How To Guide: LED Lighting and Control Infrastructure for Houses of Worship

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A few months ago, I received a phone call from my youngest brother, who is the worship pastor at a medium-sized church in western Pennsylvania. After catching up a bit about the family, he made the following statement: "So the church is planning a building renovation, and I was hoping you could give me a quick idea of what kind of lighting we need to install. We were thinking about going with LEDs." Since I am always up for a good lighting-based conversation, I took a deep breath and responded with what seemed to be 100 questions of my own to help me better understand his church's needs: What was currently in place in the way of power? Who would be operating the equipment? What was the proposed budget? How was this equipment going to be purchased or bid? Without trying to seem like the hardware store clerk that always wants to know what you're building when you've simply asked on which aisle the tenpenny nails can be located, I let my brother know that this was a very broad and loaded question—and that I hoped he had time for the lengthy discussion that was about to ensue.

Regardless of your role on your tech team, as member of senior leadership, or as an integrator, nothing is more important than having those long discussions as part of the planning process for building the technical infrastructure that will carry the facility into the future.

Infrastructure for Renovations

Planning a performance lighting, power, and control infrastructure for a worship facility should always be concurrent with performance lighting fixture selection. Gone are the days of designing a system with a large quantity of dimmers as a base, and then choosing the performance fixture package to go along with it. Today, power must play second fiddle to control data. If you are renovating a building, you could actually be in a win-win scenario. Chances are, your existing power supply is limited, and the use of a new, lower-consumption technology such as LED fixtures combined with the installation of DMX-controlled motorized breaker panels can take you a long way. Today's "data-based" lighting plots can often run well on what would have been considered inadequate power 10 years

ago. Year after year, brighter LEDs have come to market, and are now making use of technologies that allow for not only wash type fixtures, but also for hard-edged beam shaping in an LED performance profile fixture that wasn't before possible. Many of these new fixtures demand 10 or more DMX addresses or "channels" to accommodate control parameters (dimming, color changing, etc.). With a single universe of DMX having 512 channels, hang 50, 100, or more of these fixtures in your facility each requiring up to 10 DMX channels and you can begin to see the importance of control vs. power.

Of course, DMX does not just magically work on its own. Something needs to generate the DMX signal and tell it how to play nicely with the fixtures and devices out on the lighting playground. As a component of the performance lighting control infrastructure, choosing the right lighting console for a project is perhaps the single most important decision a design team can make. Think of the infrastructure as a rail yard: a network of interconnected tracks and switches. The lighting console in this analogy is the yard's rail coordinator, telling which DMX trains where to go, when to go, which track to take, and how many cars they are pulling. Without the proper console in place, some of these data trains may leave the yard with only partial loads, or may not be able to leave at all. Using the aforementioned 100-LED fixture model, at 10 channels of DMX per fixture, we have quickly maxed out a 1,000-channel output console and need to look to the next level of outputs available. If we start throwing even a handful of intelligent fixtures or moving lights into the mix (it is not atypical to need between 30-60 channels of control per intelligent fixture), the required channel count quickly rises. If you are not using a consultant or designer, I highly recommend scheduling console demos for each console you may be considering for purchase, and that your operator or volunteers attend a tradeshow such as WFX, USITT, PLASA, or LDI where many of the console manufacturers will have their wares on display and are more than willing to take you through the various feature sets.

Remember, for most venue construction projects—renovation or new construction—power consumption is going down and the control channel demand continues to rise. Be sure to plan for the future.

New Outlook for New Construction

For those who are planning new construction, you have the opportunity to think outside the traditional box. During the design of a lighting and control system, the design team will make choices that will ultimately affect the entire building and operations budget. Since the design of HVAC systems will, in large part, be dictated by the heat loads imposed on the building by proposed equipment, the heat generated by lighting fixtures and system components will play a major role. By using new energy-efficient technologies such as LED lighting, recent projects have realized significant downsizing of HVAC air-handling units and ductwork, allowing for less "wasted" space to accommodate mechanical elements in attics and walls. In turn, this can potentially reduce a building's overall volume, and can affect the sizing of structural components and the quantity of surface and finish materials—creating a snowball effect that impacts the overall construction budget.

Given that all new construction starts from scratch and there is no existing dimming or power to upgrade or replace, we have opportunities to design the lighting power and control infrastructure in entirely new ways. Borrowing from the world of industrial manufacturing, we are beginning to lay-out power in churches and theatres to utilize distributed busways and busplugs to feed per-formance power locations over the stage, in the wings, and in front-of-house lighting positions.

All LED Fixtures Are Not Created Equal

At the beginning of this article, my brother asked for advice on what type of lighting he should in-stall in his church's renovation project. He went on to let me know that the church was considering the purchase of "a bunch of smaller, RGB color-changing LEDs that

cost less than $300 per fixture." He also revealed to me that they were planning a new video/broadcast component in their services. After walking him through lighting control 101, we discussed LED degradation and life expectancy, use of color, control standards, dimming curves and issues with LED flicker. In recent years, some manufacturers—in their haste to bring inexpensive LED fixtures to market—have overlooked the importance of developing their products to dim in an appropriate manner. I have had conversations with a number of church technical directors who wanted so badly to jump on the LED color-changing bandwagon, that they purchased large quantities of these low-cost (and low-quality) LED fixtures without really understanding what they were committing to. In every instance, the story ended the same way: the fixtures flickered badly when dimmed, the video accentuated the flickering on camera, and the fixtures were quickly replaced with a smaller quantity of high-quality LED fixtures that bore none of these shortcomings. Perhaps the most unfortunate thing about these stories is the fact that these churches had already spent quite a bit of money on the inferior fixtures and now had to spend as much again to purchase fixtures that would actually work. In some cases, the budget was already completely exhausted, and the church was forced to go back to using outdated lighting methods and legacy equipment to achieve its color changing needs until new monies became available.

There are a number of quality LED fixture manufacturers in the industry, and in turn, there are a lot of inferior products out there. Make sure that you or your design team is making informed decisions regarding fixture choices before spending any funds. Do your research, ask for demonstrations, spend time at tradeshows, and take the time to discuss fixture choices and options with a design consultant who understands industry standards, trends, and technologies as they pertain to your project.

Control is the Key

I used to brag about the dimming systems in my projects. If I had eight dimmer racks in my venue and you only had five, I'd let you know it. At that time, dimmers equaled control.

Over the years, I've come to realize that it wasn't necessarily the quantity of dimmers that afforded me such confidence, but rather it was the amount of control flexibility those dimmers and associated circuits rep-resented. While debates continue about distributed circuits and centralized dimming vs. localized power, it's time to start realizing that perhaps these aren't the debates we should be having. Though some industry professionals may hold differing opinions, in many ways power is, simply put, just power. With the advent of LED lighting and other energy efficient options, it is the control infrastructure that is most important. Control is the key.