LEDs for Interior Church Lighting

Even the most traditional buildings have come under the influence of solid-state lighting. Here are four applications in churches where LEDs fit right it

BY VIGGO RAMBUSCH AND EDWIN RAMBUSCH

In the 134 years since Thomas Edison developed the first commercially viable incandescent electric lamp, all advances in lighting fixture design have been the result of improvements in lamp technology: carbon filament to incandescent, fluorescent to discharge, to halogen and now, LEDs. In most cases, these advances have caused a radical redesign of fixture construction and/or usage to accommodate the new sources.

The greatest gift LEDs give to church lighting is extraordinary lamp life, burning for a reported 50,000 hours, according to manufacturers' statements. This means that lamp life equals the lifespan of a church's renovation. Usually, a church renovates once each generation, or once every 20 to 30 years. Changes in taste, congregational changes, technology, and major events such as 25- and 50-year celebrations cause a rehabilitation of the interior. This relates to the average usage time for the church's interior illumination of between 1,500 and 2,000 hours a year—i.e., 20 to 30 hours a week—in the average house of worship.

Photo: Charles Uniatowski Photography

At the Sacred Heart Chapel at Neumann University, the flood/accent lighting for the rear wall, tabernacle and cross was mounted on the top of the side walls, 2 ft below the ceiling. LED strips integrated into uplights illuminate an arrangement of floating panels.

To analyze the application of LEDs to church interior design, let us break this subject into the four main components of church lighting:

1. Light for reading (task lighting). Over the last 25 years, most congregational reading light in the pews has been generated by ceramic metal halides and halogen baffled reflector downlights. In medium to high ceilings (i.e., 20- to 50-ft high), the use of 150-W CMH or 500-W halogen lamps has been typical, generating anywhere from 10 to 20 footcandles in the congregational area. The most powerful LED fixtures have a lower lumen output at present than CMH.

Possible solutions include:

A. An assemblage of units in a package as is so successfully being done in street lighting
B. A large increase in the number of fixtures
C. A significant drop in light level
D. Adjustments for color distortion

The problems with these solutions are various: The problem with Solution A is glare, which is very detrimental to the religious environment for a worshipping community. Solution B becomes very expensive, especially in the cost of installation as each unit involves its own driver for each engine. Solution C is not an issue for younger congregations, especially when there is a good daylight component, but it becomes very difficult for older congregants, whose vision will have begun to weaken. Regarding Solution D, although there have been many improvements in CRI and Kelvin, only the recent offering of tighter binned LEDs and phosphors make the illumination systems a consideration in color critical worship spaces where the liturgical calendar is reflected in a variety of vestment colors and decorations. Although there

At Christ Church in Short Hills, NJ, pendant lanterns are fitted with LED uplights and downlights.

is a slight reduction in efficiency with these higher CRIs, they are worth studying.

The more powerful LED sources, especially "hockey pucks," hold the solution to the need for sufficiently controlled baffled units. The writer was able to create such an arrangement for the student body at Sacred Heart Chapel, Neumann University, in Aston, PA.

2. Accent lighting (vertical surfaces). The existing system of incandescent and halogen lamps is also in the process of being replaced. Wybron has come out with the Cygnus PAR unit which has a tremendous amount of punch and also comes in variable beam widths which has made it very popular. Another feature of the Cygnus (and now more LED units) is that the color mixing happens behind the lens so you don't have the "fruit salad" effect of seeing all the different colors as they come on and off. However, they are more a floodlight (a wash) rather than a spot.

Several companies have started to come out with spot units (lekos) in LED and they are slowly becoming a viable option, not yet for front light, but for side light with a bit more control than PAR lamps. ETC has come up with a Source 4 LED version. There is a lot of work that still needs to be done to get them to compete with a standard Source 4 leko. But the technology is growing in leaps and bounds, and it will be just a matter of time before they can get a better optic situation with the reflectors to make it really functional.

3. Architectural lighting (ambient lighting). Here, there are no problems with the wonderful new LED strips which can be integrated into uplights in all sorts of interesting and creative ways. The writers were able to collaborate with the architect for the Neumann University Chapel to illuminate an architectural arrangement of floating panels against a midnight blue ceiling to create a luminous ceiling.

However, there is still a need to develop new uplight reflectors as LED manufacturers have yet to produce a 360-deg lineal source for asymmetric forward optical distribution fixtures.

4. Celebration lighting (chandeliers and sconces). Especially important for weddings, Christmas and Easter, the multiplication of

many small bright lights impacting the retina of a person's eye evokes a psychological uplift conducive to elation found in joyous occasions. The introduction of small LEDs into existing chandeliers or other multi-lamps decorative units can create this joyous uplift—similar to candle flames. The critical part of using such elements is to hide any strong light source from direct sight lines.

Also, we must review the possibility of using LEDs for pendant church lanterns. These cannot be allowed to get too bright as that will negate their function, which is not only to aid the congregation to see their hymnals, but more importantly to see the action in the leadership area, the sermon from the pulpit, the wedding, etc. Small reflector uplights can be tucked into the top of the lanterns for architectural lighting. A gentle glow for a decorative light can be installed in the center. If a downlight is placed in the bottom for the parishioners below to read, this will probably result in uneven lighting as in the 1920s and 1930s, i.e., 8 or 9 fc below the lantern and 3 or 4 fc between. In those days, the elderly learned to sit under the lanterns so they could read. The answer some tried was to lower the downlight component in the lanterns for better spread, but this created glare with all its problems. Another alternative was to raise the lantern higher, creating a maintenance problem. If the lantern goes high up near the ceiling, you have a downlight, and then you have gone full circle.

CONTROL SYSTEMS

One additional element to a successful architectural lighting system is the use of a dimming and control system. Although a wonderful element, it can become quite challenging when one adds retrofit LED elements to an existing dimming system. The challenge to doing so is the varied draws of power to and through the dimmer. ■

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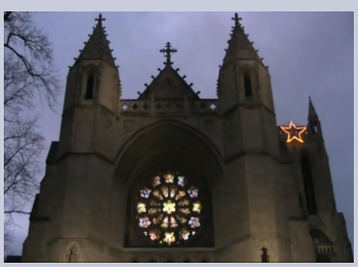
Lifting Their Spirits

Hoping to provide some comfort to hospital patients across the street but also satisfy the needs of worshipers inside, a church in Cleveland has installed an unusual lighting system for its 16-ft diameter rose window. The design had "to illuminate the window for nighttime viewing, yet still allow the daylight to come through the window during daytime hours," says consultant Lewis Sternberg.

Sternberg and Robert Halper of Halper Lighting Solutions devised the system for the Church of the Covenant. The system consists of a mechanical lift equipped with 16 white 5,000K LED panels (from Max-Lite) that rises at dusk to backlight the window for night viewing from outside. "By our calculations and the study done by me over 30 years ago, it would take 19 or 20 1,000-W metal halide [fixtures] to accomplish what 1,800 watts total of LEDs are doing now," says Sternberg, adding that the panels were also chosen for their color consistency, dimmability and ultra-thin profile.

A mechanical lift with LED panels rises inside a church so those outside can enjoy a nightly view of a rose window.

The entrance to the church and the rose window above the front door faces the University Hospital Seidman Cancer Center directly across the street. The mechanical lift inside the church raises and lowers the entire panel structure (800 pounds in total) over a two-minute cycle at dusk and dawn, respectively. Patients at the hospital can see the lighted stained glass window slowly emerge each evening and "view it all night long, as so many of them cannot sleep at night," says Sternberg.

During the day, after the lift has been lowered, the panels disappear, allowing sunlight to penetrate through the window—which has 5 to 8 percent transmission—allowing parishoners to gaze up on the rose window from the interior of the church.

—Paul Tarricone