends on the code with which your store must comply.

Regardless of the mandatory nature of compliance by code, there are compelling arguments for reducing store lighting energy consumption. For the most part, lighting reduction can be accomplished to meet the

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demands of current energy codes without compromising the quality of illumination and its ability to showcase the retailer's products. With an innovative and comprehensive design approach, a lighting solution can meet both energy codes and provide acceptable illumination. The requirements of lighting that suits the retailer's goals for illumination, and the lighting designer's resulting solutions, pit lighting designer against engineer, whose job it is to certify the compliance of the project with energy codes.

Prototype lighting schemes developed by lighting designers must recognize the requirements of model energy codes to permit fluid application in multiple locations without a complete redesign to meet these minimum standards. One recent example of a prototype design for a mall-based retail concept of approximately 6,500 square feet resulted in a calculated amount of well over 7,000 watts above the maximum wattage allowed by the most lenient of energy code interpretation.

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To put this into perspective, 7,000 watts of extra energy use is the equivalent of the energy used by a medium-sized home. When you multiply this times the many stores that are constructed annually, you can imagine how much energy could be wasted. If 10,000 stores were constructed in a year — say, the equivalent of perhaps 100 or so retailers — this energy would equate to that required to power a city of 20,000 people. Seven thousand watts of energy consumed over a typical store operating schedule equates to approximately 50,000 pounds of CO₂ production by coal fired power plants annually (CO₂ has been identified as one of the major contributors to global warming).

Beyond the socially responsible aspects of using less energy, there are other benefits to reducing a store's lighting wattage. Using less energy reduces energy charges, which in turn reduces operating cost and improves profitability. While the operating cost aspects of a store are usually a lower priority to construction personnel of most retailers than construction cost per store, it impacts the bottom line just as sure as shoplifting.

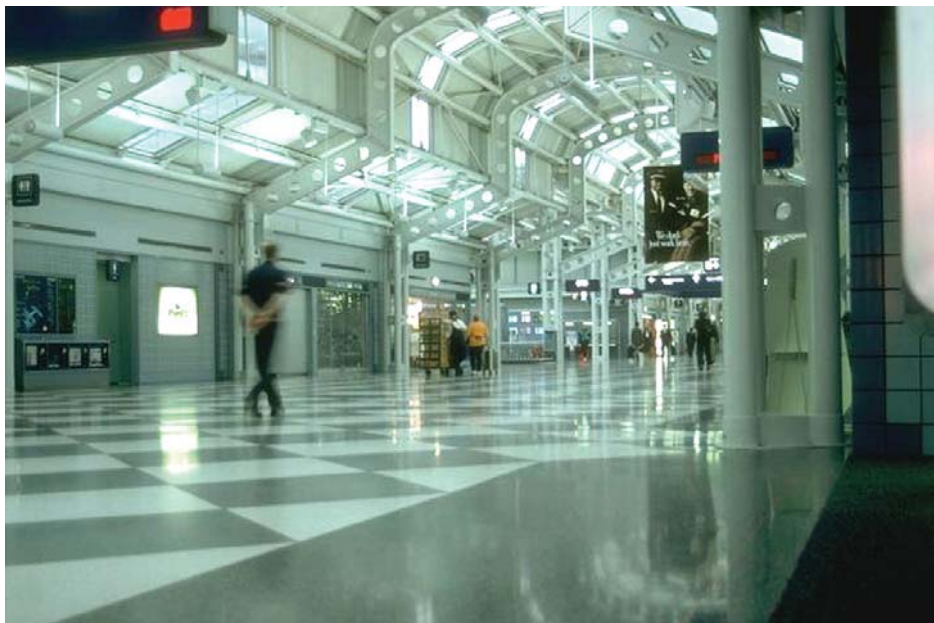
For those who look at first costs, reducing the lighting demand by only 3,500 watts, results in a reduction of one ton of cooling. Less cooling capacity is needed which means smaller cooling units, less ductwork, and potentially fewer diffusers to contend with. Reducing the lighting load also means potentially smaller electrical feeders to roof-mounted equipment when applicable. Reduction in lighting loads can result in smaller electrical panels and panel feeders. All this adds up to construction money saved.

Many retailers procure the services of lighting designers to create a design that is conducive to the display of their products and/or the ambience they want for the store. Not all lighting designers are familiar with energy codes or are required to seal lighting drawings submitted to code jurisdictions. Recently, we have seen a significant effort by lighting designers to justify their lighting schemes through creative interpretation of the energy code. While engineers are accused of black and white code interpretations, it is not appropri-

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ate to play ignorant or deceive code officials to make the lighting design for a store appear to pass the allowances.

The engineer of record, who seals the construction documents, has an ethical responsibility to enforce codes to what is considered reasonable. What can happen are major lighting reductions and compromise found through an argumentative process held between the lighting designers and engineers as each offer their respective interpretation of code requirements. This is



a process that affects the time spent during design and possibly the design schedule and may result in an unsatisfactory result.

A better alternative would be for lighting designers to create prototype lighting schemes that reasonably comply with the most prevalent codes while working with the engineer to confirm that the design is defensible. Where possible, a mock-up should be built to verify that the look is acceptable where lighting success is considered critical. Using this method, there is a chance to minimize the amount of lighting adjustments needed to conform to local amendments and ensure brand consistency. It will require that both the lighting designer and engineer understand energy codes and agree to unified defensible interpretations of the code as part of the prototype development process, whether they are from separate firms or not.

Lighting designers and engineers should be encouraged to be innovative and creative. Lighting technology is rapidly changing to meet newly enforced require-

ments with higher output lamps with better efficiencies. This innovation is being advanced due to the competitive nature of lighting fixture and lamp sales and the possibilities brought about by the need for energy efficiency.

There are lamps that are rated at 20 watts and have the ability to provide the same lumens as a 70-watt rated fixture, for example, where the color and focus of the lamp can be modified by changing a reflector in the fixture. There are products that limit light fixture track

wattage to provide the flexibility of track while still meeting code. The future of lighting will likely be changed significantly with the improvement of temperature-correctable LED lighting that uses little wattage, delivers similar light quality, and lasts a lot longer than current options.

With all this innovation it is prudent to look at any cure-all with caution. The retailer needs to gain a reasonable understanding of these code requirements and the pitfalls of new technology. While we have all grown to expect technology to overcome the obstacles that beset us, the solutions that are forthcoming for lighting and

lamp technology need to be viewed with a bit of caution. It is imperative that the lighting designer research the devices that they are proposing to use to insure that they indeed carry a UL listing and their application meets **National Electric Code**. While most manufacturers endeavor to follow these practices, the application of their products can raise safety or code-related issues.

Items that should be considered in your design:

Retail display lighting area, as defined in ASHRAE 90.1, does not include walkway or circulation space (regardless of the handbook example). This display lighting must be controlled separately from general lighting and must light the area of the display with directional lighting designed for this purpose. For Title 24, all new methods for calculating retail display are introduced.

Two different types of lighting purposes cannot be combined. In other words, general lighting cannot also be retail display lighting. They must be separately controlled and serve a separate purpose.

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Plug-in or portable lighting fixtures do not negate the need to include a reasonable allowance for their use in the lighting calculations, even if only their intended receptacles are shown.

Lighting fixtures mounted in or on store fixtures or cabinetry are not exempt from inclusion in lighting calculations. Currently, the vertical or horizontal area of the display, or summation of display shelf area, can be used in allowable display area calculations.

Track lighting has an allowance per code based on watts per foot of track, generally 30 watts per foot of track (soon to be 45 w/ft), not based on the number of track heads shown. Basic track should be avoided, minimized, or used only to its allowable amount as it will penalize the overall lighting concept.

The fixture socket rating will be used in energy calculations. If a 60-watt lamp is intended for use, do not specify a 250-watt rated fixture, since the maximum socket rating (250 watts) is required to be used in the energy calculations.

Signage and advertising lighting mean different things in ASHRAE 90.1 and Title 24, though they can pertain to the same lights. Check these allowances and exemptions for additional lighting headroom.

Wattage of heat produced by a ballasted fixture such as metal halide is not necessarily discernable. A 25-watt PAR38 metal halide fixture is ballasted and will put something on the magnitude of 40 watts of heat output and light to the space. When using ballasted fixtures, it is advisable to use the input amperage times the voltage (volt-amps) and express this as wattage for cooling load purposes. While a bit conservative, it is better than the alternative approximation.

Metal halide fixtures require UV filters to prevent product fading. With some fixtures that have been recently released, providing UV filters may be impossible due to the inability to enclose the fixture.

Metal halide fixture use is encouraged due to their efficient nature. Be aware that all metal halide fixtures have warnings that the lamps be replaced prior to failure to avert possible problems. The warnings do not seem like something that is currently managed by most retailers. Ballasts serving these fixture types need to be reviewed for safety features to minimize the risk exposure that these fixtures provide.

While there are many more lighting design pitfalls,

require your lighting designer and your engineer to work together to overcome them. Challenge them to provide you with innovative solutions to meet or exceed the energy codes where they are encountered. Recognize that the code writers are continually changing definitions and applications to close loopholes to make the code reach the intended goals of reduced energy consumption while still making it possible for your stores to exhibit your products. With each closed loophole comes additional redesign and compromise on behalf of your design team.

Finally, it should be recognized that the intent of the energy code is far reaching and goes beyond the desire to be competitive. It really benefits everyone to reduce energy consumption. With our ever increasing demand for energy comes a need for more power plants which consume fossil fuels and pollute the environment. While in retail stores the lighting effect desired can be easily found by using more watts, it

takes significantly greater consideration to make lighting effects energy efficient.

While it is probably every retailer's outward desire to meet or exceed energy codes, more often the inner philosophy is based on what maximum lighting allowance can be obtained that just passes the mathematical test. It will take a concerted effort to create spaces that perform better than the energy code allows for energy consumption given today's glitzy solutions in the competitive world of retail sales. The retailers who find solutions to provide the glitz with the least energy will be the real winners.

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