

Integrating electric light and daylight

controlling light.

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As a lighting designer, I find that daylight can be both a great resource and a cause of frustration. It is dynamic, high quality and free, but also a cause of thermal swings, a challenge to deliver to interior spaces and for half the day it is not available.

When I do an electric lighting plan I assume that the spaces need to function just as well after dark as they do on a July afternoon. The person who says; "I don't need to worry about lighting in the kitchen, I've got lots of skylights and windows" has forgotten that for six months of the year there isn't much daylight at 7:00 AM or 7:00 PM which are when many spaces are in use. Of course using daylight brings so many benefits to our living and working spaces that it should be used whenever possible. Following are some of the considerations that should be taken into account when integrating daylight and electric light.

Exterior Photocells

One of the most common applications where daylight & electric light interact is photocells. A photocell is a switch that is controlled by light. As the ambient light levels diminish, the photocell turns on the light it is connected to, which are usually entry lights or other exterior lights. There are pros and cons to the use of photocells. On the positive side the lights are on when you need them (after dark) but not on during the day (saving power). Also having the lights turn on even when you are not there can give the building an occupied appearance and help to deter crime. On the negative side the lights are on all night and perhaps long after there will be anyone needing them (3:00 AM). This condition can be mitigated in two ways. First a timer can be used in addition to the photocell to automatically turn off the lights at some preset time (~1:00 AM). Second, this is an excellent application for a compact fluorescent lamp (CFL). At 10 times the lamp life and about 1/4 the power, its convenient and energy efficient. I personally used a 9W CFL on my back porch that was on all night every night and it lasted over 3½ years. Be aware that

some photocells are not compatible with CFLs and they will usually say incandescent only on the packaging (*see sidebar*).

Interior Contrast

Another thing to be aware of with daylight integration is contrast ratios. This is the difference in brightness between the daylight and electric light. Daylight is much brighter than normal electric light levels. A brightly lit work area (kitchen or office) may have 75 FC (FC = footcandles are a quantity of light) on a counter while outside the home the illumination may be well into the thousands of FC. If you aren't near a window but have one in your field of view, your pupils will contract as though you have a bright light in your eyes making the surrounding area appear darker than it really is. The eye can adapt to a wide range of light levels, but it can only adapt one at a time. In one office that I tested (this could have been a kitchen or even a living room), I measured 80 FC on desk X by the window, but only 8 FC on desk Z just 12 ft away. The dynamic nature of daylight is such that at other times I have 300 FC on X but only 20 on Z. Direct sunlight on desk X is more than 2000 FC, necessitating the use of blinds. Skylights and other advanced daylighting techniques (light shelves, overhangs, and window treatments) can go a long way toward controlling this problem. One strategy that is used commercially incorporates photocells on interior lighting circuits to control lights that are near a window (the daylight zone) to switch them off when high levels of daylight are present.

These are some of the ways we can adapt to the dynamic nature of daylight while allowing us to maximize the use of a truly wonderful resource.

Check out www.lightingdesignlab.com for more information on integrating lighting and controls in the months ahead.

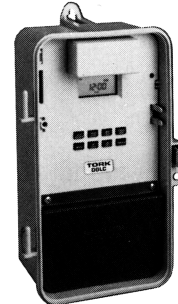


photo courtesy Tork Controls

above.

Timeclocks (l) and photocells (r) offer a terrific way to add both convenience and energy savings to outdoor lighting.

Photocells enable the system to run automatically, but only when the light from the sun is insufficient. Timeclocks turn the electric lights off later at night, when the likelihood of anyone being out to need the light is reduced. Combining these controls empowers building operators to provide safety, security, and nighttime presence while trimming energy use to the minimum.

Some residential-grade photocells and other controls are not compatible with compact fluorescents because they play around with the system voltage and can damage a fluorescent ballast. Make sure your controls are compatible with with fluorescents when you are integrating the system.